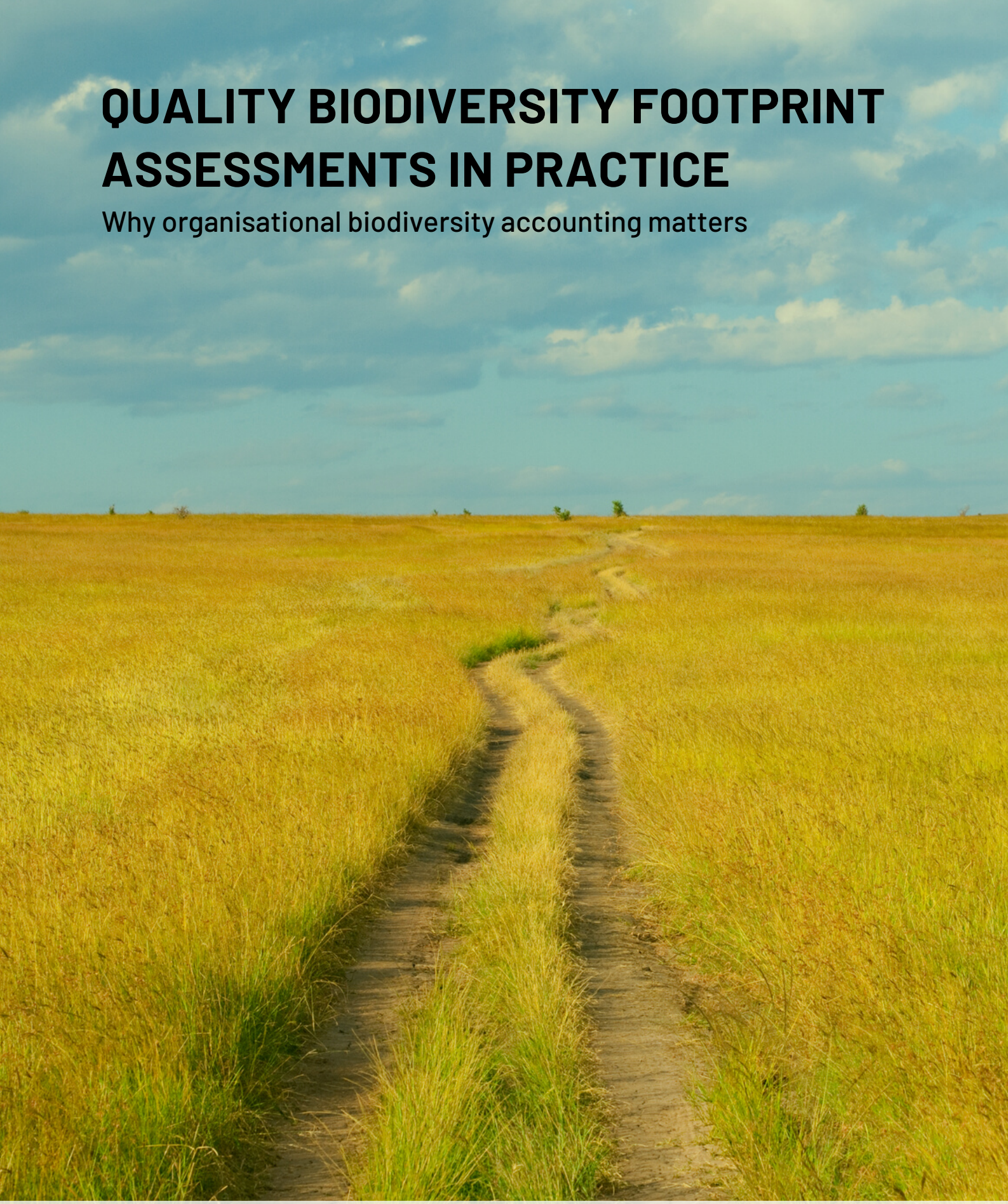
QUALITY BIODIVERSITY FOOTPRINT ASSESSMENTS IN PRACTICE

Why organisational biodiversity accounting matters



A position paper of the
Biodiversity Disclosure Project (BDP)

prepared by the Endangered Wildlife Trust

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BIODIVERSITY DISCLOSURE PROJECT

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Citation:

Houdet, J & Teren, G. 2022. Quality Biodiversity Footprint Assessments in Practice: Why Organisational Biodiversity Accounting Matters. A Position Paper of the Biodiversity Disclosure Project (BDP). National Biodiversity and Business Network, Endangered Wildlife Trust, South Africa.

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1. Introduction

There is accelerating momentum around corporate biodiversity impact measurement, with a proliferation of initiatives and methods now available, especially for biodiversity footprint assessments. At the same time, there is a growing recognition that not all approaches are equal,[1,2] and that some level of standardization and quality control is required.[3]

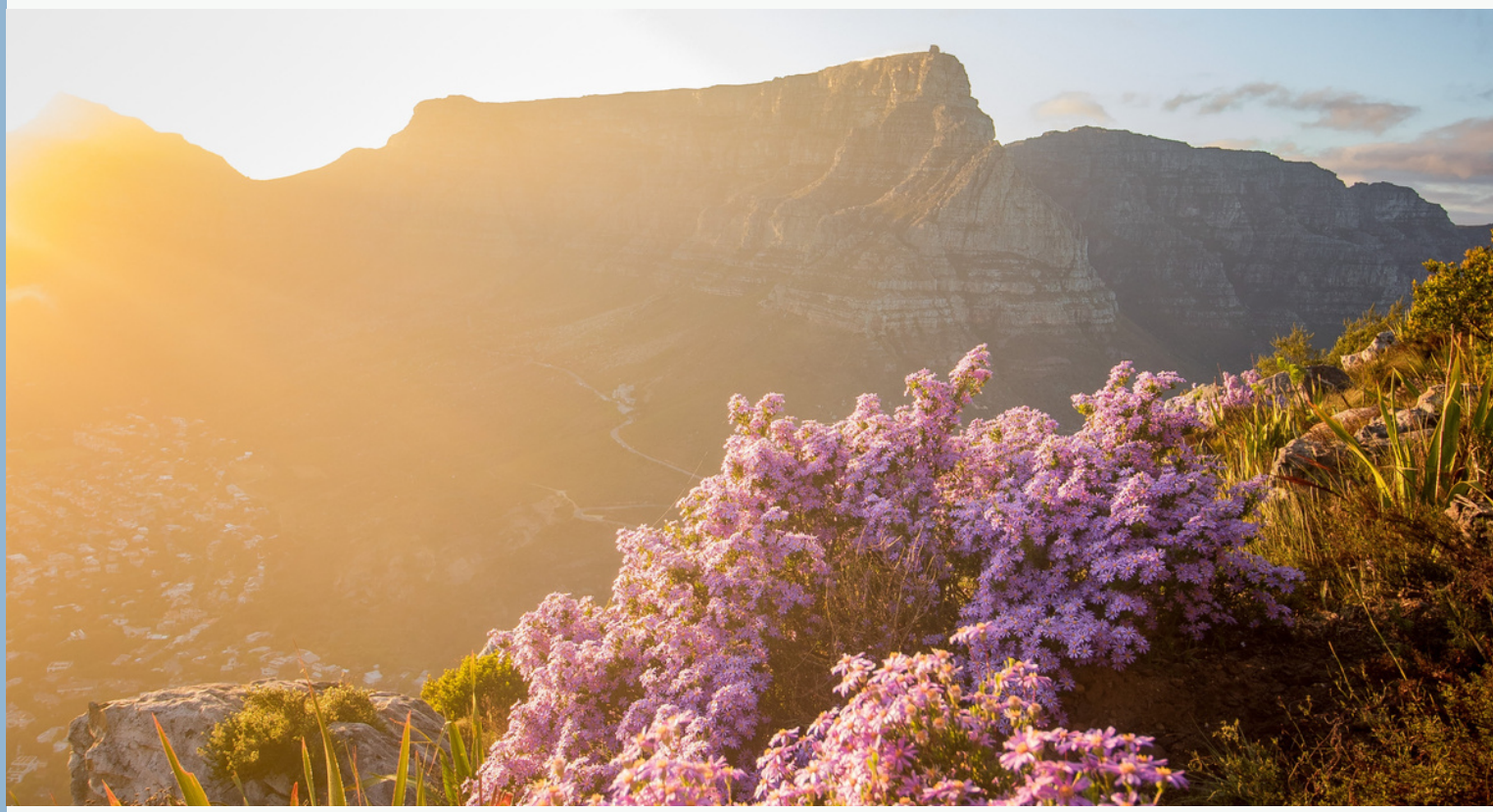
The Biological Diversity Protocol (BD Protocol)[4] aims to address this challenge. It constitutes the first accounting framework that helps organizations identify, measure, record, consolidate and report on the periodic and accumulated changes in the state of biodiversity, through double-entry bookkeeping (DEBK). The goal is to enhance the completeness, accuracy and comparability of biodiversity impact information, for internal reporting and external disclosure.

