

The development of the biological diversity protocol and its effectiveness in discharging accountability for nature, species and biodiversity

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Abstract

Purpose – This paper aims to explore how the development and use of the Biological Diversity Protocol render biodiversity impacts calculable and how Protocol-generated information may support organizational decision-making and accountability for biodiversity protection. It also examines the Protocol's relevance to rewilding and de-extinction while distinguishing impact measurement from organizational, stakeholder and ecological outcomes.

Design/methodology/approach – The study adopts a qualitative design involving document analysis, a focused, structured review of relevant academic and practitioner materials, and semi-structured interviews with purposively selected stakeholders, protocol developers, biodiversity and spatial-data specialists, participants with experience supporting organizational applications and stakeholder engagement, and an assurance provider. The analysis is informed by sensemaking theory to examine how biodiversity accountability is constructed around the protocol in practice. Atlas.ti software (Version 24) was used in analyzing the data from the second empirical phase, semi-structured interviews.

Findings – The BD Protocol renders biodiversity impacts organizationally visible through boundary-setting, reference states, impact inventories, and the accounting of gains and losses. Participants reported that Protocol-generated information was used for biodiversity baseline and footprint assessments, value-chain analysis, management reporting, budgeting and disclosure, as well as for evaluating rehabilitation, restoration, offsetting and other conservation actions. Its broader accountability contribution is nevertheless conditioned by data quality, resource and expertise constraints, incomplete value-chain coverage, limited organizational and policy integration and the absence of a Protocol-specific assurance benchmark. The findings, thus, distinguish the Protocol's demonstrated calculative contribution from participant-reported organizational uses and conservation-related outcomes.

Originality/value – The study explains how a South African-developed biodiversity-accounting protocol converts ecological complexity into organizational accounts and identifies the conditions under which calculative sensemaking may or may not develop into integrated, credible and outcome-oriented biodiversity accountability.

Keywords Accountability, Biodiversity, Biological diversity protocol, Disclosure, Reporting, Sustainability

Paper type Research article



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1. Introduction

One of the most important sustainability and biodiversity concerns in recent times is the preservation of natural ecosystems. This has made the strategic importance placed on biodiversity loss and species extinction receive increased attention from non-governmental organizations (NGOs), conservation NGOs, policymakers, financial institutions, companies, sustainability practitioners, and academics in the last two decades (Adebayo *et al.*, 2026; Boiral and Heras-Saizarbitoria, 2017). Corporate organizations now understand that they have an obligation to actively support and conserve biodiversity while reducing negative environmental impact on species, biodiversity, and nature (Ackers, 2009; Atkins and Maroun, 2018). The protection of species and the environment is a top global agenda in this era of the United Nations Sustainable Development Goals (SDGs), since biodiversity loss is among the top five global risks (World Health Organization, 2020). Hence, scholarly discourse on rewilding, de-extinction, and biodiversity protection is critical at present and contributes to the existing literature on biodiversity and extinction accounting.

In this context, research efforts should be lauded as both academics and practitioners have covered reasonable grounds and have thus examined extinction and biodiversity accounting and accountability from diverse perspectives (Boiral, 2016; Boiral and Heras-Saizarbitoria, 2017; Maroun and Atkins, 2018; Usher and Maroun, 2018; Zhang and Noronha, 2023; Hassan *et al.*, 2020). Research convergence on biodiversity has covered biodiversity practices and characteristics (Bebbington *et al.*, 2023); determinants of biodiversity (Atkins *et al.*, 2023); socioeconomic consequences of biodiversity (Arjalies and Gibassier, 2023; Cho *et al.*, 2022); compliance with regulations on biodiversity (Adler *et al.*, 2021); proposed index/framework or model/new disclosure/reporting measurement methods for Biodiversity (Zhang and Noronha, 2023); and disclosure/reporting on biodiversity, conservation and extinction (McBride *et al.*, 2023; Gaia and Jones, 2017).

Research efforts have identified several frameworks/standards for reporting/disclosing biodiversity practices, especially those developed by key sustainability stakeholders such as the Global Reporting Initiative (GRI) and the Taskforce on Nature-related Financial Disclosures (TNFD). In addition, studies also exist on the conceptual development of frameworks, which have mostly been used by academics in exploring organizational biodiversity disclosure/reporting (Jones, 1996; Samkin *et al.*, 2014). Despite this extensive convergence, studies on the development of biodiversity reporting/disclosure frameworks by sustainability practitioners and conservation stakeholders are scarce, despite notable issues with some of the frameworks, including the application to all sectors (Dutta and Dutta, 2024; Blanco-Zategi *et al.*, 2022). Thus, some meaningful insights may not have been documented. This observation finds support from recent calls to explore the development of these frameworks and their effectiveness in aiding organization biodiversity reporting/disclosure (Atkins *et al.*, 2024).

These calls appear to reiterate that perhaps the end goal of biodiversity, nature and species accounting is for organizations to report on how their activities have both positively and negatively impacted nature and the steps they are taking to ensure a sustainable future by limiting the negative impacts of their activities on biodiversity, while increasing positive impacts, which is the main idea of corporate social responsibility (CSR). Thus, the frameworks that aid this reporting/disclosure are crucial and must be given utmost attention in their development, application, and effectiveness, as well as in how impacts are measured. Instead of treating the act of reporting as an end, our analysis begins with the idea that the communication of how biodiversity impacts are recognized, measured, managed, and, hopefully, mitigated represents one means through which organizations exercise accountability. From this perspective, accountability, as investigated here, is not merely aimed at addressing concerns of investors but also those of regulatory agencies, the affected population, environmental groups, conservationists, and others interested in conservation objectives. For analytical clarity, the Protocol's contribution is evaluated at four distinct but related levels. Calculative effectiveness concerns whether biodiversity impacts can be

identified, measured, aggregated and reported. Organizational effectiveness concerns whether Protocol-generated information influences governance, strategy, risk management, budgeting or operational decisions. Accountability effectiveness concerns whether the information is credible, comparable, independently assessable and useful to stakeholders. Ecological effectiveness concerns whether Protocol-informed decisions are associated with demonstrable improvements in ecosystem condition, species protection or other biodiversity outcomes. These levels should not be conflated: producing a biodiversity account does not, by itself, demonstrate changed decisions or improved ecological conditions. It is particularly critical to frame it this way, given the current reporting environment. Biodiversity reporting was previously talked about in terms of its voluntariness. However, currently, there is a need to consider it against a background of rapidly emerging sustainability reporting frameworks such as ESRS E4 under the EU's CSRD, and IFRS S1 and IFRS S2 developed by the ISSB, which have led to increased pressure on governance, strategy, risks, metrics, and interconnection of disclosures related to sustainability aspects. The application of IFRS S1 and IFRS S2 will begin for annual reporting periods starting from 1 January 2024, whereas ISSA 5000, developed by the IAASB, raises expectations regarding the credibility and assurance of sustainability information. In light of this, it is crucial to analyze the BD Protocol, as it provides an accounting logic for biodiversity but still leaves many issues unresolved.

In this context, there are a few reporting frameworks, most of which are applied on a voluntary or regulatory basis, such as the TNFD, the Biological Diversity Protocol (BD Protocol), and the Natural Capital Protocol (NCP). Our motivation for this study is to respond to the call to explore “the development of biodiversity and nature-focused reporting and disclosure frameworks such as the [Biological Diversity Protocol \(2021\)](#) and their effectiveness in discharging accountability for nature, species and biodiversity” in the Accounting Auditing and Accountability Journal. Although the call for papers offers an obvious academic trigger for work in this area, the significance of the research undertaken here is independent of this call. What makes the BD Protocol significant is that it seeks to bring biodiversity disclosure closer to the concept of biodiversity accounting by using a tool to identify, tally, and report net biodiversity impacts in a standardized manner. For these reasons, the BD Protocol is interesting not just as a specific framework case, but also as a starting point for considering how accountability might be discharged for what is a highly wicked sustainability issue, and how certain conditions might facilitate decision-useful and credible biodiversity accounting practices. In particular, this study is in the context of a developing economy, South Africa, where the BD Protocol was developed, focusing on “the development of *Biological Diversity Protocol and its effectiveness in discharging accountability for nature, species, and biodiversity.*” Accordingly, the study asks: *How and under what conditions does the development and use of the Biological Diversity Protocol support biodiversity accounting and accountability for biodiversity protection, and what relevance does it have for rewilding and de-extinction initiatives?* The analysis examines how the Protocol renders biodiversity impacts calculable, how the resulting information is used in organizational and stakeholder decisions, whether participants identify conservation-related outcomes, and which data, capacity, integration and assurance conditions enable or constrain these contributions.

To answer this research question, the study deductively adopts a qualitative approach to get firsthand information. The study began by analyzing documents related to the BD Protocol in the first empirical phase. In the second empirical phase, a semi-structured interview was conducted with biodiversity stakeholders involved in developing and using the BD Protocol. Findings indicate that the BD Protocol was developed to address obstacles to organizations' efficient management of biodiversity risks and impacts, and to enhance decision-making by offering companies an accounting and reporting framework that facilitates the consolidation of their biodiversity impact data across value chains and jurisdictions. Further findings suggest that the BD Protocol application/use follows seven steps and that impacts may be measured in several ways, including focusing on the ecosystem and documenting changes in its state. We document the challenges of implementing the BD Protocol and potential improvements to

increase adoption among organizations. We provided recommendations in this regard, highlighted the study's implications for several stakeholders, and concluded by outlining avenues for further research.

The research contributions made in this paper are theoretically, empirically, and practically oriented. From a theoretical perspective, the paper advances the existing sensemaking literature by explaining how a particular biodiversity accounting protocol operates as a calculative device, in which various stakeholders collectively determine what can be considered a biodiversity impact, materiality, comparability, and accountability. From an empirical standpoint, the paper offers valuable insights into the development, implementation, and effectiveness of the biodiversity accounting and reporting framework in an emerging economy context, where the existing body of knowledge has largely focused on developed-country environments and reporting outcomes rather than on the development and implementation of reporting protocols. Finally, from a practical point of view, this paper targets protocol developers, standard setters, policymakers, reporting companies, and assurance service providers in order to show that the BD Protocol value does not consist merely of promoting disclosures but rather consists of structuring more systematic biodiversity accounting while highlighting some challenges related to data accuracy, value chain scope, integration, and validation.

Following the introduction, the study proceeds thus. [Section 2](#) presents the literature review, followed by the discussion of the theoretical framework in [Section 3](#). In [Section 4](#), the study presents the methodology, and thereafter the results and analysis in [Section 5](#). [Section 6](#) presents the implications and recommendations, concludes in [Section 7](#), and provides avenues for further research.

