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WHAT NATURAL CAPITAL DISCLOSURE FOR INTEGRATED REPORTING?

DESIGNING & MODELLING AN INTEGRATED FINANCIAL – NATURAL CAPITAL ACCOUNTING AND REPORTING FRAMEWORK

African Centre for Technology Studies (ACTS), Gigiri Court No:49, Off United Nations Crescent, P.O. Box 45917 – 00100, Nairobi - Kenya.

The African Centre for Technology Studies (ACTS) is an Intergovernmental organization founded in 1988 to pursue policy oriented research towards strengthening the capacity of African countries and institutions to harness science and technology for sustainable development. In 2013, it was rated amongst the top Environment Think Tanks in Africa and the world. ACTS is also a past winner (1991) of the Justinian Rweyemamu Prize from CODESRIA (Africa's Social Science Research Council) for its work in expanding the knowledge base for Africa's development.

Synergiz, 69 rue de Rochechouart - 75009 Paris.

Synergiz is a non-profit organisation, founded in 2006 and based in Paris, France. Synergiz is a sustainability research think tank which works primarily on (a) business, biodiversity and ecosystem services, (b) natural capital accounting, valuation, reporting and disclosure, as well as on (c) urban ecosystems. With a strong international network of sustainability researchers and practitioners, Synergiz produces thought-provoking research, policy documents and new tools to drive sustainable organisational changes.

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environmental expenses externalities framework GHG habitat impacts information integrated liabilities natural capital offset organisation performance reporting services stakeholders standards statement sustainability water wood biodiversity accounting modelling case study financial position

[1] *Comments may be directed to the corresponding author, Dr. Joël Houdet at jhoudet@synergiz.fr*

EXECUTIVE SUMMARY

Business and government leaders from around the world are increasingly sounding the alarm about the need for effective management of business dependencies and impacts on ecosystems. As a consequence, financial institutions have recently made a formal commitment to work towards integrating natural capital considerations into their decision-making processes, including helping improve the accounting and disclosure practices of reporting organisations.

Though various frameworks and standards have been developed and implemented to improve extra-financial accountability to stakeholders, current 'sustainability reporting' falls short in providing the information needed for accurate investment decision-making. The recent releases of Integrated Reporting (IR) guidelines, notably by International Integrated Reporting Committee, have been presented as a significant step in the right direction by professionals and academics.

This paper argues that a **solid accounting foundation** is required for these to be able to effectively incorporate the broader and longer-term social and environmental consequences of corporate decision-making. To support this argument, this paper first provides a brief **review of Natural Capital accounting methods** and **main reporting practices**. Based on this analysis, the paper proposes the **key principles** and **methodological foundations** for an **Integrated Financial – Natural Capital Accounting and Reporting Framework** which can be used to fulfil the aspirations of IR guidelines.

A theoretical case study involving selected natural capital accounts (GHG emissions, wood consumption, water footprint, habitat loss) illustrates the practical implications of such a framework over three years, by notably explaining: i) the integrated financial - natural capital accounting journal entries, ii) the ensuing Integrated Financial – Natural Capital Statements of Position and Performance; and iii) how to calculate and disclose the natural capital biophysical and externality intensity of financial accounts.

In doing so, this Framework provides the concrete foundation for building up a ***time*** *and* ***space*** *distributed "catalogue" of* ***natural capital dependency*** *and* ***impact information aligned with financial information*** *recorded by companies*, hence providing the **integrated accounting application for other environmental accounting standards and guidelines**, such as the Water Footprint and GHG Footprint Standards and potentially the forthcoming Natural Capital Protocol. It can hence be used to improve business decision-making, drive sustainable organisational changes and improve natural capital accountability.

CONTENTS

INTRODUCTION

Business and government leaders from around the world are increasingly sounding the alarm about the need for effective management of business dependencies and impacts on ecosystems. Access to benefits derived from functioning ecosystems is vital to both human societies and to companies. Such is the concern over loss of this access that the recent Rio+20 UN conference on sustainable development saw CEOs of 39 financial institutions, including banks, investment funds, and insurance companies, make a formal commitment to work towards integrating natural capital considerations into their products, services, corporate responsibility, governance, accounting and disclosure practices[2] (The Natural Capital Declaration, 2012).

