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THE EXTENT OF BIODIVERSITY AND SPECIES REPORTING BY THE TOP 75 COMPANIES LISTED ON THE LONDON STOCK EXCHANGE (LSE)

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In partial fulfilment of the requirements for the degree of Master of Commerce (Accounting)

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List of abbreviations and acronyms

Acronym / Abbreviation	Details
BAP	Biodiversity Action Plan
CDP	Carbon Disclosure Project
CSR	Corporate Social Responsibility
ESG	Environmental, Social and Governance
GRI	Global Reporting Initiative
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
JSE	Johannesburg Stock Exchange
LSE	London Stock Exchange
NGO	Non-Governmental Organisation
SSSI	Sites of Special Scientific Interest
TCFD	Task Force on Climate-Related Financial Disclosures
UK	United Kingdom
WEF	World Economic Forum
WWF	World Wildlife Fund

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Abstract

Corporate activities have significantly contributed to the accelerating decline of biological diversity on a global scale, having contributed to resource exploitation, industrialisation, land-use changes and deforestation in their associated operations. In recent years, the loss of habitats, ecosystems and threatened species has been brought to the attention of the public, mostly as a result of adverse events caused by these organisations in the conduct of their operations. The real impacts and consequences of biodiversity loss, has however, largely remained under-reported resulting in the need for organisations to adopt greater levels of corporate accountability and transparency within their biodiversity reports.

This study analyses the primary reports (i.e., annual reports) of the top 75 companies listed on the London Stock Exchange (LSE) across a three-year period (2018 – 2020). These reports are studied in order to assess the quality and quantity of the biodiversity and species extinction disclosures, with the purpose of identifying any trends and patterns across the three years. This research also assesses the possible determinants driving biodiversity disclosures.

A mixed method approach is utilised. The content in the primary reports is analysed and evaluated to identify biodiversity-related disclosures and categorises them according to the themes outlined in a detailed disclosure checklist developed using the existing professional and academic literature. Secondly, the quantum and quality of the biodiversity and species extinction related disclosures included in these reports will be determined using a standardised scoring system.

This paper finds that the biodiversity and species extinction disclosure among the LSE-listed companies has remained low in both quality and quantity. Although there is considerable improvement in the biodiversity disclosures year-on-year, the disclosures remain limited in substance, lacking sufficient detail over the biodiversity-related matters conveyed to key stakeholders.

This research provides insight into the environmental reporting practices of UK-listed companies and aims to identify the trends, patterns and weaknesses found within biodiversity reporting. This study expands on the limited volume of literature within the environmental accounting field, to ultimately aid the transformation in corporate reporting practices.

Keywords: Biodiversity, Species, Extinction, Corporate Reporting, Integrated Thinking

1. Introduction

1.1 Purpose and context of the study

Planet earth is entering a sixth period of mass extinction (Grabsch et al., 2012, Ceballos et al., 2017). Biodiversity loss and species extinction are directly affected by the exploitation of natural resources, mismanagement of land use, climate change, human-induced habitat changes, and nutrient overloading (Hassan et al., 2020). Mammal, bird, and fish populations have reduced by 68% as a result of humanity's expansion into wilderness areas (World Wide Fund [WWF], 2020). There is no evidence of the rate of biodiversity loss slowing down (Gaia and Jones, 2017, Liu et al., 2011).

Government and non-governmental organisations play an important role in biodiversity conservation by implementing policies and regulations with the objective of requiring businesses and consumers to reduce their impact on biodiversity loss and species extinction (Potdar et al., 2016). This idea is confirmed in prior literature which suggests that compliance with environmental regulation drives motivation and subsequently shapes positive action (Smith et al., 2020; Dempsey, 2013), but these efforts and actions alone are insufficient (Potdar et al., 2016).

Corporate entities play an increasingly important role in raising awareness, implementing positive change and confirming that biodiversity can be conserved on a commercial basis (Potdar et al., 2016). Prior literature, however, confirms that many businesses remain slow to advocate positive change required to protect against biodiversity loss and species extinction (Smith et al., 2020). This is despite the fact that the explicit relationship between the natural world and the business world can no longer be denied (Atkins and Atkins, 2019, Atkins et al., 2020).

Biodiversity loss is recognised as one of the World Economic Forum's top 5 global risks (Hassan et al., 2020) and is directly relevant to long-term corporate continuity (Adler et al., 2018). Companies must recognise that biodiversity, nature and ecosystems provide fundamental value to corporate activity and that it is imperative to integrate and report on biodiversity impacts as part of their risk assessments, governance systems and strategies (Hassan et al., 2020, Jones and Solomon, 2013). This normative position provides the basis for the current research which, using a comprehensive disclosure checklist, highlights gaps in corporate accountability relating to biodiversity and species extinction reporting, by examining the quality and quantity of these related disclosures included within the primary reports of companies listed on the London Stock Exchange.

1.2 Research questions

This research aims to evaluate both the quality and quantity of biodiversity- and species-related disclosures by the top 75 companies listed on the London Stock Exchange (LSE), by using a disclosure checklist. The first research question (RQ) is:

> **RQ1: What are the quality and quantity of biodiversity and species extinction disclosures among companies listed on the London Stock Exchange (LSE), based on the disclosures included in their annual reports from 2018 to 2020?**

Building on the first question, the second research question asks:

> **RQ2: What are the possible factors driving the quality and quantity (levels) of biodiversity and species extinction reporting?**

RQ2 is broken down into the following sub-questions:

> **RQ2.1: Do companies with higher Environmental, Social and Governance (ESG) performance ratings (as per S&P Global Sustainable1 Ratings[1]) have a higher level of biodiversity and species extinction disclosures than companies with a lower ESG performance rating?**
>
> **RQ2.2: Do companies with higher ESG risk ratings (as per Sustainalytics[2]) have a higher level of biodiversity and species extinction disclosures than companies with a lower ESG risk rating?**
>
> **RQ2.3: Does a company's industry affect the level of its biodiversity and species extinction disclosures?**
>
> **RQ2.4: Do companies with a biodiversity partnership[3] have a greater level of biodiversity and species extinction disclosure than companies without a biodiversity partnership?**
>
> **RQ2.5: Do larger companies have a higher level of biodiversity and species extinction disclosures than smaller companies?**

1.3 Contributions and significance of the study

Despite the exponential loss of biodiversity and increasing extinction in species, academic research on this topic is neglected (Jones and Solomon, 2013, Grabsch et al., 2012). This iterates the general lack

[1] The metrics utilised for ESG performance ratings are explained in greater detail within section 3.2: Table 1 – RQ2.1
[2] The metrics used for ESG risk ratings are explained in greater detail within section 3.2: Table 1 – RQ2.2
[3] The measure for biodiversity partnership existence is explained within section 3.2: Table 1 – RQ2.4

of awareness of and concern about the importance of biodiversity conservation (Gaia and Jones, 2017). Prior studies on corporate disclosure have placed minimal emphasis on biodiversity and species extinction (Hassan et al., 2022, Samkin et al., 2014b) with a limited number of studies having exclusively analysed the biodiversity reporting practises of corporate entities (Hassan et al., 2020, Van Liempd and Busch, 2013b).

Furthermore, previous studies have not been clear on how elements of biodiversity, ecological and extinction accounts are being applied and how organisations are engaging with, and reporting on, biodiversity-related issues in a practical, rather than theoretical, setting. The empirical work on biodiversity reporting prioritises developing economies and only some developed economies such as for example, Denmark (van Liempd and Busch, 2013a) and other global companies (Hassan et al., 2022). The UK specifically has not been focused on in detail. There have been some studies focused on the UK for example, (Grabsch et al., 2012), however , these studies are dated before 2010 and do not necessarily take into account the increased focus that biodiversity reporting has received in the last 5 years.

In certain instances, companies may intentionally minimise their biodiversity disclosures in an effort to minimise the risk of public scrutiny (Mansoor and Maroun, 2016), resulting in information which is often generic. In other instances, companies fail to provide adequate biodiversity disclosures as a result of limited guidance on how companies can integrate biodiversity matters into their risk assessments, business practices and reporting processes (Buchling and Maroun, 2023). This research contributes to the existing literature by tracking and analysing the evolution and changes in how listed companies in the UK report their dependencies on the ecosystems and natural capital, as well as their impacts and risks relating to the species affected directly and indirectly by their operations, over a 3-year period. The UK, as a developed economy with a well-established and technically advanced assurance market, is a fitting jurisdiction in which to conduct environmental research as it provides an excellent setting and context for the examination of expanded integrated/ESG reporting requirements.

This research contributes to the existing literature on biodiversity and species extinction reporting, as it measures the quality of biodiversity disclosures for the top 75 LSE companies by adopting an 81-item disclosure list developed by da Mata and Maroun (2021) built on both the guidelines suggested by Global Reporting Initiative (GRI) as well as taking into account a multitude of adaptions and considerations identified in prior literature identified as necessary to include but which have not been previously emphasised in any widely accepted external frameworks (such as the GRI).

This research aims to identify trends, patterns and gaps in corporate disclosures relating to biodiversity loss and species extinction, which may be of particular interest to academics, regulators and non-profit

organisations, stimulating social awareness for biodiversity and species conservation and ultimately driving substantive action (Maroun and Atkins, 2021).

Social consciousness of biodiversity has been heightened by the lasting impacts of the Covid-19 pandemic together with the fact that recent studies suggesting that zoonoses may have been a result of biodiversity and ecosystem loss (Hassan et al., 2022, Atkins et al., 2020). Biodiversity consideration forms an integral part in the recovery of businesses from the Covid-19 pandemic and must be integrated within the business risks, governance policies, strategies, and reporting of these entities going forward (Hassan et al., 2022). This research takes the opportunity to compare the biodiversity and species extinction disclosures from a pre- and post-pandemic perspective, as a result of using the 2018-2020 period of analysis.

1.4 Limitations and delimitations of the study

- Firstly, this research only selects and analyses biodiversity and extinction information in an Annual Report or Integrated Report of the sampled companies. It excludes any information arising from press releases, websites, magazines, advertisements social media, or news announcements. The focus is on corporate primary reports because these are widely recognised as the most important document used to convey the social imagery of an organisation (Bason and Anagnostopoulos, 2015). In addition, the focus on only primary reports avoids the risk of incorporating into the analysis content which has not been prepared by the respective organisation and/or subject to its systems of internal control and governance.

  The use of primary reports limits the number of documents analysed and allows for the data extracted to maintain a favourable level of consistency and comparability (Bason and Anagnostopoulos, 2015). It is, however, understood that the exclusive focus on primary reports may result in an incomplete picture of a company's disclosure practices.
- Secondly, only companies listed on the London Stock Exchange are studied as they are required to prepare an annual financial report (London Stock Exchange [LSE], 2022). Non-listed companies are inherently difficult to assess for the quantity and quality of biodiversity and species extinction reporting as they are not obligated to prepare annual reports, giving rise to the importance of setting this limitation. South African companies are not being analysed because these have been considered by earlier researchers (Mata and Maroun, 2021, Usher and Maroun, 2018). This research evaluates the biodiversity and species extinction disclosures of a single jurisdiction. Cross-Jurisdictional comparisons of corporate biodiversity reporting may be deferred for future research.

- Thirdly, the scope of this research is limited to London companies as a means of controlling the differences in the cultural, economic and regulatory environments of the companies and the impacts these factors have on the levels of biodiversity and species extinction reporting.
- Please note that this study focuses on biodiversity specifically, which does, in some instances differ from environmental considerations in totality. Put differently, environmental considerations can include a broader spectrum of issues. This thesis focuses specifically on biodiversity-related disclosures as a subset of environmental disclosures. The reason for this is that regulators, standard-setters, and institutional investors are interested in the current state of biodiversity reporting, specifically by a member of the G7 (UK) because the global community is paying increased attention to extra-financial disclosure. The focus is also particularly on biodiversity-related issues, including risks from biodiversity loss, which contribute to the broader ESG narrative. Doing so provides an important contribution as world's most prominent organisations are paying more attention to issues such a climate change, habitat loss and the state of ecosystems.

2. A Review of prior literature

This research adopts the biodiversity definition developed by the Global Reporting Initiative (2007):

> "The variability among living organisms from all sources including among other things, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part, this includes diversity within species, between species and of ecosystems." (Grabsch, 2012, p. 4)

The next section will assess the most prominent and widely accepted reporting frameworks for biodiversity reporting, as well as how the guidelines and criteria within each of these frameworks are used to develop the biodiversity checklist used within this study.

2.1. Current reporting frameworks

Currently, there is no universally accepted framework for reporting on biodiversity and species extinction (Mansoor and Maroun, 2016). Organisations need to consider how different species impact their organisation, including a broader assessment of how species may impact the value and supply chain across the organisation's capitals. Several different bodies have developed their own respective frameworks as a means of providing guidance on biodiversity reporting. The more prominent and widely recognised frameworks include the United Nations Sustainable Development Goal (SDGs), the Integrated Reporting Framework (IR), the CDP (Formerly known as the Carbon Disclosure Project), the Global Reporting Initiative (GRI) and the Convention on Biological Diversity (CBD) (refer to Appendix B for further information on the relevant biodiversity related frameworks used within this study).

The United Nations established the 17 Sustainable Development Goals with the aim to promote people, planet prosperity, peace and partnerships on a global scale (Krauss, 2022). In the attempt to minimise and reverse the global impacts of biodiversity loss and species extinction, the closest link to terrestrial biodiversity conservation is evident in SDG 15 titled 'Life on Land' (Krauss, 2022). This SDG is further broken down and divided into twelve targets reflected as recommendations for the protection of terrestrial ecosystems and biodiversity sites (Krauss, 2022).

Each of the above frameworks can be used to construct a disclosure checklist which captures different "elements" of biodiversity. The development of this checklist is discussed in more detail in Section 3.2.

2.2. Theoretical frameworks and derivation of the research questions

To date, the volume of research done on the biodiversity reporting practises of companies is limited. (Gaia and Jones, 2017). Although there is evidence in which the academic interest in biodiversity is slowly starting to gain momentum (Liu et al., 2011), biodiversity and its related human implications, go virtually unreported in corporate reports and is effectively invisible when considering the practises and actions from the decisions made by businesses (Raar et al., 2019).

A number of recent studies are paving the way for a biodiversity-based research movement, mostly using some form of content analysis. Hassan et al. (2022) investigated the range of biodiversity disclosures among the top 200 companies from the Fortune Global 500 list. The researchers found that the biodiversity-related disclosures were "minimalist and generic, containing vague statements and lacking consistency across the entire set of disclosure items" (Hassan et al., 2022, p. 10). Similar findings are reported by van Liempd and Busch (2013a) study on the extent of biodiversity disclosures on Danish companies from both a qualitative and quantitative perspective of analysis. The findings reflect that the related biodiversity disclosures are poor. The same is true for studies performed on South African listed companies within the food, mining and seafood industry (Mansoor and Maroun, 2016, Usher and Maroun, 2018, Maroun et al., 2018), irrespective of the fact that the country tends to boast one of the most developed codes on corporate governance.

While the above research provides important insights, it predates important developments designed to bolster awareness of biodiversity. The UN has brought global attention to the risks of biodiversity loss and species extinction by declaring the period 2011 - 2022 as the 'Decade on Biodiversity' in addition to calling upon all its member nations to join the fight against biodiversity loss and species extinction through Resolution 65/161 (Raar et al., 2019).

This is especially the case in the United Kingdom, where increasing population density was identified as a primary contributor of 35% of scarce plant species extinctions (Hardman, 2011). In response, the UK has adopted a reactive approach, by implementing and introducing several conservation frameworks (i.e., Birds and Habitats Directives 1979 and 1992, Wildlife and Countryside Act 1981, Convention on Biological Diversity 1992) in the pursuit of enhancing biodiversity conservation and awareness (O'Connell and Yallop, 2002).

Stakeholder Theory

Stakeholders have given an increasing level of effort and attention to projects, plans and activities with the underlying goal of reversing biodiversity loss and mitigating species extinction (Adler et al., 2018). Stakeholders, as a result, expect businesses to play their part and to contribute to biodiversity protection and conservation activities (Adler et al., 2018), UK-listed companies may, therefore, utilise their

biodiversity and species extinction reporting as a communitarian accountability tool aimed at raising awareness of biodiversity's importance, as well as the entities' risks, dependence and impacts on the biodiversity involved in its operations (Gaia and Jones, 2017).

Numerous studies have focused on investigating the quality of biodiversity disclosures reported by corporate entities based within the UK. Research performed by Grabsch et al. (2012) examined the biodiversity-related information disclosed by companies in both the UK and Germany. The findings show that although the UK companies report significantly more on biodiversity than do their German counterparts, the reporting of financial data related to biodiversity conservation and progress is still lacking (Grabsch et al., 2012). Biodiversity-related reporting also appears to be 'partial and biased' (Grabsch et al., 2012, p. 17). Where these narratives do exist, they are usually dominated by an anthropocentric approach to biodiversity reporting (Gaia and Jones, 2017).

Impression Management

For businesses, an anthropocentric approach facilitates impression management in which entities select their best practices for biodiversity conservation (Grabsch et al., 2012) as a means of self-justification rather than as a reflection of meaningful, ongoing change (Boiral, 2016). Hassan et al. (2022) reveals strong evidence supporting impression management and more specifically, green-washing theory as their study finds that a positive relationship exists between companies from high-risk sectors and developing countries and their level of biodiversity disclosures. Hassan et al. (2020) suggest that these companies are in more need of employing defensive impression management strategies.

A study done by Dempsey (2013) identifies several biodiversity-related business risks (such as regulatory, reputational, operational and financial risks) as drivers of corporate entities to act on biodiversity conservation and change. However, other studies suggest that corporate reporting on biodiversity and species extinction is dominated by impression management. Although the identified level of biodiversity disclosures varies among studies for companies in developing countries and high-risk sectors, the reasoning or motivation under all instances of high and low levels of biodiversity-related disclosures are still supported by impression management and greenwashing.

Research conducted by Hassan et al. (2020) suggests that among the companies in the top 200 fortune global, the motivation for protecting, preserving and disclosing biodiversity and species extinction exists only when it is aligned with their own self-interest or when there is some benefit to them. For most companies, the execution and implementation of biodiversity reporting is an opportunity to "indulge in impression management" (Hassan et al., 2020, p. 12).

Consistent results are found in Boiral (2016) which examines the sustainability reports for a sample of companies extracted from the GRI database. The findings confirmed that in the absence of transparent

and comparable accounts regarding biodiversity issues, disclosures primarily focused on the objective of positively influencing the impression of stakeholders, rather than holding themselves accountable by the release of positive and negative information with the underlying intention of improving corporate transparency.

Derivation of the research questions

Over the last ten years, corporate entities have placed an ever-greater emphasis on ESG principles (Arun et al., 2021, Mousa et al., 2021). Utilising stakeholder theory, entities may aim to increase their transparency with regards to biodiversity matters in order to enhance their corporate accountability to various stakeholders (Masiero et al., 2019). This research paper aims to provide an updated investigation into the biodiversity-related corporate disclosure practises of UK companies as the last study was conducted by (Grabsch et al., 2012).

The Covid-19 pandemic may have emerged from wildlife reservoirs linked to environmental disruption, transmitted to humans via the wildlife trade, ultimately highlighting the damage and loss to biodiversity and species (McNeely, 2021, Atkins et al., 2022). The pandemic period has highlighted the importance of adopting ESG principles to minimise the threats of human activities, as well as shifting the business agenda, to facilitate a wider stakeholder approach, through a set of purpose-driven plans and actions (Mousa et al., 2021). This research, conducted pre-, during and post-Covid-19 (years 2018, 2019 and 2020), allows for an effective evaluation of corporate reporting practices in response to mitigating the biodiversity and species extinction-related risks from the Covid-19 pandemic. In this context, the first primary research question is:

> **RQ1: What are the quality and quantity of biodiversity and species extinction disclosures among companies listed on the London Stock Exchange (LSE), based on the disclosures included in their annual reports from 2018 to 2020?**

As biodiversity loss and species extinction continues to climb at an alarming rate and the adverse impacts on air, water purification, soil health, and climate change become clear (Convention on Biological Diversity [CBD], 2022), concerns arise about the existence of the human race (Gaia and Jones, 2017). A growing number of stakeholders have become increasingly invested in biodiversity and species extinction conservation and awareness. They want to understand organisations' impact and dependence on biodiversity and the steps being taken at the corporate level to contribute to long-term sustainable development, including biodiversity conservation (Jones and Solomon, 2013).