2. Literature review

In this section, the larger context of biodiversity conservation will first be discussed in relation to biodiversity accountability and thereafter will move on to biodiversity disclosures and reporting mechanisms. Though rewilding and de-extinction are part of the broader context of biodiversity conservation, they do not form part of the core of this discussion. It is, therefore, in a narrower context that this study discusses the development of biodiversity accounting and reporting frameworks, including the BD Protocol. As highlighted previously, the field of biodiversity practices and characteristics focuses on the study of general biodiversity practices and their specific features ([Bebbington et al., 2020](#); [Tashakor et al., 2019](#)). The determinants of biodiversity encompass the factors that shape biodiversity composition, the importance of accounting for biodiversity, and the origins of biodiversity through both natural processes and historical events ([Atkins and McBride, 2022](#)). The socioeconomic implications of biodiversity encompass the effects of biodiversity practices on socioeconomic factors as well as the repercussions of organizations declaring or reporting such activities ([Arjalies and Gibassier, 2023](#); [Denedo et al., 2017](#)). The topic of biodiversity disclosure/reporting primarily focuses on empirical studies ([McBride et al., 2023](#); [Sun and Lange, 2023](#)).

2.1 Rewilding, de-extinction and biodiversity protection

Rewilding, de-extinction, and biodiversity protection appear to broadly mean ensuring the conservation of natural resources ([Nogués-Bravo et al., 2016](#); [Lorimer et al., 2015](#)). Rewilding is a versatile term that has been used to describe a range of ideals and land management methods. It possesses various interpretations. Typically, these efforts have the primary goal of preserving or enhancing biodiversity while mitigating the effects of human activities by restoring species and ecological processes. The study and management of trophic cascades resulting from species extinctions have become important focal points in rewilding research and practice. Rewilding efforts encompass practices such as implementing naturalistic grazing and fire regimes in prairies or boreal forests, as well as altering flood patterns in river systems.

Rewilding may encompass passive management, allowing natural recolonization, assisted migration, and the restoration of species presumed absent from a particular ecosystem. These could consist of (de)domesticated and/or non-native counterparts of extinct species (Lorimer *et al.*, 2015).

Biodiversity refers to the wide variety of species that play a crucial role in maintaining healthy ecosystems, thereby ensuring the long-term sustainability and survival of the human population (Hassan *et al.*, 2020). Biodiversity loss is widely recognized as a significant threat to the planet today (Rimmel, 2021; Cuckston, 2018a,b; Jones and Solomon, 2013). The accounting community has devoted some attention to biodiversity, but the significant responsibility of accounting in ensuring that multinational corporations, governments, and other organizations are held accountable for their impact on the biodiversity crisis has been largely overlooked or undervalued (Powell and McGuigan, 2023; Rimmel, 2021; Cuckston, 2018a,b). The Earth is currently undergoing the sixth mass extinction event, which is considered more severe than previous events in geological history. Unlike previous mass extinctions, this current event is predominantly attributed to human activities (Rimmel, 2021; Cuckston, 2018a,b; Jones and Solomon, 2013).

Biodiversity is considered a valuable asset from both human and non-human perspectives (Jones and Solomon, 2013). Biodiversity is crucial to the well-being of the planet and its human population because of its anthropocentric significance. Biodiversity serves as a direct source of essential human necessities, including sustenance, clothing, and pharmaceuticals. It indirectly contributes to activities such as pollination, food production, and climate stability, making it highly significant. It is widely recognized that humans have exploited different elements of nature for their own financial gain (McBride *et al.*, 2023). While biodiversity has traditionally been considered a valuable resource without cost, it is now evident that this perception is inaccurate (Jones and Solomon, 2013). Governments and organizations seldom incorporate concerns such as biodiversity decline and habitat destruction into their financial plans or cost projections. The ecological services facilitated by biodiversity are essential for a flourishing economy. However, at a deeper level, it is essential for humanity's very survival. The inherent worth of biodiversity, when considered from a non-anthropocentric standpoint, is also of great moral and ethical importance. From an ecocentric perspective, the value of nature does not depend on its usefulness to humans.

2.2 Biodiversity reporting/disclosure

The idea behind biodiversity reporting/disclosure is that the prioritization of profits by corporate businesses will have negative impacts on the environment, and that one of the only ways to manage these is through getting corporate and public sector organizations to report on how their activities are impacting the environment and how they are striving towards mitigating adverse effects on the environment. Thus, it is important that these organizations provide accounts of how they have done so.

With regard to biodiversity disclosure/reporting, Jones (1996) advanced accounting research on biodiversity. His 1996 article may have introduced the most widely used biodiversity accounting model (Hossain, 2017; Horner and Davidson, 2020). Jones (1996) highlighted that an inventory accounting of natural assets may be conducted in at least three of the six stages. After creating the organization's land and ecosystems, a natural inventory is done in the first of six steps. The organization's non-critical habitats are valued and graded ecologically in the second phase. The third and final step is to consolidate the data and publish an executive summary in the annual report. Atkins *et al.* (2018) modified the GRI framework to develop a possible framework for extinction accounting that expands and improves upon the GRI guidelines for species listed as endangered by the International Union for Conservation of Nature's (IUCN) Red List. Burritt and Cummings (2002) address measurement issues in environmental accounting, specifically those related to assessing threatened and endangered animals, through a case study. To identify biological asset value in financial statements,

Australian Accounting Standard AASB 1037, Self-Generating and Re-Generating Assets (SGARAs), was issued. From 1995 to 2001, Earth Sanctuaries Ltd., a listed conservation company in Australia, was the subject of this study's examination. Using the conceptual framework and the qualitative characteristics of relevance and dependability, the study examines these values. The study concludes that attempts to legitimize the environmental cause are hampered by the Commonwealth policy against trading in wildlife, and that there are concerns about the surrogate measurement base used to assess the assets.

Morrison *et al.* (2023) studied how statistics affect corporate environmental reporting. Number and accounting histories are examined to understand the ontological meanings of enumeration in nature. Distancing and control are significant themes in these histories. The study reveals that quantifying nature creates a metaphorical gap between the firm and nature, eroding the link associated with genuine caring for nature. Corporate action harms the environment, making these results crucial. While presented as a method to reduce environmental damage, the reports tacitly perpetuate it. Ogilvy *et al.* (2022) developed a natural capital (NC) accounting technique that can show whether primary producers are preserving, improving, or degrading their NC, making it suitable for supply chain environmental performance reporting (Atkins and Peirce, 2024). They stated that farm management and supply chain performance data can be used to aggregate regional and national assessments. Samkin *et al.* (2014) illustrated the development of a biodiversity reporting and evaluation framework. They then demonstrated the application of the framework to an exemplar organization, thereby identifying biodiversity-related annual report disclosures and analyzing changes in their nature and levels over time. Samkin and Wingard (2021) utilized a framework of systemic change to comprehend the stakeholder, social, political, cultural, and economic context factors that contribute to the social and environmental narratives of a conservation organization undergoing transformation. In a study on established measurement methods and indexes, Hossain (2017) examined the biodiversity reporting practices of the Murray-Darling Basin Authority (MDBA), an Australian public sector enterprise, using the natural inventory methodology developed by Jones (1996). In a similar vein, Rimmel (2021) examines whether IUCN classifications and extinction accounting might enhance biodiversity disclosures for a conservation organization, and how and when to use them based on IUCN categories to prevent extinction. The study focuses on Sweden's lone Nordic zoo, which is the only one in Europe dedicated solely to the preservation of threatened species. This study demonstrates that IUCN classifications are useful for disclosing biodiversity information about species extinction risks. IUCN classifications are used by organizations that implement conservation programming as a means of stakeholder communication. According to the study, biodiversity information is included in legitimate conservation reports.

Further, Freeman and Groom (2013) show that using typical environmental accounting practices to estimate long-term discount rates may lead to the rejection of biodiversity-sensitive projects in the name of the greater good. At about the same time, Cuckston (2013) analyzed the impact of including the conservation of a tropical forest ecosystem in corporate financial reporting by developing a greenhouse gas emissions offset product for sale on the voluntary over-the-counter carbon markets and the resulting protection of the ecosystem's biodiversity. The results show that there are significant accounting hurdles to overcome before a global calculative mechanism to aid in financing the conservation of all remaining tropical forest species can be built. Jones and Solomon (2013) problematize the concept of "accounting for biodiversity" and lay out a framework for assessing and understanding the role of accounting in the maintenance and improvement of biodiversity on Earth. They reported that philosophy and science, accountability, technical accounting, and accounting practice are the four main areas where difficulties arise in accounting for biodiversity. Horner and Davidson (2020) examine the practicality of applying Jones' (1996) natural inventory model (NIM) in biodiverse wildlife corridor plantations, with a focus on non-governmental organizations (NGOs). The results show that using the present NIM is not practical for a low-budget NGO.

However, by adding scientifically grounded parameters, the NIM can be adjusted to account for plants in biodiverse wildlife corridors.

Powell and McGuigan (2023) seek to create an accounting pedagogy that builds larger ecocentric narratives by rewinding accounting education, considering posthumanist and ecofeminist philosophy. Educators in accounting can help with crisis management by developing new teaching strategies that significantly shape how future accountants are prepared for their careers. Sullivan and Hannis (2017) investigate and contrast ecological and natural capital accounting methods used in the UK to produce uniform, numerical economic values for elements of the natural world that are not inhabited by humans. Another objective is to compare the underlying ontological and ethical presumptions of these numerical methods for ecological accounting to those of fractal geometry and Pythagorean nature-numbering practices. They argued that some values that can't be quantified in money are ignored, and they note that the natural capital accounts and biodiversity offsetting accounting practices they discussed provide nature-signaling statistics that are contested rather than standardized and clarified.

2.3 Biodiversity reporting frameworks/standards

There are quite a number of biodiversity accounting and reporting frameworks/standards developed by various organizations for accounting and reporting/disclosing biodiversity practices, most of which are voluntary. Since our focus in this study is on the BD Protocol, we will discuss it first before briefly highlighting other major biodiversity reporting frameworks/standards.

2.3.1 The Biological diversity protocol. One of the first tools to offer a standardized way for any business to account for and consolidate all its net impacts on ecosystems and species is the Biological Diversity Protocol (BD Protocol). It enables businesses of all sizes and across all sectors to create a standard dataset for measuring their impact on biodiversity and identifying ways to improve. For the sake of businesses, shareholders, and consumers, businesses can incorporate biodiversity data into their integrated reports and let stakeholders know what they're doing to reduce their impact. In an ideal world, this platform would lead the commercial sector to significantly lessen its negative effects on the planet's vital ecosystems and species.