Though various frameworks and standards have been developed and implemented over the past 15 years to improve extra-financial accountability to stakeholders, they have yet to generate the same level of influence as financial statements do. Recent evidence suggests that sustainability reporting is falling far short of providing the detailed sustainability information needed by the institutional investment community for investment decision-making (Solomon et al., 2011; UNEP PRI / UNEP FI 2011). Institutional investors are being forced to supplement sustainability reporting with private reporting on climate change and other Environmental – Social – Governance factors (Solomon & Solomon, 2006; Solomon et al., 2011). Accordingly, many academics, practitioners and organisations (e.g. WBCSD, Natural Capital Coalition) have voiced the need for reporting on natural capital to be significantly improved (Bishop 2010; Bonner et al., 2012; Boulter, J., 2011).

The recent releases of Integrated Reporting (IR) guidelines by the Integrated Reporting Committee of South Africa (2011) and the International Integrated Reporting Committee (2013) have been argued to be a significant step in the right direction by many, both professionals and academics. The concept of integrated reporting – i.e. disclosing financial and non-financial governance, performance and risk management in an integrated way within the same annual document - is generally perceived as a necessary, forward-looking evolution of sustainability reporting. These IR guidelines have been argued to support the information needs of long-term investors, by showing the broader and longer-term social and environmental consequences of decision-making. We focus on IR disclosure for three main reasons: first, because it provides an exciting opportunity to address the market failure associated with lack of access to robust information about corporate

[2] *The declaration specifically states that members should "work towards building a global consensus for the integration of Natural Capital into private sector accounting and decision-making; supporting, when appropriate, the related work of the TEEB for Business Coalition, and other stakeholders"*

natural capital dependencies and impacts; second, because it is a practical alternative to the impossibility of accurately and exclusively expressing all corporate natural capital dependencies and impacts in monetary terms and; third, because IR puts strategic financial and non-financial information at the same level of importance for corporate performance disclosure and stakeholder accountability.

Yet, combining sustainability and financial information requires care, as these two very different strands of accounting and reporting are at very different stages of development and use. Contrary to financial accounting and reporting, sustainability accounting is still in development (especially for biodiversity and ecosystem services- Houdet et al. 2010; Jones & Solomon, 2013) while sustainability reporting differs greatly between companies in quality and content. As argued by Houdet et al. (2011), the potential for integrated reporting to be successful depends to a large extent on the quality of the existing sustainability reporting and its comparability with the financial reporting with which it is to be integrated. Furthermore, these authors have argued that *rigorous accounting foundations* are a pre-requisite for an IR framework to be successful in disclosing the *interactions* between *ecological, social, governance* and *financial performance*.

This paper therefore aims to present the theoretical foundations for developing a comprehensive set of accounting rules and reporting methods towards integrated financial – natural capital accounting systems and disclosure models. We first provide a brief review of the main natural capital reporting practices and associated accounting methods. Key messages learned from this exercise allow us subsequently to focus our attention on the development of the aforementioned theoretical foundations, which would enable organisations to disclose, annually, their Integrated Financial – NC Statements of Performance and Position. Finally, we propose and illustrate an Integrated Financial – NC Accounting & Reporting Framework through a theoretical case study making use of selected financial and natural capital accounts over a period of three years.

This paper targets mainly integrated reporting academics and practitioners, as well as specialists in natural capital accounting and sustainability / environmental accounting and reporting. We hope to open up the debate and engage companies to start testing the proposed framework.

KEY DEFINITIONS

Integrated Reporting (IR): IR is defined, by the International Integrated Reporting Committee (IIRC - http://www.theiirc.org/), as "*a process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communications regarding aspects of value creation. An integrated report is a concise communication about how an organization's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value in the short, medium and long term.*" In other words, an IR is expected to present financial and extra-financial information in an integrated way within the single report.

Natural capital (NC): NC refers to the components of nature that can be linked directly or indirectly with human welfare (TEEB 2010). In addition to traditional natural resources such as timber, water, and energy and mineral reserves, it also includes biodiversity, endangered species and the ecosystems which perform essential ecological services. According to the Millennium Ecosystem Assessment (MA 2005), natural capital is one of four types of capital that also include manufactured capital (machines, tools, buildings, and infrastructure), human capital (mental and physical health, education, motivation and work skills) and social capital (stocks of social trust, norms and networks that people can draw upon to solve common problems and create social cohesion).