Li et al. (2018), for example, finds a positive relationship between ESG disclosure and firm value, suggesting that improved transparency and accountability by companies on their environmental matters, enhance stakeholders' confidence and, in turn, firm value measured in monetary terms. Companies are

not only reliant on serving the interests of their shareholders to achieve successfully their intended objectives; their focus needs to shift to serving a wider body of stakeholders who have a vested interest in the social and environmental performance of the company (de Silva Lokuwaduge and de Silva, 2020). In other words, accountability for extra-financial performance (which includes biodiversity-related matters) is relevant for maximising financial values and must be managed holistically by organisations and reported transparently to shareholders and non-shareholding stakeholders (Rodgers et al., 2013, Jones and Solomon, 2013).

Where biodiversity and species extinction reporting is poor, this may necessitate an investigation into the factors driving the effective disclosure of corporate responsibility over biodiversity and species extinction, with the objective of meeting the information needs of material stakeholders (Atkins and Maroun, 2018a, Maroun and Atkins, 2018). Stakeholder theory may be used to examine how effective biodiversity and species extinction reporting is as a means of communicating a company's biodiversity accountability to its material stakeholders (Gaia and Jones, 2017).

Linked closely to examining the quality and quantity of disclosures is considering possible determinants of biodiversity reporting hence RQ2:

> **RQ2: What are the possible factors driving the quality and quantity (levels) of biodiversity and species extinction disclosures?**

Studies conducted by Dawkins and Fraas (2011) find a negative association between environmental performance and environmental disclosures by companies. Mahoney et al. (2013) suggest that companies which are perceived to be poor environmental performers may choose to apply modes of 'greenwashing' by emphasizing their positive environmental actions, while failing to disclose their negative environmental performance in the pursuit of maintaining their endorsement in society. Greenwashing also suggests that poorly performing companies in relation to their environmental activities may also obtain a substantially greater benefit from manipulating stakeholders' perceptions of the company's environmental performance (Hassan et al., 2020). Contradictory results are found by Clarkson et al. (2008) and Lu and Taylor (2018) which show a positive relationship between environmental performance and environmental disclosure. This gives rise to the first sub-question linked to RQ2:

> **RQ2.1: Do companies with higher Environmental, Social and Governance (ESG) performance ratings (as per S&P Global Sustainable1 Ratings[4]) have a higher level of**

[4] The metrics utilised for ESG performance ratings are explained in greater detail within section 3.2: Table 1 – RQ2.1

biodiversity and species extinction disclosures than do companies with lower ESG performance ratings?

Stakeholder theory predicts a negative association between environmental performance and the level of discretionary disclosures and, ultimately, suggests that environmental disclosure is a function of 'social and political pressures' (Clarkson et al., 2008). Where an entity is perceived to have a high environmental risk, it (1) tends to be subject to a greater level of environmental regulation and legal requirements (Hassan et al., 2020) and (2) tends to face a greater level of social pressure, resulting in a threat to its legitimacy (Clarkson et al., 2008). In response, the entity will attempt to increase discretionary environmental disclosures to persuade stakeholders' perceptions about its performance (Hassan et al., 2020, Clarkson et al., 2008). This gives rise to the sub-research question:

RQ2.2: Do companies with higher ESG risk ratings (as per Sustainalytics[5]) have a higher level of biodiversity and species extinction disclosures than companies with lower ESG Risk ratings?

This anticipated negative association between environmental risk and the level of environmental disclosures may also be identified on a sector level. García-Ayuso and Larrinaga (2003) suggests that the greater the level of attention and exposure of an industry, as a result of its higher environmental sensitivity, the greater the incentives for companies within that industry to make environmental disclosures (García-Ayuso and Larrinaga, 2003, Hassan et al., 2020). An industry's environmental sensitivity is primarily driven by the 'potential' and or 'actual' impact companies within that industry have on the ecosystems, habitats and environments around them (García-Ayuso and Larrinaga, 2003). Empirical studies performed by (Hackston and Milne, 1996, García-Ayuso and Larrinaga, 2003, da Silva Monteiro and Aibar-Guzmán, 2010) confirm the negative association among high-risk industries (i.e., High profile industries and environmentally sensitive industries, because of greater environmental pressure from stakeholders), with the level of corporate environmental disclosure. This gives rise to another sub-research question:

RQ2.3: Does a company's industry affect the level of its biodiversity and species extinction disclosures?

Effective collaboration with stakeholders may result in benefits extending beyond that of effective communication. It may also enhance social legitimacy, avoid conflicts with populations surrounding business operations and facilitate the sharing of biodiversity-related knowledge (Boiral and Heras-

[5] The metrics used for ESG risk ratings are explained in greater detail within section 3.2: Table 1 – RQ2.2

Saizarbitoria, 2017). While there is no legal or regulatory obligation for companies to report their biodiversity and species extinction monitoring, impacts and dependencies, the disclosure of such information is crucial for the effective discharge of their accountability (Schneider et al., 2014, Jones and Solomon, 2013). The empirics support the link between stakeholder theory, biodiversity, and accountability.

Stakeholder engagement is recognised as a means of reinforcing a company's credibility and its support for biodiversity projects and initiatives (Boiral and Heras-Saizarbitoria, 2017). This concept is reinforced under legitimacy theory which suggests that collaborative efforts, joint projects, associations, and partnerships formed in the pursuit of biodiversity conservation and awareness, gives companies additional actions to disclose upon, simultaneously allowing an entity's compliance with environmental laws and regulations (Hassan et al., 2020). Biodiversity partnerships may also be utilised and leveraged for strategic and commercial benefits (Boiral and Heras-Saizarbitoria, 2017). Adler et al. (2018) identifies instances where entities disclose their partnerships with Conservation International with the intention of leveraging this relationship to secure their operating licenses. Prior studies conducted (Adler et al., 2018, Hassan et al., 2020) find a positive significant relationship between the presence of a biodiversity partner and the level of biodiversity-related disclosures. This gives rise to:

RQ2.4: Do companies with a biodiversity partnership[6] have a greater level of biodiversity and species extinction disclosure than companies without a biodiversity partnership?

Legitimacy theory predicts a positive association between a company's size and the level of environmental disclosures. This is possibly because of the fact that larger companies are perceived to carry a greater level of environmental risks from the perspective of their stakeholders, therefore, attracting more scrutiny and public attention (Bhattacharyya and Yang, 2019, García-Ayuso and Larrinaga, 2003). In response, companies may use biodiversity disclosures as a means of communicating their biodiversity activities and action plans to gain, maintain or enhance their legitimacy (Bhattacharyya and Yang, 2019). Prior studies conducted find an insignificant relationship between company size and the level of biodiversity and species extinction disclosures (Hassan et al., 2020, García-Ayuso and Larrinaga, 2003). Studies performed by Bhattacharyya and Yang (2019) find no association between company size and biodiversity disclosures. So this prompts the inclusion of the sub-question:

RQ2.5: Do larger companies have a higher level of biodiversity and species extinction disclosures than smaller companies?

[6] The measure for biodiversity partnership existence is explained within section 3.2: Table 1 – RQ2.4

3. Methodology

A mixed method approach is utilised as this employs both a qualitative and quantitative approach simultaneously to create a research outcome stronger than either method achieves individually (Malina et al., 2011).

Firstly, the content in the primary reports is analysed and evaluated to identify biodiversity-related disclosures and categorise them according to the themes outlined in a detailed disclosure checklist developed using the existing professional and academic literature (see Section 3.2). Secondly, the quantity and quality of the biodiversity and species extinction-related disclosures included in these reports are determined using a standardised scoring system adapted from (Hassan et al., 2020, Adler et al., 2018, Hooks and van Staden, 2011). The quantity and quality scores are used to generate descriptive statistics and graphical plots to support an analysis of the quality and quantity of biodiversity reporting among LSE-listed firms. Possible determinants of the quality and quantity of biodiversity reporting are tested using non-parametric tests (detailed in Section 3.2).

3.1. Sample

In order to investigate the extent of biodiversity reporting disclosures among the top 75 companies listed on the LSE, the primary reports (annual report or integrated report) for 2018, 2019 and 2020 are selected and analysed for the biodiversity and fauna/flora species-extinction related disclosures. During the period 2018 – 2020, there have been few regulatory changes and this may specifically impact the nature of biodiversity and species extinction disclosures. The 2021 primary reports are not selected and analysed as at the current time, several companies within the sample have not released their primary reports.

A sample of 75 companies were be selected for this research. The sample constitutes the 75 largest companies by market capitalisation (as at 31/03/2022) on the London Stock Exchange (LSE)[7]. The selection is based on the fact that the UK has historically been a leading nation in the pursuit of effective sustainability reporting, with specific emphasis placed on the UK's largest companies (Miles and Ringham, 2019). This is shown by the country's early mandate of environmental disclosures within the reports of the jurisdictions listed-companies (implemented within the UK Companies Act 2006 – Regulation 2013).

Across 35 countries, the UK is one of sixteen countries to have mandated environmental and social disclosures through local legislation and/or stock-exchange listing requirements (Krueger et al., 2021).

[7] Please note the population for this study is all listed entities on the LSE and the sample is then selected as the top 75 companies.

The mandatory alignment of the ESG disclosures produced by Britain's largest businesses to the guidelines of the TCFD (the UK is the first G20 member to implement these laws, effective from April 2022), highlights the country's ability to manage its biodiversity loss and species extinction risks proactively, through the promulgation of ESG-driven legislation.

The largest listed companies are included in this study. This controls for the possibility that a lack of resources or technical expertise or a lack of financial analysts following will impact the report quality (Malola and Maroun, 2019). If the report quality is impacted, this adversely affects the organisations' ability to disclose biodiversity-related information. The largest listed companies are more likely to have the resources and controls (Stubbs and Higgins, 2014) to gather the data necessary to implement integrated biodiversity disclosures. The sophisticated reporting environment can be leveraged to disclose the biodiversity impacts to stakeholders (Stubbs and Higgins, 2014).

These large organisations also gain most attention from the wider group of stakeholders and are more likely to disclose their dependencies and impact on biodiversity and species extinction (Hassan et al., 2022). The sample consists of companies from 34 different industries (Refer to Appendix C for additional information.

3.2. Method: data collection and analysis

Data are collected and analysed in two phases. Phase 1 entails a qualitative content analysis to identify and classify biodiversity disclosures. Phase 2 is concerned with quantifying the range and quality of the biodiversity disclosure. Each phase is discussed below.

Phase 1: Qualitative content analysis: identification and coding of disclosures (RQ1)

Disclosure checklist

The research uses the "Biodiversity and Species Extinction Disclosure Framework" developed by da Mata and Maroun (2021). This framework incorporates elements and themes originally developed by Grabsch et al. (2012) and was adapted later using categories and elements grounded in prior literature (da Mata and Maroun, 2021). The framework offers the most comprehensive disclosure checklist to capture, not only the quality of biodiversity-relevant data but also relevant data related to species extinction disclosures. The framework is organised according to the following themes (developed by Samkin et al., 2014b, Grabsch et al., 2012, Hassan et al., 2020):

1. Scene-setting,
2. Species related,

3. Social engagement,
4. Performance evaluation,
5. Risk,
6. Internal management,
7. External reports,
8. Valuation.

Scene-setting aims to identify a company's holistic introduction and approach to biodiversity reporting as well as the motivation and ethics behind a company's actions of biodiversity conservation (Grabsch et al., 2012, Van Liempd and Busch, 2013b). This theme includes criteria assessing whether a company provides any biodiversity definitions, policies, and mission statements. Species-related looks at a company's disclosure of specific operational sites, the types of species, and habitats, as well as the company's impact and risks to its surrounding ecosystems and biodiversity (Grabsch et al., 2012, Mansoor and Maroun, 2016). The Social engagement theme relates to partnerships, awards and recognition for biodiversity conservation and stakeholder engagement on biodiversity matters (Grabsch et al., 2012). Performance Evaluation includes the biodiversity targets set by the companies, as well as the associated costs and performance in the pursuit of achieving those biodiversity targets (Usher and Maroun, 2018).

Risk relates to a company's disclosure of its biodiversity risk, as well as any systems or processes used to manage those risks (Grabsch et al., 2012). This theme also aims to identify whether an entity has openly disclosed its biodiversity incidents and whether it considers biodiversity risk a material matter (Grabsch et al., 2012, Usher and Maroun, 2018). Internal Management encompasses the biodiversity actions and plans of a company, and whether the company plays a role in improving land management and afforestation activities (Grabsch et al., 2012, Mansoor and Maroun, 2016). External reports refer to whether an entity reports in accordance with an internationally recognised convention on biodiversity conservation, as well as whether the company prepares a report more specifically in accordance with the GRI and the IIRC (Grabsch et al., 2012, Usher and Maroun, 2018).

This research adopts an eighth theme titled 'Valuation' which aims to identify whether companies have recognised and quantified the value attached to the biodiversity, ecosystems, and habitats within the jurisdiction of their operations. This theme is developed beyond the themes identified in prior literature (Grabsch et al., 2012, Mansoor and Maroun, 2016). The sub-categories and individual criteria were adopted and interpretively developed from prior literature, conventions, and policy frameworks. The comprehensive checklist can be found in Appendix A.

Thematic content analysis

A thematic content analysis is used to measure the extent to which the top 75 companies listed on the LSE are disclosing their biodiversity-related information. Content analysis has been used extensively in social and environmental reporting research (Gaia and Jones, 2017) and is used frequently to examine non-financial disclosures (Mahyuddin et al., 2021). It primarily involves codifying the content of a piece of writing, text or subject matter into various different categories according to specified criteria (Gaia and Jones, 2017). This allows for publicly available information such as an annual report or integrated report to be analysed in a systematic and reliable manner (Samkin et al., 2014a).

Although the activity of content analysis remains subjective as a result of the researcher's data collection and analysis, this does not (1) render the coding unreliable and invalid and (2) does not pose a threat to validity and reliability (Potter and Levine-Donnerstein, 1999). Validity and reliability controls are outlined in Section 3.3. In maintaining an interpretive approach, the activity of coding is primarily focused on the context, quality, and construction of disclosures rather than solely relying on an objective analysis of, for instance, the occurrence of particular words/sentences in those disclosures (Buchling and Maroun, 2021).

Thematic analysis is recognised as a powerful and flexible tool because it is not only a method of describing data but also allows for an interpretation in the selection of codes and the creation of themes (Hassan et al., 2022). It can be effectively used in the attempt to comprehend a set of experiences, thoughts, trends or behaviours across a data set (Hassan et al., 2022).

The data collection and processing follows a similar approach to that adopted by Buchling and Maroun (2021) and Hassan et al. (2022). Firstly, each primary report is broken down into its separate sections as per the table of contents to gain a sense of structure and content (Buchling and Maroun, 2021). Each section is then further separated into individual paragraphs which serves as the unit of analysis, to minimise the risk of omitting content. All disclosures identified have been listed.

To ensure that all biodiversity and species extinction-related disclosures are captured, a keyword search is run on each primary report (Buchling and Maroun, 2021). These keywords are most relevant phrases, ideas and topics identified within prior biodiversity and species extinction literature (da Mata and Maroun, 2021). The set of keywords are also adapted and developed during the coding of the data and had initially included the terms "Biodiversity", 'Animals', 'Fauna', 'Plants', 'Flora', 'Species', 'Extinct', 'Marine', 'Habitat', 'Ecology' and 'Ecosystem'.

Next, each disclosure is examined by the researcher and tagged with one or more of the 81 items listed in the checklist (see Appendix A). These items are akin to pre-determined codes and are all obtained from existing reporting guidelines or prior related academic research. After the disclosures are tagged,

they are grouped according to the 8-theme heading above. The grouping of the items per the theme headings is based on prior research only in order to limit researcher bias.

Disclosure scoring system

After the disclosures are tagged, the researcher computed two scores. The quantity of disclosures is determined simply as the frequency of all biodiversity disclosures per each of the 8 themes and in total after controlling for repeated disclosures. To enable comparability, the scores are expressed in total and relative to the respective maximum frequency scores.

When scoring the quality of the biodiversity and species extinction-related disclosures an interpretive text analysis approach is adopted. The approach followed is similar to that of Hassan et al. (2022). For each of the 81 items, they have been scored on a scale of 0 to 3, resulting in a total possible score of 243 (81 x 3) for each company per year (da Mata and Maroun, 2021). Repeated disclosures are identified, selected, and scored for every instance in which they appear. The total score is calculated by aggregating all of the scores identified under each of the 81 criteria. The total score is appropriately adjusted by counting only the highest score for the related item under consideration as per the biodiversity and species extinction disclosure checklist (da Mata and Maroun, 2021). Refer to section 3.3 which details the steps taken to control the levels of subjectivity when scoring the biodiversity-related disclosures against each criterion within the checklist provided.

Using the scoring structure developed by Hassan et al. (2022) for scoring the biodiversity and species extinction-related disclosures:

> *"A disclosure is assigned a score of '0' where there is no disclosure at all. A score of '1' was awarded when the disclosure relating to an item was minimal, vague and/or completely general. A score of '2' was awarded when disclosures contained objective, verifiable and current data. A score of '3' was awarded when disclosure included all the ingredients of code '2', plus other components. These components include providing specific information identifying the site/operating facility affected species and/or number of affected flora/fauna. A description of specific measures taken and/or amount of money spent, a discussion of trend information and/or a linking of the data presented to a company strategy aims performance measure, target, incident, or accident (Hassan et al, 2022, p. 4).*

Analysis and presentation of results for RQ1

The final results are reflected in a frequency table showing the respective scores for each company in each year and categorised according to the stipulated themes (Buchling and Maroun, 2021). Descriptive

statistics are appropriate for summarising source characteristics which can be used as a means of stratifying the underlying analysis, uncovering socially meaningful patterns in the primary reports (MacQueen and Milstein, 1999). Descriptive statistics are used to identify the trends, behaviour, and patterns across the 3 years under study. The descriptive statics are used to address research question 1 and will be supported by:

- Graphical plots of the quality and quantity scores;
- Examples of disclosures per theme to highlight how biodiversity is being reported and to contextualise the descriptive statistics and plots.

Phase 2: Quantitative Analysis

The data collected and coded for the purposes of Research Question 1, is used to address Research Question 2. Because of the data having a non-normal distribution and the use of ordinal measures, a Spearman correlation test is conducted to identify and evaluate possible correlations between biodiversity and species extinction disclosure levels.

Kruskal-Wallis H, Jonckheere-Terpstra and Mann-Whittney U tests are used to complement the Spearman correlations. The tests are used to determine if biodiversity and species extinction disclosure scores (by quantity and quality considered separately and treated as the independent variable) vary with the level of the independent/grouping variables and the related signs of any associations identified. The following general expression is used:

Biodiversity Disclosure Levels (BDL) =

f(ESG Risk Rating, ESG Performance Rating, ESG Risk Rating, Industry, Biodiversity Partnership, Size)

These tests are conducted using the aggregate scores per independent variable. The independent variables are listed in Table 1 (page 26). Each variable is analysed individually. The quantity and quality of disclosures (levels of disclosures) are also be examined separately. A 5% level of significance is used to evaluate if there are no differences in BDL with changes in the grouping/independent variables where each variable is tested separately.