The BD Protocol was developed to improve decision-making by ensuring that companies have access to an accounting and reporting framework that consolidates their biodiversity data across value chains and jurisdictions (Biological Diversity Protocol, 2021). With the aid of the BD Protocol, companies can develop their biodiversity impact inventory and the associated Statements of Biodiversity Position and Performance for various applications, from site or project management to disclosure. Further, when companies adhere to the accounting and reporting principles of the BD Protocol, they can present their biodiversity impact data in a standardized, comparable, credible, and unbiased manner. The BD Protocol aligns with the Natural Capital Coalition (2016), a standardized framework for identifying, measuring, and valuing impacts and dependencies related to natural capital. Specifically, it offers guidance tailored to biodiversity for assessing changes in biodiversity condition (i.e. biodiversity impacts), by outlining procedures in line with the Natural Capital Protocol. Ultimately, the BD Protocol can assist organizations in accounting for and reporting on biodiversity impacts as an integral component of comprehensive reporting. While the International Integrated Reporting Council (IIRC, 2013) recognizes that biodiversity is a critical component of natural capital, it has recommended that information on species threatened with extinction be included in integrated reports (Biological Diversity Protocol, 2021).

2.3.2 Other biodiversity reporting frameworks/standards. There are currently more than six biodiversity disclosure initiatives, of which three are regulatory and three are voluntary (TNFD, 2024). The regulated biodiversity disclosure initiatives include the European Sustainability Reporting Standard (ESRS) E4 on biodiversity and ecosystems, part of the

Corporate Sustainability Reporting Directive (CSRD), the Sustainable Finance Disclosure Regulation (SFDR), and the French Energy and Climate Law, in particular Art 29. The voluntary disclosure initiatives include the disclosure recommendations and additional guidance of the Taskforce on Nature-related Financial.

Disclosures (TNFD), Biodiversity Standard of the Global Reporting Initiative (GRI), Biodiversity disclosure requirements by CDP (the former Carbon Disclosure Project), and the Climate Disclosure Standards Board (CDSB) framework. However, the three mostly referenced biodiversity disclosure/reporting frameworks/standards in academic research are the CDSB framework, the TNFD framework, and the GRI 101 (Biodiversity 2024) standard (Kopnina *et al.*, 2024; Atkins and Macpherson, 2022; Ogilvy *et al.*, 2022; Haque and Jones, 2020).

The principal frameworks perform different accountability functions. IFRS S1 provides an investor-oriented baseline for reporting material sustainability-related risks and opportunities that may affect an entity's prospects, while IFRS S2 applies this architecture specifically to climate-related matters. TNFD connects nature-related dependencies, impacts, risks and opportunities with governance, strategy, risk management, and metrics and targets. GRI 101 focuses on an organization's impacts on biodiversity, while ESRS E4 places biodiversity and ecosystems within a regulated double-materiality framework.

The BD Protocol differs because it provides an accounting logic for defining boundaries, establishing reference states, recording biodiversity gains and losses and consolidating net impacts over time. Its relative strength is therefore calculative discipline rather than the breadth of its disclosure requirements. Its limitations include partial value-chain coverage, voluntary adoption, no prescribed organizational use for the resulting accounts and no Protocol-specific conformance or assurance standard.

Recent literature confirms that the relevant issue is no longer simply whether organizations disclose biodiversity information. Atkins *et al.* (2026) connect rewilding and de-extinction with accounting, governance, financing and assurance. Fox *et al.* (2026) show how biodiversity accounting may become embedded in organizational identity and practice rather than operate as an isolated reporting exercise. King and King (2026) demonstrate continuing fragmentation in how biodiversity is conceptualized, measured, disclosed and financialised. Pigatto *et al.* (2026) argue that research must move beyond descriptive reporting towards conservation, rewilding and extinction-related outcomes. Maroun *et al.* (2026) identify organizational rationale, biodiversity measurement, performance management, governance and assurance, and reporting as interconnected elements of more transformative biodiversity accountability.

Collectively, this literature reveals a more precise gap: limited empirical evidence explains how a biodiversity protocol converts ecological complexity into organizational accounts, whether those accounts become integrated into decisions, whether stakeholders can rely on them and whether their use is connected to conservation outcomes. This study addresses that gap by examining the BD Protocol's calculative, organizational, accountability and ecological contributions.

2.3.3 The biological diversity protocol and the other frameworks/standards. The BD Protocol guides organizations in selecting the appropriate organizational and value chain boundary; develop and manage a biodiversity impact inventory; determine material biodiversity impacts; assessing impacts on biodiversity, considering the nature of the biodiversity features impacted; accounting for net changes in biodiversity, in accordance with the mitigation hierarchy and the associated equivalency principle; applying the Biodiversity Accounting Framework to build Statements of Biodiversity Position and Performance and account for biodiversity gains and losses over time; validating or verifying a biodiversity impact assessment; and reporting on or disclosing business impacts on biodiversity in a coherent and meaningful manner (Biological Diversity Protocol, 2021).

Compared with other frameworks and standards, the BD Protocol primarily functions as an accounting and reporting instrument, which is why the Natural Capital Protocol is the closest

of the three frameworks described earlier. The BD Protocol provides a structured accounting framework for systematically documenting and aggregating net biodiversity impact data over time at the corporate level. It complements (rather than supplants) current effect-measurement methodologies, enabling biodiversity impact disclosure to be comparable across industries and enterprises. Its emphasis on an accounting methodology renders it crucial for generating consistent, comparable, and routinely produced biodiversity impact statistics at the corporate level. Impact measurement and accounting are essential prerequisites for any valuation exercise, if necessary, and organizations must understand the magnitude of their effects prior to initiating the valuation process ([Biological Diversity Protocol, 2021](#)).

Unlike other frameworks, the BD Protocol aims to be neutral regarding programs and policies. It promotes adherence to its biodiversity accounting and reporting standards by corporations; however, it does not establish standards for verification or auditing processes related to a biodiversity impact inventory and the corresponding Statements of Biodiversity Position and Performance. The BD Protocol can facilitate cost-benefit analysis, risk assessment, reporting for any business function or organization, and submissions to various disclosure programs, but it does not mandate the utilization of biodiversity impact information in any particular manner. Moreover, it does not intend to furnish a comprehensive enumeration of biodiversity impact indicators as seen in other frameworks or standards.

The BD Protocol offers a framework for net impact accounting and reporting that facilitates the use of current indicators for biodiversity, namely, measuring changes in ecosystem extent and condition, as well as in the target and actual population or habitat sizes of relevant taxa [1]. The BD Protocol, while subject to future revision and expansion, presently relies on two primary biodiversity concepts used in scientific discourse, as well as on existing legislation, policy papers, and established international guidelines, particularly those from the IUCN ([Biological Diversity Protocol, 2021](#)). This indicates that the BD Protocol does not encompass all aspects of biodiversity. For example, it excludes genetic resources, biodiversity dependencies, and the related ecological activities, processes, and services. Additionally, impact drivers, including business inputs and outputs; the financial valuations of biodiversity dependencies and their effects on businesses and/or society; and the biodiversity components for which labor and capital goods are regularly or exceptionally necessary for their renewal, reproduction, or continued existence as part of business operations or activities are also excluded ([Biological Diversity Protocol, 2021](#)).

The BD Protocol emphasizes the assessment and integration of biodiversity impacts across the entire firm or organization, based on selected organizational and value chain parameters ([Biological Diversity Protocol, 2021](#)). The BD Protocol emphasizes guidance on accounting for and consolidating biodiversity impacts. The BD Protocol accounting and reporting framework comprises three main stages, each with various steps. The first stage is the development of a biodiversity impact inventory. The steps involved in this stage include setting organizational boundaries, setting value chain boundaries, identifying the components of the biodiversity impact inventory, assessing the materiality of taxa for inclusion in the biodiversity impact inventory, segregating direct from indirect impacts, applying accounting and reporting principles, and managing inventory quality. The second stage is the measuring and accounting for biodiversity impact stage. The steps involved in this stage are: applying the mitigation hierarchy to assess net impacts, measuring impacts on biodiversity, the biodiversity impact pathway, compiling biodiversity impact accounts, choosing appropriate methods for measuring impacts on ecosystems, choosing appropriate methods for measuring impacts on taxa, the Biodiversity Accounting Framework, the Statements of Biodiversity Position and Performance, impact segregation and apportionment, accounting conventions and journal entries, accounting for baseline impacts, and accounting for gains and losses. The last stage is the validation, verification, reporting, and disclosure stage. The steps here are validation and verification, and reporting and disclosing net biodiversity impacts. The [Biological Diversity Protocol \(2021\)](#) document provides detailed steps for organizations to conduct the stages, including the accounting methods and entries.

3. Theoretical discourse

For the theoretical framework for this study, reference was made to the contemporary academic discourse in the communication literature for a relevant theory. We felt this was necessary considering two things. The first is that as highlighted earlier, subject matter knowledge appears to indicate that the end goal of biodiversity reporting frameworks is not just on guiding organizations to ensure that they embrace sustainable practices, but that ultimately, in being transparent by communicating their biodiversity practices through external reporting, their internal and external sustainable practices will be improved as different stakeholders will have access to such external reports, and organizations may want to ensure that information provided are correct to avoid observers labeling such communication as greenwashing. The second is that reporting/disclosure are essentially ways for organizations to communicate with internal and external stakeholders about their activities, both financial and non-financial.

Thus, we followed [Apostol et al. \(2021\)](#) in using the sensemaking theory ([Onkila and Siltaoja, 2017](#); [Onkila et al., 2018](#); [Weick, 1995](#)). Organizations, especially for-profit organizations, may not want to disclose the environmental impact of their practices due to the costs and effort involved. However, this is changing in contemporary times as a result of a number of factors, the core of which is the activities of conservation organizations in developing frameworks for which they are expected to report their sustainability practices. In this context, in his seminal work “*Sensemaking in Organizations*” [Weick \(1995\)](#) emphasizes that in organizational sensemaking individuals in organizations collectively construct meaning in response to unexpected events, in this case the development and use of different biodiversity reporting frameworks by conservation stakeholders with the expectations that this will mitigate organizations’ negative impacts on the environment, thereby ensuring a sustainable future. Thus, our study shows that the sensemaking theory is applicable in two ways in the context of this study regarding the development and use of biodiversity reporting/disclosure frameworks. The first is crisis management (reducing organizational negative environmental impacts), and the second is communication (reporting/disclosing how organizations communicate their efforts to reduce their negative environmental impacts).

Sensemaking is not used in this study simply as a synonym for interpretation. Following [Weick \(1995\)](#), the analysis draws on seven interrelated properties: identity construction, retrospection, enactment, social construction, ongoing activity, extracted cues and plausibility rather than complete accuracy.