This position paper is an output of the Biodiversity Disclosure Project. It intends to clarify several key issues regarding the quality, credibility and uses of biodiversity footprint assessments, within a biodiversity accounting context, for various business applications. From the forthcoming CBD Post 2020 Global Biodiversity Framework, these issues need to be addressed to avoid corporate greenwashing, notably in the context of growing calls for nature positive targets.[5]

1. UN Environment Programme World Conservation Monitoring Centre 2020. Biodiversity Measures for Business: Corporate biodiversity measurement and disclosure within the current and future global policy context. Cambridge, UK, 60 pp. URL: https://www.unep-wcmc.org/featured-projects/aligning-biodiversity-measures-for-business
2. See EU Business@Biodiversity work. URL: https://ec.europa.eu/environment/biodiversity/business/assets/pdf/EU%20B@B%20Platform%20Update%20Report%203_FINAL_1March2021.pdf
3. Objective of the ALIGN project. URL: https://ec.europa.eu/environment/biodiversity/business/align/index_en.htm
4. URL: https://www.nbbnbdp.org/bd-protocol
5. Locke et al. (2020). A Nature-Positive World: The Global Goal for Nature. URL: https://www.wbcsd.org/download/file/11960

This position paper covers several complementary topics:

- Defining organisational biodiversity accounting and its links with biodiversity footprint assessments;
- Debunking the myth of the single metric for consolidating biodiversity impacts;
- The critical importance of double-entry bookkeeping to build an audit trail and avoid greenwashing;
- The relevance of biodiversity accounting for all value chain boundaries;
- How biodiversity accounting enables the intrinsic valuation of biodiversity;
- How biodiversity accounting enables appropriate biodiversity target setting: Dispelling the myth of the biodiversity positive company and its implications for Target 15 of the draft Post-2020 Biodiversity Framework.[6]



6. UN CBD 2021. Draft Post-2020 Global Biodiversity Framework.
URL: https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf
Draft as of September 2022.

2. Defining biodiversity accounting for organisations

As per a recent report on corporate natural capital accounting by the Capitals Coalition (2022)[7], biodiversity accounting can be defined as the systematic process of identifying, measuring, recording, summarising and reporting the biophysical state of biodiversity assets and the periodic and accumulated net changes to those assets. Biodiversity accounting has to follow accounting rules:

- An asset inventory or register of affected ecosystems and material species, organised in line with relevant international (e.g. IUCN Global Ecosystem Typology) and national classification systems (e.g., EUNIS Habitat Classification in Europe[8], South African ecosystem types[9], Terrestrial Ecological Systems of the United States[10]),
- Measurement techniques that use spatially explicit data, suitable to each asset category,
- The assessment of net impacts for gains and losses of like-for-like assets (ecological equivalency principle) in line with the mitigation hierarchy,
- Use of recording rules based on double-entry bookkeeping (DEBK) from financial accounting,
- Compilation of asset-specific statements of performance and position, which can be aggregated for ecosystems but need to be kept separate for material species,
- Time period assumption[11], and
- The segregation of biodiversity state data per value chain boundary[12], as well as per type of impact (direct[13], indirect[14], future[15]).

7. Capitals Coalition, 2022. Time to Take Stock. URL: https://capitalscoalition.org/publication/time-to-take-stock/
8. URL: https://www.eea.europa.eu/data-and-maps/data/eunis-habitat-classification-1
9. URL: http://biodiversityadvisor.sanbi.org/planning-and-assessment/national-biodiversity-assessment-nba-2018/
10. URL: https://www.natureserve.org/products/terrestrial-ecological-systems-united-states
11. Time period assumption is the accounting rule that time can be divided into distinct and consecutive periods and that accounting transactions can be allocated to these periods using criteria laid out by other rules and principles.
12. E.G., as per the Natural Capital Protocol (2016): direct operations, upstream (suppliers) and downstream (clients).
13. For biodiversity impact accounting and reporting within the context of the BD Protocol, direct impacts constitute changes in the state of biodiversity which are caused directly by your business activities. In other words, direct impacts involve business impact drivers which can be traced to specific, verifiable biodiversity assets, that is direct causal link between your company's actions (e.g. land clearing or ecosystem restoration measures) and a change in the state of ecosystems or taxa (e.g. decrease/increase in ecosystem condition, habitat loss/gain for several species).
14. In the BD Protocol, indirect impacts are defined as changes in the state of biodiversity which cannot be traced to specific business activities. This implies that changes in biodiversity arising from indirect impacts can only be modelled (e.g. GLOBIO). In other words, indirect impacts involve the various impact drivers to which no specific change in biodiversity (e.g. degradation of the condition of an ecosystem type/loss of taxa in a specific location) can be attributed.
15. Impacts that can reasonably be reasonably expected to occur, but have not yet materialized. For instance, when a development plan has been approved but will go ahead in six months form the reporting date.

Furthermore, biodiversity accounting for organisations:

- Has been developed or conceptualized with the organisation as its focus (i.e. not a supply chain, a product or a portfolio of assets), as is the case for financial accounting. It does not make sense to produce statements of financial position and performance for a product or a supply chain (i.e. financial accounting only applies to a legal entity such as companies). However, many people work with various management accounting and economic models for products, commodities, industries, asset classes and supply chains. Similarly, in the biodiversity space, many are involved in biodiversity assessments for products and supply chains, which is different from biodiversity accounting (i.e. which focuses on the legal entity).
- Can be used to support all impact, dependency and target-based approaches to biodiversity-related valuation. Biodiversity accounting does not involve valuation per se, it precedes it. From the perspective of biodiversity conservation, intrinsic values should be the focus of valuation exercises (see section 7).

3. Biodiversity impact measurement, biodiversity footprint assessment and biodiversity accounting
– Unpacking the links

The BD Protocol (2021) defines a biodiversity impact (or impact on biodiversity) as a change in the state of biodiversity (comprising both ecosystems and material species). This change can be positive or negative, or both, for instance a positive change for an ecosystem (e.g. increase in structural complexity of a forest as trees age and die) may be negative for a species (e.g., decrease in the population size of a herb shaded under the closed canopy) within the same spatial area. While the BD Protocol recognizes that biodiversity is complex, changes in its state can still be measured using the best available evidence.

Biodiversity impact measurement can be undertaken for any organisational focus (e.g., project, product, company as a whole) and value chain boundaries (i.e. direct operations, supply chains, clients).
It assesses changes in the state of biodiversity that have already taken place or will / may occur in the future, for instance as per different scenarios. For ecosystem impacts, it involves assessing both their extent and condition.

Biodiversity impact measurement is the process of assessing the scale of biodiversity impacts.
It provides the input data for organisational biodiversity accounting.

The condition rating method used will have a reference or pristine state embedded within it; which is different from the baseline chosen for the assessment.[16] Biodiversity impact measurement thus provides the input data for organisational biodiversity accounting.

6. The original state of biodiversity is often impossible to assess because losses have often occurred many years ago (i.e. accurate biodiversity state data is not available). Despite this, condition rating methods all (attempt to) describe the reference or pristine state against which condition, at a given time, can be assessed. This is essential so that all condition rating assessments are standardised against the same benchmark. This is very different from a baseline, which typically refers to a date after which the responsibility for the biodiversity impacts that have or are likely to take place, has been recognised or accepted by management.

A biodiversity footprint refers to the total impact of an organisation, project, region, service or product on biodiversity.[17] A biodiversity footprint is typically expressed in a surface area adjusted for condition (e.g., Hectares equivalents, MSA.Km^2 - Mean Species Abundance per Km^2) (See example in Table 1). However, some biodiversity footprint approaches communicate the amount of surface area equivalents lost or gained[18] over a period but do not assess the residual state of all ecosystems impacted by the business over a chosen value chain boundary.

As one way to measure biodiversity impacts, biodiversity footprint assessments can be used as part of the biodiversity accounting process. However, not all biodiversity footprint assessments are equal. To evaluate whether a biodiversity footprint assessment is adequate for biodiversity accounting, one needs to assess whether it:

- Includes an inventory or register of impacted ecosystems and material species, organised in line with appropriate classification systems (see example in Table 2),
- Measures the state of biodiversity assets using spatially explicit data (see example in Figure 1), and methods suitable for each asset category,
- Applies the principle of ecological equivalency (like-for-like) when assessing net impacts (i.e. netting off gains and losses only within the same asset categories) (see example in Table 3), in line with the mitigation hierarchy,
- Uses recording rules based on double-entry bookkeeping (see section 5),
- Compiles asset-specific statements of performance and position, which are then aggregated for ecosystems but are kept separate for material species.