Table 1: Variables employed in the statistical analysis			
Related RQ	**Independent Variable**	**Explanation and Interpretation**	**Test**
RQ1	Year	Disclosure scores are accumulated according to each separate year (2018, 2019, 2020)	Kruskal-Wallis H, Jonckheere-Terpstra
RQ2.1	ESG Performance Rating	Companies' ESG Performance Ratings are extracted from (S&P Global, 2022). High-performing companies are coded '3', Medium-performing companies are coded '2' and Low-performing companies are coded '1'. S&P's Global ESG performance scores are developed utilising a combination of verified company disclosures. This ESG metric is built upon a company's practices and response to critical ESG factors, including its performance and activities in managing biodiversity loss (S&P Global, 2022). As a result, this score may provide the best quantitative proxy for a company's environmental performance. This allows for the calibration of the schematic to well-known proxies for ESG performance to further validate the results.	Kruskal-Wallis H, Jonckheere-Terpstra
RQ2.2	ESG Risk Rating	Companies' ESG Risk Ratings are extracted from Sustainalytics (2022). The database provides an ordinal score ranging from severe risk (coded 4) to negligible risk (coded 0). The companies are categorised according to the grouping structure developed by Sustainalytics (2022). Sustainalytics provides high-quality, analytical ESG risk ratings for the purposes of research. In developing the ESG risk ratings, Sustainalytics utilises a materiality framework that measures a company's exposure to industry-specific material ESG risks by scoring the rating according to exposure, management and unmanaged risks, where the overall score reflects the level of unmanaged risks by an entity (Sustainalytics, 2022). More importantly, where biodiversity loss reflects a material risk for a particular company, the ESG	Kruskal-Wallis H, Jonckheere-Terpstra

Table 1: Variables employed in the statistical analysis			
Related RQ	**Independent Variable**	**Explanation and Interpretation**	**Test**
		risk ratings developed by (Sustainalytics, 2022) have factored into account the respective risks. These measures can therefore provide the best proxy when quantitatively assessing the association between LSE-listed companies' environmental risks and the respective companies' biodiversity reporting practices. This allows for the calibration of the schematic to well-known proxies for ESG risk to further validate the results.	
RQ2.3	Industry	Entities are allocated scores based on their respective industries' biodiversity risk. Companies are allocated scores based on industry sensitivity. A score of '2' for companies within the Industrial/Mining sector, '1' for companies within Other industries and '0' for companies within the Financial Services Sector (Michelon et al., 2015). This research will categorise companies by industry (Malola and Maroun, 2019). The industries include 'Industrial/Mining', 'Financial services' and 'Other industries. The Industrial/Mining sectors are considered to be sensitive industries, therefore requiring a higher score. As a result, these sensitive industries are expected to disclose more information relating to environmental matters in the pursuit of satisfying their material stakeholders needs (Malola and Maroun, 2019). The Industrial/Mining sector is identified as the most sensitive industry, as it is subject to the highest level of social taboos, moral debates and political pressures, as a result of the industry's environmental and social damage (Garcia et al., 2017).	Kruskal-Wallis H, Jonckheere-Terpstra

Table 1: Variables employed in the statistical analysis			
Related RQ	**Independent Variable**	**Explanation and Interpretation**	**Test**
RQ2.4	Existence of a Biodiversity Partnership	Companies are allocated a value of '0' where no evidence of a biodiversity partnership exists, and a score of '1' where a biodiversity partnership exists.	Mann-Whittney U tests
RQ2.5	Size	Company size is measured by market capitalisation (as at 31/03/2022), with companies being grouped by quartile. The largest companies are coded '4', and the smallest companies are coded '1'.	Kruskal-Wallis H, Jonckheere-Terpstra

However, although possible determinants are tested, this thesis stops short of definitively concluding on determinants of biodiversity reporting and this is deferred for future research where interpretive and qualitative studies can be performed to better understand the context of biodiversity reporting for specific organisations.

3.3. Validity and reliability

To ensure the validity and reliability of the data, each of the following points are conducted within this research:

- A test study was initially carried out on a sample of 25 LSE-listed companies, firstly, to gain comfort over the coding process and secondly to address any inconsistencies and discrepancies identified in the checklist with the supervisor. To ensure the precision, relevance and completeness of the checklist, each criterion has been informed and adapted from prior literature. The standardised scoring system has been adopted and adapted from prior literature (Hassan et al., 2020), in order to reduce potential inconsistencies with prior research and the impact of research bias.
- This research is conducted with a clear understanding that the coding process inherently carries a level of subjectivity. The researcher aims to reduce this risk by utilising a set of biodiversity-related keywords adopted from prior literature and continually developed through the coding process (Van Liempd and Busch, 2013b, Mansoor and Maroun, 2016).
- The keywords have been disaggregated into two separate groups. The first set of keywords used are 'specific keywords' used to identify biodiversity and species extinction disclosures relating to

specific criteria within the checklist. Secondly, the second set of 'general keywords' are used to identify those disclosures which may cover a broad range of criteria within the checklist. The separation is carried out with the purpose of minimising the risk of omitting any potential biodiversity and species extinction disclosures.

- In order to minimise the risk in which any biodiversity-related disclosures are omitted or overlooked, the researcher has broken-down the annual report into relevant sections in order to identify any biodiversity sections within a company's annual report. A set of keywords (as mentioned above) are also be used to minimise the risk of missing any relevant biodiversity-related disclosures (Van Liempd and Busch, 2013b, Gaia and Jones, 2017).
- The coded data are measured on an ordinal scale, in which the assumption of a normal distributed data set is absent. As a result, non-parametric tests (Mann-Whitney U Test, Kruskal-Wallis Test) are used as a best measure of the expected skewed distributions. Findings are generated using (1) the quantity of the biodiversity and species extinction disclosures and (2) the quality scores, each considered individually.
- The data collected in accordance with Research Question 2, and analysed using non-parametric tests, meet the five primary assumptions supporting the use of the Mann-Whitney U Test and Kruskal-Wallis Test, namely:

  (1) The dependent variable (*Level of Biodiversity Disclosure*) is measured at the ordinal scale.

  (2) Each independent variable (*ESG Performance Rating, ESG Risk Rating, Industry, Biodiversity Partnership and Size*) consists of two or more categorical and independent groups.

  (3) Independence of Observations: Observations or scores within one category are not included within another category or group, suggesting mutual independence amongst the various samples.

  (4) The distributions within each group of a specific independent variable are assumed to follow a similar distribution from one to another.

  (5) Each group of a specific independent variable has a sample size larger than 5 companies.
- Scores used to determine the level of biodiversity and species extinction disclosures were assigned by the researcher and evaluated by the supervisor/co-supervisors working independently to ensure the reliability and consistency of the coded data. Material differences were flagged for the attention of the lead researcher who determined the final score. Statistical measures for inter-coder reliability were not generated as all differences were examined and resolved by the lead researcher through consultation and discussion. There were specific criteria to dictate the judgement with limited

complexities to rate the respective reports. The framework is, as a result, simple to apply. This has benefits for a company seeking to operationalise the framework to enhance biodiversity reporting[8].

[8] Because this is an emerging framework; findings should be generalised with caution

4. Analysis of results

4.1. Total biodiversity disclosures

Given the current global biodiversity crisis, an investigation into the quality of biodiversity disclosures allows for a critical assessment of whether the sample of 75 London companies[9] has discharged their corporate accountability and stewardship for biodiversity awareness and conservation over an updated three-year period (Grabsch et al., 2012).

Figure 1: Total Biodiversity Disclosure Scores

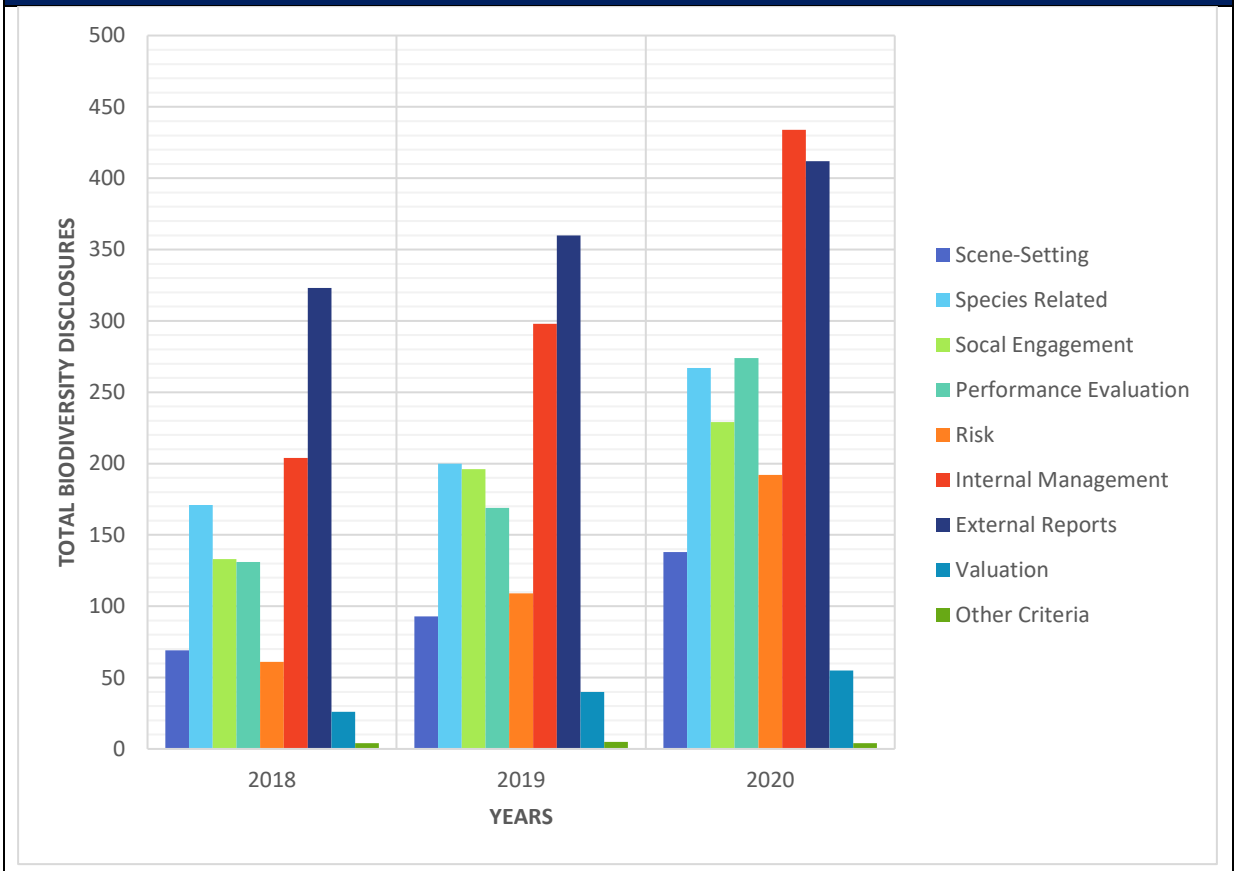


Figure 1 above shows the total biodiversity scores within each of the nine themes analysed from 2018 – 2020. It highlights changes in the extent of biodiversity disclosures across the three years under study.

[9] Note: All extracts are obtained from publicly available integrated/sustainability reports and are included for illustrative purposes. References to higher or lower quality disclosures are the outcomes of the report quality assessments in conjunction with the application of the disclosure checklist in Appendix A and are not an overview of the actual business intentions or performance. Extracts from published reports should be read in conjunction with the full report itself including its notes and other applicable information. Please contact the corresponding author for further details on the disclosure checklist application. The companies are recorded using the coding convention from the checklist as the focus is on the actual disclosures rather than the organisation. Annual reports used are available from the author on request.

Figure 1 shows that the total biodiversity disclosure scores experienced substantial growth from 2018 to 2019, with a sharper increase from 2019 to 2020 (the highest level of scores across all themes noted in 2020).

Taking into account that the biodiversity disclosures have remained relatively limited across all three years, together with the fact that the levels of valuation-related disclosures have remained trivial in quantity, the results suggest that although companies have disclosed more (year-on-year) on their biodiversity risks and opportunities, they have done so in a qualitative manner (by intentionally limiting their disclosure of quantitative data), reducing the ability of stakeholders to evaluate and measure the organisations biodiversity progress to limit effectively the subsequent levels of accountability held by stakeholders against the organisations themselves.

Ultimately, this study finds that listed companies on the London Stock Exchange score poorly for their corporate reporting on biodiversity matters. Over the three-year period under study, the UK has had twelve instances of annual reports with no inclusion of any biodiversity-related disclosures and total disclosure scores of zero[10]. The UK's listed companies are scoring 20.4 points on average across the three different years.

There is an increase year-on-year (A 31% increase in the total biodiversity disclosure scores from 2018 to 2019, and a 36% increase in the total biodiversity-related disclosure scores from 2019 to 2020). From the sample of the 75 listed UK companies, the 2020 annual report of Company 22 has achieved the highest total biodiversity disclosure score of 101 (which equates to 42%, where the total possible score of 243 is taken into account), this is relatively significant, given that the average biodiversity score across all three years was 20.37 (roughly five times higher than the average). The lowest scores across the three years from the sample were 0, where several companies failed to provide any disclosure relating to biodiversity loss and species extinction.

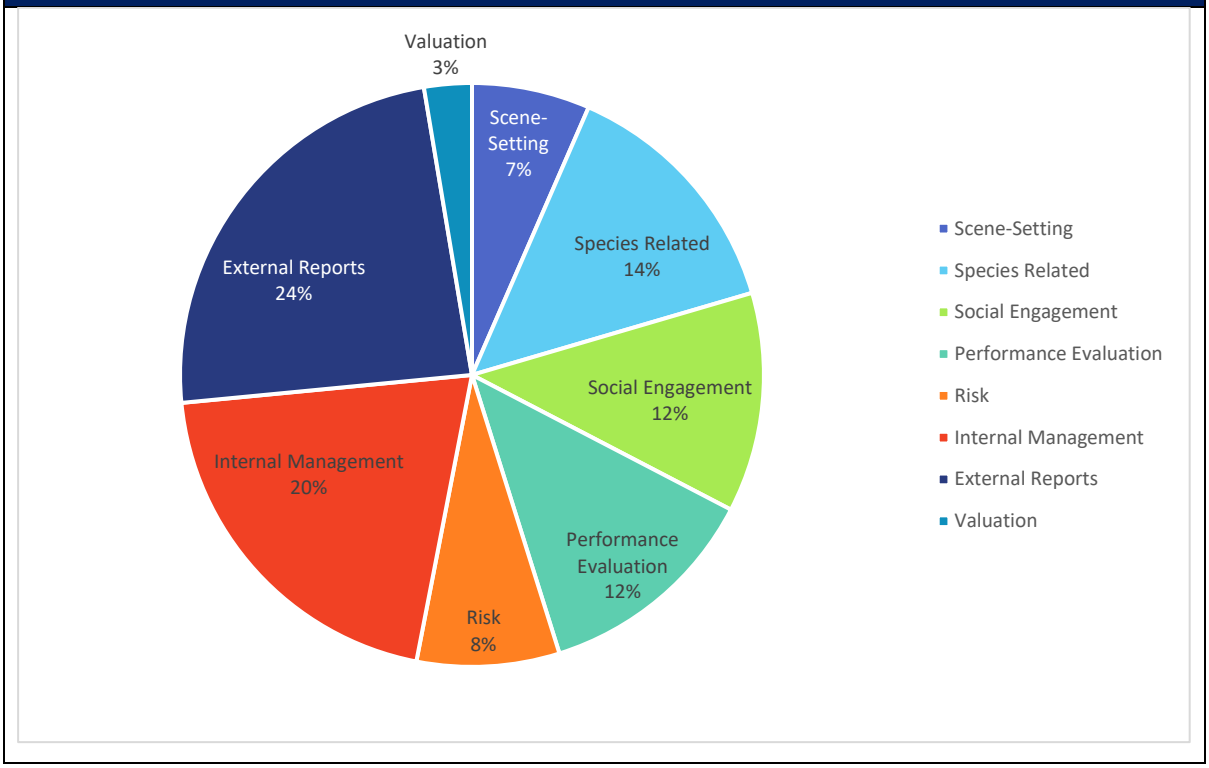
With reference to Figure 2 (page 33), the themes which reflect the highest scores are External Reports (24% of all disclosures). This suggests that companies are progressively seeking and utilising external frameworks, as both a means of guidance and support in structuring their biodiversity content within their respective reports, as well as making use of these checklists to claim their compliance with the codes of best practice, so to as legitimise their biodiversity disclosures (Mansoor and Maroun, 2016).

Internal Management (20% of all disclosures) and Performance Evaluation (12% of all disclosures) reflect the second and third-highest-scoring biodiversity themes, indicating that companies are

[10] Which may be attributed to seven different companies in various years

increasingly more invested in disclosing their own internal management around their respective biodiversity action plans, as well as the related appraisal of the effectiveness of these plans.

Figure 2: Total Biodiversity Disclosure Scores (Relative)



The three lowest-scoring themes were Valuation (3% of all disclosures), Scene-Setting (7% of all disclosures) and Risk (8% of all disclosures). The total biodiversity disclosures among listed companies in the UK have evidently improved year-on-year (Reference to Figure 1) but this has mostly been shown on a purely qualitative level. Companies are struggling to report and value their biodiversity risks, dependencies and other key matters using quantitative measures. This may potentially be a result of insufficient guidance provided by external frameworks in accounting for biodiversity on a quantitative level. Where the disclosure of quantitative data surrounding biodiversity is intentionally kept to a minimum, this may highlight the rife levels of impression management among UK-listed companies: the subsequent accountability faced by these respective entities is minimised, through reducing stakeholders' ability to monitor effectively and objectively the progress related to an entity's stipulated biodiversity action plans.

Similar results are found in Usher and Maroun (2018) which finds that Scene-Setting was one of the lowest-performing biodiversity-related themes disclosed by companies within the South African fishing industry. The results of our findings however differ from the results found in Grabsch et al. (2012)

which concludes that Scene-Setting was the third highest-scoring theme amongst listed companies in the United Kingdom and Germany, and Van Liempd and Busch (2013b) which finds that Scene-Setting is the most disclosed theme amongst Danish companies.

One potential explanation suggests that the higher scene-setting scores within a South African setting may be the result of the Johannesburg Stock Exchange (JSE), and its supplementary listing requirements (for South African listed entities) adopting an integrated reporting approach which places greater emphasis on an organisations' ability to display a 'holistic picture of the combination, interrelatedness and dependencies between the factors that affect the organisations' ability to create value over time' (IIRC, 2021a). As a result, listed South African companies are encouraged to provide a greater level of detail in depth, context and meaningfulness, supporting the disclosure of their six capitals (prime emphasis on natural capital) with specific reference to the setting of the organisations' biodiversity scene, i.e., the motivational and moral drivers, underlying their biodiversity initiatives and partnerships.

The following sections are going to take a more granular look by placing attention on the identified trends and patterns within each of the eight different biodiversity reporting themes.

Table 2: Descriptive statistics for all eight themes under study

Statistic	Scene Setting (SS)	Species Related (SR)	Social Engagement (SE)	Performance Evaluation (PE)	Risk (R)	Internal Management (IM)	External Reports (ER)	Valuation (V)	All Themes
MEDIAN *	**1,33**	**2,84**	**2,48**	**2,55**	**1,61**	**4,16**	**4,87**	**0,54**	**20,37**
2018	0,92	2,28	1,77	1,75	0,81	2,72	4,31	0,35	14,91
2019	1,24	2,67	2,61	2,25	1,45	3,97	4,80	0,53	19,53
2020	1,84	3,56	3,05	3,65	2,56	5,79	5,49	0,73	26,68
MAX *	**11,00**	**25,00**	**19,00**	**24,00**	**19,00**	**21,00**	**9,00**	**6,00**	**101,00**
2018	10,00	15,00	15,00	15,00	12,00	15,00	9,00	4,00	59,00
2019	9,00	15,00	19,00	15,00	11,00	15,00	9,00	6,00	76,00
2020	11,00	25,00	15,00	24,00	19,00	21,00	9,00	6,00	101,00
MIN *	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**	**0,00**

Table 2: Descriptive statistics for all eight themes under study

Statistic	Scene Setting (SS)	Species Related (SR)	Social Engagement (SE)	Performance Evaluation (PE)	Risk (R)	Internal Management (IM)	External Reports (ER)	Valuation (V)	All Themes
2018	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2019	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2020	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

**** Statistics are covered across all three years under study***

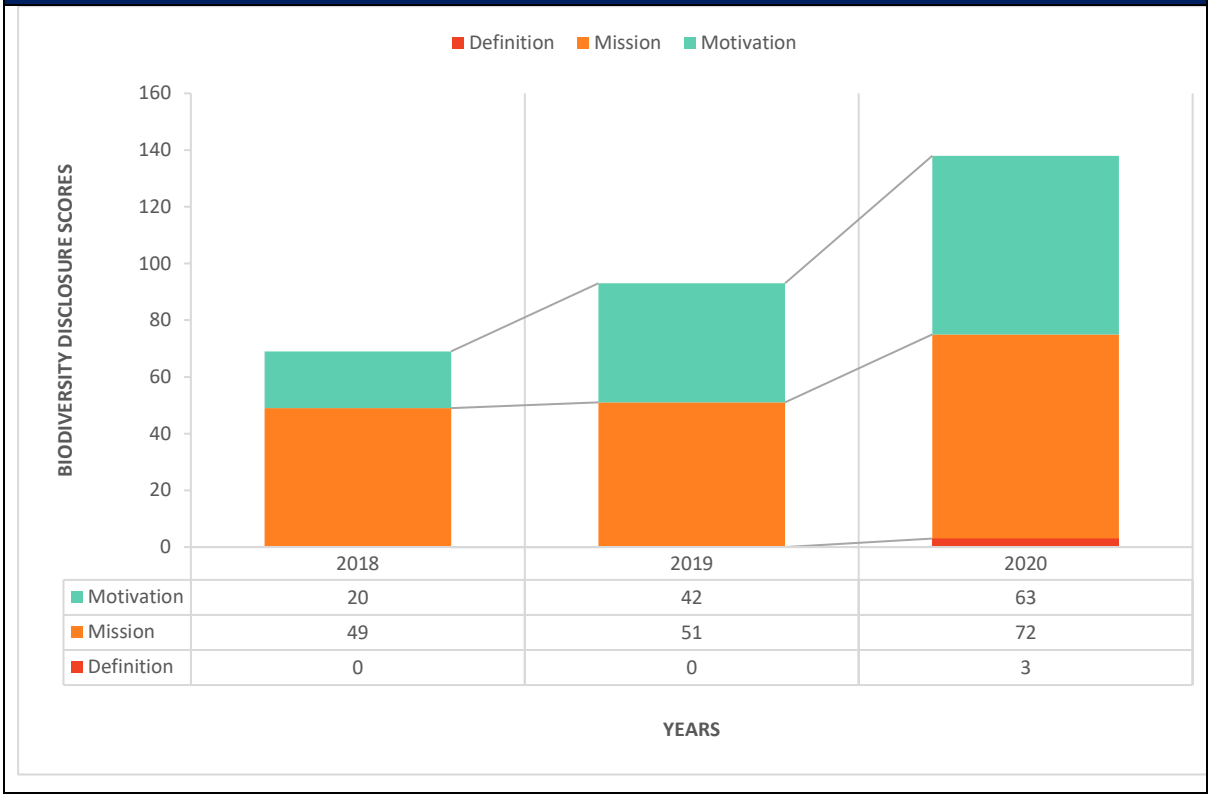
4.1.1. Scene-setting disclosures

Concerning Figure 3 (page 36), the disclosures identified within the scene-setting theme, show an increasing trend, with a 35% increase from 2018 to 2019, and a subsequent increase of 48% from 2019 to 2020. The median scores within the scene-setting theme increased by 35% from 2018 to 2019, and by 48% from 2019 to 2020 with the maximum score of 11 (from 2020) across the three years (Table 2 – page 34). This theme, however, is identified as the second lowest scoring theme (Figure 2 – page 33), as scene-setting contributes 7% to the total level of biodiversity disclosure scores. This suggests that scene-setting is not a material consideration for most UK companies as these organisations are failing to disclose sufficiently their interpretations of biodiversity and what meaning it carries for their businesses.

van Liempd and Busch (2013a), suggest that the absence of content-specific reporting is part of a recognised practice of de-emphasising and understating negative biodiversity indicators. The lack of biodiversity scores may be attributed to the fact that companies would rather refrain from making these disclosures in order to minimise the subsequent accountability shareholders will demand from negative events/outcomes related to their biodiversity performance and reporting (Usher and Maroun, 2018).