Enactment concerns how decisions about organizational boundaries, value-chain boundaries, reference states, ecosystems and taxa construct the biodiversity object that is subsequently measured. Extracted cues include hectares, ecosystem condition, material taxa, biodiversity debits, credits, gains and losses. Retrospection is evident when present impacts are compared with earlier baselines and when shortcomings in the first Protocol version inform later revisions. The repeated reporting cycle illustrates the ongoing character of sensemaking. The Protocol’s collaborative development and implementation demonstrate social construction, while incomplete data, proxies and professional judgement create tension between ecological accuracy and a sufficiently plausible account. Identity construction concerns how organizations understand and present themselves as responsible biodiversity actors. Integrated thinking provides a complementary but more demanding organizational perspective. It examines whether biodiversity information is connected with leadership, strategy, stakeholder engagement, organizational structures, performance management and cross-functional decision-making ([Maroun et al., 2023](#); [Dimes and de Villiers, 2024](#)). Sensemaking explains how actors construct a workable account of biodiversity; integrated thinking assesses whether that account becomes embedded in organizational decisions and conduct. An organization may therefore produce a plausible biodiversity account without changing its strategy, resource allocation or environmental performance.

These perspectives generate three analytical expectations. First, the Protocol may make biodiversity organizationally visible by creating calculable categories and recurring accounts.

Second, uncertainty concerning data, boundaries and reference states may produce a plausible but incomplete representation. Third, accountability remains incomplete unless calculative sensemaking is connected to organizational integration, stakeholder scrutiny, assurance and observable conservation consequences. The theoretical contribution therefore lies in explaining the gap between calculative sensemaking and integrated, outcome-oriented accountability. In other words, what people do can influence the environment they are trying to make sense of (Weick, 1995).

4. Research method

A qualitative research method was adopted involving two phases: document analysis and semi-structured interviews. We began by analyzing the content of the [Biological Diversity Protocol \(2021\)](#) and related documents, such as the [Natural Capital Coalition \(2016\)](#). We purposively selected the Endangered Wildlife Trust (EWT) [2] Employees involved in the development, use, and engagement with other organizations in the use of the BD Protocol, and other consultants involved in the development, use, and promotion of the BD Protocol, for semi-structured interview purposes. [Table 1](#) shows the characteristics of the participants interviewed.

The importance of the South African setting extends beyond its rich biodiversity. First, South Africa offers a combination of a sustainable, integrated approach and substantial exposure to industries sensitive to biodiversity issues, such as mining, agriculture, forestry, energy, and retail. Second, South Africa is a country that demonstrates relatively visible collaboration among businesses, conservation organizations, investors, and communities of standards, making it a great place to study the development of practices related to the emergence of biodiversity accountability tools. Finally, the South African context is valuable on a global scale due to its ability to show the processes of developing biodiversity accounting within the scope of an emerging economy in relation to biodiversity reliance, resource extraction, sustainability reporting, and institutional capacity issues ([Atkins and Maroun, 2018](#); [Maroun and Atkins, 2018](#); [Da Mata et al., 2025](#)).

4.1 Data capturing and analysis

The main purpose of the document analysis was to establish how the BD Protocol was developed, how it was intended to be used, and which issues required further exploration in

Table 1. Characteristics of participants

SN	Interviewees	Position	Location	BD protocol project team member	Interview duration (in minutes)
1	Participant 1	Consultant	Hong Kong [3]	Yes	50
2	Participant 2	Sustainability Manager	South Africa	Yes	60
3	Participant 3	Principal Biodiversity	South Africa	Yes	55
4	Participant 4	Biodiversity Disclosure Project Manager	South Africa	No	40
5	Participant 5	Spatial Biodiversity Analyst	South Africa	No	60
6	Participant 6	Biodiversity Analyst	South Africa	No	50
7	Participant 7	Programme Manager	South Africa	No	55
8	Participant 8	Geographic Information System Specialist	South Africa	No	55
9	Participant 9	Biodiversity and Business Project Manager	South Africa	No	50
10	Participant 10	Assurance Provider	South Africa	No	35

interviews. To enhance the comprehensiveness of phase one, the document review process was enriched with a targeted scoping search of the academic and practitioner journals on biodiversity accounting, biodiversity disclosure, and the Biological Diversity Protocol. The targeted literature review used keywords including “Biological Diversity Protocol,” “biodiversity accounting,” “biodiversity reporting,” “nature-related disclosure,” “TNFD,” “GRI biodiversity,” “Natural Capital Protocol,” and “South Africa biodiversity reporting.” It was not intended to conduct an independent systematic review through this process, but merely to ensure that the interview guide ([Appendix 1](#)) is built around the latest discussions surrounding biodiversity accountability. Phase one involved a purposively selected corpus of BD Protocol documents, technical guidance, consultation and pilot materials, related biodiversity-reporting frameworks and available application examples. Documents were identified through relevant academic databases, organizational repositories and websites using search terms related to the BD Protocol, biodiversity accounting and reporting, impact measurement, assurance and the South African context. Materials were included where they informed the Protocol’s development, purpose, boundaries, measurement methodology, implementation, organizational use, relationship with other frameworks, verification or conservation outcomes. All four authors participated in reviewing and coding the documents according to these themes, with differences discussed collectively and resolved by consensus. The accompanying targeted literature search was used to confirm the completeness of the coding categories and inform the interview guide; it was not intended as an independent systematic or bibliometric review.

Triangulation was achieved through the iterative process of document analysis and interview data. Through document analysis, a certain perception of the protocol as it was supposed to operate was already established; interviews served to verify the claims raised by the documents through the firsthand accounts of developers, users, and protocol assurance providers. Hence, in the results section, document-based insights serve as the basis for interpreting interviews. Thus, in the results section, apart from discussing the protocol’s contents, an explanation of how it is actually perceived, employed, and challenged is also provided.

In the second empirical phase, purposively selected stakeholders directly involved in the development and use of the BD Protocol were interviewed. A semi-structured interview guide was adopted to collect interview data. There were two parts to the guide. Questions were first asked about basic demographics, and the second part covers core questions on the BD Protocol. Thus, the study sought to determine the participants’ primary areas of responsibility to document their roles in their respective industries, before settling on a series of questions on the subject.

One participant was pre-tested using the interview guide. The semi-structured interview guide is provided in [Appendix](#) to further clarify how these themes were operationalized in the interviews. This allowed the researchers to determine whether the questions captured what they intended, provide comments on the interview questions’ structure, language, and wording, and monitor participants’ behavior and reactions as they answered. All ethical issues were addressed in the two empirical phases. In the second empirical phase, we conducted our analysis using the Atlas.ti software (Version 24). The themes that emerged from the research question were presented in a thematic network diagram in Atlas.ti. The diagrams were subsequently interpreted and discussed. Following the reviewer feedback, all interview transcripts were subjected to a second-cycle analysis. The original coding focused mainly on the application, impact measurement, implementation challenges, and future improvements. The second-cycle analysis examined relevant evidence distributed across the transcripts that had not been fully integrated into the original thematic structure. Three related code families were applied. The first comprised the sensemaking properties of enactment, retrospection, social construction, ongoing activity, extracted cues, plausibility and identity construction. The second comprised integrated-thinking dimensions, including leadership and governance, strategy, stakeholder engagement, organizational structures, risk and performance

management, and cross-functional decision-making. The third distinguished calculative, organizational, accountability and ecological effectiveness. Additional codes captured references to IFRS S1, IFRS S2, TNFD, GRI 101, ESRS E4, assurance and conservation-related outcomes. Interview passages were coded to more than one category when they connected, for example, biodiversity measurement with a subsequent management or conservation decision. Negative and contradictory evidence was retained, including criticism of the first Protocol version, differing views on adoption as a measure of impact, uncertainty concerning future revisions and concerns about verification and conformance.

Nine core participants were interviewed in the primary phase of the research. The average interview length was about 52 minutes. One additional interview was conducted with an assurance provider during the revision phase to enable us to conduct a deeper analysis of the verification, credibility, and conformance issues raised by the reviewers. We checked for saturation in the primary interview phase through iterative reading, coding, and transcript comparison. Comparison of the final transcripts against the revised coding framework produced additional examples and qualifications, but no materially new analytical dimensions within the participant network were examined. This supported thematic sufficiency concerning the Protocol's development, calculative logic, implementation, organizational relevance, conservation applications and credibility. Saturation is therefore claimed for this bounded expert and implementation network, not for every possible category of reporting entity, investor, regulator, affected community, non-adopter or other disclosure user. Data from the interview phase are analyzed explanatorily after transcription and used narratively to discuss our results in [Section 5](#). The study used the data collection phases to structure [Section 5](#), detailing how they inform one another. In this regard, the first phase informs the second by posing questions to participants to gain further insights into the first phase's results.

4.2 Research control

According to [Mackieson et al. \(2019\)](#), researcher bias is a potential issue in qualitative research. To mitigate selection bias, the researchers employed purposive rather than convenience sampling ([Smith and Noble, 2014](#)). The selection process was thoroughly detailed. Additionally, to mitigate potential analysis bias ([Smith and Noble, 2014](#)), a specific methodology was employed to organize the data, aligning with the theoretical propositions and thereby facilitating a methodical and rigorous analysis of the unstructured data used in this research ([Mackieson et al., 2019](#)). The researchers employed an applied thematic approach (ATA) ([Guest et al., 2012](#)) in order to mitigate potential biases ([Mackieson et al., 2019](#)). The ATA framework was established with the explicit intention of providing a deliberate, methodical approach to qualitative research and to organize and prepare text-based qualitative analysis. To mitigate bias, the study was conducted in three stages, drawing on insights from [Mackieson et al. \(2019\)](#) and [Guest et al. \(2012\)](#). During the initial stage, the interview questions were formulated based on subject-matter knowledge. Subsequently, a participant was selected to undergo a pre-testing process to assess the effectiveness and clarity of the questions. During the second stage, all researchers conducted a thorough, impartial evaluation and analysis of the document. In the third step, a comprehensive comparison and thorough analysis of the data were conducted, with particular focus on minor inconsistencies. Following extensive deliberation, an agreement was ultimately obtained, leading to the formulation of conclusive findings.

5. Development, use, impact, and future improvement of the biological diversity protocol

5.1 Overview of section

In this section, we present our findings from the document analysis (the need for the BD Protocol) and semi-structured interviews (with some of the project members of the BD Protocol, as well as participants experienced in the BD Protocol, both in terms of use and in

terms of collaborating with stakeholders, especially listed companies. The discussion of the findings takes account of the logic of triangulation explained above. The discussion begins with an explanation of what the documents say about the official justification, design, and the supposed role of the BD Protocol in accountability. The interviews are then used to understand how official statements are interpreted in practice. Such an approach to discussing the findings is crucial since it enables one to separate the protocol as designed from that which is being understood, applied, contested, and even verified. Although we recognize there may be overlaps, we present our analysis in relation to the themes that emerged from the unpacking of our research question. These themes are: application/use of the BD Protocol, impact measurement, challenges of applying/using the BD Protocol, and future improvements to the BD Protocol.