Ecosystem: An ecosystem is a community of living organisms (plants, animals and microbes) in interaction with the non-living (abiotic) components of their environment (air, water, soil) which constitutes a functioning system - e.g. ecosystems include deserts, coral reefs, wetlands or rainforests.

Biodiversity: The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems. Biodiversity contributes to the formation and maintenance of natural capital (e.g. clean water and hydrocarbon formation) and hence the availability of ecosystem services for humans and business.

Ecosystem services: The making available of benefits that human beings and business derives from ecosystems – i.e. uses of natural capital. These can be classified into three categories (CICES – URL: http://cices.eu/):

- **Provisioning services**: generate beneficial goods, such as food and water
- **Regulating services**: generate tangible benefits derived from ecosystem processes, such as flood and disease control.
- **Cultural services**: generate social benefits obtained from experiencing ecosystems, such as recreation and spiritual values.

Biodiversity offset: Measurable conservation outcomes resulting from compensation for significant residual adverse biodiversity impact, in particular, those that persist even after appropriate prevention and mitigation measures have been taken (BBOP 2012). Ecological equivalency between lost biodiversity and biodiversity offset measures is a critical aspect.

Environmental offset: An environmental offset is an intervention, or interventions, specifically implemented to counterbalance an adverse environmental impact of land-use change, resource use, discharge, emission or other activity at one location that is implemented at another location to deliver a no-net-impact / loss, net environmental benefit. This has been extensively used for offsetting to GHG emissions (i.e. carbon offsets) and is contemplated or being pilot-testing other environmental impacts, such as for water abstraction / pollution and other air emissions.

1. A REVIEW OF CORPORATE NC ACCOUNTING METHODS AND MAIN REPORTING PRACTICES

1.1. What is Natural Capital from a business perspective? What accounting approaches are available?

For business, NC can first be understood as a set of resources and benefit streams to reach organisational outcomes, such as critical production assets (e.g. raw materials, energy, genetic materials) and natural risk mitigation services provided by well-functioning ecosystems. Depending on the context, changes in their availability or quality may generate different types of risks (e.g. changes in resource availability, degradation of ecological infrastructure supporting specific regulating services such as water quality and aquifer recharge) and changes in capital and operational costs (e.g. machinery, land, purchase, management, access, transport, transaction and transformation costs).

At the same time, NC can be impacted by business, notably in terms of:

- NC stock sustainability / availability: i.e. impacts of NC exploitation when directly used by a business (e.g. mining non-renewable mineral resources, overfishing renewable fish stocks).
- Direct and indirect impacts of business activities on receiving ecosystems and associated biodiversity and ecosystem services (e.g. land use change, monocultures, waste deposition, erosion, dust pollution).

Impacts on NC are also, themselves, a source of business risks (legal / regulatory, project delays, stakeholder pressures), costs (impact mitigation, offsets) and benefits (e.g. improved brand value if stakeholder perception of NC management is improving, long-term asset security when NC is well managed).

There are many NC / Environmental Management Accounting (EMA) methods, systems, tools and / or standard available. Environmental accounting methods may make use of biophysical and / or monetary information, have a short or long term focus, have different timeframes (past, present and / or future) and may be ad hoc or based on the routine gathering of information (e.g. Burritt et al., 2002; Burritt et al., 2011; Richard 2009) (Table 1.1). For instance, in terms of Physical Environmental Management Accounting (PEMA), one can mention the well-known Water Footprint Standard and the GHG Protocol that help organisations account for green, blue and grey water footprints and greenhouse gas emissions respectively. On the other hand, Monetary Environmental Management Accounting (MEMA) includes environmental cost accounting, environmental long term financial planning or environmental life cycle budgeting and target pricing (Table 1.1). The emerging methods and tools for accounting for dependencies and impacts on biodiversity and ecosystem services, expressed in biophysical units, geographical coordinates and / or monetary values (Houdet et al., 2012; Waage & Kester, 2014), would belong to one or more of the aforementioned groups.