Another element may suggest that UK-listed companies are simply failing to understand and investigate where their companies lie and what roles they play within the different ecosystems and biodiversity impact chains. This creates ambiguity in the interpretation and subsequent conveyance of the motivation and morale supporting their efforts against biodiversity risks and their adverse impacts on threatened species of fauna and flora. These disclosures may indicate an organisation's intentional decision to maintain and perpetuate their levels of environmental compliance, while simultaneously foregoing any disclosures made to describe in greater depth, the context supporting the company's biodiversity strategy.

Figure 3: Scene Setting – Total Disclosure Scores



London-listed companies do not provide disclosure regarding their biodiversity definitions in both 2018 and 2019. The trend is similarly found in 2020 as a single listed company provided definitions of biodiversity and its inherent components. Where companies are unable to define biodiversity and its interrelated systems and components, this may point to a lack of sincerity, understanding and commitment by businesses regarding their biodiversity impacts, as well as their critical role in confronting the global biodiversity crisis (Mansoor and Maroun, 2016).

Mission-related disclosures make the largest overall contribution to Scene-Setting but only 22 listed companies have reported some sort of biodiversity-related mission statement (29% of the entire sample organisations). These disclosures have gradually decreased as a portion of the total disclosure scores year-on-year (71% in 2018, 55% in 2019 and 52% in 2020). Despite the relatively high level of scores pertaining to biodiversity-related Mission Statements, these disclosures are often found to be (1) indistinct, vague and generic with (2) limited to no inclusions in the overall objectives and mission statements within the strategic roadmap section of the annual reports. This agrees with the findings in (Mansoor and Maroun, 2016, Van Liempd and Busch, 2013b). On the other hand, the proportion of motivation-related disclosures (relative to total Scene-Setting disclosures) has increased year-on-year (29% of all Scene-Setting disclosure scores in 2018, 45% in 2019 and 46% in 2020).

This may indicate that listed companies are becoming increasingly aware of the heightened scrutiny and pressures produced by stakeholders, demanding more disclosures than generic mission statements, and influencing companies to place a greater emphasis on reporting their underlying morals, motives and business ethics for biodiversity preservation, conservation and applied action (Boiral and Heras-Saizarbitoria, 2017).

An extract from the 2019 annual report of Company 22 is an example of a high-quality biodiversity mission statement, giving insight into the overall biodiversity mission and commitments of the company, as well as further guidance on how they're practically achieving the sub-objectives which make up the overall mission.

> *'We're committed to creating thriving bird, insect, and plant habitats in our region. We improved biodiversity on six hectares of Sites of Special Scientific Interest ('SSSIs') during the year, and we're on-track to reach our target of 75 hectares by 2020.'* ***(Company 22 Annual Report, 2019)***[7]

This may be contrasted with the statement made in the 2019 annual report of Company 69 which reflects a poorly scored disclosure, attempting to draw the attention of stakeholders to many different areas within the realm of environmental sustainability, but however, offering a predictable and vague mission statement with limited traces of actionable direction and no further clarity on which of the specific areas within biodiversity are to be their focus.

> *'In line with this, we manage natural resources efficiently and are constantly seeking ways to reduce water consumption, source cleaner sources of energy and protect biodiversity, while always collaborating with local communities. We are sensitive to the threats posed by climate change and are always seeking to improve our practices accordingly.'* ***(Company 69 Annual Report, 2019)***

The inability to define a business's understanding of 'biodiversity' and its related components, which contextualises the importance of biodiversity from an organisations' own perspective, can be seen as a crucial weakness in biodiversity reporting (Mansoor and Maroun, 2016). The poor performance relating to definition, mission and motivation statements are of concern as over the recent years, many initiatives

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[7] All extracts are obtained from publicly available integrated/sustainability reports and are included for illustrative purposes. References to higher or lower quality disclosures are the outcomes of the report quality assessments in conjunction with the application of the disclosure checklist in Appendix A and are not an overview of the actual business intentions or performance. Extracts from published reports should be read in conjunction with the full report itself including its notes and other applicable information. Please contact the corresponding author for further details on the disclosure checklist application. The companies are recorded using the coding convention from the checklist as the focus is on the actual disclosures rather than the organisation. Annual reports used are available from the author on request.

(including those of the World Wide Fund for Nature, International Union for Conservation of Nature, United Nations Principle for Responsible Investing, Rainforest Alliance, and Greenpeace), have been developed to assist companies in adopting and defining biodiversity-related policies, guidelines, and standards.

This indicates that listed companies on the LSE are underutilising these resources and are failing to place a greater emphasis on biodiversity importance when communicating to stakeholders through their primary reports (Van Liempd and Busch, 2013b). Mansoor and Maroun (2016), suggest that the lack of clarity in the guidelines proposed by these initiatives may be primarily responsible for breeding uncertainty among companies when considering what to include.

4.1.2. Species related disclosures

Disclosures dealing with site- and species-specific information as well as disclosures made in relation to CDP questionnaires, were the third highest-scoring disclosures among companies listed on the LSE. Species-related disclosures constitute 15% of all biodiversity-related disclosures in 2018, 14% in 2019 and 13% in 2020. The proportion of species-related disclosures in relation to all other themes is decreasing year-on-year. Concerning Table 2 (page 34), the median scores for this theme, have increased by 17% from 2018 to 2019 with a subsequent increase of 33% from 2019 to 2020. For the species-related theme, the maximum score of 25 for an individual company across the three years, relates to the 2019 period.

The increases in both the aggregate and median scores within the species-related theme are predominantly driven by disclosures relating to the organisation's involvement and/or participation in the Carbon Disclosure Project (CDP), as well as the disclosure of their associated CDP ratings. The expansive growth in CDP disclosures from 2018 to 2020 may evidence the fact that UK-listed companies have recognised the advantage in utilising the CDP's platform as a means of creating long-term value creation and corporate legitimacy through improving their own respective levels of environmental accountability and transparency as desired and essentially valued by their key stakeholders.

Companies may also be choosing to disclose voluntarily their biodiversity matters through the CDP (which is fully aligned with the recommendations developed by the Task Force on Climate-related Financial Disclosures) in anticipation of the UK's legislative mandate ordering its listed businesses to disclose their environmental risks and opportunities in line with the TCFD's recommendations.

Figure 4: Species Related - Total Disclosure Scores



	2018	2019	2020
Site-Specific	23	25	48
Specific-Species	12	10	31
IUCN Red List	13	25	35
Surveys	123	140	153

Survey related disclosures

In relation to Figure 4 above, survey-related disclosures account for 72% of the disclosure scores within the species-related theme in 2018, 70% in 2019, and 57% in 2020. Although the scores are increasing in absolute size year-on-year, they are also declining relative to all other disclosures within the species-related theme. The survey-related disclosures are primarily attributable to scores granted for the specific criteria identifying whether companies have: "Included reference to CDP questionnaires". During 2018, 41 listed companies included reference to the CDP's questionnaires. The number of companies referencing the CDP's questionnaires increased to 48 in 2019. This had further grown by another 3 companies in 2020, resulting in a total of 51 listed companies referring to the CDP's questionnaires.

This reflects a 68% participation rate by UK listed companies in 2020 and indicates that two-thirds of the UK's listed organisations are firstly, willingly invested in voluntarily weighing up and disclosing their environmental risks, impacts and dependencies on (a) climate change, (b) forests and (c) water security, to achieve a 'net-zero, nature positive and equitable future' (CDP, 2022). Secondly, this indicates that a greater number of listed companies are focused on managing their respective CDP scores by identifying their progress and challenges to improve substantive action on the CDP's three key areas. Company 36 provides an example in its 2020 annual report:

- *In 2020, Company 36 completed its first scored CDP questionnaire.*
- *Our C rating indicates that, although we have opportunities to improve our environmental and climate programme, we have an appropriate awareness and some existing mechanisms for monitoring and improving our operations and business practices to reduce our environmental footprint.* ***(Company 36 Annual Report, 2020)***

Company 36 (included within the software and media industry) sufficiently mentions its participation in the CDP's questionnaire, as well as disclosing its own respective rating. The organisation also mentions the possible opportunities needed to improve upon its existing environmental programmes. The disclosure fails to specify any biodiversity strategies, sites or action plans and targets towards actually achieving the 'improvements' in its programmes and they lack depth and clarity in guiding stakeholders in improving their C rating (awareness-level engagement). For company 36 to reach a B rating (environmental management), the organisation needs to show evidence of its progress towards addressing the environmental impacts of their business and to ensure good environmental management (CDP, 2023).

This study finds that among the eight companies included in the 'software and media' sector (these companies have been included in other industries for the purpose of the industry comparison – see table 1 – page 26), not a single mention of 'biodiversity' is included in their respective annual reports for the 2020 period. The lack of emphasis placed on biodiversity may possibly be attributed to the fact that these organisations' experience and encounter no direct dependence and/or impact on biodiversity and choose not to disclose or engage with any biodiversity initiatives to limit their accountability to stakeholders when monitoring their associated progress.

With the intention to improve their environmental impact and subsequently, their CDP ratings, companies falling within the software and media sector can leverage off of their existing technologies and data to cultivate and deploy a set of digital technologies to manage biodiversity inventories, perform hazard assessment and predictions (i.e., fire, storm, flood and pest damage to flora) and monitoring anthropogenic threats in the form of illegal felling and deforestation to forests (Shivaprakash et al., 2022).

The majority of the listed companies mentioned their CDP participation as well as their respective scores (covering the CDP's three key areas) in their annual reports. Where the companies disclosed more in-depth information covering the recommended practises, impacts, risks, and opportunities relating to their forestry and water-related operations (in accordance with the guidelines of the CDP), this was generally sub-ordinated to their respective sustainability reports.

On the contrary, companies may intentionally choose to disclose less information within their annual reports, or report information which is confusing (da Silva Monteiro and Aibar-Guzmán, 2010) to minimise the levels of risks relating to the accountability demanded by stakeholders, when evaluating the company's environmental performance (Usher and Maroun, 2018).

IUCN Red List-related disclosures

Figure 4 (page 39) illustrates that IUCN Red List-related disclosures make up 11.4% of all disclosure scores within the species-related theme. These disclosures have gradually increased year-on-year by 92% from 2018 to 2019 and by 40% from 2019 to 2020. In total, twelve of the sample companies referred to the IUCN's Red List. Although the IUCN Red List-related disclosures are low in quantity across the sample, most of the disclosures include specific information detailing the specified species affected, the names of the operations and locations in which these species lie, as well as the potential risks and dangers which may be caused to these particular species.

Consistent results are identified in Mansoor and Maroun (2016) who found that South African companies within the mining and food industry disclose detailed information about the specific species and locations affected by an organisation's biodiversity impacts. These results differ from those found in Adler et al. (2018) who found that the vast majority of Fortune companies provided general statements and lacked detail. In the study conducted by Van Liempd and Busch (2013b) they found that the same type of disclosures among Danish companies was generally quite poor.

Company 13's annual report (2020) provides an example of a well-documented species-related disclosure by firstly discussing the operational sites, as well as the details of the nature of biodiversity (wetlands and woodlands) surrounding the company's operations:

> *The medium risk sites were: SS* Argentina, where the Rio Reconquista runs close to the site and flows into a network of regionally important wetlands; Chromalox Mexico, where the Rio Grande River flows close to the site, which is home to two IUCN Endangered Species (the Rio Grande Silvery Minnow and the Golden-cheeked Warbler); and SS* USA, which adjoins a local woodland and, as a result, could have a minor local impact on wildlife during normal operations as a result of disturbance from noise or light.* ***(Company 13 Annual Report, 2020)***

The disclosure also effectively highlights the specific species classified under the IUCN Endangered Species list and states where these species are located, and how the conduct of the companies' operations may disturb them. This type of disclosure was generally found where an associated biodiversity risk assessment had been carried out by the respective organisation on its operational sites.

These disclosures suggest a genuine commitment by some corporate entities to identify, evaluate and engage with the risks created by their operations (Mansoor and Maroun, 2016).

Site-specific and Specific species-related disclosures

With respect to Figure 4 (page 39), site-specific disclosures contributed 15% to the total disclosure scores within the species-related theme; specific-species disclosures contributed a total of 8% to the theme. Site-specific disclosure scores increased moderately by 9% from 2018 to 2019 and experienced a significant increase of 92% from the period 2019 to 2020. Specific species disclosures declined by 17% from 2018 to 2019, but had subsequently increased by 210% from 2019 to 2020.

Although the two subgroups of disclosures (Site-specific and Specific-species disclosures) contribute a small portion to the species-related theme (A total of 23% together), the substantial increases from the 2019 to 2020 period indicate significant growth and a positive movement in the UK's listed companies' behaviour when understanding the risks posed to specific species, measuring the flora and fauna wealth around their operations and initiating substantive action through relocation schemes and repopulation programmes.

Company 69 provides an example which shows an evolution in the site and species-related information disclosed from 2019 to 2020. Company 69's disclosure report states:

> *The Choapa Valley, where Los Pelambres is located, is particularly rich in biodiversity. In this area, we manage four nature sanctuaries, including an important wetland. Together with areas of reforestation and other initiatives, these sanctuaries total 27,000 hectares, equivalent to seven times the area used for the operation.* ***(Company 69 Annual Report, 2019)***

The disclosure above mentions the site-specific location and the nature of the habitats but lacks detail regarding the specific species the organisation intends to improve. There is also uncertainty as to whether the company's related objectives include assisting the populations of the species within this location, improving the surrounding conditions or if they intend to only create awareness. Company 69's disclosure example within their 2020 annual report mentions:

> *Both Centinela and Los Pelambres monitor the environmental variables of the marine environment in the vicinity of their port facilities, studying the water column, sediments and the marine fauna. Through a public-private programme led by the Chilean government's economic development agency, CORFO, Los Pelambres participates in R&D projects to repopulate the area near its port facilities with the Chilean sea urchin*

and the Chilean abalone. Other initiatives are associated with the Chilean conger (congrio colorado and congrio dorado). ***(Company 69 Annual Report, 2020)***

In contrast, this disclosure effectively shows a critical evolution in the organisations' reporting detail as the organisation discloses the intentions and different methods of studying the marine fauna surrounding their mining operations, as well as disclosing the specific species of *Chilean sea urchin and the Chilean abalone* which the organisation intends to repopulate in order to strengthen the neighbouring levels of biodiversity.

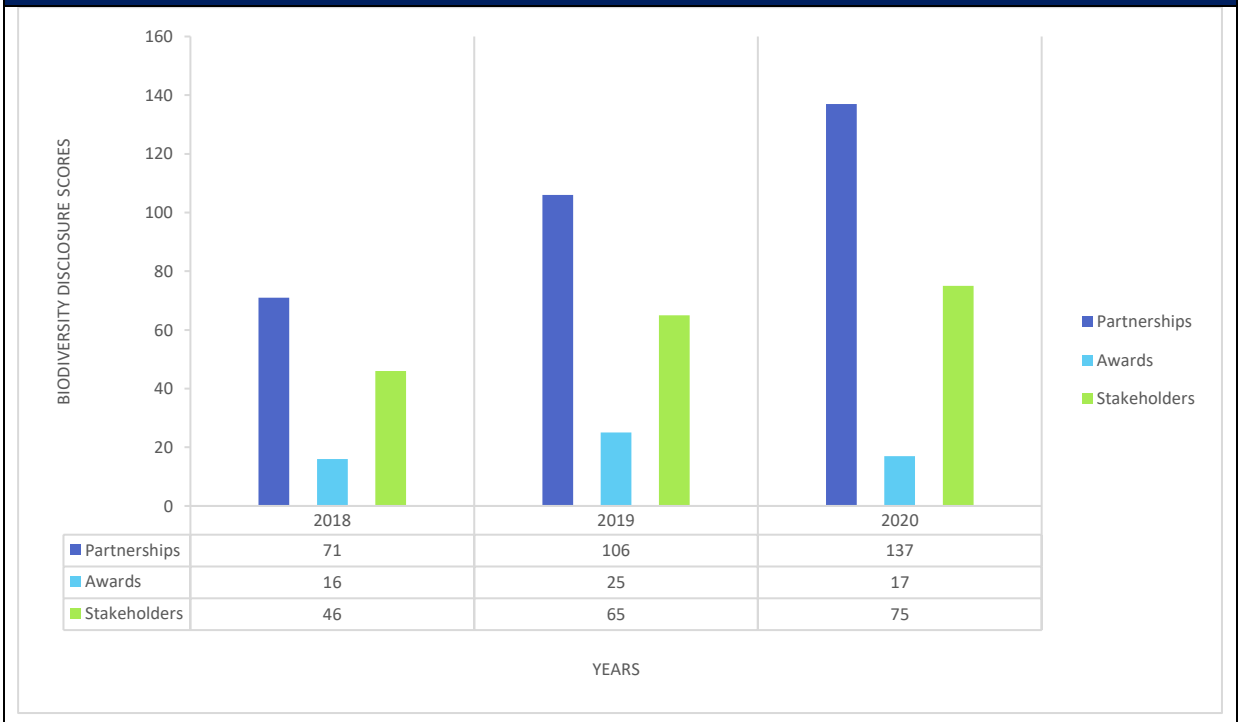
4.1.3. Social engagement disclosures

Social engagement includes any disclosures made with reference to an organisation's partnerships with biodiversity or conservation organisations, any awards received in recognition of biodiversity restoration, and biodiversity initiatives created with an organisation's key stakeholders.

Social engagement disclosure scores contribute 12% to the total biodiversity disclosure scores (Figure 2 – page 33). Within this theme, the three sub-categories of Partnerships, Awards and Stakeholders make up 56%, 10% and 34% of the total scores, respectively. Consistent findings in Mansoor and Maroun (2016) show that the dominant disclosure item relates to partnerships between South African listed entities and various organisations. Concerning Table 2 (page 34), this theme reflects a maximum score of 19 (identified within the 2019 year), out of a total possible score of 45, attributed solely to the social engagement theme (i.e., 42% coverage across all scores within the social engagement theme).

Table 2 (page 34) illustrates increases in the median score of 47% from 2018 to 2019, and a further increase of 17% from 2019 to 2020, reflecting positive growth. Within this study, UK-listed companies were progressively found to report on their mobilisation of predominantly employee and community groups in carrying out their biodiversity initiatives, together with well-recognised biodiversity partners. As companies have started to reap the benefits of legitimizing their brand through their association with positively perceived biodiversity institutions, this may explain the substantial increase in the scores attributed to the social engagement theme, year-on-year.