5.2 *The need for the biological diversity protocol*

The document analysis shows that the BD Protocol emerged from a collaborative, multi-stakeholder process involving the design team, contributors, consultation participants, pilot organizations and funders. Eskom Holdings SOC Ltd and the WWF Nedbank Green Trust provided funding, while Eskom personnel contributed to data collection and processing during the pilot application of the [Biological Diversity Protocol \(2021\)](#). Participant 2 confirmed that the Endangered Wildlife Trust developed the Protocol with funding from Eskom and that it was initially tested at an Eskom site. The Protocol has since been applied by other organizations, particularly those operating in extractive industries ([Houdet and Teren, 2023](#); [Nelson et al., 2023](#)). Its development therefore illustrates collaboration among public, private, and conservation-sector actors to address biodiversity impacts.

The documents and interviews indicate that the Protocol was developed in response to the need for organizations to identify, measure, manage and report their biodiversity impacts more systematically. Biodiversity loss creates operational, financial, regulatory and reputational risks for organizations whose activities depend on or affect ecosystems and species. The Protocol responds to this need by providing an accounting structure through which biodiversity impacts can be consolidated across organizational activities, value chains and jurisdictions. However, the findings do not suggest that biodiversity accounting or disclosure automatically produces conservation outcomes. The Protocol's contribution to biodiversity protection is indirect and depends on whether the resulting information is incorporated into organizational decision-making, used to evaluate biodiversity gains and losses and subjected to stakeholder scrutiny. Participants 1, 2 and 7 also emphasized that the collective action required to support wider biodiversity accountability remains limited. Such actions may include enabling policies, corporate disclosure requirements, investor and shareholder engagement, informed consumer choices and greater academic involvement in developing and assessing biodiversity-accounting practices. The document analysis generated three principal design claims for empirical examination. First, the Protocol seeks to standardize the identification, measurement and consolidation of net biodiversity impacts. Second, it is intended to make biodiversity information useful for organizational management, reporting and stakeholder accountability. Third, it seeks to produce comparable and credible biodiversity accounts despite not prescribing a uniform verification or assurance standard. Participants 2, 4 and 6 confirmed that the Protocol draws on the Natural Capital Protocol while providing a more specific accounting structure for biodiversity impacts.

From a sensemaking perspective, the Protocol's collaborative development reflects a socially constructed response to the uncertainty and complexity surrounding biodiversity impacts. Through decisions concerning boundaries, reference conditions, ecosystems, taxa, gains and losses, the Protocol converts ecological complexity into categories that organizations can identify, measure and communicate. These categories make biodiversity more organizationally visible, but their accountability value ultimately depends on how the Protocol is interpreted, applied, integrated into decisions and independently assessed. The

following sections use the interview evidence to test and qualify these design claims. Calculative standardization is examined through participants' accounts of boundaries, baselines, reference states, impact inventories and biodiversity gains and losses. Organizational usefulness is examined through evidence concerning management reporting, budgeting, conservation decisions, adoption and alignment with other reporting frameworks. Credibility is examined through data quality, specialist expertise, transparency, verification and assurance. The analysis, therefore, distinguishes the Protocol as designed from the Protocol as interpreted, applied and contested.

5.3 Using, measuring impact, and improving the biological diversity protocol

While the document analysis phase provides generic insights into the BD Protocol, especially regarding its development and relationships with other frameworks, the interview phase takes it further by exploring its use, impact measurement, and future improvements. The document analysis phase provided a solid foundation for the interview phase regarding the questions posed to participants.

5.3.1 Application/use of BD protocol. This section explored the application or the use of the BD Protocol. Figure 1 presents the Atlas.ti network diagram of the applications/uses of the BD protocol. According to the findings, the Biological Diversity Protocol (BD Protocol) is applied in various ways to enhance accountability for nature, species, and biodiversity.

Participants noted that it is used to conduct biodiversity baseline assessments, assess biodiversity footprints, and serve as a framework for integrating biodiversity into value chain analysis. In this regard, Participant 3 noted that *"it is around disclosing and reporting on nature-related issues in terms of impacts and dependencies. I suppose it depends on where a company would want to disclose in terms of its footprints."* This is consistent with how the BD

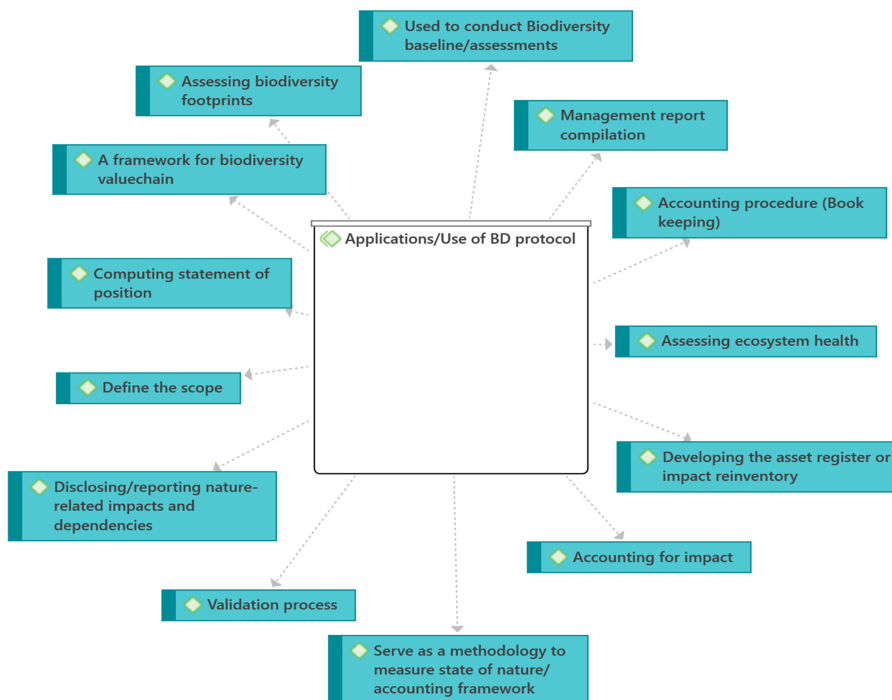


Figure 1. Interview network on the applications/use of BD protocol

Protocol is to be used, as established in the [Biological Diversity Protocol \(2021\)](#) document's analysis phase. Organizations use the protocol to compute biodiversity-related statements of position, define the scope of biodiversity accounting, and disclose nature-related impacts and dependencies transparently. It aids in compiling management reports, performing biodiversity bookkeeping, and assessing ecosystem health. Furthermore, the findings disclosed that the protocol supports the development of biodiversity asset registers or impact inventories, which account for biodiversity impacts and validate biodiversity data for reliability. In this context, Participant 1 stated that *"There are a number of steps, actually seven steps, to be followed in the use/application of the BD Protocol. The first step is to define the scope, and this is actually a legal approach, and the last step is basically putting it all together for management, budgeting, reporting, disclosure, and then you start the process again next year."* [Figure 1](#) contains the other five steps. The seven-step cycle illustrates the ongoing and retrospective properties of sensemaking. Scoping and boundary decisions enact the biodiversity object by determining which ecosystems, taxa and value-chain impacts become visible. Reference states, hectares, gains and losses operate as extracted cues through which ecological complexity is converted into an organizational account. Repeating the process annually enables organizations to reinterpret current impacts against prior baselines and incorporate new information. The findings also reveal the limits of this process. Data gaps, disputed boundaries, and different measurement choices may produce several plausible accounts of the same ecological conditions. The Protocol can therefore stabilize a workable account without necessarily capturing every biodiversity impact. Its accountability value ultimately depends on whether the resulting information is integrated into organizational decisions and subjected to credible verification. Lastly, findings confirmed that it functions as a methodology for measuring biodiversity within a broader nature accounting framework, making it a comprehensive tool for biodiversity management and accountability. Participant 9 noted that *"it is applied/used as both a methodology for measuring the state of nature and an accounting framework which helps companies understand and disclose biodiversity impacts."* An insight from Participant 9's response is that the BD Protocol is not just a framework but also a methodology. Participants 1 and 3 appear to have concurred with Participant 9, noting that the BD Protocol differs from most other biodiversity disclosure and reporting frameworks/standards in its computation methods, which are based solely on financial accounting measures. In this context, Participant 1 submitted that *"So, and maybe just to clarify, the BD protocol is an accounting framework, it's based on adaptations of financial accounting to biodiversity impact for business and organizations, and it's based on double entry bookkeeping."* Thus, it may be suggested that the BD Protocol has implications not only for reporting and disclosure but also for biodiversity accounting methodology.

5.3.2 Impact measurement. The idea here is to establish how biodiversity impact is measured using the BD Protocol. Biodiversity impact measurement is the process of assessing the scale of biodiversity impacts. It provides the input data for organizational biodiversity accounting ([Houdet and Teren, 2022](#)). Participant 1 suggests that the best way to measure impact is to focus on the ecosystem. [Figure 2](#) presents the impact measurement of the BD protocol. Findings appear to suggest that impact is measured through several approaches. Participant 1 noted that *"I'm just going to focus on ecosystems at this stage, so we define impact as a change in the state of an ecosystem. What do we mean by state? We mean the integrity or condition of an ecosystem. So to measure the condition of integrity, you need a methodology that embeds a reference state for that ecosystem, which is where the BD Protocol comes in handy."* This appears to align with the system of system change highlighted by [Samkin and Wingard \(2021\)](#) in their framework.

Participants further highlighted the use of intuitive accounting equations to estimate changes in biodiversity and emphasized quantifying the number of hectares positively impacted by conservation efforts. Here, Participant 8 noted that *"the Biological Diversity Protocol measures biodiversity impacts by assessing baseline conditions, quantifying organizational pressures, evaluating negative and positive impacts, and calculating net*

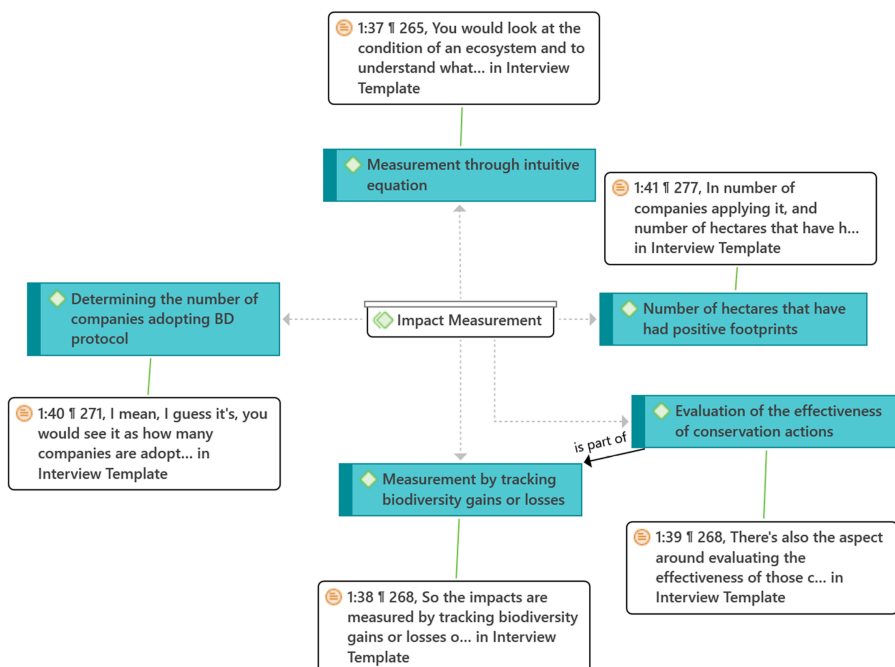


Figure 2. Interview network on impact measurement

changes using biodiversity indicators over time.” A key point in this response, also noted by Participant 1 in discussing the seven steps to using/applying the BD Protocol, is that it is used to make sense of an organization’s biodiversity footprint over a specific period, usually a year, and then the process is repeated in subsequent years.

