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ACRONYMS AND ABBREVIATIONS

BSI 8632	British Standard 8632:2021 Natural Capital Accounting for Organizations
CDSB	Climate Disclosure Standards Board
CNCA	Corporate natural capital accounting
GAA	Global Accounting Alliance
GIRI	Global Reporting Initiative
IT	Information technology
LEAP	TNFD's Locate Evaluate Assess and Prepare framework for risk and opportunity evaluation and preparation of disclosures
NNC	Nuveen Natural Capital (NNC)
SBTs for nature	Science Based Targets for nature
SEEA EA	System of Environmental-Economic Accounting – Ecosystem Accounting
TNFD	Taskforce on Nature-related Financial Disclosures
TTTS	Time to Take Stock
TTTS Team	Time to Take Stock team (John Finisdore and Alan Dayeh from ERM, Joël Houdet from the Biodiversity Footprint Company, Carl Obst from IDEEA Group, and Ian Dickie from ettec)

1. EXECUTIVE SUMMARY

A series of workshops sponsored by the Global Accounting Alliance (GAA) affirmed the need for corporate natural capital accounting (CNCA) and central role that the accounting profession has in developing and implementing it. The workshops also identified a range of opportunities, roadblocks, and developments to advance CNCA. This resulted a set of recommendations to GAA to help support its member bodies with CNCA and advance the field.

Because of the increasing importance of natural capital to corporate resilience and sustainability (TNFD, 2023), corporations will increasingly need comparable, auditable data that can be consolidated (Capitals Coalition, 2022). CNCA has developed to meet this need. A previous paper Time to Take Stock, set out a conceptual framework for CNCA, identifying seven proposed 'standardisations' that provide an overarching framework to guide adoption of CNCA:

1. Defining the natural capital stock as an asset
2. Developing "natural capital asset registers of stocks" using classification systems
3. Measuring changes in the state of natural capital
4. Use of recording rules for accounting events and linked journal entries (double entry book keeping)
5. Summarizing the biophysical state of natural capital with a statement of natural capital position
6. Summarizing net periodic biophysical changes in natural capital with a statement of natural capital performance
7. Using valuation or other analytical methods to link the stock-based accounts and integrated datasets with complementary value framing perspectives.

The GAA hired ERM with support from the Biodiversity Footprint Company, IDEEA Group and eftec (TTTS team) to:

1. *Build awareness and understanding* in CNCA among GAA and its member bodies (e.g., explaining what CNCA is, what it involves, what kinds of industry/businesses is it aimed at)
2. *Describe the relevance* of CNCA to financial accountants and financial accounting bodies (e.g., why do businesses need to adopt CNCA? Why do financial accountants need to be engaged with CNCA?)
3. *Identify the barriers* to the use and increasing uptake of CNCA by accountants
4. *Discuss the role of accountants and accounting bodies* in advancing CNCA
5. *Identify opportunities for GAA* to advance CNCA

Two sets of three consecutive workshops were held in October and November 2023; one set in the Atlantic region and one set in the Asia Pacific (APAC) region. They were attended by members of the GAA and its affiliates. Prereading material was provided before the workshops and the combined 3.5 hours for each region provided an opportunity to discuss the items above. Along

with confirming the need and support for CNCA, the workshops highlighted that there needs to be a:

- a. *More unified understanding of CNCA*, rather than the range of interpretations that exist at present
- b. *Compelling business case for CNCA* including how:
 1. Improves business applications (e.g., supply chain management, return on investment analysis, reporting, risk analysis) with, among other items, integrated datasets
 2. Accountants can benefit from implementing CNCA
- c. *Clearly defined roles for accountants* within the broad range of experts needed for CNCA (e.g., ecologists, economists)
- d. *Iterative development process* that shows how the standardizations can be progressively implemented.

In addition to advancing in these areas, the workshops also highlighted other implementation challenges including building internal corporate capacity, establishing consistent terminology, understanding the interplay between public and private natural capital accounting, reducing the cost of information supply and determining the information technology requirements. To address these challenges and to advance the use of CNCA by the accounting profession, GAA could:

1. Raise awareness across the accounting profession
2. Advance through leadership pieces and efforts that shape the field
3. Build capacity in corporate use of CNCA
4. Build training and certification programs
5. Develop partnership withing GAA's existing networks
6. Support standards development

The accounting profession has demonstrated its capacity to design and implement rigorous, coherent and detailed information management solutions for financial data. This has supported global harmonisation of many management practices and investment approaches. The development of CNCA provides an additional opportunity for the accounting community to apply its unique perspective and skill sets to the integration of data on natural capital into business and financial decision making. As such, the GAA and its member bodies are well positioned to advance leadership in this space.