Figure 5: Social Engagement - Total Disclosure scores



Partnership-related disclosures

The general findings in the sample of 75 listed companies suggest that companies are disclosing their biodiversity engagements and partnerships in substantial detail, generally indicating the nature of the relationship, performance inline with set targets, and what benefits the underlying partnerships intend to reap. These results differ from Mansoor and Maroun (2016) who finds that the nature of the partnership disclosures varies widely from 'very brief and generic to more detailed discussions'.

For example, Company 2's 2020 annual report provides a detailed disclosure of its various partnerships and collaborative projects:

- *In 2016, Company 2* built on this foundation by launching The Company 2* Farm Partnership – an improved farm partnership model working with UK conservation charity, The Wildlife Trust and LEAF.*
- *In 2019, Company 2* assisted the Seeds for Bees project in Californian almond groves, introducing wildflowers on 512 acres of land. This practice boosts biodiversity and improves pollination and almond yields. The flowers also provide ground cover, which reduces soil erosion and improves moisture retention – a significant benefit in this drought-hit area.* ***(Company 2 Annual Report, 2020)***

These disclosures, firstly, highlight the key conservation groups the organisation is primarily dealing with, as well as specific details about their conservation efforts. Additionally, these disclosures help in assisting key stakeholders understand the nature of the biodiversity relationships and how their efforts improve the wealth of fauna and flora within the designated action areas. Several companies have also included disclosures regarding their involvement with employees and their surrounding communities in conducting volunteer work when collaborating with environmental partners in achieving their biodiversity action plans. For example, Company 31 discloses within its 2018 annual report:

> *Working with Bromsgrove District and Redditch Borough Councils, colleagues have donated 750 volunteering hours to improving the various parklands within the Midlands area. Their efforts have assisted with creating a bark path, building dead hedging and a wildlife hibernaculum, thinning woodland, painting benches, planting floral displays, and removing the invasive Himalayan balsam from the waterways.* ***(Company 31 Annual Report, 2018)***

The most popular biodiversity partnerships engaging with listed UK companies include the Woodland Trust, the Wildlife Trust, the Marine Conservation Society and the World Wide Fund for Nature (WWF).

Figure 5 above illustrates a gradual and upward trend in biodiversity partnership-related disclosures as these disclosures increased by 49% from 2018 to 2019 and by 29% from 2019 to 2020. Similarly, stakeholder-related disclosures follow a similar upward trend, reflecting a 41% increase from 2018 to 2019 and a 15% increase from 2019 to 2020. These disclosures also share a common trend in which the gradients underlying the growth within their respective disclosures visibly decreases over the years under study.

The dominating share of partnership disclosures within the social engagement theme, as well as the significant increase in partnership disclosure scores from 2019 to 2020, can potentially be explained as the organisation's motivation and action in improving corporate legitimacy and social responsiveness with key stakeholders by acquiring expertise and knowledge through recurringly engaging with Non-Governmental Organisations (NGO) and other conservation groups to reflect the development of recognised competencies within specific areas of intervention (Boiral and Heras-Saizarbitoria, 2017).

Awards and stakeholder-related disclosures

Figure 5 (page 44) indicates that award-related disclosures contribute 10% of disclosure scores to the entire social engagement theme (the smallest contributor of the three sub-groups). These disclosures increased from 2018 to 2019 by 56% but subsequently declined by 32% from 2019 to 2020. As a result, the highest scores for award-related disclosures were recorded in 2019 at a score of 25 (Figure 5 – page

44). 19 listed companies within the sample disclosed information in recognition of an award granted to their respective organisations for biodiversity conservation or restoration (74% of the entire sample of listed companies gave no information relating to biodiversity recognition or rewards). Similar results can also be found in (Adler et al., 2018), which finds that greater than 80% of Fortune Global companies failed to disclose any information relating to biodiversity awards.

Partnership-related disclosures were generally found to be basic, lacking depth of detail in explaining the motivation underlying the partnerships, the objectives of the partnerships, as well as the biodiversity targets of the collaboration. As a result, satisfactory disclosures were far and few and where identified, reflected ideal/model disclosures for future reference.

For instance, Company 48 provides a sufficiently detailed example mentioning that:

> *For example, at our Cape Lambert operation in the Pilbara region of Western Australia, our turtle monitoring programme, a partnership with the Department of Biodiversity, Conservation and Attractions, has been expanded to become a collaboration between operational teams, local communities, regulators, and the Ngarluma Aboriginal Corporation. This proactive management was acknowledged with an Excellence in Environmental Management award at the 2019 Australian Mining Prospect Awards.* ***(Company 48 Annual Report, 2019)***

This indicates the nature of their biodiversity partnerships, the other key stakeholders involved in the collaborative project, their shared commitment to the above-mentioned biodiversity programmes and initiatives, and how this directly links to their award for biodiversity conservation.

Stakeholder Engagement disclosures

Stakeholder engagement contributes substantially to initiatives and programmes for biodiversity and provides benefits which companies could not have attained independently (Boiral and Heras-Saizarbitoria, 2017). With reference to Figure 5 (page 44), stakeholder engagement-related disclosures make up 34% of all disclosure scores within the social engagement theme. These disclosures have grown 41% from 2018 to 2019 and a gradual increase of 15% from 2019 to 2020. 14 companies have actively defined the steps taken in driving biodiversity awareness amongst employees and communities.

The same number of companies have also included disclosure regarding the collaboration with key advisors, scientists, and experts in confronting the challenges and risks posed by biodiversity loss. 6 companies have openly disclosed feedback from stakeholders regarding biodiversity issues affecting the company. This indicates that listed companies are failing to account for the considerations of their key stakeholders and experts when undertaking biodiversity action plans.

Stakeholder engagement disclosures are critically important disclosures as a company's primary communication should be with stakeholders who are ultimately impacted by the organisations' operations (Usher and Maroun, 2018). These disclosures include an organisation's statement within the annual report mentioning the relevant steps taken for creating biodiversity awareness amongst employees and communities, social media interactions relating to biodiversity conservation and stakeholder engagement with the companies' biodiversity initiatives/programmes. Across the sample of listed companies, these disclosures were generally found to be adequately detailed.

Disclosures detailing biodiversity initiatives/programmes involving the voluntary labour of employees and communities were often found in the annual reports of the sample companies, in which most common initiatives identified included flora-based planting programmes. To highlight the magnitude of tree planting-related initiatives across the sample of listed companies, various statements from annual reports have been extracted:

- *Over 50,000 trees for individuals, schools, community groups and MPs to plant in their communities through our support for the Queen's Commonwealth Canopy. Page 23.* ***(Company 33 Annual Report, 2019)***
- *50m AZ Forest is our 50-million tree reforestation initiative in collaboration with local governments and One Tree Planted, a non-profit organisation focused on global reforestation.* ***(Company 41 Annual Report, 2019)***
- *Partnering with the Woodland Trust - In January 2020 we announced a new partnership with the Woodland Trust to plant ten million trees over the next ten years expanding the UK's carbon sink and helping to reforest the UK. Our partnership has three parts.* ***(Company 56 Annual Report, 2020)***

Within the disclosure examples above, these organisations effectively convey their use of, and involvement in many different stakeholders' groups, together with the combined targets and progress associated with their joint afforestation initiatives. This enhances the disclosure scores with the other themes (i.e., performance evaluation), as it opens the disclosures to detailing the nature of these stakeholder relationships, what their combined purpose, targets and objectives are, and their respective contributions towards the projects underlying performance. The statements identified above are best practice examples and can be used to guide the future disclosures of listed companies within the UK as they recognise the inherent value and synergies attached to building on the linkages and inter-dependencies among the eight biodiversity themes.

4.1.4. Performance evaluation disclosures

Disclosures within the performance evaluation theme include the reporting of any biodiversity-related targets, the related performance and achievement of those targets and the costs associated with biodiversity rehabilitation, conservation, and initiatives. Performance Evaluation disclosure scores contribute 12% to the aggregate of all disclosure scores within this study. In relation to Table 2 (page 34), the median scores for this theme have increased by 29% from 2018 to 2019 and by 62% from 2019 to 2020. The maximum score of 24 was found in the 2020 period.

The increases in performance evaluation disclosures year-on-year (which was largely driven by companies within the industrial/mining industry) are accredited to the substantial improvements in the disclosure details around biodiversity action plans, initiatives and partnerships in addressing inefficient land use and deforestation. For instance, Company 33's 2018 annual report, provides limited details in the disclosure relating to their progress on overcoming biodiversity loss within their stakeholder performance section:

- *Natural capital - Number of trees planted on catchment land 12,800*
- *No net loss of biodiversity across capital programme 100%* ***(Company 33 Annual Report, 2018)***

In comparison, company 33's 2020 annual report provides disclosure on not only the metric related to their progress in confronting deforestation but also an asset management plan (AMP) diagram illustrating the company's contribution towards:

- *27,000 hectares of woodland creation (over 400,000 trees planted)*
- *30,000 hectares of peatland restoration Planted 350,000 trees to create new woodland*
- *Since 1995 we have planted over 2 million trees across our capital projects and catchment land* ***(Company 33 Annual Report, 2020)***

As well as pledging to *Planting 1 million trees to create 550ha woodland by 2030*, in addition to their afforestation progress of *Number of trees planted on catchment land 29,696 and No net loss of biodiversity across capital programme 100%* which indicates a vast improvement in the depth of details and quality of the organisation's biodiversity-related disclosures. Company 33 provides a statement of best practices within its 2018 annual report:

> *Working with the Woodland Trust Not only are we focused on reducing deforestation, we are also a big advocate of planting trees. We have been working with the Woodland Trust since 2004 and have raised over £7 million from the sale of eggs, chicken and turkey among other products. The money has funded the planting of three million trees as well as*

educating children and advising our farmers on the benefits of planting trees. This also contributes to the Government's Clean Growth Strategy and its commitment to planting 11 million trees. ***(Company 33 Annual Report, 2018)***

The above highlights the company's commitments and progression in their purpose towards reducing deforestation and how they plan to achieve their goals (aligned to a vision transcended beyond the organisation itself, i.e., the government's clean growth strategy), by leveraging the skills and resources from its partnership with key institutions like the Woodlands Trust. This is a clear example of how UK-listed companies may build upon the depth and details of their biodiversity disclosures by linking their performance evaluation to other themes (i.e., in this case, to the social engagement and internal management theme).

Figure 6: Performance Evaluation - Total Disclosure Scores



Cost related disclosures

In terms of Figure 6 above, cost-related disclosures carries the lowest number of disclosure scores relative to all other disclosures within the Performance Evaluation theme (contributing 5% to the total performance evaluation disclosure scores). The negligible levels of cost-related disclosures are also found in Van Liempd and Busch (2013b) which finds that cost data reported by listed Danish companies were 'fully absent' and in Grabsch et al. (2012) which observed that only 3.4% of UK companies disclosed any biodiversity related cost data.

Company 22 presents a statement of best practice within its 2018 annual report, which may be used as a guide for other UK-listed companies, to disclose effectively the estimated costs or investments required for the restoration and conservation of ecosystems and habitats, or for the rehabilitation of endangered species, while simultaneously giving consideration to the nature of the respective projects:

> *'In AMP6 we will be delivering our largest ever environment programme, spending over £300 million to deliver improvements to rivers throughout our region, a programme which is supported by our customers who want to see us do more to improve river water quality. This year we expect to regain our 4* Environmental Performance Assessment status from the Environment Agency.'* ***(Company 22 Annual Report, 2018)***

The lack of organisational reporting on biodiversity-related costs highlights a crucial weakness in corporate biodiversity reporting and indicates that these listed companies are not taking the restoration and conservation of biodiversity as seriously as need be (Usher and Maroun, 2018). Dissimilar results are, however, found in Mansoor and Maroun (2016) which finds that cost-related information, is the dominant disclosure among South African food and mining companies.

Target and Performance related disclosures

In relation to Figure 6 (page 49) above, Target related disclosures account for 63% of all scores within the theme. These disclosures increased from 2018 to 2019 by 61% and increased by a further 54% from 2019 to 2020. This sub-group includes an organisation's disclosure about its current and future biodiversity-related targets, disclosure of the targets set in line with the United Nations Sustainable Development Goals 14 and 15, as well as any reporting on strategies for the future development and improvement of biodiversity initiatives.

Performance-related disclosures contribute 32% to the total scores within performance evaluation. This sub-group includes an organisation's disclosure over its biodiversity-related performance and achievement of targets, an organisation's assessment of outcomes relating to partnerships, as well as its efforts in preventing extinction. Performance disclosures decreased by 12% from 2018 to 2019 but subsequently increased by 85% from 2019 to 2020.

With reference to Table 3 (page 51), companies are improving their approach to disclosing their biodiversity-related targets year-on-year as the average score among companies has increased from 1.82 in 2018, to 2.03[11] in 2020 (an overall increase of 12%). Concurrently, companies' disclosures of their

[11] At this stage, this movement is only considered from a descriptive statistics point of view. As such, it is not precluded that the movement may be due to averages. Further statistical tests and relationships are analysed in Section 4.2.

performance and achievements of these respective targets have declined from an average of 1.87 in 2018 to a score of 1.8 in 2020.

Table 3: Number of companies reporting target and performance-related disclosures

Details	2018	2020		Details	2018	2020
Number of companies reporting future target-related disclosures				**Number of companies reporting performance-related disclosures**		
Scores = 3	3	8		Scores = 3	4	8
Scores = 2	3	14		Scores = 2	5	4
Scores = 1	5	7		Scores = 1	6	13
Average Score	**1.82**	**2.03**		**Average Score**	**1.87**	**1.8**

This may suggest that the UK's listed companies are more interested in utilising the face value of CSR when managing the impressions of stakeholders through the selective disclosure of attractive biodiversity targets to enhance artificially the company's legitimacy (Hassan et al., 2020), without following through in those intended targets and plans with substantive action. As a result, companies are less likely to disclose their performance in line with their targets to minimise the risks of being held accountable for their poor/inadequate environmental performance (Usher and Maroun, 2018).

Company 39 provides some of the best performance evaluation disclosures by disclosing their intended biodiversity-related targets in their 2018 annual report and subsequently reported on the progress and performance aligned to these targets in their 2019 annual report. This suggests the company's commitment to future biodiversity-orientated goals and objectives while giving comfort to stakeholders in assuring that the organisation is willing to be held accountable should these objectives not be met. The biodiversity targets set out in Company 39's 2018 annual report state:

> *Biodiversity*
>
> - *Our commitment is to maximise the biodiversity potential of all our development and operational sites and achieve a 25% biodiversity net gain across the five sites offering the greatest potential by 2030.*
> - *In total, 63 measures across the portfolio have been identified to support our net gain commitment which are planned for installation in the next 3-5 years. A total of ten measures have been installed since 2016/17.* ***(Company 39 Annual Report, 2018)***

These disclosures highlight the key intentions communicated to the organisation's stakeholders in understanding the company's approach to overcoming biodiversity loss. These targets detail the number of operations involved in the biodiversity plans (although the specific sites are not mentioned), a suitable

timeframe indicating when the company ideally expects to fulfil their commitments and a measurable net gain target. The Sustainability Performance Report within the 2019 annual report of Company 39, states:

> *Performance:*
>
> - *On track - In the year we extended our biodiversity commitment to our assets in London and are assessing opportunities for installations in the year ahead. We've planned and secured budget for biodiversity enhancements to the five sites offering the greatest potential, which will deliver net gain in biodiversity at each site of between 5% and 25%.*
> - *Completed projects include a 220m2 wildflower garden installed at Hatfield Galleria and planting of aquatic plant species in the lakes at White Rose, Leeds. We're also committed to delivering net gain through our development pipeline, and our 21 Moorfields development will deliver over 1,700m2 of new green walls, trees and plants, totalling 76 different species. We are developing a strategy for all future developments to deliver net gain.* ***(Company 39 Annual Report, 2019)***

In the subsequent year disclosures are made signifying the company's progress towards achieving its net gain target. Company 39 also further details important information relating to the individual locations, as well as both the nature and quantity of biodiversity populations and species installed within these locations. This allows stakeholders the ability to trace independently the company's biodiversity progress and achievements, increasing stakeholders understanding and impressions of these respective organisations.

Across the entire performance evaluation theme, companies are struggling to integrate their biodiversity targets and performance-related statements with their strategic/core performance sections (These sections are dominated by financial measures and motives) as most biodiversity targets and performance are included within their own secluded sections within the organisation's annual report. Where this is found to be included, reference is mostly made to improving the general grouping of 'sustainability' or 'environmental' performance with no mention specifically made to reversing biodiversity loss and species extinction.

4.1.5. Risk disclosures

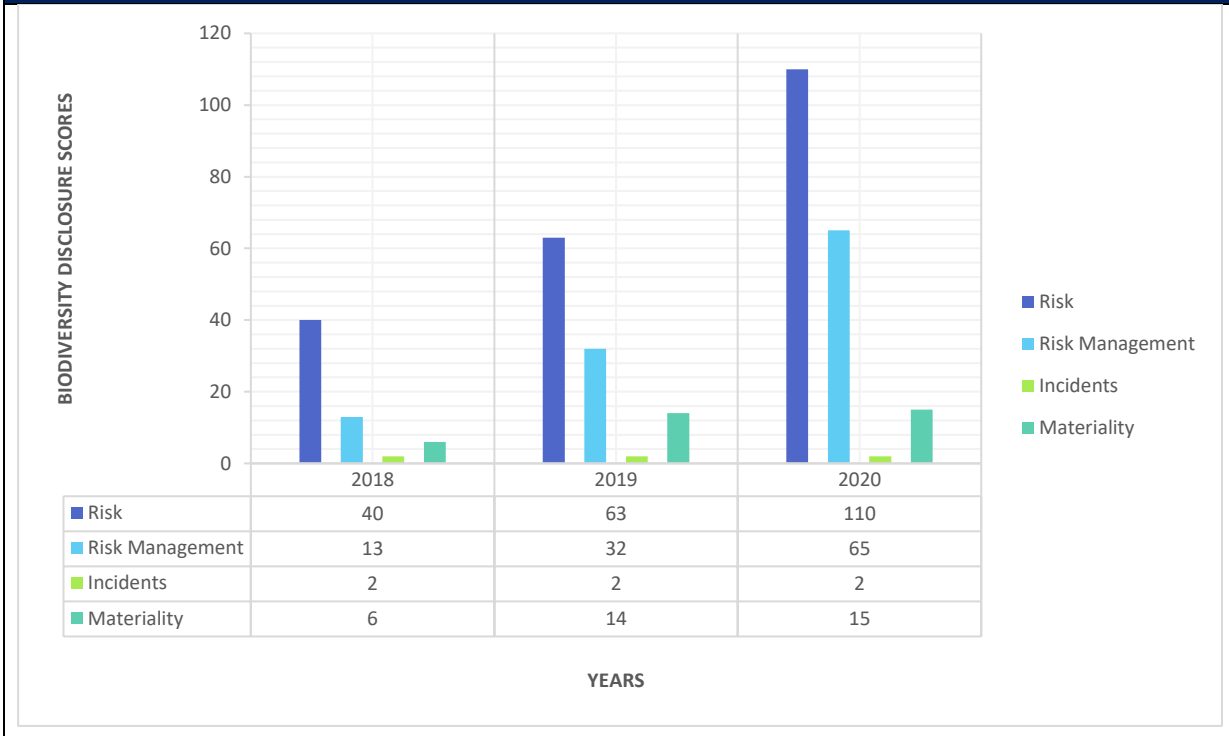
Risk-related disclosures account for 8% of all biodiversity disclosure scores and are recognised as one of the lowest-scoring themes within this study (Figure 7 – page 53). This theme includes an organisation's disclosure regarding whether it reports and assesses biodiversity-related business risks,

utilises tools to measure their biodiversity impacts, reports on any specific incidents which have affected biodiversity and whether the company considers biodiversity a material issue. Risk disclosures are critically important for organisations to disclose as stakeholders should be informed about what an organisation's material risks are, as well as what plans or strategies the company has put in place to minimise or completely mitigate those risks (Usher and Maroun, 2018).

The median scores within this theme have increased by 79% from 2018 to 2019 with a subsequent increase of 77% from 2019 to 2020 (Table 2 – page 34). The maximum score is shown as 19, attributed to the 2020 period, and is out of a possible total score of 36 for the risk theme. The significant increases in the median score relating to this theme are primarily driven by the increase in the disclosures associated with an organisation's ability to report and assess its biodiversity risks.