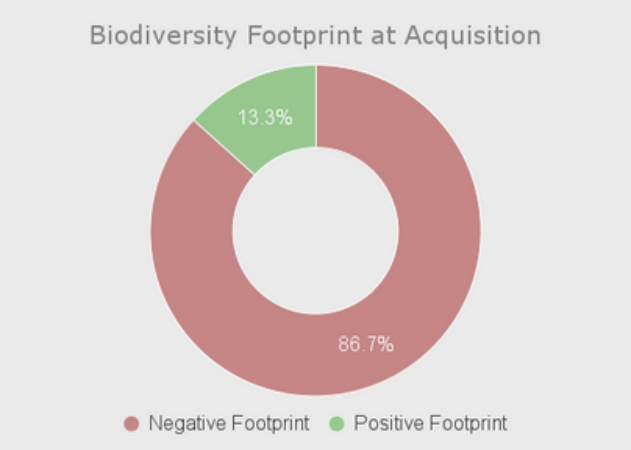
In other words, changes in biodiversity which are modelled, producing potential changes in the state of biodiversity, cannot be used for biodiversity accounting. Some biodiversity footprint approaches rely on impact driver data and so cannot satisfy the requirements of biodiversity accounting. For instance, they do not identify biodiversity assets, do not have spatial information for each asset category, and cannot apply ecological equivalency at any meaningful scale (i.e. not useful for on the ground management and accountability).

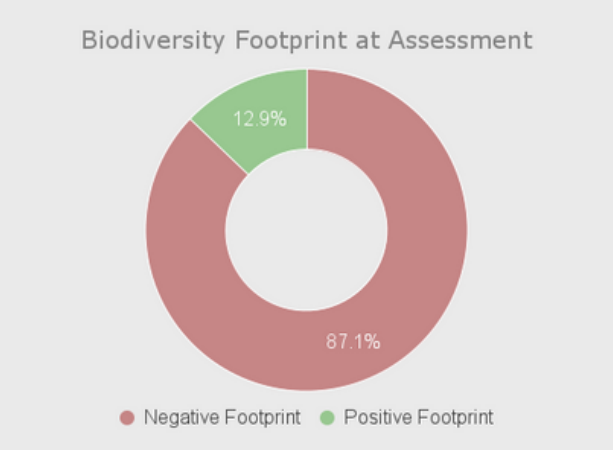
17. CDSB Biodiversity Guidance - URL: https://www.cdsb.net/sites/default/files/biodiversity-application-guidance-single.pdf
18. For instance, ASN Bank's biodiversity footprint - URL: https://www.asnbank.nl/web/file?uuid=14df8298-6eed-454b-b37f-b7741538e492&owner=6916ad14-918d-4ea8-80ac-f71f0ff1928e&contentid=2453

Table 1:

The consolidated Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) of Sibanye-Stillwater (a) at mine acquisition dates and (b) at time of assessment (2021)[19]

At acquisition (different dates)	Total Biodiversity Footprint (TBF, in Ha)	49897,41
	Percentage of TBF / TBF (%)	**100%**
	Positive Biodiversity Footprint (PBF, in Ha eq.)	6745,78
	Percentage of PBF / TBF (%)	**13,52%**
	Negative Biodiversity Footprint (NBF, in Ha eq.)	43151,64
	Percentage of NBF / NBF (%)	**86,48%**
Current state after management takeover (2021)	Total Biodiversity Footprint (TBF, in Ha)	49912,01
	Percentage of TBF / TBF (%)	**100%**
	Positive Biodiversity Footprint (PBF, in Ha eq.)	6422,68
	Percentage of PBF / TBF (%)	12,87%
	Negative Biodiversity Footprint (NBF, in Ha eq.)	43489,32
	Percentage of NBF / NBF (%)	87,13%





19. Houdet, J., Teren, G., 2022. Sibanye-Stillwater's consolidated biodiversity footprint. Pilot assessment as per the Biological Diversity Protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

Table 2:

Portion of Sibanye-Stillwater's ecosystem asset register, as per the South African national ecosystem list, (a) at mine acquisition dates and (b) at time of assessment (2021)[20]

		Soweto Highveld Grassland Wetland	Carletonville Dolomite Grassland	Carletonville Dolomite Grassland Wetland	Central Free State Grassland Wetlands	Gauteng Shale Mountain Bushveld	Gold Reef Mountain Bushveld
At acquisition (different dates)	TBF(Ha)	604.66	8915.86	1055.49	306.24	5561.27	10.92
	% of TBF / TBF	100%	100%	100%	100%	100%	100%
	PBF(H eq.)	237.70	676.16	317.24	96.85	622.80	0.00
	% of PBF / TBF	39.3%	7.6%	30.1%	31.6%	11.2%	0.0%
	NBF(Ha eq.)	366.96	8239.70	738.26	209.39	4938.47	10.92
	% of NBF / TBF	60.69%	92.4%	69.9%	68.4%	88.8%	100.0%
Current state after management takeover (late 2021)	TBF(Ha)	619.26	8915.86	1055.49	306.24	5561.27	10.92
	% of TBF / TBF	100%	100%	100%	100%	100%	100%
	PBF(Ha eq.)	238.52	676.16	317.24	96.85	622.80	0.00
	% of PBF / TBF	38.5%	7.6%	30.1%	31.6%	11.2%	0.0%
	NBF(Ha eq.)	380.74	8239.70	738.26	209.39	4938.47	10.92
	% of NBF / TBF	61.5%	92.4%	69.9%	68.4%	88.8%	100.0%

20. Houdet, J., Teren, G., 2022. Sibanye-Stillwater's consolidated biodiversity footprint. Pilot assessment as per the Biological Diversity Protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

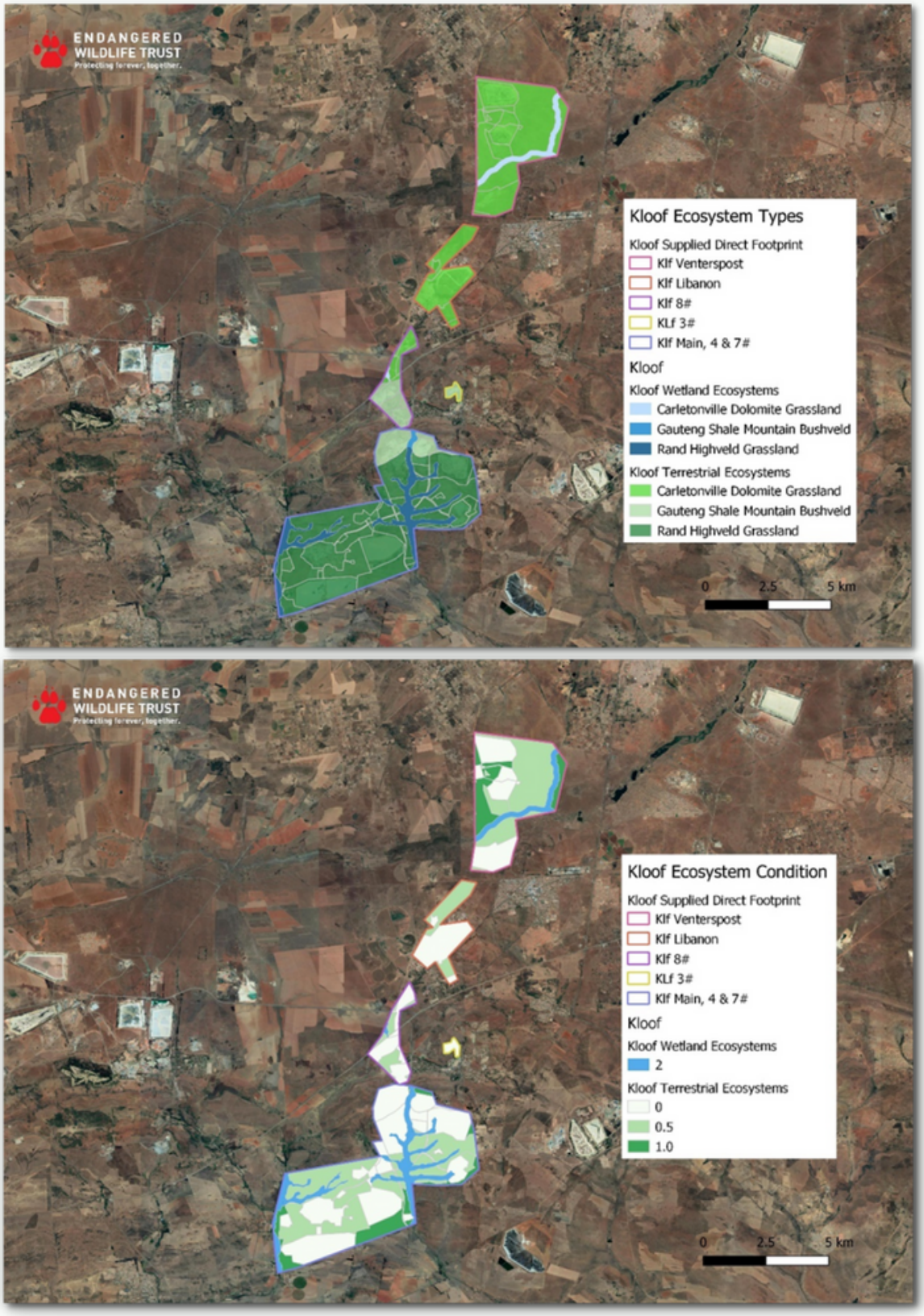


Figure 1:
Spatially explicit extent and condition of ecosystem assets at Kloof mine[21]