2. INTRODUCTION

We are at an early stage of CNCA's development. While much work has been undertaken on measuring the environment and progress has been made to harmonize those measurements, CNCA practitioners are only now starting to formalize accounting rules for stocks and flows of natural capital building on the logic inherent in double entry bookkeeping. Companies have begun implementing CNCA (nearly 40 have been identified in this research), often publishing results. The examples demonstrate the contribution that CNCA can make to business applications from risk assessment and sustainable land management, to developing natural capital targets.

Three key differences between the early stages of financial accounting and CNCA's emergence are that:

- 1) There are already regulations covering some dimensions of CNCA (e.g., Corporate Sustainability Reporting Directive [CSRD])
- 2) Advanced information systems are available to support CNCA, though software needs to be built to integrate the data from these systems into accounting processes and information systems
- 3) CNCA practitioners predominantly have non-financial accounting expertise

Differences one and two will help speed the rate at which CNCA is adopted and difference three speaks to the opportunity the accounting profession has to engage with the existing multidisciplinary community.

This project

To help understand the relevance of CNCA to the accountants' toolkit and inform next steps regarding how the profession might engage in and advance the use of CNCA; the GAA facilitated workshops of GAA members and their affiliates in from September to November 2023. One series of three workshops (3.5 hours in total) covered the Atlantic region and one the APAC region. Prereading material was provided before the workshops. The workshops provided an opportunity to:

1. *Build awareness and understanding* in CNCA among GAA and its member bodies (e.g., explaining what CNCA is, what it involves, what kinds of industry/businesses it is aimed at)
2. *Describe the relevance* of CNCA to financial accountants and financial accounting bodies (e.g., why do businesses need to adopt CNCA? why do financial accountants need to be engaged with CNCA?)
3. *Identify the barriers* to the use and increasing uptake of CNCA by accountants
4. *Discuss the role of accountants and accounting bodies* in advancing CNCA

5. *Identify opportunities for GAA to advanced CNCA*

This report summarizes the key learning from those workshops, drawing on pre-reading material, input from participants, and the presentations of the CNCA practitioners that lead the events (i.e., the Time to Take Stock team of ERM, The Biodiversity Footprint Company, IDEEA Group, and eftec). An appendix provides a summary of workshops with details on the materials presented, agendas and attendees.

3. OVERVIEW OF CNCA

Responding to the growing need to manage corporate risks and opportunities related to corporate impacts and dependencies on natural capital, CNCA has emerged to improve data management by creating interoperable data that is:

1. Comparable among sites, companies and industries; and over time
2. Auditable, rather than just the process being assured
3. Can be consolidated across business units

CNCA also:

4. Improves the precision of methods used to measure dependencies and impacts, including valuation, by providing a strong base of biophysical measures, integrated datasets and properly identified final ecosystem services.
5. Serves to establish targets for natural capital management, notably biodiversity conservation
6. Helps integrate natural capital into risks and opportunity analysis
7. Supports direct engagement with managers of other assets concerning the integrated management of different types of capital
8. Is likely to be more readily integrated with an array of business applications (see section 6 below)
9. Eases the ability of nonexperts to engage with natural capital
10. Enables consolidation and reconciliation of disparate metrics for natural capital assets
11. Helps avoid recording errors (e.g., misstatements, imbalances) and inconsistencies (e.g., in measurement methods and assumptions). ([Capitals Coalition, 2022](#))

Said another way, CNCA enables the measurement of the net change in a company's impact on natural capital over time, in a standardized way. The data produced by CNCA creates context relevant measures of natural capital that are interoperable with numerous existing natural capital assessment methods, efforts, and business applications. It creates data that is comparable from site to site and over time, auditable and that can be consolidated. As a result, corporations using CNCA will be better able to integrate natural capital impacts and dependencies into their decision making.

Moreover, CNCA complements and supports existing natural capital assessments, analysis and reporting approaches or methodologies, including the Natural Capital Protocol, Science-Based Targets for nature [SBTs for nature], Global Reporting Initiative [GRI], CDSB Biodiversity Application Guidance, the Taskforce on Nature-related Financial Disclosures [TNFD] and British Standard 8632:2021 Natural Capital Accounting for Organizations [BSI 8632].