This study, however, finds that a majority of these disclosures are purely qualitative in nature. As a result, these disclosures lack quantitative substance (also see section 4.1.8: Valuation disclosures) which is publicly used to inform the understanding of stakeholders within their evaluation of the companies (1) progress relating to the quantities of fauna and/or flora rehabilitated and (2) the future forecasts relating to the quantity of threatened species expected to be recovered as a direct result of the company's own initiatives.

Figure 7: Risk - Total Disclosure Scores



	2018	2019	2020
Risk	40	63	110
Risk Management	13	32	65
Incidents	2	2	2
Materiality	6	14	15

Risk and Risk Management related disclosures

Figure 7 (page 53) illustrates a significant increase in risk-related disclosures of 58% from 2018 to 2019 and 75% from 2019 to 2020. Overall, this sub-group contributes 59% to the total disclosure scores within the risk theme. This substantial increase highlights a positive shift in the willingness of listed companies to disclose their biodiversity-related risks and impacts. 35 companies disclosed information regarding their assessment of biodiversity-related risks. On the other hand, only 15 companies disclosed information relating to an organisation's development of risk management strategies, with the intended purpose of minimising these biodiversity-related risks. 19 companies within the sample described their ability to capitalise on any business opportunities created as a result of the biodiversity risks and 12 companies disclosed their use of tools in measuring the positive and negative impacts of biodiversity.

A vast majority of the risk-related disclosures identified within this study are, however, presented as basic or general statements with minimal details lacking specifics on the nature of the business risks, the impacts that these risks have on the perpetuity of the company and the financial implications these risks carry. The lack of scores is a great concern for UK-listed companies as it indicates that these entities are uninterested in disclosing their biodiversity activities (Usher and Maroun, 2018).

For example, company 13 provides:

> *Biodiversity commitments include:*
>
> *Identify any harmful direct impacts and dependencies our business has on nature and biodiversity and set targets for reducing them.* ***(Company 13 Annual Report, 2020)***

This disclosure lacks details regarding the nature of the risks, the implications of these on the sustainability of the organisation, as well as the potential financial implications of these biodiversity-related risks. Significant improvement needs to be made with regards to risk disclosures as this information is vital for stakeholders when understanding the adequacy of an organisation's plans and actions in mitigating biodiversity loss.

Incident-related disclosures

The only incident-related disclosures identified within the 2018, 2019 and 2020 periods belong to the annual reports of Company 40. Their 2018 annual report discloses information regarding its active participation with the IUCN, which is to *'enhance remediation techniques and to protect biodiversity at sites affected by oil spills'* within the company's areas of operations, as well as the company's intention to *'launch further improvement initiatives to help strengthen its remediation and restoration efforts'*. These disclosures are consistent across all three annual reporting periods and generally disclose

the nature of the spills as well as the financial implications, but information regarding the species and wildlife affected is kept minimal.

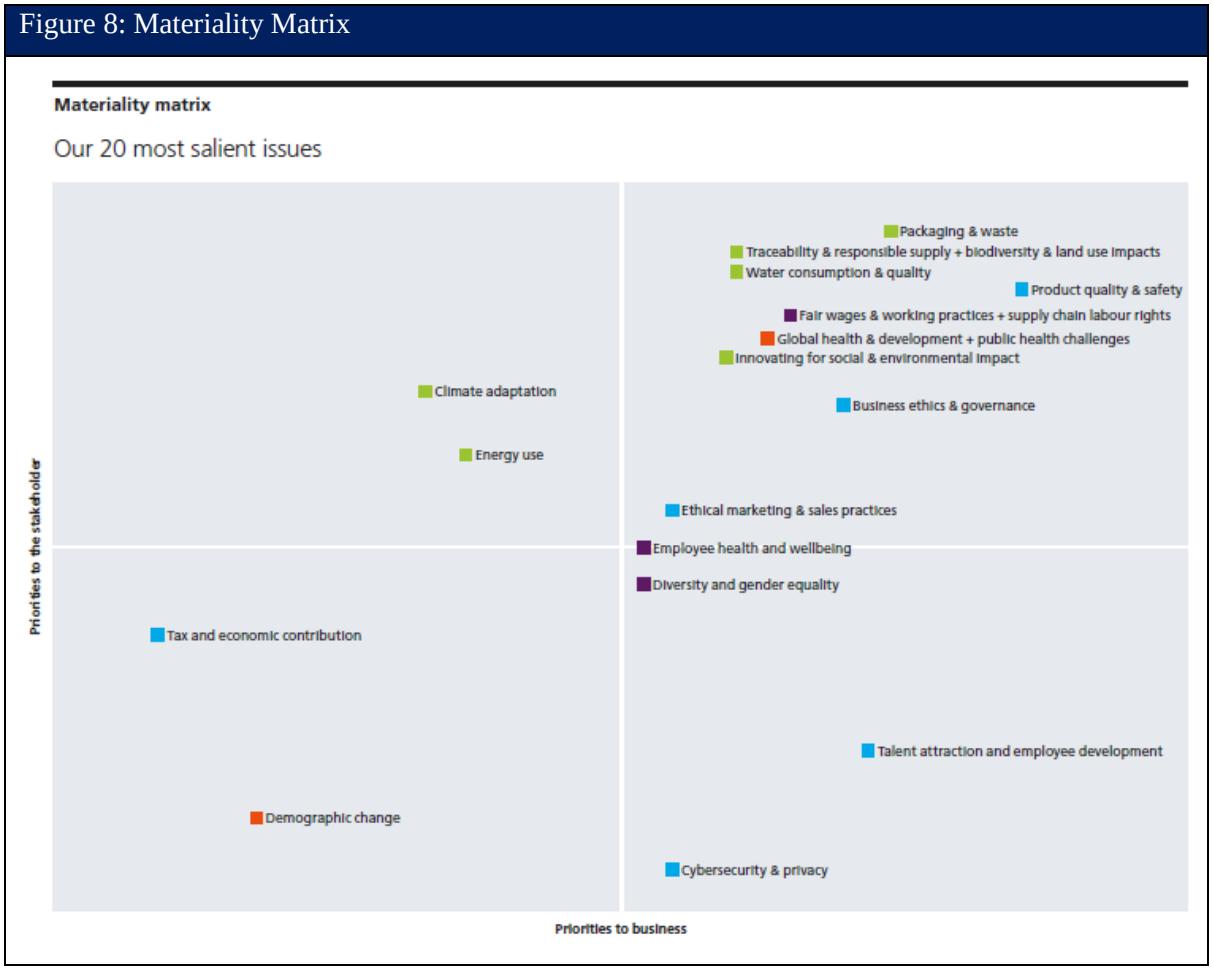
Materiality related disclosures

Materiality-related disclosures accounted for 17% of all disclosure scores within the risk theme. Across the entire sample 15% of listed companies disclosed some information relating to the organisation's use of materiality assessments across different biodiversity issues. The materiality assessment-related disclosures ranged from basic to detailed statements.

In the instances where a biodiversity materiality assessment was carried out, this was usually regarded as low and not as important as an organisation's other 'key concerns', which include other areas of sustainability i.e., climate change (also see Van Liempd and Busch (2013b)). These materiality assessments are usually reported using a materiality matrix, referencing the company's observations of their biodiversity-related risks, relative to the organisation's other risks. This information may have a bearing on the decisions of stakeholders in actively engaging or being involved with an organisation (Usher and Maroun, 2018).

For instance, Company 54 effectively presents a Materiality Matrix for its internal and external stakeholders within the 2019 annual report (see the extract below), detailing the relative importance of its twenty most salient issues. The entity classifies biodiversity and land use as a material matter, ranking above those usually considered material for an organisation's success (i.e., business ethics and governance, employee health and well-being, and ethical marketing and sales practises) highlighting biodiversity and its related matters as a key priority to both the business and its stakeholders.

Figure 8: Materiality Matrix



(Materiality Matrix identified within Company 54 Annual Report, 2019)

Where the materiality used in an organisation's biodiversity consideration is effectively communicated (as is evidenced in Figure 8 – page 56), this may allow for key stakeholder groups to gauge how invested and committed an organisation is to biodiversity conservation and awareness when reducing the effects of global biodiversity loss and species extinction. Companies may also find these biodiversity assessments useful when evaluating the losses attributed to ecosystem services and how they may directly and indirectly affect a business's operation (F&C Asset Management, 2004).

In the case of Company 54 (refer to Figure 8 – page 56), the group recognises the importance of addressing the challenges related to its packaging and waste, by declaring that single-use plastics remain a pervasive and growing problem, mostly ending up in oceans and contaminating the planet. The organisation also recognises biodiversity & land use impacts as a material consideration (by its inclusion in the top-right quadrant) and ranks this area over other matters like corporate tax and employee health (which are perceived to be of lesser priority by the group's stakeholders). This effectively highlights the company's focus on committing resources to address both its direct and indirect impact on

deforestation within its existing supply chains, by development of comprehensive land use plans (as per Company 54's 2019 annual report).

Where a materiality matrix is effectively considered, designed and implemented by an organisation's management (i.e., Company 54 as discussed above), this may effectively display the organisation's prioritisation and allocation of its limited resources towards addressing its stipulated key risk areas. Company 54 also highlights the importance of continuously examining the different materiality clusters within its materiality assessments as it gives the organisation *'further insights which guide our strategic and operational priorities'.* ***(Company 54 Annual Report, 2019)***

This organisation also recognises changes in their materiality matrix from prior years, highlighting how invested the group is in assessing those areas of importance to the entity's core internal and external stakeholders.

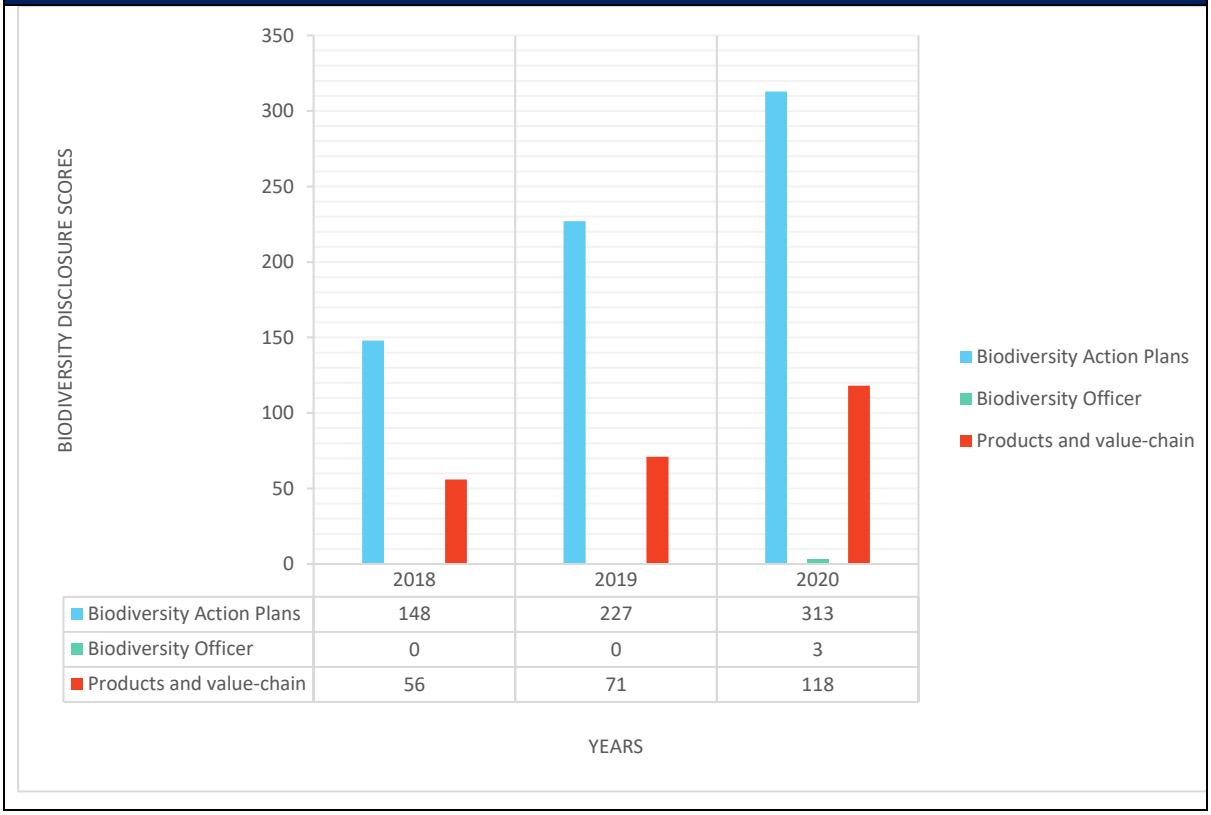
> *Analysis of the feedback revealed some notable shifts in the materiality landscape since our 2016 assessment. Innovation, water, packaging materials and talent retention and acquisition have all become significantly more important to both internal and external stakeholders.* ***(Company 54 Annual Report, 2019)***

On the other hand, where entities fail to classify biodiversity as a material concern, despite, (F&C Asset Management, 2004)'s classification of biodiversity loss as a material risk for companies), entities may disregard the need to disclose and account for biodiversity risks and their subsequent strategies for mitigating these associated risks. This may result in adverse outcomes far beyond the realm of commerce and financial gains, as it may lead to the collapse of ecosystems, the existence of which are essential in sustaining life (Van Liempd and Busch, 2013b).

4.1.6. Internal management disclosures

Internal management-disclosures contribute 20% to the total disclosure scores identified within the study. Internal management-disclosures constitute the second largest theme, after external reports. These disclosures include an organisation's statement regarding its biodiversity action plans, details of an entity's land management and afforestation activities, as well as an organisation's disclosure of the impact which its products, processes and services have on biodiversity. Table 2 (page 34) shows the maximum score of 21 for a company relating specifically to this theme (found in the 2020 period). The median scores identified under this theme, increase by 46% from 2018 to 2019, with an equivalent percentage increase from 2019 to 2020.

Figure 9: Internal Management - Total Disclosure Scores



Biodiversity Action Plan (BAP)-related disclosures

With respect to Figure 9, these disclosures dominate the internal management theme, accounting for almost three-quarters of all disclosure scores. Disclosures relating to biodiversity action plans increased by 53% from 2018 to 2019 and by a further 38% from 2019 to 2020. Across the vast majority of disclosures referencing biodiversity action plans, most are found to be vague commitments only mentioning that BAPs will be implemented and lacking sufficient substantiation as to how these are to be carried out and what their objectives are. Examples of this are shown:

- *Through our MAP2030 commitments, we will conduct water stewardship and biodiversity assessments at all our mills and forestry operations by 2025, introducing action plans where necessary.* ***(Company 23 Annual Report, 2020)***
- *Our nature goal is underpinned by ambitious targets and focuses on water reduction and water stewardship compliance, waste reduction and circularity (including eliminating plastics), API emissions reduction, adoption of biodiversity action plans and measurement of carbon and/or land use improved from nature-based solution programmes.* ***(Company 45 Annual Report, 2020)***

- *We require all operations to develop risk-based biodiversity action plans and site-level biodiversity targets, to drive progress in this critical area.* ***(Company 49 Annual Report, 2020)***

The disclosures above fail to adequately address even some of the principle elements of a biodiversity action plan set out in (UEBT, 2019). No mention is made about to what the intended targets and objectives are, who's expected to carry out the BAP and how the progress will be measured. This highlights the poor quality of disclosures relating to BAPs, in which Usher and Maroun (2018) suggest that companies may intentionally choose to disclose lesser amounts of biodiversity action plan data to minimise the risks of biodiversity progress tracking allowing for these organisations to minimise their obligations of accountability to stakeholders.

Product and Value Chain related disclosures

Overall, products and value chain-related disclosures contribute 26% to the total scores across the sample. Figure 9 (page 58) shows a gradual increase in these disclosures of 27% from 2018 to 2019 and a greater increase of 66% from 2019 to 2020. In relation to this particular theme, the UK's listed companies are displaying satisfactory results within their biodiversity reporting, as 39 companies have disclosed statements regarding their involvement in afforestation activities. For instance, the 2020 annual report of Company 47 includes an afforestation-related disclosure stating:

> *Afforestation initiatives in farming communities We support community-based afforestation programmes in a number of countries. For example, our afforestation programmes in Bangladesh and Pakistan date back to the early 1980s and have planted over 196 million tree saplings combined. Both are recognised to be among the largest private sector-driven programmes in these countries.* ***(Company 47 Annual Report, 2020)***

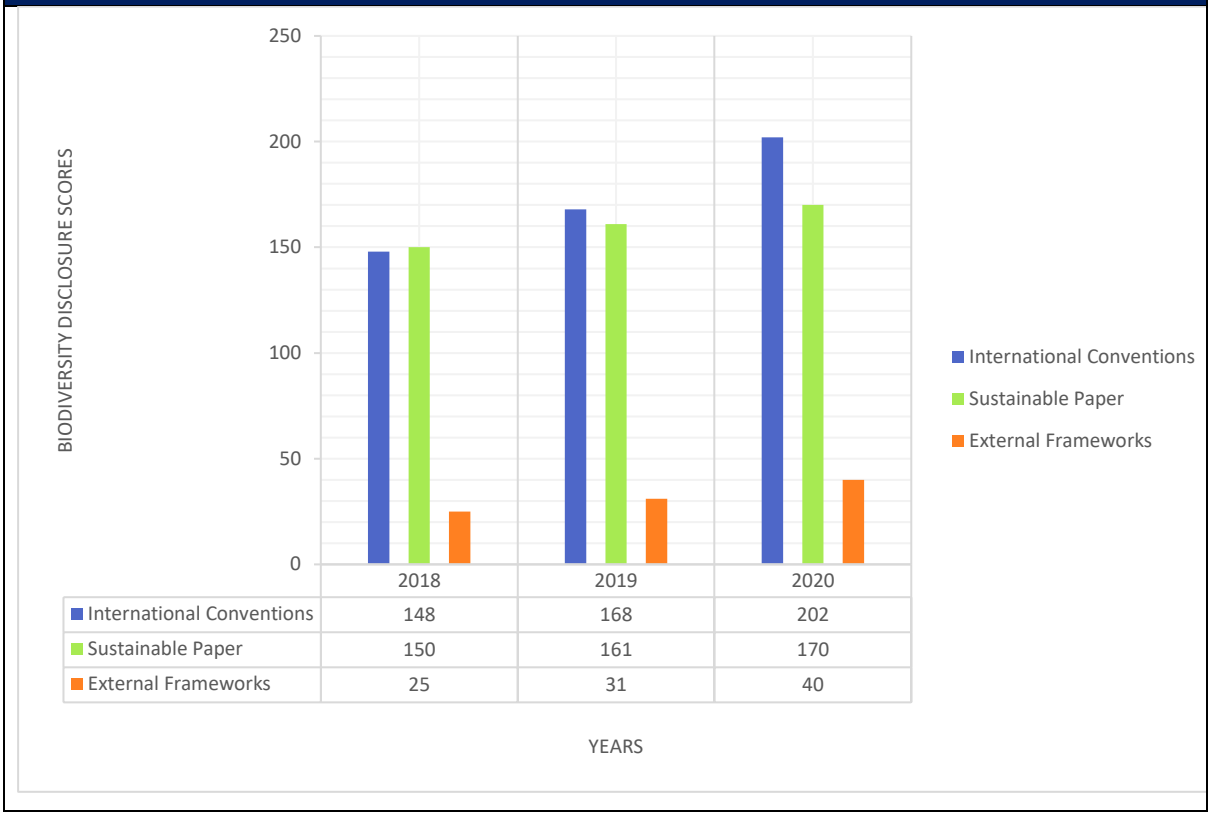
The vast majority of afforestation-related disclosures found across this study are generally found to include sufficiently detailed information, indicating the locations of the afforestation activities, the number/populations of planted flora, collaborations with NGOs and the organisation's biodiversity performance.

4.1.7. External reports disclosures

External Report disclosures are the highest disclosure scoring theme as they account for 24% of all the biodiversity disclosures within this study. Stakeholders are increasingly demanding more reporting on not just an organisation's economic performance, but its environmental practices as well.

This has been the primary driver, after the development of numerous external reporting frameworks and guidelines (i.e., GRI), intended to enhance the reporting of specific environmental areas, measure an organisation's progress, clarify consistency between activities and improve the levels of comparability across organisations in different operating areas (Siew, 2015, Mansoor and Maroun, 2016).

Figure 10: External Reports - Total Disclosure Scores



	2018	2019	2020
International Conventions	148	168	202
Sustainable Paper	150	161	170
External Frameworks	25	31	40

Table 2 (page 34) illustrates an increase in the median scores related to this theme, 11% from 2018 to 2019 and a further increase of 14% from 2019 to 2020. The highest score of 9 was identified within all three years. This study finds that a small portion of the sample companies (17 companies explicitly mention their use of the GRI in guiding the construct of their annual reports) are utilising the GRI as a reporting framework.