Yet, this diversity of tools (i.e. with different aims, scopes, organisation boundaries, focus themes, outputs and uses) fails to provide a clear, comprehensive and harmonised NC accounting framework to the business community (Houdet et al., 2012; TEEB 2010). A standardized accounting methodology (clear scope definition – organisational, geographic and thematic, set of core and non-core indicators, measurement protocols, management and performance monitoring, guidelines for business applications in various decision-making settings, including for

		Environmental Management Accounting (EMA)							
		Monetay Environmental Management Accounting (MEMA)				Physical Environmental Management Accounting (MEMA)			
		Short Term Focus		Long Term Focus		Short Term Focus		Long Term Focus	
Past oriented	Routinely genereated information	1.	Environmental cost accounting (eg. variable costing, absorption costing, and activity based costing)	2.	Environmentaly induced capital expenditures and revenues	9.	Material and energy flow accounting (short term impacts on the environment - product, site, division and company level)	10.	Environmental (or natural) capital impact accounting
	Ad hoc information	3.	Ex post assessment of relevant environmental costing decisions	4.	Environmental life cycle (and target) costing Post investment assessment of individual projects	11.	Ex post assessment of short term environmental impacts (eg. of a site product)	12.	Life cycle inventories Post investment assessment of physical environmental investment appraisal
Future oriented	Routinely genereated information	5.	Monetary environmental operational budgeting (flows) Monetary environmental capital budgeting (flows)	6.	Environmental long term financial planning	13.	Physical environmental budgeting (flows and stocks) (eg. material and energy flow activity based budgeting)	14.	Long term physical environmental planning
	Ad hoc information	7.	relevant environmental costing (eg. special orders, product mix with capacity contraint)	8.	Monetary environmental project investment appraisal Environmental life cycle budgetingand target pricing	15.	Relevant environmental impacts(eg. given short run constraints on activities)	16.	Physical environmental investment appraisal Life cycle analysis of specific project

Table 1.1: *A comprehensive framework of environmental management accounting (Burritt et al., 2002; Schaltegger et al., 2000).*

stakeholder engagement) for NC impacts and dependencies has thus been advocated by many, including by the members of the Natural Capital Coalition[3] who work towards the development of a Natural Capital Protocol.

A comprehensive business NC accounting framework should be able to account for all business NC dependencies and impacts in biophysical terms first, making use of existing ecosystem services classifications such as the Common International Classification of Ecosystem Services (CICES; Haines-Young & Potschin, 2013; e.g. see the Biodiversity Footprint methodology in Houdet, 2012) or the Final Ecosystem Goods and Services Classification System (FEGS-CS) (Landers & Nahlik, 2013). If appropriate, depending on the type of NC (i.e. objects that can easily be priced versus cultural components of biodiversity) and the intended use of the biophysical information, this framework should also enable users to express NC dependencies and impacts in economic terms, making use of appropriate environmental management accounting tools (including monetary valuation techniques) and making sure the "fitness-for-purpose" test is rigorously applied (Houdet 2012). Finally, such a protocol should include a clear methodology for materiality[4] analysis, one that is flexible enough so as to be able to account for intra-sectoral and inter-sectoral materiality variances. Table 1.2 presents a potential general framework for NC accounting.

1.2. Natural Capital Reporting & Disclosure – What approaches have been used by business?

To date, three main distinct NC reporting methods have been used to disclose NC dependencies and / or impacts to external stakeholders (Houdet et al., 2010), namely Environmental Financial Reporting (EFR), Extra-Financial Environmental Reporting (EFEA) (as part of conventional Sustainability Reporting), and the Disclosure of Environmental Externalities (DEE).

1.2.1. Environmental Financial Reporting (EFR)

EFR constitutes an extension of conventional Financial Reporting. It aims to differentiate commercial, economic or legal events, with environmental implications, which have a direct financial impact on the reporting entity. These events may relate to the present (expenses, sales) or the future (long-term liabilities, provisions). From a financial auditing perspective, it relates to the considerations of environmental matters. The EFR approach is monetary, by definition, and is largely "self-referential", since it addresses primarily the concerns of its core stakeholders (shareholders, main creditors).