Defining CNCA

CNCA is the systematic process of identifying, measuring, recording, summarising and reporting the periodic and accumulated net changes to (a) the biophysical state of natural capital assets and

(b) *the associated values of natural capital to business and wider society* (Capitals Coalition, 2022).

CNCA requires iterative implementation of:

- A defined scope according to organisational and value chain boundaries.
- An asset inventory recognising the biophysical properties and dynamics of each asset category.
- Measurement techniques that use spatially explicit data and apply the principle of ecological equivalency (like-for-like).
- Recording rules based on double-entry bookkeeping from financial accounting.
- Asset-specific biophysical statements of performance and position.

Seven standardisations

Undertaking CNCA based on this definition involves the following seven sequential steps, referred to as 'standardisations' (to reflect their rules-based intention) and which provide an overarching framework to guide the implementation of CNCA. The seven CNCA standardisations are:

1. Defining the natural capital stock as an asset
2. Developing "natural capital asset registers of stocks" using classification systems
3. Measuring changes in the state of natural capital using appropriate methods specific to each asset category
4. Employing recording rules for accounting events and linked journal entries
5. Summarizing the biophysical state of natural capital with a statement of natural capital position
6. Summarizing net periodic biophysical changes in natural capital with a statement of natural capital performance
7. Using valuation or other analytical methods to link the stock-based accounts and integrated datasets with complementary value framing perspectives.

Standardizations 1-6 are used to sequentially, measure natural capital assets, and underpin implementation of standardization 7.

The standardisations are not a formalized accounting standard and indeed, Time to Take Stock (TTTS) calls for an active and purposeful process to articulate accounting standards in these areas.

Use of the seven CNCA standardizations turns corporate focus of natural capital measurement away from impacts, emissions and discharges and towards the state of biophysical stocks of natural capital. This focus on stocks and the associated development of natural capital asset registers of stocks, combined with appropriate measurement methods (e.g., condition adjusted hectares), ensures that a strong integrated dataset of ecosystem assets underpins all analysis. A focus on stocks also shifts the focus to the management of natural capital assets, thus complementing subsequent measurement of impacts, flows and benefits. Finally, a focus on stocks serves as a basis for assessing sustainability and encourages more integrated systems thinking.

CNCA and its standardisations has been developed based on the UN System for Environmental Economic Accounting, the Biological Diversity Protocol and the BS 8632 Standard for Natural Capital Accounting for Organisations. Collectively, they represent the leading thinking and practice on corporate natural capital accounting.

4. TRENDS IN THE USE OF CNCA IN THE MARKET

With the growing climate-water-biodiversity crisis, corporations are seeing rising risks and opportunities. This is driving them to embrace a 'natural capitals perspective' that recognizes the value that natural capital provides to corporations. For example:

- *Science Based Targets for nature* are being implemented by 120+ companies in 30 countries with a market capitalization of over USD 4 trillion ([SBTN, 11 February 2024](#))
- *Taskforce for Nature-related Financial Disclosures* are being implemented by 319 companies, including 105 finance institutions such as UBS, AXA, Bank of America, Emirates National Bank of Dubai, and Standard Charter ([TNFD, 11 February 2024](#))
- *Business for Nature's Call to Action* has been signed by some over 1,400 companies with revenues of over USD 7 trillion ([Business for Nature, 11 February 2024](#))

Moreover, GRI's updated Biodiversity Standard, and the mandatory CSRD are driving companies to better manage their risks and opportunities related to natural capital. However, to date, most corporate measurement of natural capital uses a mix of methods, indicators and data management practices. As a result, it is difficult for corporations to compare assessments from one site to another, consolidate the findings across business units and provide auditable data for investors or other stakeholders.

The growing need for natural capital data, combined with measurement challenges, has spurred a range of companies to implement CNCA, drawing lessons that will inform its advancement.

Early adopters

Early adopters of CNCA range from financial institutions and mining companies to forestry plantations. A short list of these companies was captured by the TTTS team in July 2023. All have adopted CNCA with varying degrees of sophistication, but all starting their analysis using the logic reflected in the seven standardisations.