A great number of UK-listed companies are actively foregoing the opportunity to increase the credibility, reliability, and transparency of their biodiversity reports through the utilisation of the GRI. Additionally, where the GRI was used, organisations generally applied these standards on a broad basis without making reference to biodiversity indicators and measures. Other external frameworks and

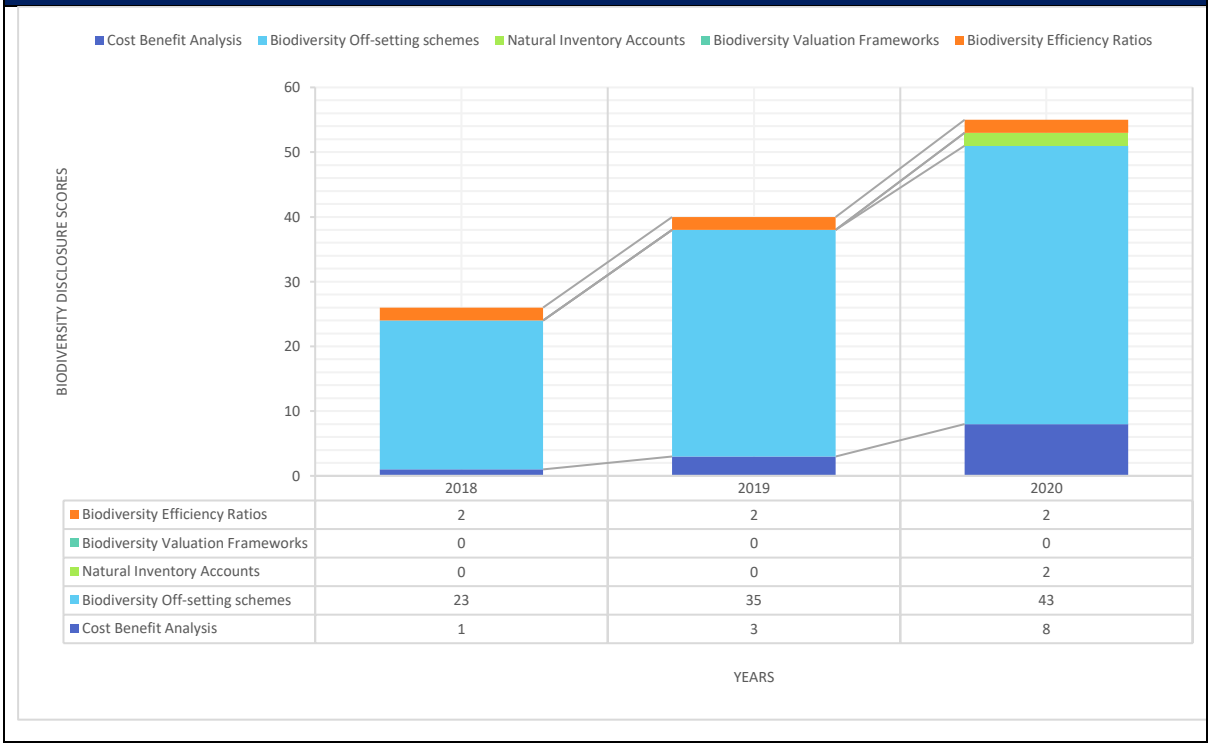
initiatives often mentioned include the Sustainability Accounting Standards Board (SASB) and the Task Force on Climate-related Financial Disclosure (TCFD).

4.1.8. Valuation disclosures

According to Figure 11, Valuation related disclosures account for 3% of all disclosure scores, representing the smallest biodiversity theme within this study. Disclosures made in reference to biodiversity off-setting schemes dominate the greater portion of this theme's disclosure scores (as per Figure 11 below). These scores are increasing year-on-year with an increase of 52% from 2018 to 2019, and a subsequent increase of 23% from 2019 to 2020.

A similar increasing trend is found in the median scores, as Table 2 (page 34) depicts a 51% increase from 2018 to 2019 and a further 38% increase from 2019 to 2020. The maximum for this theme was identified as a score of 6 found within both the 2019 and 2020 periods.

Figure 11: Valuation - Total Disclosure Scores



	2018	2019	2020
Biodiversity Efficiency Ratios	2	2	2
Biodiversity Valuation Frameworks	0	0	0
Natural Inventory Accounts	0	0	2
Biodiversity Off-setting schemes	23	35	43
Cost Benefit Analysis	1	3	8

Minimal disclosures are made in reference to an organisation's inclusion of biodiversity efficiency ratios, biodiversity valuation frameworks, inventory accounts and cost-benefit analysis conducted by an entity (The disclosure scores relating to these themes cumulatively contribute 17% to the valuation

theme). This is in contrast to the high level of target-related disclosures in the performance evaluation theme (Figure 6 – page 49) as it questions an organisation's ability to (1) measure effectively or value their biodiversity-related progress towards their intended targets and to (2) monitor and account for the natural capital within their respective operational areas.

These poor levels of disclosure scores, question UK-listed companies' commitment to achieving substantive action through the reporting of useful quantitative data surrounding an organisation accounting for biodiversity gains and losses. Qualitative reporting provides stakeholders with a narrative account of the organisation's biodiversity activities but where this is unsubstantiated with sufficient quantitative data, stakeholders are unable to verify an organisation's progress, as well as its effectiveness in the biodiversity initiatives undertaken. These disclosures presented by organisations can then be perceived as 'superficial' amongst stakeholders, questioning the entity's ability to follow up with legitimate action (Usher and Maroun, 2018).

Although few, an example of best practices within biodiversity offsetting disclosure is provided by Company 50 within their 2020 annual report stating:

> *We are investing in biodiversity offsets at several sites in the region of the Minas-Rio operation by way of combating ongoing deforestation. These offset sites cover more than 15,000 hectares, of which around 12,000 hectares are legally constituted forest and are managed directly by Company 50. The remaining hectares will be donated to the Minas Gerais state government in order to help conserve protected land by creating a 'green ribbon' that connects these areas.* ***(Company 50 Annual Report, 2020)***

This effectively communicates the organisation's commitment to biodiversity off-setting schemes by detailing the specific region and operation where the biodiversity off-setting initiatives will occur, as well as the nature and estimated quantities of flora on which the project is expected to impact. This disclosure illustrates the organisation's ability to improve its existing levels of corporate transparency, by going in-depth and explaining the nature of the organisation's relationships and commitments with its key stakeholders (i.e., state government) regarding its joint conservation plans. Within the next section, the biodiversity disclosure scores will be analysed on an industry basis, to analyse and evaluate the reporting patterns and trends identified within this study.

4.2. Biodiversity Quantitative Analysis

4.2.1. Biodiversity correlation matrix

Table 4 (page 65) reflects the correlation matrix for all variables (dependant and grouping) included within this study in order to identify whether any multicollinearity problems exist, i.e., the lack of orthogonality among the variables within regression analysis (Alin, 2010). Overall, the levels of correlations among the variables are mostly high (Refer to the darkly shaded cells in Table 4) with statistically significant relationships identified between and among all eight of the biodiversity disclosure themes.

The correlation matrix illustrates that statistically significant and positive correlations exist among all biodiversity disclosure themes and the presence of a biodiversity partnership. These international bodies and regulators tend to put pressure on organisations to formulate biodiversity action plans in order to reduce the latter's biodiversity impact on the entity's surrounding ecosystems and habitats (Adler et al., 2018). As the environmental expectations of stakeholders continue to grow, organisations are motivated by both internal and external pressures to improve their environmental performance and disclosures where their corporate legitimacy is questioned if not challenged.

These partnerships were generally found to assist the entities in understanding their biodiversity-related engagements, risks and dependencies. These findings suggest that most companies utilised their opportunity to expand their disclosures to incorporate a greater level of detail, including the nature and motivation underlying the partnerships (scene-setting), the partnership's joint objectives and existing performance (performance evaluation), the jointly developed initiatives (internal management), as well addressing the specific species of fauna/flora attended to (species related).

Statistically significant and positive relationships are also identified among company industry and six of the eight biodiversity disclosure themes (except the external reports and valuation theme). The non-existent relationship between company industry and the valuation theme continues to highlight a common trend identified within this study which finds that, although companies within higher-risk industries tend to disclose more on the matter, these statements are usually qualitative in nature and lack sufficient quantitative data. This supports and/or strengthens the finding, which suggests that companies are intentionally disclosing a lesser amount of quantitative information to manage the perceptions of stakeholders through minimising their (stakeholders) ability to measure, evaluate and conclude on the organisation's progress in relation to their initiated action plans.

The results support the fact that companies across all industries are utilising frameworks and guidelines to assist with their related biodiversity disclosures, regardless of the differences in the perceived environmental risks associated with the different industries.

No significant correlations are found between the biodiversity disclosure themes and (1) ESG Performance ratings, and (2) ESG risk ratings, indicating a weak association with these grouping variables, which results in the inability to use these variables as determinant factors underlying biodiversity disclosure.

ESG performance ratings may potentially be a poor gauge for both the quality and quantity of an organisation's biodiversity disclosures as the metric factors into account social, governance and economic factors material to an organisation's existence (i.e., human capital development, risk and crisis management, and tax strategy) which may have no significant and/or direct bearing on the company's environmental performance and its biodiversity performance.

The broader 'environmental' theme (as defined by the S&P Global ESG scoring methodology) includes several considerations and areas beyond that of just biodiversity loss and species extinction. For instance, the methodology driving the ESG performance ratings also factors into account other environmental issues like climate change, water-related risks, decarbonisation, mineral waste management and electricity generation (S&P Global, 2023), which may have an indirect and/or trivial association to biodiversity management and the organisation's subsequent disclosures.

The scoring methodology developed by S&P Global (2023), weighs new criteria low in the initial years, to assist companies in the alignment of their disclosures with the new concepts and to improve their data collection and reporting systems within identified areas. However, where biodiversity is considered a relatively new topic, the questions may be weighted relatively low, contributing less to the overall ESG performance rating. This once again questions the rating's ability to act as a primary driver behind corporate reporting on biodiversity where it may be primarily determined by factors and questions with little to no relation to biodiversity.

ESG risk ratings takes into account social and governance matters, as well as a multitude of environmental factors over and above those issues relating to biodiversity loss and species extinction. The methodology developed by Sustainalytics (2022) in the determination of their ESG risk rating is primarily based on identifying and quantifying the gaps between an organisation's exposure to certain risks and its ability to manage those related risks. A problem arises, for instance, where a company's management over its biodiversity risks is practically effective, however, its management over its social and/or governance-related risks is evidently poor, as this will have a net adverse/downward effect on the related ESG risk rating, questioning the metric's ability to be used as an effective determinant of an organisation's biodiversity disclosure.

Table 4: Biodiversity Correlation Matrix

Variables	Count of SS	Count of SR	Count of SE	Count of PE	Count of R-	Count of IM	Count of ER	Count of V-	DV1 Partnership	DV2 ESG Performance	DV3 ESG Risk	DV4 Industry	DV5 Size
Count of SS	**1,000**	.391**	.667**	.672**	.689**	.789**	.267**	.364**	.502**	.216**	0,082	.350**	0,019
Count of SR		**1,000**	.378**	.398**	.403**	.439**	.469**	.197**	.264**	-0,089	0,016	.254**	-0,110
Count of SE			**1,000**	.672**	.640**	.776**	.193**	.300**	.744**	0,101	0,089	.280**	-0,051
Count of PE				**1,000**	.586**	.827**	.279**	.491**	.515**	0,046	-0,053	.372**	-0,099
Count of R-					**1,000**	.748**	.237**	.404**	.458**	.188**	0,106	.351**	0,001
Count of IM						**1,000**	.294**	.450**	.549**	0,111	0,037	.353**	0,016
Count of ER							**1,000**	.265**	.140*	0,128	-0,069	-0,006	0,128
Count of V-								**1,000**	.225**	.141*	-0,024	0,132	-0,056
DV1 Partnership									**1,000**	0,075	0,054	.213**	-0,082
DV2 ESG Performance										**1,000**	0,020	0,067	.317**
DV3 ESG Risk											**1,000**	.260**	.313**
DV4 Industry												**1,000**	0,066
DV5 Size													**1,000**

*** Correlation is significant at the 1% level*
** Correlation is significant at the 5% level*

4.2.2. Non-parametric tests

Table 5 presents the non-parametric results for the relationships between biodiversity disclosure themes, and all grouping or independent variables (including ESG Performance, ESG Risk, Industry, Risk and Biodiversity Partnerships). The individual factors relating to each biodiversity theme is discussed in more detail below.

Table 5: Non-Parametric Results

Quantity	ESG Performance		ESG Risk		Industry		Biodiversity Partnership		Size	
Themes	KW-Test (H)	Std. JT-Test	KW-Test (H)	Std. JT-Test	KW-Test (H)	Std. JT-Test	MW Test (U)	N/A	KW-Test (H)	Std. JT-Test
Scene-Setting (SS)	15,724 ***	3,168 ***	2,486	1,213	0,094	0,307	1702,5 ***	N/A	15,014 ***	0,395
Species Related (SR)	2,727	-1,35	2,058	0,246	0,819	-0,905	2886,5 ***	N/A	9,891 **	-1,568
Social Engagement (SE)	13,600 ***	1,547	3,607	1,309	1,074	1,036	351,5 ***	N/A	18,610 ***	-0,688
Performance Evaluation (PE)	4,231	0,711	1,75	-0,747	4,781 **	2,187 **	1610 ***	N/A	31,153 ***	-1,255
Risk (R)	9,441 **	2,731 ***	5,861	1,535	0,028	0,168	1993,0 ***	N/A	8,411 **	0,012
Internal Management (IM)	5,168	1,587	0,66	0,561	1,875	1,369	1275 ***	N/A	19,994 ***	0,353
External Reports (ER)	5,249	1,875 *	2,77	-1,005	7,455 ***	-2,73 ***	3534,5 **	N/A	44,311 ***	2,124 **
Valuation (V)	5,542	2,076 **	15,081 ***	-0,39	0,461	0,679	3273,5 ***	N/A	21,368 ***	-0,813
All Disclosures	4,636	1,493	1,018	0,49	39,13 ***	5,023 ***	973,5 ***	N/A	31,723 ***	0,426

****** Significant at the 1% level***

***** Significant at the 5% level***

**** Significant at the 10% level***

ESG performance

There is a positive relationship between ESG performance and biodiversity disclosures (H= 4,636, p> 10%), but this relationship is not statistically significant (similar results found in Hassan et al. (2020)). Statistically significant and positive relationships exist between ESG performance and scene-setting, social engagement, and risk disclosures. These results fail to support prior stakeholder theory studies which suggests that poorer environmentally performing companies tend to disclose more voluntary disclosures, in response to the increased level of political and social pressures threatening their perceptions amongst stakeholders (Clarkson et al., 2008).

ESG risk

There is no statistically significant relationship between ESG Risk ratings and biodiversity disclosures (H= 1,018, p> 10%). These results are supported by Rimmel and Jonäll (2013) who identifies that no differences in biodiversity reporting exists among Swedish companies when separately grouped into three different risk categories. These results oppose the findings identified in F&C Asset Management (2004), which proposes that there should be differences in biodiversity reporting amongst different risk categories. These findings also contradict the conclusions reached in Husin et al. (2018), which finds a statistical difference in biodiversity disclosure among different risk categories more specifically between risk level 2 (amber zone) and risk level 3 (green zone).

No statistically significant relationships have been identified between ESG Risk ratings and the disclosures within all biodiversity themes, except for Valuation, in which a statistical relationship (H= 15,081, p< 1%; J= -0,39, p> 10%) exists. These findings are at odds with stakeholder theory as it suggests that listed companies included in higher ESG risk groups may decisively choose to disclose less information relating to an organisation's cost-benefit analysis, biodiversity off-setting schemes and biodiversity valuation frameworks as this may open up the organisation to additional examination by stakeholders, increasing the risks of identifying any critical weaknesses within the organisation's biodiversity reports (Usher and Maroun, 2018).

Industry

There is a statistically significant and positive relationship between company industry and biodiversity disclosures (H= 39,13, p< 1%) and (J= 5,023, p< 1%). These findings support the conclusions in (Adler et al., 2018), suggesting that companies within environmentally high-risk industries will have the greatest need to report, and by necessity, will be most likely to report biodiversity-related information to stakeholders (Adler et al., 2018, Grabsch et al., 2012). Consistent results are also found in Husin et al. (2018).

F&C Asset Management (2004) indicates that companies falling within the Mining/Industrial industry shall be classified as 'red zone' or 'high risk' sectors, as they directly impact and are dependent upon large-forested areas, requiring blasting, clear-cutting and excavation operations which may irreversibly affect the landscapes and adversely harm the local ecosystems (Boiral and Heras-Saizarbitoria, 2017).

These high-risk companies need to employ either defensive impression management or legitimacy-repairing strategies (Hassan et al., 2020), resulting in a greater tendency for these organisations to deploy greater levels of disclosure surrounding their biodiversity-related risks. These results suggest that companies falling within the lower risk industry groups (i.e., 'amber zone' and 'green zone') may have a relatively 'lower' and potentially more 'indirect' impact on the biodiversity and ecosystems surrounding their operations, resulting in their stakeholders requiring a lower level of environmental accountability and transparency from the organisation's corporate disclosures.

The mining/industrial industry inherently carries a greater environmental impact on an organisation's surrounding forestry, biodiversity, ecosystems, and species. In line with stakeholder theory, an entity's stakeholders may demand greater levels of corporate accountability and transparency from an organisation, through the effective disclosure of their biodiversity plans, motives, impacts and dependencies (Grabsch et al., 2012, Hassan et al., 2020).

Biodiversity partnership

Table 5 (page 66) provides that a statistically significant and positive relationship exists between the presence of a biodiversity partnership and biodiversity disclosures ($U= 973{,}5$, $p< 1\%$). These findings support the conclusions reached in Adler et al. (2018), and Hassan et al. (2020) which suggest that stakeholder partnering serves to expand the number of events and initiatives an organisation can disclose on, while triggering accountability requirements. Organisations are also able to utilise the expertise and resources offered through biodiversity partnerships and NGOs translating into greater levels of accountability and transparency when reporting to stakeholders.

Company size

A statistically significant and positive relationship exists between company size and biodiversity disclosures ($H= 31{,}723$, $p< 1\%$; $J= 0.426$, $p> 10\%$). Similar results are also found in (Adler et al., 2018) who utilises assets as a proxy for measuring the size of Fortune Global companies. Inconsistent results are also identified in Hassan et al. (2020) which concludes no significant relationship exists between company size and biodiversity disclosures, within their study.

5. Conclusion and recommendations

The following section summarises the final results. Section 5.2 provides the contribution of the thesis to the accounting literature. Lastly, Section 5.3 recognises the limitations and suggests areas for future research.

5.1. Conclusion

The accelerating rate of biodiversity loss and ecosystem collapse is recognised as one of the top ten global risks faced by the commercial sector (World Economic Forum, 2015). Biodiversity is vital for the existence of major ecosystems, where disruptions in species groups can cause habitats to crumble (van Liempd and Busch, 2013a). Safeguarding ecosystems and protecting flora and fauna life has never been so important, and necessary for not only the survival of businesses but for the continuing existence of humankind (Adler et al., 2018).

The purpose of this study is to investigate the reporting practices of biodiversity loss and species extinction by the top 75 companies listed on the London Stock Exchange. Overall, biodiversity reporting in the UK has low quality and quantity scores. Only a handful of companies are providing significant and detailed disclosure across the eight different themes. These are companies which have been identified as those having a direct and observable dependence on the natural resources necessary for the production of their ordinary output.

For instance, Company 22 which is an organisation responsible for the provision of clean water in the UK, claimed the highest aggregate scores across all three years, because of the organisations' detailed disclosure of its water dependence and treatment and the subsequent effects on its impacted ecosystems. Additionally, companies in industries with high-risk backgrounds are also found to disclose significantly more detail in their biodiversity risks and action plans. (Findings consistent with (Rimmel and Jonäll, 2013, van Liempd and Busch, 2013a, Mansoor and Maroun, 2016).

While there is considerable improvement in the biodiversity scores year-on-year, these statements have generally remained limited in substance, lacking sufficient detail over the biodiversity-related matters conveyed to stakeholders within their respective primary reports. The findings support the results from (Hassan, 2020) and (Adler, 2018), in which there is a call for awareness and corporate accountability through biodiversity and species extinction reporting.