Participants further noted that evaluating the effectiveness of specific conservation actions was also a key metric (Participants 2, 6, and 7). Furthermore, tracking biodiversity gains and losses over time provides critical insights into the protocol’s impact. In this regard, Participant 3 noted that “so, it’s based on a sort of double-entry bookkeeping system. So, effectively, you’ve got debits and credits. Whatever you, as a company, are impacting negatively, those are your losses; whatever you can do to improve that by either doing rehabilitation and/or restoration, and/or offsetting or compensation, those are your gains.” Compared to the responses of other participants, Participant 9 offered a different perspective, noting that perhaps the best way to measure BD Protocol impact is to determine the adoption rate of the BD Protocol among companies, reflecting its influence and integration into corporate practices. Participant 9 argued that, since the BD Protocol is a framework for assessing the impact of organizations on nature, species, and biodiversity, its adoption is a key measure of that impact.

5.3.3 From biodiversity measurement to organizational and conservation outcomes. The foregoing findings explain the Protocol’s internal measurement methodology: baseline ecosystem conditions are established, organizational pressures are identified, positive and negative changes are measured, and net impacts are recorded over time. This demonstrates calculative effectiveness, but it does not, by itself, establish that the Protocol has changed organizational decisions or improved biodiversity performance. Participants 2, 4, and 8 noted that the Protocol itself is a means to an end and not an end in itself. These participants noted that after measurement, organizations are to use the Protocol-generated information to, among other things, improve governance. This will demonstrate organizational use because the biodiversity account influenced an identifiable process rather than merely producing

disclosure. The connection with rewilding arises where the Protocol is used to establish ecological reference conditions, record restoration or species-reintroduction activities, and monitor subsequent changes in ecosystem conditions. The Protocol does not itself perform rewilding; it provides an accounting framework for recording and evaluating interventions, resources, and resulting changes. The connection with de-extinction is narrower and should be supported by direct interview evidence concerning threatened taxa, species restoration, habitat conditions or species reintroduction. The Protocol's contribution lies in making the impacts, habitats, resources and conservation actions associated with species recovery accountable. It should not be presented as evidence that the Protocol has itself achieved de-extinction. The evidence, therefore, identifies a sequential accountability pathway: measurement produces an account; the account informs a decision; the decision supports an intervention; and subsequent monitoring determines whether biodiversity conditions change. Failure at any stage prevents calculative effectiveness from becoming ecological effectiveness.

5.3.4 Integration with sustainability reporting and organizational decision-making. IFRS S1 requires disclosure of material information about sustainability-related risks and opportunities that may affect an entity's prospects, while IFRS S2 applies this framework specifically to climate-related risks and opportunities (ISSB, 2023a, 2023b). The BD Protocol does not replace either standard, and IFRS S2 is not a biodiversity measurement standard. The Protocol may nevertheless supply biodiversity-impact information relevant to an IFRS S1 assessment where biodiversity-related matters affect organizational prospects. A majority of the participants discussed alignment with (IFRS S1, IFRS S2, TNFD, GRI, ESRS, integrated reporting or another relevant framework). Their responses indicate that interoperability involves more than simply repeating the same metric across reports. It requires biodiversity information to be connected to governance oversight, strategy, material risks and opportunities, resource allocation and organizational performance. They suggest that organizational integration will involve a key Protocol information entering a board paper, risk register, management report, budget, project approval, procurement decision or performance target. By contrast, it may be argued that information currently remains confined to technical, biodiversity, or reporting specialists, demonstrating incomplete integration. Thus, participants described alignment as a planned future developmental objective to move from interoperability to an established practice.

The findings reveal a tension between calculative integration, where biodiversity data are consolidated into an account, and organizational integration, where the account changes governance and management processes. The Protocol may therefore produce information relevant to contemporary sustainability reporting without ensuring that integrated thinking has taken hold.

5.3.5 Challenges in applying/using BD protocol. Figure 3 presents the challenges in applying/using the BD protocol. We envisage that, as obtained in the contemporary academic discourse on frameworks/standards for reporting on biodiversity, which appears to suggest that the frameworks are usually not entirely fit for purpose, such as a lack of applicability to all sectors (Dutta and Dutta, 2024; Blanco-Zaitegi *et al.*, 2022), there may be challenges in applying/using the BD Protocol. Participant 1 appears to have confirmed our thoughts early into the interviews by noting that "*there was an initial version of the BD Protocol and there's recently been an updated version.*" Participant 1 further noted that "*at least in my opinion, the first version of BD Protocol disclosure was very basic and not useful at all. And it was not very much applied by companies, and whatever was disclosed was of no use at all, in my opinion. I think the latest version is much more tangible and hopefully companies would apply it more.*" This is significant negative-case evidence because it comes from a participant with direct knowledge of the Protocol and challenges the assumption that a structured biodiversity disclosure necessarily provides useful accountability. The statement indicates that the first version may have enabled formal reporting without producing sufficiently tangible, decision-relevant or widely applicable information. The participant's expectation that the revised

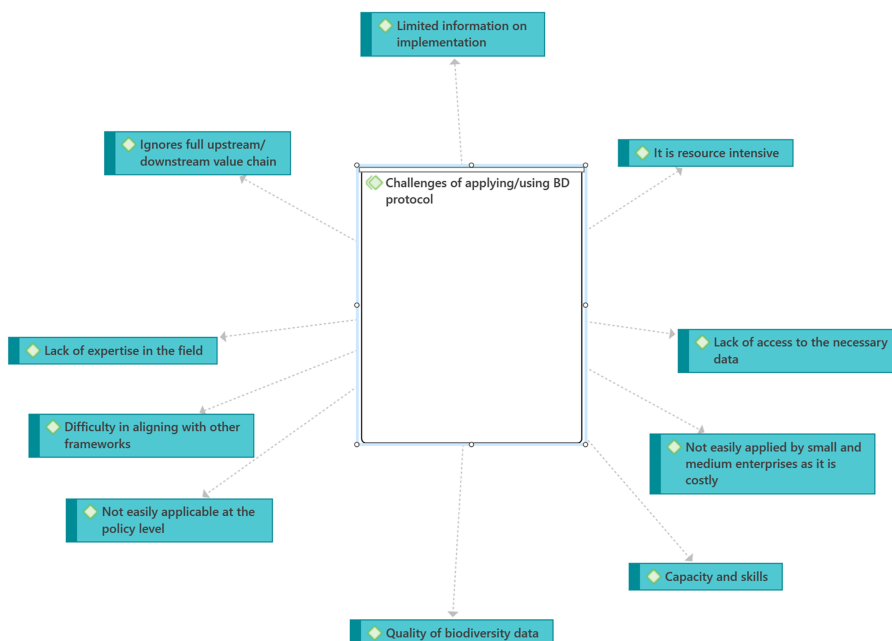


Figure 3. Interview network on challenges in applying/using BD protocol

version will hopefully be more useful is prospective and should not be treated as evidence that usefulness has already been achieved.

Theoretically, the revision of the Protocol illustrates retrospective sensemaking: limitations in the first version prompted reconsideration of which measurements and disclosures could constitute a plausible and useful biodiversity account. It also reveals an integrated-thinking tension. A technically compliant disclosure may remain disconnected from strategy and decision-making. The observation thus reiterates concerns regarding usefulness and effectiveness rather than serving only as evidence that frameworks require periodic updating.

Findings suggest that applying the BD Protocol faces several challenges, as identified by participants. A key challenge is the limited information on implementation, which hinders effective adoption. While Participant 1 believes that it is early days, “no, I think it’s too soon. It’s 2021, and we are only in 2024,” the participant believes that there are a couple of challenges. Participant 1 noted that “*there’s limited public information about how it’s been implemented. I think it’s too soon, but so far as I’m aware, there’s no report, so I can mention a couple of changes if you want. The biggest issue is that not all countries or jurisdictions have the same quality of special data on biodiversity. For instance, it’s quite easy to do biodiversity footprint accounting as per the BD protocol in South Africa, it’s more difficult in DRC for instance because there’s a lack of scientific knowledge about ecosystems there.*” Participant 2 added that “*one of the key components of BD Protocol is the baseline biodiversity data and there is a limitation on baseline biodiversity data for some organizations.*” These accounts demonstrate how the South African context shapes the practical feasibility of biodiversity accounting. Participant 1’s comparison indicates that the availability of mapped ecosystems and spatial biodiversity information makes reference-state and footprint calculations more practicable in South Africa than in jurisdictions with weaker ecological data infrastructure. Resource availability also shapes participation (Participants 4, 6 and 9). Participant 2’s account indicates that the cost of implementation favours large corporations and may exclude SMEs, while Participant 9 identifies shortages in accounting and biodiversity expertise (Participants

3, 6 and 7). The collaboration between Eskom and the EWT further illustrates the roles of a state-owned enterprise and a conservation NGO in providing funding, ecological expertise, and a pilot setting. Participant 2's observation that the Protocol has not been fully integrated into government policy or adopted widely by other NGOs shows that project-level collaboration does not automatically produce broader institutionalisation. Participant 5's work on a model initially applicable to mining infrastructure, with planned extension to forestry, also demonstrates how the economy's exposure to biodiversity-sensitive industries shapes measurement development. The emerging-economy contribution therefore lies in identifying the interaction among data infrastructure, institutional intermediaries, resource constraints, specialist capacity and sectoral exposure. The study does not claim that these conditions characterise every emerging economy.

The protocol is also resource-intensive (Participants 2 and 7), making it costly and difficult to implement for small and medium enterprises (SMEs). [Horner and Davidson \(2020\)](#) have previously highlighted that biodiversity accounting and reporting are usually beyond the reach of small enterprises, including NGOs, due to cost. In this context, Participant 2 noted that "whilst any organization, especially in the corporate space, can utilize the BD Protocol, the reality is that it often aligns better with large corporates, large companies, smaller and medium enterprises don't always have the opportunity to utilize *it because it is costly*." Participants also indicate that there is a lack of access to necessary data, coupled with concerns about the quality of biodiversity data, which further complicates its application (Participants 1, 2, and 7).