[3] *URL: http://www.naturalcapitalcoalition.org/*

[4] *Materiality is a concept or convention within auditing and accounting relating to the importance/significance of an amount, transaction, or discrepancy. Information is material if its omission or misstatement could influence the economic decision of users taken on the basis of the financial statements. Materiality depends on the size of the item or error judged in the particular circumstances of its omission or misstatement. Thus, materiality provides a threshold or cut-off point rather than being a primary qualitative characteristic which information must have if it is to be useful.*
Material topics for a reporting organization should include those topics that have a direct or indirect impact on an organization's ability to create, preserve or erode economic, environmental and social value for itself, its stakeholders and society at large. Materiality for sustainability reporting is thus not limited only to those sustainability topics that have a significant financial impact on the organization. Determining materiality for a sustainability report also includes considering economic, environmental, and social impacts that cross a threshold in affecting the ability to meet the needs of the present without compromising the needs of future generations.

		Dependencies on ES	Impacts on ES
1	Define the business scope	**Scope A** : direct dependencies of activities / land fully controlled by the business **Scope B** : direct dependencies on ES from ecosystems surrounding land / activities which are controlled by the firm (no / limited control with geographic proximity) **Scope C** : Indirect dependencies generated through the activities of suppliers, joint ventures and / or clients (no / limited control and no geographic proximity)	**Scope A** : direct impacts of activities / land fully controlled by the business **Scope B** : direct impacts on ES from ecosystems surrounding land / activities controlled by the firm (no / limited control with geographic proximity) **Scope C** : Indirect impacts generated through the activities of suppliers, joint ventures and / or clients / products sold (no / limited control and no geographic proximity)
2	Determine the ES involved and prioritise the most material ones	ES stocks and flows influencing the business activities - e.g. according to the CICES (Haines-Young & Potschin, 2013) or FEGS-CS (Landers & Nahlik, 2013) classifications	ES stocks and flows influenced by the firm - e.g. according to the CICES (Haines-Young & Potschin, 2013) or FEGS-CS (Landers & Nahlik, 2013) classifications
3	Assess the bio-physico-chemical dependencies and impacts	Identify and quantify the relevant interactions with the company activities (e.g. production processes, emissions / discharges, land-use), using direct assessment or relevant databases	
4	Determine associated internal costs and revenues	Direct (expenses / sales of ES) and indirect (labour costs, capital investments for ES management) monetary flows associated to ecosystem changes	
5	Identify ES used by / important to stakeholders	Assess how business dependnecies and impacts influence the availability of ES used by other agents (competing uses of the same ES or degradation of other ES caused by the business activity)	
6	Ecocomic valuation of externalities (changes in ecosystem services availability / delivery)	Use economic valuation methodologies which are appropriate to specific ES dependencies (costs or forgone benefits for the company), satisfying the fitness-for-purpose test	Use economic valuation methodologies which are appropriate to specific ES impacts (forgone benefits for third parties), satisfying the fitness-for-purpose test
7	Adapt results to business applications	For both internal (investment appraisal, decision-making / trade-offs, budgeting and product pricing, performance management) and external (accountability purposes: financial, sustainability and integrated reporting; ESG rating) stakeholders	
8	Undertake third-party assurance	With regards to principles, methodologies and results	

Table 1.2: *Potential steps or components for a comprehensive business NC accounting framework (adapted from Houdet 2012; Houdet & Germaneau, forthcoming; WBCSD 2011).*

Accounting for NC could take two forms from an EFR perspective, with the detailed disclosing of:

- **Environmental costs**: e.g. expenses in the statement of financial performance, liabilities / provisions in the statement of financial position (see examples in Tables 1.2 and 1.3) and
- **Environmental benefits**: e.g. sales of natural resources in the statement of financial performance (see Table 1.5, assets related to natural resources in the statement of financial position).

Beyond common environmental expenses and liabilities[5] (see Table 1.4), relatively recent and innovative (potential) financial accounting entries of an 'environmental nature' may involve (a) a loss or gain in asset value (e.g. loss in land value due to a pollution event) and (b) new types of assets (e.g. GHG emissions quotas as immaterial assets). For instance, with respect to positive externalities which benefits the reporting organisation, Comello et al. (2014) make a compelling argument in favour of recording the value of certain ecosystem services (e.g. wastewater treatment by a wetland) within financial accounting systems provided three conditions are met: "*(i) ownership/control of the ecosystem service can be fairly established, (ii) an engineered equivalent system can be identified (thus providing a comparison that has a market value), and (iii) an ecological model exists (or is developed) to describe an ecosystem service (and its limit states) to the level of detail similar to that of the engineered equivalent system.*" Similar research on accounting for wildlife from the perspective of conservation and eco-tourism organisation have also been published (Burritt & Cummings, 2002; Wentzel et al., 2009). From a broader perspective, one needs to mention the work carried out by Sustainability Accounting Standards Board (SABS) in various industries.
To date, disclosing NC costs from an EFR perspective has been limited to events of a material nature (i.e. above a certain monetary threshold) as per standard financial reporting standards and guidance (e.g. the financial implications of the BP oil spill; Houdet and Germaneau, 2011; Table 1.3). Yet, many reporting organisations fail to appropriately disclose their material environmental expenses and liabilities, especially in the mining sector (e.g. Silva-Macher & Farrell, 2013; Van Zyl et al., 2012).