21. Houdet, J., Teren, G., 2022. Sibanye-Stillwater's consolidated biodiversity footprint. Pilot assessment as per the Biological Diversity Protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

Table 3 part 1/2

Portion of the accounting journal entries for the Sibanye-Stillwater Driefontein mine, showing how gains and losses for similar ecosystem assets are netted off via double-entry bookkeeping[22]

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(a) Reference State							
1	Accounting for reference state of ecosystem assets, which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Carletonville Dolomite Grassland	5	4,107.64	
				Gauteng Shale Mountain Bushveld	5	4,294.44	
				Carletonville Dolomite Grassland Wetland	5	389.25	
				Gauteng Shale Mountain Bushveld Wetland	5	471.52	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Carletonville Dolomite Grassland	5		4,107.64
				Gauteng Shale Mountain Bushveld	5		4,294.44
				Carletonville Dolomite Grassland Wetland	5		389.25
				Gauteng Shale Mountain Bushveld Wetland	5		471.52
(b) At time of assessment							
2	Stock Taking of Carletonville Dolomite Grassland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Carletonville Dolomite Grassland	0	1,638.08	
					0.5	977.24	
					1	1,319.31	
					1.5	54.75	
					2	118.25	
					5		4,107.64
3	Stock Taking of Gauteng Shale Mountain Bushveld assets, according to their condition scores			Gauteng Shale Mountain Bushveld	0	957.15	
					0.5	1,875.54	
					1	994.35	
					2	467.40	
					5		4,294.44
4	Stock Taking of Carletonville Dolomite Grassland Wetland assets, according to their condition scores			Carletonville Dolomite Grassland Wetland	2	389.25	
					5		389.25
5	Stock Taking of Gauteng Shale Mountain Bushveld Wetland assets, according to their condition scores			Gauteng Shale Mountain Bushveld Wetland	2	471.52	
					5		471.52
6	Recording condition-adjusted losses and gains associated to existing condition scores of Carletonville Dolomite Grassland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Carletonville Dolomite Grassland	5	4,107.64	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)		0		1,638.08
					0.5		879.52
					1		1,055.45
					1.5		38.32
					2		70.95
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)		0.5		97.72
					1		263.86
					1.5		16.42
					2		47.30

22. Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: Driefontein. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

Table 3 part 2/2

Portion of the accounting journal entries for the Sibanye-Stillwater Driefontein mine, showing how gains and losses for similar ecosystem assets are netted off via double-entry bookkeeping

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(a) Reference State							
7	Recording condition-adjusted losses and gains associated to existing condition scores of Gauteng Shale Mountain Bushveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Gauteng Shale Mountain Bushveld	5	4,294.44	
					0		957.15
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)		0.5		1,687.99
					1		795.48
					2		280.44
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)		0.5		187.55
					1		198.87
					2		186.96
8	Recording condition-adjusted losses and gains associated to existing condition scores of Carletonville Dolomite Grassland Wetland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Carletonville Dolomite Grassland Wetland	5	389.25	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)		2		233.55
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)		2		155.70
9	Recording condition-adjusted losses and gains associated to existing condition scores of Gauteng Shale Mountain Bushveld Wetland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Gauteng Shale Mountain Bushveld Wetland	5	471.52	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)		2		282.91
			Y (Statement of Biodiversity Performance)		2		188.61
10	Closing the Statement of Biodiversity Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Net impact		1,343.01	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Carletonville Dolomite Grassland	0.5		97.72
					1		263.86
					1.5		16.42
					2		47.30
				Gauteng Shale Mountain Bushveld	0.5		187.55
					1		198.87
					2		186.96
				Carletonville Dolomite Grassland Wetland	2		155.70
				Gauteng Shale Mountain Bushveld Wetland	2		188.61

4. Debunking the myth of the need for a single metric for consolidating biodiversity footprints.

There is a common myth in the biodiversity footprint space that a single metric measuring biodiversity state is required for consolidation, for instance at the corporate level.[23] While a single unit is indeed required to consolidate ecosystem impact data, conversion tables allow for different biodiversity state metrics to be translated into a surface area adjusted for condition / integrity metric (i.e. surface area equivalents; Table 4). Consolidating separate, but ecologically-appropriate measurement metrics is superior to trying to use one metric to measure all ecosystems in a one-size fits all approach (see for example Table 5). Best practice in biodiversity impact measurement should involve:

- Undertaking separate assessments of impacts on ecosystems and impacts on material species,
- Consolidating impact information only for ecosystem accounts,
- Using ecosystem condition / integrity assessment methods that are most appropriate to the ecosystem type (i.e. most generally accepted / recognized method in the region where the impact occurs), at the finest possible spatial scale;
- Using the same ecosystem condition / integrity method for ecologically equivalent, ecosystem assets (e.g., the same method for all similar grassland ecosystems)
- These principles aim to ensure ecological equivalency[24] is used at the finest scale possible, in recognition of the incommensurability of biodiversity (no two sites hold exactly the same biodiversity features). Not following these principles presents risks of greenwashing as companies may underreport losses of biodiversity assets or claim reaching targets (e.g., net gains / net positive impacts or no-net-loss) without any evidence.

23. See example in Schneider Electric's biodiversity footprint on page 37 "The business world needs metrics like CO_2-eq. The CO_2 ton-equivalent metric played a key role in mainstreaming climate issues and driving actions to mitigate climate change. The industry needs comparable metrics for natural capital, and in particular for biodiversity, to properly address biodiversity loss meaning quantitative metrics depicting the state of biodiversity, broadly used and accessible to all, scientifically consensual and that can be aggregated or disaggregated at multiple levels. [...] To date, the Global Biodiversity Score, is the most advanced and innovative methodology for companies that wish to assess their biodiversity impact and biodiversity intactness. Notably, the MSA.km^2 metric has all the ingredients it needs to become a part of the "CO_2-eq of biodiversity": synthetic, easy to understand, and widely applicable." CDC Biodiversité – Schneider Electric (2020). Assessing biodiversity footprint, the occasion to accelerate corporate biodiversity strategy. Schneider Electric performs the first ever end-to-end biodiversity footprint assessment with the Global Biodiversity Score (GBS), a tool developed by CDC Biodiversité. URL: https://usermanual.wiki/m/acc20dd0848aa0b673433a6ff9f0f47010b6d2c87d55c34a1e2179159a049c80.pdf

24. Quétier, F., & Lavorel, S. (2011). Assessing ecological equivalence in biodiversity offset schemes: Key issues and solutions. Biological Conservation, 144(12), 2991–2999. https://doi.org/10.1016/j.biocon.2011.09.002

Some of the potential sources of greenwashing that may occur, amongst others, include:

- Not developing an asset register, so that all losses and gains are netted off against each other, without considering ecological equivalency and not being able to scientifically verify positive or negative changes on the ground (e.g., see Schneider Electric's biodiversity footprint[25] in Table 5);
- Combining different ecosystems within the same asset category in the asset register (e.g., using a broad ecoregion as the basic level of classification), despite being able to distinguish them, and then netting off gains and losses for these ecosystems together while claiming no-net-loss or net positive targets overall;
- Using a single, simple, yet inaccurate condition or integrity rating method for all ecosystem assets (e.g., MSA, which currently does not work well for freshwater ecosystems) while other methods are available (e.g., specific ones for wetlands such as WET-Health[26] in South Africa).

25. URL: https://usermanual.wiki/m/acc20dd0848aa0b673433a6ff9f0f47010b6d2c87d55c34a1e2179159a049c80.pdf.
26. Donovan C. Kotze, Douglas M. Macfarlane, Dean J. Ollis (2018), Chapter 5.7 - WET-Health, a Method for Rapidly Assessing the Ecological Condition of Wetlands in Southern Africa, Editor(s): John Dorney, Rick Savage, Ralph W. Tiner, Paul Adamus, Wetland and Stream Rapid Assessments, Academic Press, Pages 545-550, ISBN 9780128050910, https://doi.org/10.1016/B978-0-12-805091-0.00056-6.

Table 4:

Example of conversion of different condition / integrity assessment metrics into a single surface area equivalent metric for consolidation purposes.