Participant 9 affirms that lack of expertise in the field and inadequate capacity and skills among practitioners present additional barriers. [Powell and McGuigan \(2023\)](#) have recently highlighted the importance of education and training to biodiversity accounting and reporting. In this regard, Participant 9 noted that "being a new tool, there is a lot of training required, particularly for the accounting. There are also conceptual misunderstandings about themes such as accounting for full footprint and measuring against the reference state." Further, it was noted that aligning the BD Protocol with other frameworks is challenging, and it is not easily applicable at the policy level, which limits its broader integration. Participant 2 stated that "*there's still a gap in terms of government being able to understand and integrate it into national policy. And I think there's also a gap in other NGOs being able to utilize it, and use it with their partners, and I think the initial intention was that the BD Protocol would be something that the Endangered Wildlife Trust could utilize from a competitive perspective. But in order for this to gain traction, it needs to be opened to as many people as possible.*" Furthermore, it tends to ignore the full upstream and downstream value chain, thereby reducing its comprehensiveness and utility. A point that was noted in the [Biological Diversity Protocol \(2021\)](#) document itself, as highlighted in [Section 2.3.3](#). In this instance, Participant 3 noted that "*obviously what it doesn't take into account is the full upstream and downstream value chain, I mean, I think that would be the next step, but importantly for us, it's around, just being transparent.*" These challenges collectively stress the need for enhanced support, resources, and capacity-building to improve the effectiveness and accessibility of the BD protocol.

These challenges reveal tensions predicted by the theoretical framework. The aim of comparable accounting conflicts with the ecological specificity of different ecosystems and taxa. The demand for comprehensive value-chain information conflicts with data and resource limitations. Finally, the ability to produce a plausible biodiversity account may precede both independent verification and integration into organizational decisions. The findings therefore qualify, rather than simply confirm, sensemaking theory: collective agreement can make biodiversity governable while leaving important impacts, stakeholders and outcomes outside the account.

5.3.6 Verification, assurance and the credibility of protocol-based accounts. The BD Protocol encourages organizations to comply with its biodiversity accounting and reporting principles, but does not prescribe a specific standard for verifying or assuring a biodiversity impact inventory and the related Statements of Biodiversity Position and Performance.

Participant 10, the assurance provider, identified two related limitations: a lack of clarity concerning the verification process and the absence of an agreed conformance index against which an organization's application of the Protocol can be assessed. These limitations may result in different preparers or assurance practitioners reaching different conclusions from similar biodiversity information. They also highlight the need to distinguish among data validation, which concerns the reliability of the underlying biodiversity data; Protocol conformance, which concerns whether the Protocol's requirements have been applied appropriately; and external assurance, which concerns the independent assessment of the resulting information. The existence of a biodiversity account does not, therefore, establish that the account can be assessed consistently and independently. The assurance concern is connected to the wider challenges identified by participants, including incomplete data, differences in reference states, limited expertise and partial value-chain coverage. Although these problems are not unique to the BD Protocol, subjectivity in sustainability and biodiversity reporting may weaken legitimacy and accountability when reported claims cannot be evaluated against clear, consistent criteria (Alrazi *et al.*, 2015). Biodiversity accountability consequently depends not only on disclosure but also on the credibility and independent assessability of the information disclosed.

From a sensemaking perspective, assurance may help stabilize a shared interpretation of how the Protocol has been applied, but it cannot eliminate ecological uncertainty or transform incomplete information into a fully accurate account. The findings therefore identify an assurance-readiness gap: the Protocol provides an accounting and reporting architecture, but consistent assurance requires clearer guidance on verification, conformance, evidence and the treatment of professional judgement. As Participant 10 was the only assurance provider interviewed, this evidence is presented as an important specialist perspective, supported by related concerns raised by other participants, rather than as representative of assurance practice generally.

5.3.7 Future improvements. This section explored future improvement plans to the BD Protocol arising from stakeholder feedback and internal analysis, as discussed under the challenges to the use/application above. Figure 4 presents the future improvements to applying/using the BD protocol. Findings from participants reveal several future improvement plans for the BD Protocol, based on stakeholder feedback and internal analyses by some project team members and users.

Participants highlighted the need to update key metrics and indicators to ensure more precise, relevant measurements (Participants 4 and 5). Sullivan and Hannis (2017) have previously highlighted the importance of harmonizing metrics to biodiversity accounting and reporting. In this context, Participant 4 noted that *"I am not sure, but possibly some updates to the metrics and indicators and some sector – specific guidance."* Participant 5 takes this further by stating that *"we are developing a model (phase 1 to be published next year) as a tool to aid in measuring ecosystem condition. Currently, the tool is more aligned with measuring conditions around mining infrastructure. But we plan to grow the tool to be able to assess the ecosystem condition for more sectors (i.e. Forestry)."* The development of BD Protocol Version 2.0 was emphasized, aligning the protocol with other global frameworks to enhance its applicability and coherence. Participant 2 noted that *"we don't have an intention for a revision, but I think that it is important because there's a lot more frameworks such as the TNFD, and it's important that we start to see if our next version can address some of the gaps that have been picked up over time, as well as align to more of the global frameworks. So, I think there is a need to look at a version 2.0, but we certainly as an organization are not looking at it right now."*

Future plans should also include creating supply chain guidance to facilitate integration across business operations, which is also key. Participant 1 noted that *"I think guidance for the supply chain should be developed. There's a misconception that you cannot measure the state of the ecosystem in the supply chain. It's too difficult, actually. We don't believe it's true because we have satellite imagery. You will be surprised how many companies actually know*

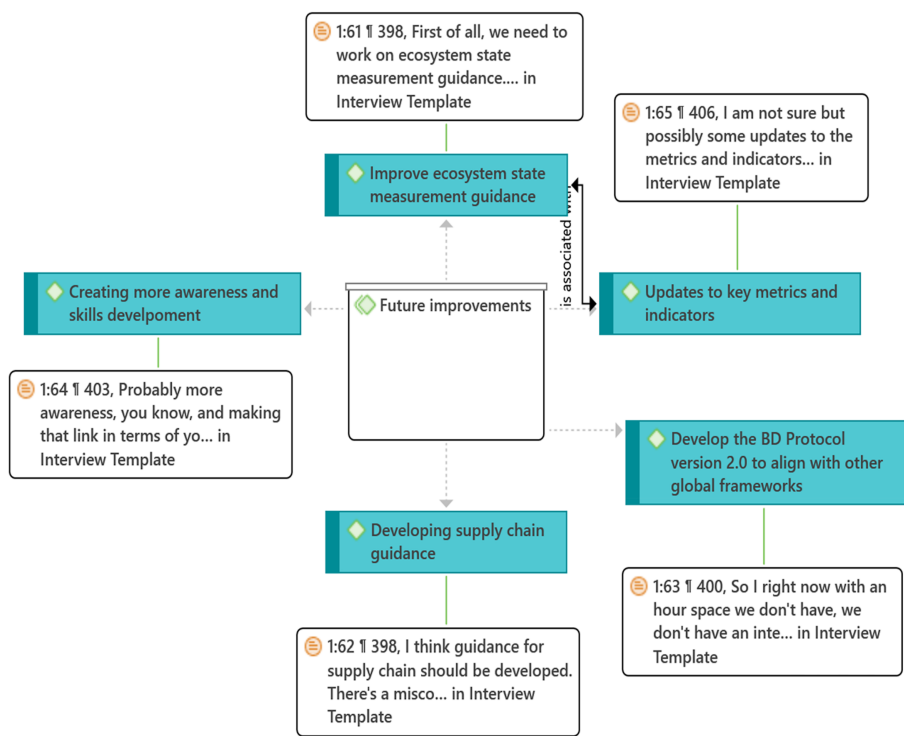


Figure 4. Interview network on future improvements to the BD Protocol

their suppliers and their supply chain, so it's not quite easy and possible to actually map.” Ogilvy *et al.* (2022) have previously sounded the importance of the supply chain in biodiversity accounting and reporting. Further, efforts to increase awareness and provide skills development were identified as critical for broader adoption and effective implementation (Participants 2 and 3). Participant 3 stated that “Probably more awareness, and making the link in terms of why it's important for companies to report and disclose on this. Expertise and knowledge are quite limited in the field. So, the more that you can share information on it as to why, not only why we're doing this, but the sort of how and what, so it's really important.” Furthermore, the participants indicated that guidance on measuring ecosystem states should be a priority to improve the protocol's effectiveness and accountability for biodiversity conservation. Participant 1 noted, “So there are a couple of things that I will mention. First of all, we need to work on ecosystem state measurement guidance, as well as make the case that we need custom-specific monitoring protocols. There's a belief by many, many consulting companies and many companies that we should just have one metric for biodiversity. And we think it's wrong, but we have to provide guidance on applying/using the different metrics.” The participants were quite optimistic that, should these improvements be implemented, there may be an increase in the use/application of the BD Protocol by organizations.

6. Implications and recommendations

This study has implications for various stakeholders, including organizations, policymakers, standard-setters, and conservation NGOs. For organizations, it stresses that the BD Protocol is one of the best biodiversity accounting and reporting frameworks that may be used in conjunction with other frameworks, especially those that are not based on the principles of

financial accounting. For standard setters and policymakers, it reiterates the importance of collaboration for setting policies and developing frameworks/standards. In particular, the development of the BD Protocol strengthens the case for collaboration. A state-owned company initiated the project and engaged a CNGO to develop the protocol. The CNGO engaged several stakeholders from the public, private, and third sectors, as well as academics, to contribute to the development of the protocol. The call by some participants for academics to further promote the use of the protocol further indicates that collaborative efforts are necessary to ensure biodiversity accounting and reporting, and sustainability as a whole. For conservation NGOs, Eskom Holdings' engagement with the Endangered Wildlife Trust to develop the BD Protocol further enhances their credibility as an organization that may be viewed as providing an alternative mechanism for enhancing credibility, alongside auditors and other assurance providers. In this context, we have seen several collaborations between CNGOs and organizations from the three sectors highlighted earlier, as well as with academic institutions. The aftermath of such collaborations is often helpful for biodiversity conservation and sustainability, and the reports are usually free of greenwashing by organizations.

Based on the findings, to enhance the application and effectiveness of the BD Protocol, awareness-raising and capacity-building should be created. Further, the development of targeted training programs and workshops to build capacity and expertise among practitioners, particularly in SMEs, will go a long way toward ensuring that the BD Protocol is used not only by large companies but also by SMEs. Also, awareness campaigns should be launched to promote the benefits and applications of the BD Protocol to a broader audience, including policymakers and businesses. Academics are encouraged to assist in this regard by publishing key commentaries and other publications. To improve access to data and ensure data quality, standard setters and policymakers should consider establishing centralized data repositories and tools to facilitate easy access to reliable biodiversity data. It is also recommended that standardized methodologies for data collection and validation be developed to improve the consistency and quality of biodiversity-related information. In terms of alignment with other frameworks/standards, the project team should ensure that any development of BD Protocol Version 2.0 or future improvements align with existing biodiversity frameworks/standards, such as the Convention on Biological Diversity and the TNFD. Further, the project team or the Endangered Wildlife Trust may collaborate with international organizations to promote harmonization and compatibility across frameworks.