In addition, disclosing NC benefits has been mostly limited to reporting organisations which can be classified into the primary industries category (mining, farming) (Table 1.5). This is because their sales and assets are directly related to (mostly) untransformed natural resources. However, there is usually no or little explanation disclosed with regards to the nature of the commodity traded (i.e. renewable versus non-renewable resources).

1.2.2. Extra-Financial Environmental Reporting (EFER)

EFER is most often referred to as the environmental dimension of sustainability reporting. EFER has been advocated because of EFR's failure to properly disclose to both internal and external stakeholders, companies' NC dependencies and impacts in non-monetary quantitative terms. Indeed, disclosing environmental expenses (taxes, compliance costs) and liabilities does not give information about the nature and extent of the impact on stakeholders. Besides, merely disclosing environmental expenditures gives neither an indication of the efficiency of the company's environmental performance nor evidence of the benefits accruing to society (Huizing and Dekker, 1992; Richard 2009). The stakeholder base for EFER is broader than that of EFA.

[5] *e.g. pollution prevention, recycling, energy usage, cleaning-up of polluted sites, management and disposal of waste and hazardous materials, management of time-limited facilities whose renewal requires governmental authorization, or liability for goods and materials which have reached their end-of-life.*

Analysis of replacement cost profit (loss) before interest and tax and reconciliation to profit (loss) for the period

Second quarter 2009	First quarter 2010	Second quarter 2010		First half 2010	First half 2009
			$ million		
5046	8292	**6244**	Exploration and production	**14536**	9366
680	729	**2075**	Refining and marketing	**2804**	1770
(583)	(328)	**(70)**	Other businesses and corporate	**(398)**	(1344)
-	-	**(32192)**	Gulf of Mexico oil spill response	**(32192)**	-
76	208	**98**	Consolidation adjustment	**306**	(329)
5219	8901	**(23845)**	RC profit (loss) before interest and tax	**(14944)**	(9463)
(321)	(228)	**(214)**	Finance costs and net finance income or expense relating to pensions and other retirement benefits	**(442)**	(689)
(1714)	(2966)	**7188**	Taxation on a replacement cost basis	**4222**	(3168)
(44)	(109)	**(102)**	Minority interest	**(211)**	(79)
3140	5598	**(16973)**	**Replacement cost profit (loss) attributable to BP shareholders**	**(11375)**	5527
1874	705	**(284)**	Inventory holding gains (loss)	**421**	2128
(629)	(224)	**107**	Taxation (charge) credit on inventory holding gains and losses	**(117)**	(708)
4385	6079	**(17150)**	**Profit (loss) for the period attributable to BP shareholders**	**(11071)**	6947

***Table 1.3**: The financial impact of the BP oil spill on BP's P&L in 2010, showing US$ 32,192 Billion accounted as exceptional expenses, though only US$2,9 Billions have actually been incurred as at June 30, 2010.*

Consolidated environmental expenses	2007	2006	2005
	M€		
Protection and treatment of soil and water	1123	786	457
Air quality and climate protection	1468	686	555
Wastewater management	18	461	29
Waste management	49	17	1346
Biodiversity and landscape protection	84	74	8
Other environmental protection activities	748	903	1758
Total by environmental media	**3490**	**2927**	**4153**
Pollution prevention	554	1507	1802
Assessment monitoring and control	1649	806	314
Pre-treatment, treatment and elimination	13	481	13
Recycling and associated activities	1274	133	2024
Total by type of activity	**3490**	**2927**	**4153**