The companies include:

- | | |
|---|--|
| 1. Australian REIT | 16. Kilter Rural (farm investor) |
| 2. Anglo American | 17. Melbourne Water |
| 3. Another global natural capital investment fund | 18. Midway (Victoria forestry company) |
| 4. Better Energy (solar plant in Denmark) | 19. Mining firm #1 |
| 5. BHP | 20. Mining firm #2 |
| 6. Bord Iscaigh Mhara (Irish seafood development agency) | 21. Mining firm #3 |
| 7. Bord na Mona (Irish peat extractor) | 22. Mondi |
| 8. Cassinia (Australian environmental markets player) | 23. New Forests (Forico) |
| 9. Eskom (South Africa and USA) | 24. Northumbrian Water |
| 10. Farming for the Future (~20 Australian farms of 400ha and larger) | 25. Nuveen Natural Capital (investor) |
| 11. Forestry England | 26. Olam |
| 12. Forico, Tasmania forester | 27. Sasol (Southern Africa) |
| 13. Glencore Ferroalloys (BF) | 28. Shoprite (Africa's largest retailer) |
| 14. Glencore global (training in CNCA) | 29. Sibayne-Stillwater |
| 15. Global natural capital investment fund | 30. Transport for London |
| | 31. United utilities (water) |
| | 32. University of NSW, Sydney |
| | 33. Victoria Forests |

Apparent from this list, CNCA is likely to have more direct value to larger companies operating across multiple locations and those specialized in:

- Primary industries and other landowners and managers. Forestry, agriculture, aquaculture, water supply and mining firms already collect natural capital data to manage the ecosystems they depend on, and to report to regulators and investors.
- Manufacturing, wholesale and retail companies who have connections to primary industries. They will see value in CNCA as supply chain data becomes more consistently recorded and required. For them it will improve their own risk analysis since suppliers can report CNCA-aligned data directly to them.

- Finance. For these companies CNCA can streamline the identification, measurement, recording and summation of natural capital data while also achieving the benefits listed in section 3. To secure these benefits requires increased data collection by investors or investees providing CNCA compatible data, noting that if proxy measures are used to fill these gaps it can erode the benefits listed above.

It is also important to note that while the technology exists to enable the partial automation of CNCA, the accounting applications have not been built. Without this basic technology and more complete CNCA methods and guidance (see section 7. Barriers & Challenges), implementation by smaller companies will likely be slower.

Case studies

The case studies below show that these early adopters are drawing from the range of approaches to CNCA, and are emphasising different standardisations as per their unique needs. Market use of CNCA is expected to continue to evolve, for example, as CNCA practices and data/tools mature, standards evolve, and stakeholder demands for more robust, auditable disclosures grow (see also section 6, which further explores the business case for using CNCA).

BHP (Capacity building, reputational risk management)

As part of a restoration effort of a closed site, Beenup in Western Australia, BHP undertook a CNCA exercise to highlight the site's value. A registry of assets was developed (standardization 2) consisting of the extent of the ecosystems and their condition (professional judgment of high, medium or low). Moving to standardization 7, BHP then measured and valued the site's ecosystem services and reported them. These values were put into monetary balance sheets and income statements. The case study demonstrated that accounts can be built with data gaps. It was used to build capacity inside BHP and highlight the restoration value of BHP closure procedures as it provided direct benefit to local communities.

Forico (Identification of opportunities, enhanced corporate valuation)

Forico, a Tasmanian forester, has been using CNCA since 2016 to measure and report on the natural capital of their estates' production and conservation areas. Similar to BHP, this has included capturing existing data to develop a registry of assets (standardization 2), measuring the changes in stocks of natural capital (standardization 3) and moving to standardization 7 to value and report on the value of the estates' ecosystem services. Because Forico has published multiple annual natural capital reports, it has an increasingly valuable integrated data set showing these changes. For example, concerning the carbon sequestration values of their holdings which have market potential. These, and other values, are of interest to investors. In addition, readers are able to see the iterative process Forico used, integrating additional parts of their estates and ecosystem services overtime.

Nuveen Natural Capital (NNC) (Risk reduction, asset valuation, investor engagement)

NNC has been using CNCA to better understand natural capital risks of potential investment properties. They published natural capital asset registers (standardisation 2) and balance sheets for pilot properties¹ which quantified the role of nature in an investment property (standardisation 7). The accounts measure a wider range of benefits than are identified through market data alone, and highlight the relationship between these benefits and the costs of maintaining natural capital assets. NNC has used the accounts to support communication with investors (standardisation 7), including through its annual reports and in developing TNFD disclosures.