Ecosystem types	Area (ha)	Current condition score (2021)					Condition-adjusted surface area (Ha eq.) (Area (Ha) multiplied by A divided by B)(2021)
		Method	Current score (2021)	Reference state	A Converted score value (if needed)	B Reference state converted value (if needed)	
Vaal-Vet Sandy Grassland	273.95	NDVI	10%-40%	85%+	1	5	54.79
Vaal-Vet Sandy Grassland	256.88	NDVI	40%-55%	85%+	2	5	102.75
Western Free State Clay Grassland	180.57	NDVI	10%-40%	85%+	1	5	36.11
Western Free State Clay Grassland	224.74	NDVI	55%-70%	85%+	3	5	134.84
Highveld Alluvial	125.06	WET-Health	B	A	4	5	100.05
Highveld Alluvial	75.12	WET-Health	E	A	1	5	15.02
Vaal-Vet Sandy Grassland (riparian)	19.9	WET-Health	F	A	0	5	0
Vaal-Vet Sandy Grassland	1587.21	MSA	0.25	1	0.25	1	396.8
Vaal-Vet Sandy Grassland	290	MSA	0.5	1	0.5	1	145
Namaqualand Heuweltjie Strandveld	435.5	1 - 10 survey based	7	10	7	10	304.85
Total	3468.93					Total (Ha eq.)	1290.23

Table 5:

Extract from Schneider Electric's Biodiversity Footprint (p. 13)[27], which lacks an asset register, does not show the residual state of impacted ecosystems (i.e. no spatially explicit data) and nets off gains and losses without considering ecological equivalency while claiming 200 MSA.km^2 of *"net savings delivered to customers through Schneider Electric's technology"*

		Direct operations (Scope 1, MSA.km²)	Placeholder header	Upstream (Scope 3, MSA.km²)	Downstream (Scope 3, MSA.km²)
Terrestrial	Dynamic	0.79	1.1	46	290
	Static	9.6	1.4	3 600	Not assessed
Aquatic	Dynamic[7]	0.0095	0.011	0.91	2.9
	Static	1.2	0.063	140	Not assessed

Table 1

Summarized results of end to end footprint assessment (excluding savings delivered in use phase)
Source: GBS 1.0.0 calculations, August 2020, Sibylle Rouet-Pollakis

		Direct operations (Scope 1, MSA.km²)	Placeholder header	Upstream (Scope 3, MSA.km²)	Downstream (Scope 3, MSA.km²)
Terrestrial	Dynamic	NA	NA	NA	-200

Table 2

Summarized results of net savings delivered to customers through Schneider Electric's technology
Source: GBS 1.0.0 calculations, August 2020, Sibylle Rouet-Pollakis

Nota Bene: Static and aquatic cannot be summed together, as explained in paragraph 4.1.

27. CDC Biodiversité – Schneider Electric (2020). Assessing biodiversity footprint, the occasion to accelerate corporate biodiversity strategy. Schneider Electric performs the first ever end-to-end biodiversity footprint assessment with the Global Biodiversity Score (GBS), a tool developed by CDC Biodiversité.
URL: https://usermanual.wiki/m/acc20dd0848aa0b673433a6ff9f0f47010b6d2c87d55c34a1e2179159a049c80.pdf

5. The critical importance of double-entry bookkeeping to build an audit trail and avoid greenwashing

Double-Entry Bookkeeping (DEBK) comes from financial accounting and was first popularized in the late 13th century by Luca Pacioli, who formalized the long-established accounting methods practiced by Venetian traders to keep track of their intricate web of transactions. With DEBK, every financial event involves recording each transaction in an account with an equal and opposite effect in at least one other account. These transactions are summarized in the preparation of financial statements, including the Statement of Financial Position (or Balance Sheet) and the Statement of Financial Performance (or Profit & Loss Statement), which are based on two inter-dependent equations. DEBK thus enables organisations to record both periodic and cumulative changes in transactions of a financial nature and to aggregate individual financial events at the organisational level. Because accounting journal entries must balance out, DEBK reduces the likelihood of errors and fraud and helps improve transparency and financial management (Trotman & Gibbins, 2003).[28]

DEBK has been adapted to account for the net, accumulated biodiversity impacts of organisations (Houdet et al., 2020).[29] It constitutes the backbone of biodiversity accounting, with the changes in the state of biodiversity assets the equivalent to transactions in financial accounting. Because it is also based on two, biodiversity-specific equations which always balance out (Box 1), biodiversity accounting helps record both periodic and cumulative changes in the state of biodiversity assets (Table 6) and aggregate individual change events at the organisational level.

Double-Entry Bookkeeping has been adapted to account for the net, accumulated biodiversity impacts of organisations

Because it implicitly allows for cumulative changes to be expressed as the real state of the ecosystem relative to a reference state (e.g. unimpacted or pristine state of that ecosystem, as embedded in all condition rating methods), companies can set targets in the context of the state of all biodiversity assets they have influence over, hence preventing claims based exclusively on selected impacts or narrow periodic (and potentially more advantageous due to shifting baselines) changes in state. Indeed, it is critical to account for the full and true extent of nature loss in the Anthropocene.

28. Trotman, K., Gibbins, M. (2003). Financial accounting: An integrated approach. 2nd edition, Thomson Nelson Australia.
29. Houdet, J., Ding, H., Quétier, F., Addison, P., Deshmukh, P. (2020). Adapting double-entry bookkeeping to renewable natural capital: An application to corporate net biodiversity impact accounting and disclosure, Ecosystem Services, Volume 45, 101104, ISSN 2212-0416, https://doi.org/10.1016/j.ecoser.2020.101104.

The equations underpinning biodiversity double-entry bookkeeping, and the production of the Statements of Biodiversity Position and Performance for the Total, Positive and Negative Biodiversity Footprints of organisations

Equation for the Statement of Biodiversity Position (Biodiversity Balance Sheet)

Biodiversity assets (ecosystem extent accounts in hectares)
(A)
=
Cumulative positive impacts
(condition-adjusted ecosystem extent accounts in hectares equivalent)
(B)
+
Cumulative negative impacts
(condition-adjusted ecosystem extent accounts in hectares equivalent)
(C)

or A=B+C

Equation of the Statement of Biodiversity Performance (Biodiversity Net Impact Statement)

Net biodiversity impacts (hectares equivalent
(X)
=
periodic Positive Impacts/Gains
(condition-adjusted ecosystem extent accounts in hectares equivalent)
(Y)
-
periodic Negative Impacts/Losses
(condition-adjusted ecosystem extent accounts in hectares equivalent)
(Z)

or X=Y-Z

Table 6:

DEBK enables the definition of periodic gains and losses and accumulated positive and negative impacts

Statement of Position			Statement of Performance		
	Ecosystems	Species		Ecosystems	Species
Total impacts (A)	Sum of accumulated positive and negative impacts expressed in surface area	Target population (e.g. number of breeding or mature individuals) or habitat size (e.g. ha / Km²) of a species.	**Periodic net impacts**	Gains minus losses (can be consolidted across asset categories)	Gains minus losses (per species)
Accumulated Positive Impacts (P)	Actual areas (A) of ecosystem assets multiplied by their current condition/ integrity score (I), divided by the maximum potential condition score (J)	Actual or current population (e.g. number of breeding or mature indivisduals) or habitat size (e.g. ha or Km²) of a species	**Periodic gains (G)**	An increase in the condition of the ecosystem assets, in area equivalents (e.g. Ha eq. MSA eq.)	An increase in the population (e.g. number of breeding or mature individuals) or habitat size (e.g. ha / Km²) of a species.
Accumulated Negative Impacts (N)	Difference between the Actial areas (A) of ecosystem assets and their condition or integrity adjusted extent (P). Expressed in area equivalents (e.g. Ha eq.)	Gap to target population (e.g. number of breeding or mature individuals) or habitat size (e.g. ha or Km²) of a species.	**Periodic losses (L)**	A decrease in the condition of the ecosystem assets, in area equivalents (e.g. Ha eq. MSA eq.)	A decrease in the population (e.g. number of breeding or mature individuals) or habitat size (e.g. ha / Km²) of a species.

6. Biodiversity accounting across value chain boundaries

Biodiversity accounting for organisations is focused on the organisation, from a legal entity perspective (see section 2), but it is applicable to all companies along the supply chain, debunking the myth that biodiversity accounting can't be consolidated across the entire value chain. For example, the BD Protocol follows the value chain boundaries of the Natural Capital Protocol[30] (i.e. direct operations, upstream and downstream). When defining the organisational boundary of a biodiversity impact inventory, two pragmatic approaches are thus available: the equity share and the control approaches. For companies with joint entities, the organisational boundary and the resulting biodiversity impact inventory may differ depending on the approach used.