In addressing resource challenges, the project team may, in any future iteration, explore creating a simplified, cost-effective version of the protocol tailored to the needs of SMEs to reduce resource barriers to adoption. Further, the project team, if possible, may sponsor, through external funders, small and medium-sized organizations to adopt the protocol. With regard to scope expansion, the project team should consider developing additional guidance to comprehensively address upstream and downstream value chains, ensuring a holistic approach to biodiversity accounting and reporting. A sector-specific application and case studies should be provided to demonstrate the protocol's relevance across different industries. To strengthen ecosystem measurement guidance, a detailed guideline should be developed to measure ecosystem states, integrating advanced tools and technologies such as remote sensing and geographic information systems (GIS). The government should encourage continuous research and innovation to refine methodologies for assessing ecosystem health and biodiversity. To foster collaboration and stakeholder engagement, forums and platforms should be established for stakeholders to share experiences, challenges, and best practices related to the protocol's application. Policymakers and regulators should be encouraged to promote the adoption of the BD Protocol at the policy level and integrate it into national biodiversity strategies. Implementing these recommendations will enhance the usability, accessibility, and impact of the BD Protocol, which will ensure that it effectively supports biodiversity accountability and conservation efforts across various sectors.

7. Concluding comments and further research

The study examined the development and application/use of the Biological Diversity Protocol (BD Protocol) in enhancing accountability for nature, species, and biodiversity, with the intention of contributing to prior research on the development of biodiversity accounting and reporting frameworks/standards (e.g. [Powell and McGuigan, 2023](#); [Samkin et al., 2014](#); [Jones, 1996](#)). The intention of the biodiversity framework (BD Protocol) studied is to bring to the fore the development, use, impact, and future improvements of one of the core innovative biodiversity frameworks, one which uses financial accounting techniques. The importance of the BD Protocol goes beyond its being referenced in a call for papers. What makes it important is that it is one step forward towards making biodiversity reporting more like biodiversity accounting through a systematic approach to recognizing and communicating net biodiversity impact over time. What it allows us to do is use the BD Protocol as a lens through which we may ask some interesting questions about accounting and organization: how far can a protocol help transform biodiversity from a diffuse environmental concern into an object of organizational accountability, and what additional conditions are required before that accountability becomes substantively credible and conservation-relevant? The empirical components consisted of document analysis and semi-structured interviews. The findings reveal that the protocol has been used by some companies, especially those in the mining, forestry, energy, and retail sectors, for biodiversity assessments, footprint analysis, value chain integration, and transparent reporting of nature-related impacts (All participants). Participants are optimistic that the protocol will be adopted by companies in other sectors over time, given that it was developed only in 2021. The participants identified several indicators of the Protocol's contribution, including recorded biodiversity gains and losses, organizational adoption, conservation evaluations, and its use in biodiversity baseline and footprint assessments, value-chain analysis, management reporting, budgeting, disclosure, and the evaluation of rehabilitation, restoration and offsetting activities. These indicators should not be treated as equivalent. Gains and losses demonstrate calculative capacity; adoption demonstrates reach; use in management, budgeting, or governance demonstrates organizational integration; stakeholder reliance on disclosed information demonstrates accountability use; and measured improvements in ecosystem or taxa condition support ecological effectiveness. Accordingly, organizational and conservation uses reported by participants are distinguished from independently verified ecological outcomes. However, challenges such as resource intensiveness, limited data quality, lack of expertise, and alignment difficulties with global frameworks hinder its broader application. Future improvement plans include updating metrics, aligning with global frameworks, enhancing ecosystem measurement guidance, and increasing awareness and capacity. Addressing these challenges and implementing improvements will strengthen the protocol's role in biodiversity accountability.

From a broader perspective, the study of the BD Protocol highlights some ways in which accounting can engage with biodiversity loss as a “wicked” problem. From the evidence obtained, it is clear that, in addition to its practical application for impact disclosure, the protocol adds value by enabling the development of an accounting discourse in which biodiversity can become more visible and discussable. In addition, it emerges from the analysis that the power of the protocol is limited by several factors, including poor data infrastructure, lack of integrated thinking within the organization, partial coverage of the value chain and inadequate means of verification, all of which imply that a protocol might enhance the process of accounting without necessarily leading to any substantive improvements in terms of conservation ([Higgins et al., 2019](#); [Al-Htaybat and von Alberti-Alhtaybat, 2018](#)). The case shows how biodiversity becomes organizationally actionable through boundaries, baselines, extracted ecological cues and recurring accounts. It also reveals the limits of calculative sensemaking: actors may agree on a plausible biodiversity account before the information is integrated into decisions, and the account may be independently assured or linked to demonstrable conservation outcomes. Integrated thinking, therefore, represents the

bridge—or missing bridge—between biodiversity calculation and outcome-oriented accountability. In this respect, the study extends research showing that biodiversity reporting remains inconsistent and underdeveloped and that the transition from disclosure to accountability, and from accountability to conservation outcomes, is not automatic (Adler *et al.*, 2018; Da Mata *et al.*, 2025).

Our study supports the work of others that biodiversity accounting/reporting frameworks have to be better tailored to specific organizations (Powell and McGuigan, 2023; Samkin *et al.*, 2014), and that standard setters and framework developers should ensure that frameworks and standards are closely related in terms of content and measures to ensure comparable results (Powell and McGuigan, 2023; Sullivan and Hannis, 2017; Samkin *et al.*, 2014). While some scholars are particular about the similarity of frameworks/standards, Participant 1 noted that it would be meaningless if the frameworks/standards were identical. Citing that there will be no need for different frameworks/standards if all are the same in terms of content and applicability, and should be consolidated when that is the case.

Perhaps the suggested future improvements, informed by the challenges reported by stakeholders involved in the development, use, and promotion of the BD Protocol, as highlighted by the participants, have implications for the continued use of the BD Protocol. Participants 1 and 2 highlighted that the first version of the BD Protocol was basic and not useful. Noting that it was not very well adopted by companies, and the reports by companies that used it didn't generate useful insights. Prompting the development of an improved version of the BD Protocol. A few participants believe the current version may need to be tweaked further in the near future to address concerns raised by stakeholders adopting it and to encourage more users. Only time will tell whether this will be done, as Participants 2 and 9 suggest that there are no planned updates to the protocol and that increased marketing will result in further adoption by stakeholders, as asserted by Participant 9.

This study has four limitations. First, participants were selected for their information-rich involvement in Protocol development, technical application, organizational engagement and assurance. Although their accounts contain direct knowledge of organizational applications and stakeholder feedback, most do not represent corporate preparers or external disclosure users in their organizational capacity. Second, one assurance practitioner was interviewed, and the assurance findings should therefore be interpreted from a specialist analytical perspective. Third, evidence concerning organizational decisions and conservation outcomes is derived from participant accounts and the documents available to the study and does not constitute an independent longitudinal ecological evaluation. Fourth, the South African evidence identifies context-specific mechanisms rather than establishing a universal distinction between emerging and developed economies. These limitations define the boundaries within which claims concerning effectiveness, saturation and transferability are made. While we have investigated challenges and likely future improvements, we have not questioned how future improvements may or should be implemented. Further research should focus on how future improvements can be implemented. In particular, future research should investigate whether there are more systematic ways to verify the application of the BD Protocol and whether an appropriate index of conformance could be developed. In addition to investigating whether organizations adopt the BD Protocol or produce high-quality disclosures, research should also examine whether the protocol's application is linked to actual conservation achievements at the ecosystem or species level. This could provide an answer to one of the key questions posed by this paper: namely, whether accountability for biodiversity leads to changes in practices, or just in representation. For example, Participant 2 mentioned developing a BD Protocol version 2.0; it is important to document the areas that need improvement. Further research may also explore innovative methodologies/techniques for enhancing the accuracy and reliability of biodiversity data to support the application of the BD Protocol. Also, studies could investigate cost-effective solutions and scalable models to facilitate its adoption by SMEs. Furthermore, research should examine

the integration of the BD Protocol with other global biodiversity frameworks and its applicability in diverse sectors and geographic contexts.

Ethical approval

Ethical approval was granted by the college ethics committee.

Appendix

INTERVIEW GUIDING QUESTIONS

(1) Part I

- (1) Good day. May I please know your name and the organisation you represent?
- (2) How long have you been working for this organisation?
- (3) What are the perks of working for this organisation?

(2) Part II

- (4) Please walk me through your understanding of biodiversity, rewilding, and de-extinction.
- (5) Please describe your understanding of biodiversity conservation reporting/disclosure frameworks.
- (6) Are you aware of any biodiversity conservation reporting/disclosure framework? If you are aware of any biodiversity conservation reporting/disclosure frameworks, please name them and describe the process. You are free to list as many as you are aware of.
- (7) What is the Biological Diversity Protocol?
- (8) Is the development of the Biological Diversity Protocol informed/influenced by any of the frameworks that you have mentioned?
- (9) What are the things that you think the Biological Diversity Protocol does better than other frameworks/standards?
- (10) What is your experience with the Biological Diversity Protocol in terms of the development, use, and promotion?
- (11) How is the Biological Diversity Protocol used/applied?
- (12) How do you measure the impacts of the Biological Diversity Protocol?
- (13) How should organisations apply the Biological Diversity Protocol?
- (14) What organisations are expected to or have mostly used the Biological Diversity Protocol, and how have they used it?
- (15) Are there reports of any challenges in using the Biological Diversity Protocol?
- (16) What are the future improvement plans to the Biological Diversity Protocol arising from stakeholder feedback and internal analysis?
- (17) What documents do you think we can use in further enhancing our understanding of the Biological Diversity Protocol, and how do we access the documents?
- (18) Who are the people you think we should interview in the industry and other sectors that have used or have direct experience with the Biological Diversity Protocol?
- (19) What are the future improvement plans to the Biological Diversity Protocol arising from stakeholder feedback and internal analysis?
- (20) Please tell us any useful information that our questions may not have covered.
- (21) Based on your reading and understanding of the protocol and as discussed, how can the output of the protocol be verified? (The assurance provider).

Notes

1. A taxonomic group of any rank, such as a species, family, or class.
2. The Endangered Wildlife Trust (EWT) is a non-governmental, non-profit, conservation organization based in South Africa and founded in 1973 dedicated to conserving threatened species and ecosystems to the benefit of all people. To affect the impact of large corporations on biodiversity positively, the EWT began engaging with big business in the early 1990s (Biological Diversity Protocol, 2021).
3. Participant 1 noted that he recently relocated to Hong Kong from South Africa.

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