Forestry England (opportunity identification, risk management, land management)

Forestry England, a quasi-governmental forestry firm, manages timber assets and large area of public land. This land contains significant priority habitat for biodiversity and areas of high recreational use, and therefore generates a range of benefits to society. Its natural capital accounts have enabled it to build a time series of data quantifying these natural capital stocks (standardisation 2) and valuing the benefits they support (standardisation 7), as well as tracking the resources (e.g., expenditure, staff) used to maintain them. This helps Forestry England understand how well it is managing natural capital assets (standardisation 5), assess trade offs in providing different benefits such as carbon sequestration and storage, the condition of protected areas, and public recreation, and demonstrate good use of its public grant.²

Sibanye-Stillwater (land management, risk analysis)

The global mining firm Sibanye-Stillwater's biodiversity vision is based a "no net loss" for greenfields and "net gain" in biodiversity for existing operations. Sibanye-Stillwater built a registry of ecosystem assets (standardization 2), measured the changes to natural capital (standardization 3), used double entry bookkeeping to create journal entries (standardization 4) and produced statements of position and performance (standardizations 5 and 6).³ The second time Sibayne-Stillwater ran this exercise, it was relatively quick as new data was needed only for those ecosystems that changed. As a result, they are able to track their site level and total corporate wide biodiversity impacts, compared to both a pre-industrial baseline and to the time at which the sites were acquired.

¹ [2023 Nuveen Natural Capital Sustainability Report](#)

² [forestryengland.uk/sites/default/files/documents/Natural Capital Account 2021-22.pdf](https://forestryengland.uk/sites/default/files/documents/Natural%20Capital%20Account%202021-22.pdf)

³ [https://www.researchgate.net/publication/371289568_Sibanye-Stillwater Biodiversity Footprint 2022 Update](https://www.researchgate.net/publication/371289568_Sibanye-Stillwater_Biodiversity_Footprint_2022_Update)

5. ROLE OF ACCOUNTING PROFESSIONALS IN UNDERTAKING AND ADVANCING CNCA

CNCA is a multidisciplinary activity that involves a range of expertise, from field ecologists and geospatial data experts, to economists and accountants. The accounting professional's role is primarily focused on (1) ensuring the recording, summarising and reporting natural capital information is done properly and (2) assuring CNCA records and associated evidence are properly presented, understood and included in decision making. These roles are parallel to the roles that accountants perform in financial accounting.

Accountants can also contribute to the development of accounting rules and standards. This includes providing input to other groups of CNCA specialists. For example, ecologists lead the development of methods for measuring the extent and condition of natural capital, but benefit from the input of the accounting profession to structure the information such that it can be used for business decision making.

These roles can also be viewed based on CNCA's seven standardisations. Table 1 describes the potential roles with a focus on the CNCA rules that need to be advanced. There is a clear need for the role of accountants and the case for them to engage in CNCA needs to be further developed and refined.

TABLE 1 ROLES OF ACCOUNTING PROFESSION PER CNCA'S SEVEN STANDARDIZATIONS

Standardization	Role of accounting profession
1. Defining the natural capital stock as an asset	Clarifying the synergies and differences between financial assets and natural capital stocks, from both a materiality and going concern perspective
2. Developing “natural capital asset registers of stocks” using classification systems	Developing stock registers (e.g., hierarchy, listings) in line with both national and international policy and legal environments, for both impact and dependency pathways, differentiating between drivers of change (e.g., greenhouse gas emissions, wastewater emissions) and actual natural capital stocks (e.g., ecosystems, species, soils, surface freshwater)
3. Measuring changes in the state of natural capital using appropriate methods specific to each asset category	Developing effective rules (e.g., accuracy, completeness, consistency) and auditing steps for verifying natural capital measurement methods, input data (e.g., maps) and outputs
4, 5 & 6. Employing recording rules and developing statements of position and performance	Validating / refining existing and developing new double-entry bookkeeping rules (adapted from financial accounting) for all types of natural capital stocks, to organise the informational infrastructure for complete audit trails
7. Using valuation or other analytical methods to link the stock-based accounts and integrated datasets with complementary value framing perspectives	Clarifying how both (a) financial accounting and (b) other valuation approaches can make use of CNCA data outputs, journal entries and statements of position and performance, with particular attention to (a) double counting risks and (b) overstatements / understatements of unverifiable positive and negative impacts on business and people (building on standardisation 1-6). For example, in forestry operations, statements of position and performance can be used to set land management performance targets. This would not be obvious to foresters as they are trained to look at metrics specific to production, not the overall ecosystem health. .