The primary reason for the organisational focus of biodiversity accounting is to ascertain the organisation's responsibility with respect to the changes in the state of biodiversity assets it is directly[31] and indirectly[32] interacting with. This means that biodiversity accounting requires segregating impact data according to value chain boundaries to highlight which economic agents are directly and indirectly responsible for the associated changes in the state of biodiversity assets.

Given the complexities (e.g., lack of cooperation in global supply chains or high costs) in collecting accurate data upstream and downstream of the organisation's direct operations, data quality will vary across value chain boundaries. For the BD Protocol, biodiversity accounting should be mandatory for direct operations and direct impacts (Table 7) because impacts can and should be verified and ground-truthed by the responsible company. This is a burgeoning field and we need more examples of whole value-chain biodiversity accounts, notably for the retail and finance industries.

For upstream and downstream value chain boundaries, as well as indirect impacts, more flexibility should be allowed at this stage (i.e. emerging biodiversity disclosures). This is because these impacts may involve other companies and / or are modelled, unverified impacts (i.e. based on impact driver, not biodiversity state data): they are not produced through an accounting process by the client or supplier (e.g., they cannot be traced to a specific biodiversity asset, location, etc.). Though these constitute critical information on the upstream and downstream biodiversity risks of the organisation, they should be assessed, reported on and disclosed separately. They should not be labelled as "biodiversity accounts", but as "biodiversity impact assessments".

30. URL: https://capitalscoalition.org/capitals-approach/natural-capital-protocol/?fwp_filter_tabs=training_material
31. See definition of direct impact in footnote 13.
32. See definition of indirect impact in footnote 14.

If a company has elected to include its upstream and/or downstream value chain boundaries as part of its biodiversity impact inventory, the apportionment of biodiversity impacts, caused by third parties but attributable to its activities, will be required. In other words, a business would only need to account for a proportion of the biodiversity impacts of its suppliers and clients.

Two main methods may be used to apportion these impacts for suppliers:

- Share of their annual production (e.g., by volume or mass) purchased by the business;
- Share of their annual sales/revenues attributable to the business.

For clients, the BD Protocol recommends using the share of their annual expenses attributable to your business to assess the share in their biodiversity impacts attributable to it.

Selecting an apportionment method for the biodiversity impacts of suppliers or clients is not anecdotal. It may lead to incorrect estimations of the overall biodiversity impacts of a company. The BD Protocol recommends selecting the method which makes most sense given both the business and biodiversity context, in accordance with the relevant accounting and reporting principle. For instance, a food retailer buying fruits directly from a farmer might have purchased 70% of the fruits produced during the period, but only contributed to 40% of the farmer's annual sales/revenues. The two apportionment methods would have significantly different implications for biodiversity accounting:

- Applying apportionment method 1 would lead the retailer to account for 70% of the farmers' biodiversity impacts over the period;
- Applying apportionment method 2 would involving accounting for only 40% of the farmers' biodiversity impacts.

Yet, because annual production can be linked directly to the ecosystem assets controlled by the fruit farmer (assuming fruit production occurs uniformly across the property), the first method would constitute the best apportionment option for the food retailer (i.e. satisfying the relevance principle). In the case of financial institutions (e.g. loans to any company), the more relevant apportionment method would be the second one.

Table 7

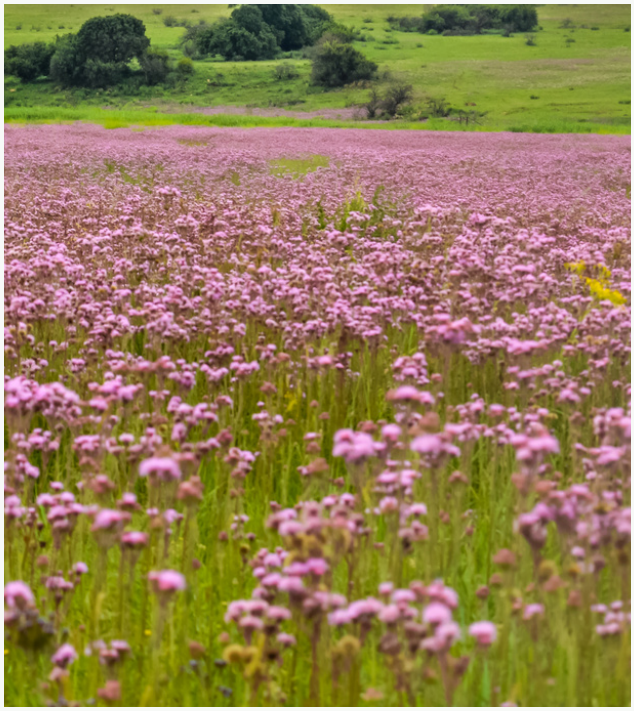
Biodiversity accounting requirements across value chain boundaries

Value chain boundary	Impact category	Biodiversity accounting	Organisational responsibility
Direct operations	Direct	Biodiversity accounting required	100% of impacts
	Indirect	Biodiversity accounting not feasible for impacts derived from some impact drivers (e.g. GHG emissions), as spatial correlation business activity and change in biodiversity state cannot be verified	Impossible to ascertain with accuracy in most cases, unless a limited number of third parties are involved (e.g. a known number of water polluters in a watershed)
Upstream (suppliers)	Direct	Biodiversity accounting recommended	100% of impacts attributed to your business, which depends on the selected apportionment rule
	Indirect	Biodiversity accounting not feasible for impacts derived from some impact drivers (e.g. GHG emissions), as spatial correlation business activity and change in biodiversity state cannot be verified	Impossible to ascertain with accuracy in most cases, unless a limited number of third parties are involved (e.g. a known number of water polluters in a watershed)
Downstream (clients)	Direct	Biodiversity accounting recommended	100% of impacts attributed to your business, which depends on the selected apportionment rule
	Indirect	Biodiversity accounting not feasible for impacts derived from some impact drivers (e.g. GHG emissions), as spatial correlation business activity and change in biodiversity state cannot be verified	Impossible to ascertain with accuracy in most cases, unless a limited number of third parties are involved (e.g. a known number of water polluters in a watershed)

7. Biodiversity accounting enables the intrinsic valuation of biodiversity beyond human-centered instrumental valuation

Valuation is the process of expressing the importance of things to people. In the context of biodiversity accounting and the BD Protocol, it is important to highlight that biodiversity impact assessment is the key process by which the intrinsic value[33] of biodiversity assets is identified and presented. This differs from an ecosystem service evaluation which values biodiversity for its use by people. Typical intrinsic biodiversity valuation can involve:

- Highlighting the threat level of each asset within the biodiversity asset register (e.g., IUCN Red List for species and ecosystems, protected species, ecosystem assets with no-net-loss or offset requirements), a form of qualitative valuation;
- Highlighting the relative importance of individual elements of the biodiversity asset register compared to others (e.g., percentage of total biodiversity footprint of the organisation which an ecosystem asset makes up within a site or across direct operations), a form of quantitative valuation;
- Comparing the size of the total, positive and negative biodiversity footprints of (a) individual sites or operations and (b) individual biodiversity assets within the asset register, a form of quantitative valuation;
- Comparing the size of the total, positive and negative biodiversity footprints across value chain boundaries or of different companies.



33. O'Connor, S., Kenter, J.O. (2019). Making intrinsic values work; integrating intrinsic values of the more-than-human world through the Life Framework of Values. Sustainability Science 14:1247–1265.

Furthermore, the BD Protocol recommends the financial valuation of mitigation measures implemented for the various assets of the biodiversity asset register. This may include expenses (e.g., restoration measures) and liabilities (e.g., offset requirements within a given timeframe). Perhaps counter-intuitively, such monetary values help understand whether the intrinsic value of biodiversity is identified, recognised and acted upon by the organisation (e.g., how much money is spent conserving biodiversity assets for their intrinsic values). This can be embedded in cost-effectiveness approaches aimed at delivering the 30X30 target for protected areas and other effective area-based conservation measures.[34]

Instrumental (or anthropocentric) valuation can also be undertaken by using the data compiled by biodiversity accounting (e.g., asset inventory). This process typically involves framing the question from the perspective of the benefits to the business and / or its stakeholders: using a classification system for ecosystem services, identifying the particular ecosystem services sought by different beneficiaries and applying various valuation techniques. This requires more resources and information than the intrinsic valuation mentioned above.