In general, the companies appeared mostly interested in disclosing their positive efforts, for instance, their engagement and implementation of biodiversity action plans, rehabilitation activities (mostly involving afforestation), environmental awards and their associated partnerships with well-recognised initiatives. Unsurprisingly, these companies were found to be much more reserved when reporting on

their associated risks affecting biodiversity as a result of their own operations, as well as the costs involved when restoring and rehabilitating these ecosystems and their threatened species.

The findings within this study identified that companies were more likely to present information within more desirable and positive themes as they predominantly disclosed statements relating to the internal management and external reporting themes (These two most popular themes already account for 44% of all disclosures – Figure 2 – page 33). This study also finds that these organisations were less likely to present information under less desirable themes (those which may result in holding the organisation accountable), such as disclosures within the risk and valuation themes (the two least popular themes make up a cumulative 10% of all disclosures – Figure 2).

For risk disclosures, the root cause may lie in the fear of negative attention and legitimacy impacts drawn from poor risk management. Organisations may also choose to limit disclosures in a time of crisis. Companies also have underdeveloped risks assessment specifically for biodiversity, which is often hard to quantify in quantitative terms, making disclosures more boilerplate and generic.

In relation to valuation disclosures, underdeveloped management information systems contribute to difficulties in quantifying biodiverse risks and responses. In addition, integrated thinking and incorporating biodiversity-related concerns into business models, strategies, risk assessments and operations is still an emerging area for most organisations. Most organisation have only just begun to develop an integrated thinking logic and so would still have surface level assessments of valuation and risks. As such, as an integrated thinking logic develops, so too will the ability of organisations to better assess their risks and quantify the value on the surrounding biodiversity affected by their operations. Further research on the link between integrated thinking and biodiversity disclosures is deferred for future research (Ecim and Maroun, 2023, Maroun et al., 2022, Myeza et al., 2023)

As a result, companies have failed to address all eight biodiversity disclosure themes adequately. In order to produce an effective biodiversity report representing high levels of transparency and accountability, organisations must recognise the inter-dependencies among all eight biodiversity themes and the importance of transparently disclosing both favourable and unfavourable outcomes related to their biodiversity initiatives. This may ultimately allow for stakeholders to gauge effectively the organisation's strengths, weaknesses and concurrent progress towards minimising biodiversity loss and species extinction.

When measuring the relationship between biodiversity disclosure and its driving factors, the results identified positive and significant relationships between biodiversity reporting and companies within high-risk industries, the presence of biodiversity partnerships and organisational size by market capitalisation. These findings are important as they provide insight into the rationale underlying

corporate biodiversity reporting. This study also finds a positive and insignificant relationship between biodiversity disclosure and ESG performance ratings and ESG risk ratings.

UK-listed companies operating in high-risk industries (more specifically mining/industrial) were likely to disclose more information on biodiversity loss and species extinction than do companies within lower-risk industries (i.e., Financial Services). The findings are consistent with (Adler et al., 2018, Hassan et al., 2020), concluding that high-risk industries (classified as 'red-zone sector companies for which the mining/industrial industry is included) have the greatest need and resulting tendency to report on biodiversity-related matters. Similar to the results found within this study, (Adler, 2018) finds no biodiversity reporting at all by the financial services industry among Danish companies.

It was further identified that the disclosure of biodiversity and species extinction by UK-listed companies shared a statistically significant and positive relationship with biodiversity partnerships. These results are consistent with (Adler, 2018) which suggests that stakeholder involvement through partnerships and collaborations contributes to the creation of new biodiversity standards and is associated with a company's greater likelihood to invest and implement biodiversity impact assessments against their operations.

5.2. Contribution of the thesis

This study contributes to the literature in several ways:

- Firstly, the study expands the limited quantity of existing literature surrounding biodiversity and species extinction reporting by listed companies in the United Kingdom (from 2018 to 2020, using the comprehensive checklist developed by (da Mata and Maroun, 2021)) which has been largely ignored within the accounting literature (Gaia and Jones, 2017).
- Secondly, this paper aims to provide insight into the current corporate reporting practises of UK-listed companies (within an updated period, 2018 – 2020) with a primary focus on their biodiversity loss and species extinction disclosure. By identifying those weaknesses in biodiversity reporting, this research also contributes to the development and enhancement of such disclosure (Mansoor and Maroun, 2016).

  Thirdly, this study answers the call of the United Nations Strategic Plan for Biodiversity and the Convention on Biological Diversity (calling for the active engagement of the commercial sector in driving biodiversity-friendly business practises and raising awareness surrounding biodiversity loss) by evaluating the progress of listed organisations in their attempt to transparently communicate their biodiversity matters.

5.3. Limitations and areas for future research

This research focuses on evaluating the progress of biodiversity disclosures among listed companies in the United Kingdom and, as a result, the conclusions reached within this study cannot be generalised across all countries. Further research can explore the quality and quantity of biodiversity disclosures within other developed and developing countries. Cross-comparison studies on biodiversity may also be conducted on different countries to assess the differences and similarities in biodiversity reporting attributable to the contextual factors specific to those jurisdictions.

This study specifically looked at the biodiversity disclosures within the primary reports of the sample companies. With the dawn of the fifth industrial revolution, company websites have become a crucial platform for an organisation's communication of its key information to its stakeholders. Future research may adopt a holistic picture of an organisation's stance on biodiversity reporting, by evaluating the digital communication (media, press releases, and videos) and secondary reports of listed companies (i.e., Sustainability Reports and CSR Reports).

Only large, listed companies have been included in this study. Because of the differences in an organisation's context and circumstances, as well as the general dissimilarities within the internal and external factors affecting organisations of different sizes, the conclusions reached within this report may not be generalised across all companies of varying magnitudes. Future studies can investigate the extent of biodiversity reporting among small to medium-sized entities within different jurisdictions.

The biodiversity checklist used within this study can also be further developed, adapted and updated for increasingly relevant biodiversity considerations by adjusting and/or adding to the existing criteria currently present within the framework. For instance, independent assurance/reviews over an organisation's biodiversity strategies and actions are progressively becoming a widely utilised service, aimed to increase the levels of transparency and reliability underlying corporate environmental reports. Additional criteria for the nature and quality of assurance performed (over biodiversity reports), may be added to the checklist and future studies can potentially be conducted. Additional research can also investigate the value associated with the provision of independent assurance over an organisation's biodiversity-related progress reports and whether this improves the quality and quantity of biodiversity disclosures.

This study focused on a limited number of factors driving biodiversity and species extinction disclosure. Future research may look at other context/industry-specific factors which may potentially affect the quantity and quality of biodiversity and species extinction disclosure. For instance, is biodiversity disclosure for companies within the construction/building industry potentially driven by an organisation's levels of land-use changes, building pollution and wastage or direct impacts on

neighbouring threatened species? Do companies with greater biodiversity accidents or incidents have a greater or lower level of biodiversity disclosures than do companies without reported accidents?

From an integrated thinking perspective, future studies may investigate how biodiversity factors are managed simultaneously at the strategic, management and operational levels to explore how integrated thinking can be utilised by an organisation's stakeholders in holding the entity accountable in its purpose of driving long-term value. Future studies may also investigate instances of how organisations have transformed their related environmental risks into viable opportunities and what factors contributed to the underlying motivation of these initiatives (i.e., advancing financial and/or reputational objectives).

Future research may also investigate biodiversity reporting from both an institutional and sector-based perspective. For example, at the sector level, are there differences in how particular sectors or industries approach and disclose biodiversity-related risks and dependencies in line with the nature of the natural capital they consume? At an institutional level, what responsibilities do biodiversity framework institutions, regulators, academic institutions and professional bodies play in advancing the quality and transparency of biodiversity disclosures?

On a regulatory level, future studies may also investigate the benefits and disadvantages of mandatory disclosure on environmental areas like biodiversity within both developed and developing economies and how this affects the transparency and accountability applied within corporate reporting. Where there is a gap in assessing an organisation's progress on an objective and comparable level (with respect to biodiversity plans and initiatives), future studies can investigate and develop proxy measures, adopted for an organisation's context, to gauge effectively how effective their respective biodiversity initiatives are.

Appendix A: Disclosure checklist[12]		
Scene-setting		
Definition	• The company defines biodiversity and its components.	• (Grabsch et al., 2012)
Mission statement	• Reporting of any biodiversity-related mission statement. • Existence of a biodiversity policy statement.	• (Grabsch et al., 2012) • (CBD, 2018)
Motivation	• Mention of the World Economic Forum's ranking of biodiversity risk. • The company provides moral or ethical motivation to work with protecting biodiversity, protecting species and preventing extinction. • The company states why protecting biodiversity important for the company and its stakeholders. • CEO/Chairperson letter refers to biodiversity.	• (World Economic Forum, 2021). • (Van Liempd & Busch, 2013) • (Van Liempd & Busch, 2013) • (CBD, 2018)
Species related		
Site-specific	• Reporting of biodiversity information relating to specific sites. • The company discloses specific habitats/ecosystems (land, marine, wetlands, rivers, etc.) affected.	• (GRI, 2020) • (Adler et al., 2018)
Specific species	• The company provides information about specific species affected at the sites where the company operates. • The company reports on potential risks/impacts on these specific species arising from the company's operations. • The company reports flora and faunal wealth around its operating area. • The company discloses which species are native or indigenous. • Company reports regular assessments of species populations in areas affected by corporate operations.	• (van Liempd & Busch, 2013) • (Atkins & Maroun, 2018) • (Adler et al., 2018) • (Adler et al., 2018) • (Atkins & Maroun, 2018)

[12] each biodiversity theme, the examples listed within the second column are not exhaustive. Furthermore, the respective organisations are scored against a detailed set of sub-indicators.

IUCN Red list	• Mention of the IUCN Red List. • The company provides a list of endangered plant and animal species whose habitats are affected by the company's activities. • Incorporates images (photos or drawings) of threatened species • The company reports biodiversity or species loss due to its operations. • Company reports operations with activities in IUCN protected areas.	• (Grabsch et al., 2012) • (GRI, 2020) • (Atkins & Maroun, 2018) • (Adler et al., 2018) • (Adler et al., 2018)
Surveys	• The company has included references to CDP questionnaires. • Reporting of biodiversity assessments/ surveys conducted.	• (ACCA, 2016) • (Adler et al., 2018)
Social engagement		
Partnerships	• Disclosures of partnerships with biodiversity organisations or NGOs helping with biodiversity conservation. • Company reports details of partnership engagements between wildlife/nature/ conservation organisations and the company which aim to address corporate impacts on endangered species. • Disclosures of which NGOs are working on biodiversity conservation in the areas where the company operates. • The company provided a donation that contributed to the conservation or protection of biodiversity. • The company participates in biodiversity associations to improve biodiversity practices in the community. • Collaborations with key advisors across professions and progress with ecologists, scientists, humanities scholars, and other experts.	• (Adler et al., 2018) • (Atkins & Maroun, 2018) • (van Liempd & Busch, 2013) • (Adler et al., 2018) • (Adler et al., 2018) • (Russell et al., 2017)
Awards	• The company discloses awards or recognition received for biodiversity conservation or restoration.	• (Grabsch et al., 2012)

Stakeholder engagements	• The company reports its steps taken for creating biodiversity awareness among its employees or in the community. • Company reports on the provision of education/training delivered on extinction accounting to all employees. • Information provided about social media interaction regarding biodiversity. • Disclosures of the feedback from stakeholders on biodiversity issues within the company. • The company discusses the relationship between local communities and biodiversity at the sites where the company operates. • Specific examples of stakeholder engagement are provided. • Provide education on extinction initiatives to schools in future. • Update shareholders/stakeholders quarterly with progress and future actions.	• (Adler et al., 2018) • (Hassan et al., 2020) • (Usher & Maroun, 2018) • (Grabsch et al., 2012) • (van Liempd & Busch, 2013) • (CBD, 2018) • (Atkins & Maroun, 2018) • (Hassan et al., 2020)
Performance evaluation		
Targets	• The company discloses biodiversity goals/targets for years to come. • The company describes current biodiversity goals. • Reference to UN SDG 14 or 15 and respective targets. • Reference to CBD post-2020 framework goals. • Report strategy for the future development and improvement of actions/initiatives.	• (Adler et al., 2018) • (Grabsch et al., 2012) • (Adams, 2017) • (CBD, 2020) • (Adler et al., 2018)
Performance	• Discussion of biodiversity-related performance and achievement of targets. • The company provides assessment and reflection on the outcome of partnerships and decisions taken about changes to initiatives going forward. • The company assesses whether the company's actions are effective in conserving biodiversity and preventing extinction • Pictorial evidence of successful conservation is provided.	• (Grabsch et al., 2012) • (Atkins & Maroun, 2018) • (Atkins & Maroun, 2018) • (Atkins & Maroun, 2018)
Costs	• The company reports the amount spent on biodiversity conservation/ restoration. • The company discloses details and the value of any fines or claims relating to biodiversity loss or damage. • The company reports the potential liabilities relating to future possible fines/claims. • Include a discussion of ways in which the company is working to prevent future liabilities related to harming endangered species	• (Grabsch et al., 2012) • (Atkins & Maroun, 2018) • (Atkins & Maroun, 2018) • (Atkins & Maroun, 2018)
Risk		

Risk	• The company reports and assesses biodiversity risk. • The company describes business opportunities created by biodiversity. • The company uses tools to measure both positive and negative impacts of biodiversity. • The company identifies which areas require biodiversity action plans.	• (Grabsch et al., 2012) • (van Liempd & Busch, 2013) • (CBD, 2018) • (van Liempd & Busch, 2013)
Risk management	• The company provides information relating to systems/processes developed to manage or mitigate biodiversity risk. • The company has researched methods to reduce its impact on biodiversity. • The company discloses the use of ecosystem services assessment tools such as InVEST.	• (Grabsch et al., 2012) • (Usher & Maroun, 2018) • (Feger and Mermet, 2017)
Incidents	• The company reported any specific incidents/accidents which impacted biodiversity. • Company provides pictorial evidence of incidents. • The company outlines a plan for the rehabilitation and restoration of areas affected by the incidents.	• (Grabsch et al., 2012) • (Atkins & Maroun, 2018) • (van Liempd & Busch, 2013)
Materiality	• The company classifies biodiversity as a material risk for the company. • The company provides materiality assessments on biodiversity issues	• (IIRC, 2021b) • (van Liempd & Busch, 2013)
Internal management		
Biodiversity action plans	• The company discloses information relating to biodiversity action plans. • The company reports biodiversity in top-level management plans and details management's approach to biodiversity. • The company provides details of land management or rehabilitation activities. • The company reports biodiversity projects undertaken to enhance biodiversity in and around the areas of operation. • The company provides details about its involvement in afforestation activities. • Company reports its involvement in the protection/conservation of "Ecological • corridors" in and around areas of operation.	• (Grabsch et al., 2012) • (CBD, 2018) • (GRI, 2020) • (Adler et al., 2018) • (GRI, 2020) • (Adler et al., 2018)
Biodiversity officer	• A biodiversity officer is identified, and his responsibilities are outlined. • The company identifies to whom the biodiversity officer reports.	• (Grabsch et al., 2012) • (van Liempd & Busch, 2013)

Products and value-chain	• Disclosures around the impact of the company's products and activities on biodiversity. • Information about whether the company's processes contribute to the mitigation, restoration or improvement of biodiversity. • The company details the importance of biodiversity as a natural capital in the value creation process. • Description of how natural capital and biodiversity loss affects the other capitals.	• (GRI, 2020) • (van Liempd & Busch, 2013) • (IIRC, 2021b) • (Atkins and Maroun, 2018b)
External reports		
GRI, IR and other frameworks	• The company reports on international conventions for biodiversity conservation and restoration. • Reference to GRI reporting, International Integrated Reporting Council (IIRC) framework or other relevant frameworks. • The company mentions that the Integrated Report is printed on recycled/ sustainably sourced paper	• (Adler et al., 2018) • (Grabsch et al., 2012)
Valuation		
Quantitative, Qualitative or Monetary measurement attempts	• Does the company perform cost-benefit analyses for biodiversity projects? • Does the company partake in a biodiversity offsetting scheme? • Does the company develop a natural inventory account? • Does the company refer to NCA or any biodiversity valuation frameworks? • Does the company provide biodiversity productivity or efficiency ratios?	• (van Liempd & Busch, 2013) • (Jones & Solomon, 2013) • (Endangered Wildlife Trust, 2020) • (Natural Capital Coalition, 2016) • (UNEP-WCMC, 2015)

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Appendix B: Summary of relevant frameworks			
Details	Summary	Link to thesis	Reference
United Nations Sustainable Development Goals (UN-SDG)	The 17 Sustainable Development Goals (SDGs), are an urgent call for action by all countries - developed and developing - in a global partnership to end poverty, reduce inequality and spur economic growth. Primary reference is made to UN-SG 14 and 15 which gives specific attention to biodiversity matters: **Sustainable Development Goal 14** is devoted to conserving and sustainably using the oceans, sea and marine resources for sustainable development. **Sustainable Development Goal 15** focuses on protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combatting desertification, reversing land degradation and halting biodiversity loss.	***Criteria Reference 39:*** ***PE - Reference to UN SDG 14 or 15 and respective targets.***	https://sdgs.un.org/goals/goal14 https://sdgs.un.org/goals/goal15
Integrated Reporting Framework (IR)	The International Integrated Reporting Framework and Integrated Thinking Principles, have been developed and used within 75 different countries, to advance business communication of value creation, preservation and erosion. The IR Framework suggests that an integrated report should include a statement relating to Natural Capital, more specifically, biodiversity and ecosystem health.	***Criteria Reference 76:*** ***ER-Reference to GRI reporting, International Integrated Reporting Council (IIRC) framework or other relevant frameworks***	https://www.integratedreporting.org/wp-content/uploads/2021/01/InternationalIntegratedReportingFramework.pdf
Carbon Disclosure Project (CDP)	Established in 2000, CDP was the first platform to influence corporate disclosure on environmental impacts and dependencies. The CDP's questionnaire collects information on measures regarding climate change, water security and deforestation. The CDP also collects data on organisational progress in recognising biodiversity risks, and any associated commitments to initiatives and actions.	***Criteria Reference 20:*** ***SR-Included reference to CDP questionnaires.***	https://www.cdp.net/en/info/about-us/what-we-do
Global Reporting Initiative (GRI)	The GRI prepares a set of guidelines (more specifically, GRI 304), to assist organisations in their approach to disclosing information relating to: ▪ Operational sites, leased, managed or adjacent to protected areas and areas of high biodiversity value.	***Criteria Reference 76:*** ***ER - Reference to GRI reporting, International Integrated Reporting Council (IIRC)***	https://www.globalreporting.org/standards/media/1011/gri-304-biodiversity-2016.pdf

	▪ Significant impacts of activities, products and services on biodiversity and, ▪ Habitats protected or restored by the organisation	***framework or other relevant frameworks***	
United Nations Convention on Biological Diversity (CBD)	Signed by 150 government leaders at the 1992 Rio Earth Summit, the Convention on Biological Diversity is dedicated to promoting sustainable development. Parties to the UN's Convention on Biological Diversity have established the post-2020 global biodiversity framework, with the ultimate goal of reversing biodiversity loss at scale.	***Criteria Reference 40:*** ***PE - Reference to CBD post-22 framework goals***	https://www.cbd.int/convention/

Appendix C: Industry Comparisons				
Industries addressed under study	Number of companies	Average Biodiversity Scores	Maximum Biodiversity Scores	Minimum Biodiversity Scores
Financial Services Industry (0)	18	14.72	70	0
Other industries (1)	42	15.79	60	0
Industrial/Mining Industry (2)	15	40	101	9

Appendix D: Candidate's Declaration

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Faculty of Commerce, Law and Management

Candidate's Declaration

Name of Candidate:	Timothy Lai
Person Number:	1670086
Degree:	Master of Commerce (Accounting)
Supervisor / Co-Supervisor:	Warren Maroun (Leading Supervisor) & Dusan Ecim (Co Supervisor)
School:	School of Accountancy
Title of Thesis/Dissertation/ Research Report:	THE EXTENT OF BIODIVERSITY AND SPECIES REPORTING BY THE TOP 75 COMPANIES LISTED ON THE LONDON STOCK EXCHANGE (LSE)

Candidate's Declaration:

i. I hereby submit my PhD Thesis/**Masters** dissertation for examination (circle applicable).

ii. I confirm that my signed declaration in terms of Rule G9.7 is included in each copy of the thesis/ dissertation.

iii. I have checked all copies of my thesis/ dissertation and declare that no pages are missing or poorly reproduced.

iv. I hereby submit a CD/USB containing a PDF version of my submission for examination and _____as requested_____ bound copies.

Candidate's Signature: ____ _____ **Date:** ___27/03/2023_____

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