6. BUSINESS CASE FOR THE USE OF CNCA

By using CNCA, corporations are able to organize natural capital data so it is comparable, auditable and can be consolidated. Moreover, it produces a single, integrated dataset of natural capital information—akin to financial datasets created through financial accounting. This integrated dataset serves multiple business applications from ecosystem management to risk analysis, target-setting, strategy, financial planning and disclosures. Often these applications are linked to wider natural capital initiatives such as TNFD or to emerging regulatory requirements. Given the rapid rise in the number of such initiatives and requirements, the availability of a single underlying natural capital data set may generate a range of efficiencies around data collection, management and release, as financial data sets do.

In addition, aside from externally focused applications, CNCA based data will provide a basis for identifying internal insights into business operations such as return on investments in natural capital (e.g. mine rehabilitation, soil management, water quality), and will support discussion and analysis of such activities in a manner aligned with investments in manufactured capital, and have been explicitly linked to execution of fiduciary duties^{4,5}.

As noted previously, implementing CNCA according to the standardisations is an iterative process, which typically starts with developing registers of natural capital assets (stocks). Many companies are already investing in developing these foundations to support analysis of changes in the status and value of natural capital stocks that they impact, own or manage. With growing emphasis on nature across policy, regulation and standards, investments in these foundational components can be seen as a way for a business to prepare in an efficient and cost-effective way across the board. These benefits will also become more evident over time as the different applications of natural capital data are repeated on a regular basis, enabling tracking of trends and changes over time.

Securing the benefits from repeated compilation of CNCA and application of the data is enabled, in part, through the application of bookkeeping and auditing methods from financial accounting to the management of natural capital data. Notably, the use of double entry bookkeeping rules from financial accounting builds more harmonized data across business units and companies, and makes corporate board and site level natural capital data more interoperable. It helps enable the business wide system thinking and integrated analysis role of accountants because it:

1. *Improves the interoperability of data*
2. *Is likely to be more readily integrated with an array of business applications including disclosures and risk analysis.*
3. *Eases the ability of nonexperts to engage with natural capital.*
4. *Enables consolidation of disparate metrics for natural capital assets.*
5. *Helps avoid recording errors (e.g., misstatements, imbalances) and inconsistencies (e.g., in measurement methods and assumptions).* (Capitals Coalition, 2022)

⁴ [Paper-Pension-Fund-Trustees-and-Fiduciary-Duties-Decision-making-in-the-context-of-Sustainability-and-the-subject-of-Climate-Change-6-February-2024.pdf \(fmlc.org\)](#)

⁵ Nature-related risks and directors' duties. 2023. Pollination Law. <https://pollinationgroup.com/global-perspectives/australian-company-directors-and-nature-related-risk-a-new-legal-opinion/>

The business case for ultimately aligning with all standardisations is expected to strengthen in the future, as nature-related data and tools mature (lowering costs), standards evolve, and stakeholder demands for more robust, auditable disclosures builds.

Overall, rather than there being a single, compelling reason for using CNCA, it is these combined advantages that make its implementation worthwhile. Further, large, primary industries and land managers will generally see more direct value in using CNCA at least in the short term (see section 4).

7. BARRIERS & CHALLENGES

Given the needs of the accounting profession, and the important role of the accounting profession in the application of CNCA, the challenges facing its advancement need to be clearly understood. There are nine major challenges.

1. Conveying the business case

Conveying the business case for CNCA to corporations needs strengthening with a particular focus on the ways in which CNCA can provide additional insights into business operations. While the use of CNCA is growing, corporations need to be convinced of the utility of CNCA and that its benefits outweigh the costs involved. Other measurement and reporting methods for natural capital are in use from Integrated Profit and Loss statements to water withdraws to impacts to endangered species. Moving away from established practices only happens with a strong rationale. A strong business case focused on the accounting profession needs to be articulated.

2. Internal corporate capacity

Corporations need to build internal corporate CNCA capacity. This requires identifying and closing skills gaps. These gaps could relate to the roles of the accounting profession in using CNCA (see section 5. Role of accounting) or to gaps in knowledge of ecology or environmental economics. These gaps need not be filled within the corporation to commence implementation of CNCA. Pilot studies may help corporations plan for this capacity building by highlighting specific training needs.