Besides, it is important to recognize that the values of ecosystem services do not equate to intrinsic biodiversity values (and cannot be added to them). The former often involve trade-offs between competing outcomes (e.g., use vs conservation of biodiversity features). For instance, maximizing wood log outputs from a forest will most likely lead to a decrease in the state of biodiversity (e.g., loss of wildlife dependent on hollow-bearing trees and dead wood)[35, 36] and a loss in the associated cultural ecosystem services (e.g., ecotourism values associated with charismatic species). Similarly, realizing the importance of pollination services does not necessarily lead to farmers investing in pro-biodiversity ecosystem management and restoration measures to support native primary pollinators (e.g., wild bees, bumblebees, bats): It often involves replacing wild species with farmed bees at a large scale[37, 38]

34. Dudley, N., Stolton, S. (eds.). 2022. Best Practice in Delivering the 30x30 Target (1st ed.).
35. Gibbons, P., Lindenmayer DB (1997). Conserving hollow-dependent fauna in timber-production forests. NSW National Parks and Wildlife Service: Hurstville, N.S.W.
36. Smith, A.P., Lindenmayer, D. (1988). Tree hollow requirements of Leadbeater's possum and other possums and gliders in timber production ash forests of the Victorian central highlands. Australian Wildlife Research 15, 347-62.
37. Bond, J.K., Hitaj, C., Smith, D., Hunt, K., Perez, A., Ferreira, G. (2021). Honey Bees on the Move: From Pollination to Honey Production and Back, ERR-290, U.S. Department of Agriculture, Economic Research Service.
38. Aizen, M.A., Harder, L.D. (2009). The Global Stock of Domesticated Honey Bees Is Growing Slower Than Agricultural Demand for Pollination, Current Biology 19 (11), 915-918, ISSN 0960-9822, https://doi.org/10.1016/j.cub.2009.03.071.

8. Biodiversity target setting: Debunking the myth of the biodiversity positive company

and its implications for Target 15 of the post-2020 Global Biodiversity Framework

In organisational biodiversity accounting, target setting applies to each component of the biodiversity asset register or inventory. It may be influenced or dictated by specific procurement rules, standards and / or jurisdictional laws or regulations, for instance no-net-loss requirements for specific biodiversity assets (e.g., protected species and wetlands in many US States, threatened ecosystems in South Africa, protected habitats and species in the EU). The changes in the state of the biodiversity assets of offset sites should also be included in the accounting process (though separated from the core accounts, depending on their legal status), to ensure accountability and transparency regarding the implementation of mandatory biodiversity measures.

Furthermore, targets should be framed from two perspectives (Table 8):

- A periodic impact perspective (Statement of Biodiversity Performance), whereby targets are based on expected or desired positive (net positive / net gain), neutral (no net loss) or negative (net loss) changes in the state of individual biodiversity assets over one or several years from a chosen baseline.
- From an accumulated impact perspective (Statement of Biodiversity Position), whereby targets are defined as the expected or desired share of the Total Biodiversity Footprint, per biodiversity asset category and overall, which is positive (Positive Biodiversity Footprint) or negative (Negative Biodiversity Footprint).

In other words, no company can claim to be biodiversity neutral or positive overall. Net neutral / positive / negative impact targets only apply to specific asset categories from a given temporal baseline: i.e. from a periodic perspective only, not from the viewpoint of the company's accumulated impacts on each asset.
All companies have both negative and positive biodiversity footprints making up their total biodiversity footprints (see Tables 1 and 8).

There is no neutrality possible for a total biodiversity footprint, no net positive impact possible for a company as a whole. However, for each company, the goal could be to set overall accumulated targets expressed as a Positive to Negative Biodiversity Footprints ratio (e.g., 30%:70%, in line with the 30X30 targets[39]) and backed up by verifiable, on the ground periodic targets for each asset category.[40]

This is why the "Nature-Positive World: The Global Goal for Nature" vision (Figure 2) could be misinterpreted or even misleading:

- It suggests all losses and gains are equivalent and can aggregated, disregarding the incommensurability of biodiversity features (it does not mention it at all);
- It narrowly focuses on periodic changes from a 2020 baseline, disregarding (perhaps even underplaying) accumulated human-induced losses.

Compounded with how many service providers produce biodiversity footprints from impact driver data and models with no spatially explicit information, no asset register, and no ecological equivalency, it raises several greenwashing risks. This is especially the case when corporate targets, using the mitigation hierarchy (i.e. reaching a no-net-loss or net-gain on a portfolio level or for company), are set while relying exclusively on the management of impact drivers (e.g., GHG and water emissions) to deliver positive changes in the state of biodiversity (see examples in the Schneider Electric[41] and AFN Bank[42] biodiversity footprints). Simply reducing GHG emissions, stopping land-use conversion and overharvesting will not necessarily bring back lost species; which often requires pro-active management (e.g., reintroduction) measures. Many ecosystems are no longer functional or so far from their (theoretical, as often unknown) reference state (e.g., loss of intact megafaunal assemblages or predator-prey cycles) so that a nature-positive goal is simply unrealistic in the context of corporate measures exclusively based on mitigating pressures / impact drivers.

39. The Campaign for Nature is calling on world leaders to commit to protecting at least 30% of the planet by 2030. URL: https://www.campaignfornature.org/

40. Biodiversity accounting enables the inter-operationality between site targets and overall group targets. A spatially explicit ecosystem asset register can be consolidated at the group level without losing any site level information which is relevant for daily management, mitigation measures or compliance

41. PRé (2021). ASN Bank Biodiversity Footprint. Biodiversity Footprint for Financial Institutions Impact Assessment 2014 – 2019. URL: https://www.asnbank.nl/web/file?uuid=14df8298-6eed-454b-b37f-b7741538e492&owner=6916ad14-918d-4ea8-80ac-f71f0ff1928e&contentid=2453

42. CDC Biodiversité – Schneider Electric (2020). Assessing biodiversity footprint, the occasion to accelerate corporate biodiversity strategy. Schneider Electric performs the first ever end-to-end biodiversity footprint assessment with the Global Biodiversity Score (GBS), a tool developed by CDC Biodiversité. URL: https://usermanual.wiki/m/acc20dd0848aa0b673433a6ff9f0f47010b6d2c87d55c34a1e2179159a049c80.pdf

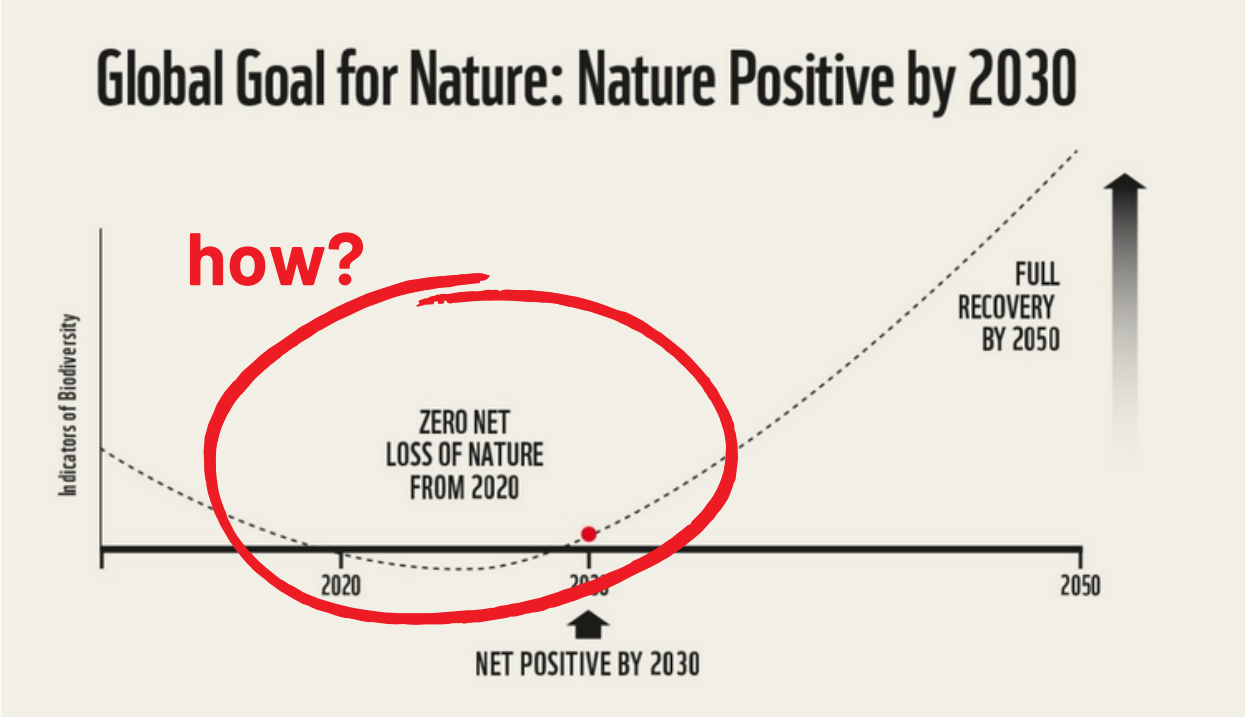


Figure 2:
Questioning the underlying assumption for a full recovery of nature from a 2020 baseline,[43] (a) without any asset register, ecological equivalency between gains / losses, double-entry bookkeeping and statements of position (i.e. it shows a periodic perspective) and (b) through the sole focus on impact driver (e.g., water and GHG emissions) management. Figure adapted from Locke et al. (2020). A Nature-Positive World: The Global Goal for Nature.
URL: https://www.wbcsd.org/download/file/11960