3. Navigating the adoption journey

A key challenge for businesses is identifying an efficient pathway to implement CNCA, as it is always an iterative journey where different CNCA standardizations are the focus in any one iteration. There are also different choices that an organisation can make along the journey, for example, investing in capacity, technology, software and data collection. A key risk for organisations is that they over (or under) invest early in their journey. Corporations need to clearly understand that implementation will be progressive, with capacities, technologies and uses expanding overtime. Guidance on different 'adoption journeys' would help and need to be built.

4. Lack of a standard

While there is a public sector standard (i.e., UN SEEA EA) and numerous private sector guidelines and standards (e.g., the Biological Diversity Protocol, BIS 8632), there is no single agreed CNCA standard for the corporate sector. The differences create confusion in the marketplace and this is confounded by the variety of reporting frameworks and guidelines (e.g., ESRS, TNFD) that make inconsistent and contradictory reference to CNCA. More work is also needed to refine the methods of any one guideline or standard and the accounting profession can be an important voice in communicating the importance of such standards.

5. Terminology

There are subtle differences between the terms used in financial accounting and CNCA that need to be resolved. For example, 'assets' may need consideration.

CNCA practitioners have been using the term 'assets' to refer to stock of natural capital in order to highlight that these renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) (a) provide value to business and society (BIS 8632) or (b) should be the focus of the accounting process to assess how their "going concern" is managed by the business (Biological Diversity Protocol). This term has been carried into the CNCA space.

However, in financial accounting an 'asset' is a resource that is owned or controlled and generates economic benefits to the corporation in the future. This scope is narrower than in CNCA, since for CNCA natural capital stocks outside of owned and leased properties may need to be accounted for (e.g., impacts on freshwater ecosystems downstream of a factory). 'Stocks' may need to be a better term, but there may be flexibility in the use of 'assets' by financial accounting standards.

6. Public and private natural capital accounting

Natural capital accounting is growing in the public and private sectors, prompting a need to consider how they can reinforce one another. Relevant issues include whether data that is collected and organized in one sector support the other sector's data needs and whether public sector natural capital accounting, coupled with data on private use help manage the global commons (e.g., the oceans or government land used for ranching). Ultimately, there may be many users of natural capital across a landscape and the interoperable data that comes from CNCA may provide the means to better understand and resolve management issues among different users of a landscape.

7. The cost of information supply

CNCA requires data measurement (including collection and processing) before recording transactions in a journal entry. There are choices that a corporation may make in this process, for example, deciding to use publicly available processed data products, interpreting satellite data or performing in situ data collection. Where there is unavailable data, choices can be made to interpolate or extrapolate from existing datasets. CNCA requires flexibility in the short term for organisations to adopt methods that suit their maturity levels and to prevent barriers to entry. Thus, some organisations may adopt low cost methods, while other organisations may adopt higher cost ones.

8. CNCA can appear overwhelming

Implementing CNCA can appear an overwhelming task. It needs to be communicated as an iterative process and one with a focused role for accounting professionals, rather than them needing to become expert ecologist and environmental economists.

The iterative nature of CNCA implementation can take several paths (see challenge 3. Navigating the adoption journey). In choosing their path, corporations need to identify their material natural capital issues and build a CNCA system around it. For example, for a food manufacturer, this could mean identifying the growing locations with the largest exposure to natural capital risk. For a smelter, emissions maybe of utmost importance.

While ultimately CNCA is a process in which standardizations 1-6 are undertaken sequentially, the implementation of this complete process can be incremental. For example, adapting double entry bookkeeping—that helps avoid errors and inconsistencies, and allows harmonization and interoperability of data across business units, sectors, geographies, scales, and times—maybe be part of a second or third iteration. Corporations may first build strong natural capital assets registers of stocks, one site at a time, before moving toward journal entries covering all sites.

The same is also true for data. Where directly collected site-level data on stocks or other components is unavailable, there are proxies that can be used (see challenge 7. The cost of information supply). These accounts should still be compiled, with proxies noted, as the accounting information remains useful and each time compilation takes place there is important capacity building. At later stages these data gaps can be filled.⁶ Indeed the case studies (see section 5 Candidate uses of CNCA) showed that the work on CNCA provided organisations with useful information and insights on natural capital despite all of them facing data limitations. Identifying and addressing such limitations is part of the iterative process.

9. Information technology

Information technology (IT) and related information systems that focus on data collection and management offers significant efficiencies in developing and implementing CNCA. While information systems for CNCA exist, specific software has not been built. As demand grows, this gap may be closed, but presently it is a barrier to entry. Moreover, the efficiencies IT and information systems creates are essential to making CNCA more accessible to smaller businesses. An information systems development strategy both industry wide but also guides for companies would help accelerate the adoption of CNCA.

⁶ This is a key difference between a data driven perspective and an accounting perspective. Rather than building a measurement and reporting system based on what is available, accountants define the data needed and built it overtime.

8. OPPORTUNITIES

There are numerous opportunities to help advance CNCA. GAA is in a unique position to coordinate and lead responses of the accounting profession as it has both a global network and deep expertise in virtually every country. These opportunities can be organized into seven groups.

1. CNCA roadmap

A roadmap for the advancement of CNCA could be developed. It could consider the range of opportunities and challenges while also serving as a focal point for further discussion and engagement across the accounting profession and among the accounting profession and other sectors.

2. Awareness raising

Given the benefits of CNCA but also the need for further development of the business case, communicating the relevance of applying CNCA across the accounting profession is likely needed. This might be advanced both by facilitating discussions on:

- a. How CNCA can add value to the roles of accountants (e.g., improving risk management, strategy, financial planning, assurance and reporting)
- b. What role of accounting professionals is in supporting the development and implementation of CNCA more broadly.

Candidate projects could include adapting existing TNFD pilots using CNCA or launching complementary pilots, possibly in cooperation with the Capitals Coalition and TNFD.

3. Thought leadership

Accounting for natural capital is an emerging field and establishing a rich and inclusive research agenda from an accounting perspective would be of great benefit. Research and thought leadership papers could cover topics such as describing the business case with case studies, consider the roles of the accounting profession in CNCA and compare different CNCA approaches. From a more technical stand-point, a paper could clarify the synergies and differences between financial assets and natural capital stocks, considering both a materiality perspective and going concern perspective. More long term, a paper could evaluate the implications of adopting different accounting rules and presentations within CNCA. Such a paper (or series of papers) may serve to clarify how both financial accounting and other applications can make use of CNCA data outputs, including journal entries and statements of position and performance, and also consider (a) double counting risks and (b) overstatements / understatements of unverifiable positive and negative impacts on business and people.

4. **Global baselining project**

To understand the current state of corporate implementation of CNCA, a baseline exercise could be conducted. It would capture which components of CNCA are being adopted. This would provide a tool for companies to understand what specific actions they need to take to match industry leaders.

5. **Build capacity in corporate use of CNCA** by:

To support implementation, the development of 'tool kits' for accounting professionals could be an active area of further work. This could involve clear explanation of processes and options for implementation as well as establishing a reference base or knowledge hub of documentation, methods, technology and other supports for those interested in taking the first steps.

6. **Training and certification**

Use of CNCA requires both upskilling existing accounting professions and integrating CNCA into core university and college curricula. There is an opportunity to drive a co-ordinated response including close engagement with relevant educational institutions and accounting curricula.

7. **Standards development**

Longer term, CNCA will require the establishment of standards for natural capital disclosures as well as accounting definitions, rules and treatments to facilitate auditing of natural capital data. Ideally this work would be undertaken in a globally co-ordinated way that will need dedicated resources and appropriate governance.

8. **Partnership engagement**

GAA is uniquely positioned to co-ordinate awareness raising, thought leadership, and influencing standards development. The global reach of accountants should not be underestimated in terms of facilitating implementation of CNCA at the scale required to help address the natural capital risks and opportunities that the world faces. In particular, engagement with global natural capital related initiatives such as TNFD, GRI, Capitals Coalition, A4S, ISSB is likely an excellent opportunity.

Collectively, these opportunities address the key learnings from the workshops. Specifically that there is a need for a:

- a. *More unified understanding of CNCA*, rather than the range of interpretations that exist at present
- b. *Compelling business case for CNCA* including how:
 1. Improves business applications (e.g., supply chain management, return on investment analysis, reporting, risk analysis) with, among other items, integrated datasets
 2. Accountants can benefit from implementing CNCA
- c. *Clearly defined roles for accountants* within the broad range of experts needed for CNCA (e.g., ecologists, economists)
- d. *Iterative development process* that shows how the standardizations can be progressively implemented

Developing responses will be a significant challenge but one that the accounting community has met before. Consider that there is no text or keystone article from financial accounting that defines the business case for large scale investment in the organization of financial data. And yet investment in standards, processes, skills and technology for financial accounting is understood as necessary not only from a regulatory perspective but for business resilience. Natural capital data will be increasingly understood in the same way. This report provides suggestions as to how a response by the accounting profession can be formulated.

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