43. Figure adapted from Locke et al. (2020). A Nature-Positive World: The Global Goal for Nature.
URL: https://www.wbcsd.org/download/file/11960

What does this mean in the context of Target 15[44] of the draft Post-2020 Global Biodiversity Framework? To avoid greenwashing, it is critical that all businesses:

- Distinguish between their periodic and accumulated impacts;
- Work towards building proper biodiversity accounts, as a priority for their direct operations, moving away from mere impact or footprint assessments;
- Shift their targets from periodic ones (net positive by 20XX), which are based on arbitrary baseline choices, towards targets which are defined as the expected or desired share of the Total Biodiversity Footprint of the company (per biodiversity asset category and overall) which is positive (Positive Biodiversity Footprint) or negative (Negative Biodiversity Footprint) (Table 9).
- Provide the science-based evidence for any claim made, which implies making public the full audit trail, from the geographic location of biodiversity assets (e.g., maps showing the extent and condition of ecosystem assets) to the accounting records (i.e. not only the statements of position and / or performance).
- Are incentivized and supported by policies which enable mandatory disclosure to catalyze change, notably through third-party performance ratings and benchmarking.

This will be also critical in the context of emerging "biodiversity markets" whereby companies may claim biodiversity outcomes through the purchase of "biodiversity credits".[45, 46] Without a complete audit trail regarding the periodic and accumulated changes in biodiversity state from the buyer's and the seller's side, how can anyone claim that no-net-loss or net positive impacts can be (or have been) reached? From the buyer's perspective, it raises many questions, for instance whether the ecological equivalency principle can be (or has been) met. From the seller's side, it raises several others, notably whether the additionality and permanence of protection / restoration measures put it place can be (or have been) demonstrated.

44. Target 15: All businesses (public and private, large, medium and small) assess and report on their dependencies and impacts on biodiversity, from local to global, and progressively reduce negative impacts, by at least half and increase positive impacts, reducing biodiversity-related risks to businesses and moving towards the full sustainability of extraction and production practices, sourcing and supply chains, and use and disposal.
45. World Economic Forum (2022). Biodiversity Credits: Unlocking Financial Markets for Nature-Positive Outcomes. 13p.
46. Taskforce on Nature Markets (2022). Nature in a era of crisis: shaping purposeful nature markets. 54p.

Table 8

Biodiversity target setting scenarios and associated total, positive and negative footprints for a 10 km^2 project in a tropical forest

Target scenarios for a tropical forest asset with a 10km^2 surface area and a condition-adjusted surface area of 5 km2 equivalent	Periodic net change (km^2 equivalents) implied by target: gains are positive numbers; losses negative numbers)	Periodic target (km^2 equivalents)	Total Biodiversity Footprint (TBF) required by target	Accumulated Negative Biodiversity Footprint Target	Accumulated Positive Biodiversity Footprint Targe	Accumulated Positive Biodiversity Footprint Target (% of TBF)	Interpretation
Managed 20% loss from current state (existing operation)	-1	4	10	6	2	40%	A loss of 1 km^2 eq. has been deemed an acceptable target by management
Managed 50% loss from current state (existing operation)	-2,5	2,5	10	8	2,5	25%	A loss of 2.5 km^2 eq. has been deemed an acceptable target by management
No Net Loss from current state (existing operation)	0	5	10	5	5	50%	Maintenance of status quo / impact avoidance is the chosen target
1 : 2 No Net Loss offset ratio requirement (greenfield project)	5	10	15	5	10	67%	An additional 5 km^{2}eq. must be secured to satisfy legal requirements. Assuming pristine tropical forest is available, an additional 5 km^2 of tropical forests would be required
Net Gain from current state (existing operation)	2	7	10	3	7	70%	A gain of 2 km^2 eq. through restoration measures, has been targeted within the existing tropical forest area.
1:3 Net Gain offset ratio requirement (greenfield project)	10	15	18	3	15	83%	An additional 10 km^2 eq. must be secured to satisfy legal requirements. Tropical Forest restoration enables a gain of 2 km^2 eq. within the existing area. An additional 8 km^2 eq. must be secured. Assuming pristine tropical forest is available, an additional 8 km^2 of tropical forests would be required.

Table 9

The risk of shifting baselines for no-net-loss or net positive targets as biodiversity state declines over time

Years	2010	2020	2022	2023
Highveld grassland extent (Ha)	1000 Ha	1000 Ha	1000 Ha	1000 Ha
Highveld grassland condition (maximum 5, minimum 0)	4	3	2	1
Condition-adjusted extent (extent X condition / maximum condition score) (Ha eq.)	800 Ha eq.	600 Ha eq.	400 Ha eq.	200 Ha eq.
Minimum offset requirements in 2023 (Ha eq.) to achieve net-positive target from 2010 baseline				600 Ha eq.
Minimum offset requirements (Ha eq.) to achieve net-positive target from 2020 baseline				400 Ha eq.
Minimum offset requirements (Ha eq.) to achieve net-positive target from 2022 baseline				200 Ha eq.
Positive biodiversity footprint (Ha eq.) after reaching NNL target with 2010 baseline				800 Ha eq.
Positive biodiversity footprint (Ha eq.) after reaching NNL target with 2020 baseline				600 Ha eq.
Positive biodiversity footprint (Ha eq.) after reaching NNL target with 2022 baseline				400 Ha eq.

9. Conclusion

In this paper we have unpacked why, and how organizational biodiversity accounting should be used to produce quality biodiversity footprints. Using proper financial accounting rules, recognizing the complexities of ecosystems and species interactions, and using best-practice scientific methodology to measure impacts and set targets are the basic tenets of meaningful biodiversity footprints. There is an immense opportunity presented to empower the private sector to account for their impacts and mitigate them cost-effectively. Using biodiversity accounting responsibly can contribute to positive biodiversity efforts and is designed to avoid greenwashing. In the end, implementing this in practice can be summarized in seven key steps illustrated with concrete examples of how this works in practice (Table 10).

Table 10

Quality biodiversity footprint assessments in practice

Step	Criteria	Quality footprint requirement	Example in practice
1	Asset inventory	All ecosystems are included and material species only, in line with appropriate classification systems.	Table 2
2	Biodiversity impact measurement	Assessment of net impacts for gains and losses of like-for-like assets using spatially explicit data of biodiversity state changes.	Figure 1, Table 4
3	Consolidating ecosystem impact data	Use of conversion tables to consolidate ecosystem impact data collected from the most appropriate method for each ecosystem asset into surface area equivalents	Table 4
4	Accounting records	Based on double-entry bookkeeping with a full audit trail.	Tables 3 and 6
5	Summarising data for reporting or disclosure	Statements of position and statements of performance. Transparency and accountability achieved through providing the underlying accounting journal entries and using spatially explicit time-bound data linked (i.e. full audit trail). Summarised data must be segregated based on value chain boundary and type of impact (direct, indirect, future).	Table 1, Journal entry 8 of Table 3, Table 7
6	Target setting, contributing to positive biodiversity efforts and the Post-2020 Global Biodiversity Framework	Setting ground-based, verifiable, accumulated and periodic targets for each asset category, mindful of shifting baseline risks. Recognition of accumulated impacts on biodiversity from an intrinsic-value reference state to avoid greenwashing. Setting targets for the desired positive biodiversity as a share of the total biodiversity footprint linked to accounting records but enabling comparisons across companies, regions, sectors etc.	Tables 7 and 8.

Acknowledgements

The authors kindly acknowledge the review of this position paper by Dr Ian Little and report design by Brad Nelson

About the National Biodiversity and Business Network (NBBN) of the Endangered Wildlife Trust (EWT).

About the NBBN

The vision of the National Biodiversity & Business Network (NBBN), hosted by the Endangered Wildlife Trust (EWT), is to promote conservation of biodiversity by working with businesses to provide solutions which mitigate their impacts and provide opportunities to ensure sustainable business practices. Towards this vision the NBBN conducts an annual corporate biodiversity performance assessment of all companies listed on the Johannesburg Stock Exchange (JSE) and several State-Owned Enterprises (SOEs) as part of the Biodiversity Disclosure Project (BDP). In 2021, the NBBN launched the open-source Biological Diversity Protocol (BD Protocol) to assist companies to measure and manage their biodiversity footprints. The BD Protocol results from a two-year collaborative, multi-stakeholder effort and is the first standardised accounting framework, based on adaptions of double-entry bookkeeping, which enables any organisation to consolidate all its net impacts on ecosystems and species, spatially and over time.

About the EWT

The Endangered Wildlife Trust (EWT) is dedicated to conserving threatened species and ecosystems in east and southern Africa to the benefit of all people.

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