***Table 1.4:** Consolidated environmental expenses from 2005 to 2007 by SECHE ENVIRONNEMENT.*

Economic value added statement for the year ended 31 December				
US Dollar million	%	2012	%	2011
Economic value generated				
Gold sales and by-product income	99%	6559	97%	6794
Interest received	1%	43	1%	52
Royalties received	0%	23	1%	79
Profit from sale of assets	0%	14	0%	-
Income from investments	0%	7	1%	75
Total economic value generated	100%	6646	100%	7000
Economic value distributed				
Operating costs	40%	2689	36%	2519
Emplyee salaries, wages and other benefits	23%	1559	21%	1459
Payments to providers of capital	7%	446	5%	327
- Finance costs and unwiding of obligations	4%	231	3%	196
- Dividends	3%	215	2%	131
Corporate taxation				
- Current taxation	6%	413	6%	407
Community and social investments	1%	19	0%	21
Loss from investments	1%	28	0%	-
Total economic value distributed	78%	5154	68%	4733
Economic value retained	22%	1492	32%	2267

Table 1.5: *Extract from AngloGold Ashanti (AGA)'s 2012 Sustainability Report showing the economic value added statement for 2012, including gold sales which can be argued to be derived from the one-off exploitation of a non-renewable provisioning ecosystem service – i.e. gold resources at the mining site, and to generate economic benefits for AGA (i.e. sales and by-product income of USD 6 559 M) and its stakeholders (i.e. USD 23M of royalties to governments and USD 1 559 M to employees).*

The aim of EFER is the disclosure of an organisation's environmental footprints and impacts, as well as its strategies, targets, action plans and performance in dealing with the later (Figure 1.1, Table 1.6). Accordingly, EFER involves reporting corporate performance with non-monetary Key Performance Indicators (KPI). The Global Reporting Initiative guidelines (G3.1[6] and G4[7]) act as a global industry standard for EFER, alongside the Carbon Disclosure Project[8] initiatives. According to ISO 14031, a standard which describes processes and methods for measuring environmental performance, three main types of environmental indicators may be used by firms to that end : indicators of business-induced environmental change (e.g. impact or pressure indicators), process-based indicators (e.g. degree of implementation of environmental management systems or action plans) and results-based indicators (e.g. eco-efficiency indicators[9]). In other words, accounting methods and tools for accounting for NC dependencies and impacts provide the information basis for EFER KPIs.

However, a key limitation of EFER is the lack consensus as regards to the NC KPI which must be disclosed by reporting organisations. For instance, there have been some concerns raised regarding the robustness and fitness for-purpose of the GRI guidelines regarding some of the environmental sustainability criteria (e.g. Moneva et al., 2006). Although the GRI has since gone a long way in trying to build a more credible sustainability reporting framework (i.e. new G4 guidelines published in 2013), including in terms of ecosystem services (Gilbert et al., 2011), this could still potentially be further enhanced. The development of a comprehensive business NC accounting framework, as advocated in section 1.1, would help provide the informational basis for stronger and more coherent NC reporting from an EFER perspective.

1.2.3. Disclosure of Environmental Externalities (DEE)

DEE has recently been strongly advocated by some stakeholders (consultancies, business associations and lobby groups) because both EFR and EFER fail to disclose the full economic dimensions of NC dependencies and impacts of the reporting entity, both for its own sustainability and that of its stakeholders. DEE involves disclosing the negative (and positive, if any) environmental externalities[10] of the reporting entity: e.g. environmental impacts in economic (monetary) terms.

The 1990 environmental report of BSO/Origin provides a good illustration of what may be done (Huizing and Dekker, 1992; Table 1.7). Quantitative environmental accounts (atmospheric emissions - CO_2, NO_x, SO_2, solid waste, waste water) were converted into monetary values via various economic valuation techniques (essentially benefit transfer). This allowed BSO/Origin to produce a relatively comprehensive sustainability profit & loss statement, representing the difference between conventional value-added and value-lost. Value-lost amounts to the costs of BSO/Origin externalities less its impact mitigation expenses.

More recently, PUMA (sports brand) released the 2010 "Environmental P&L" of its business and supply chains (Table 1.8), Novo Nordisk did the

[6] *URL : https://www.globalreporting.org/reporting/G3andG3-1/g3-guidelines/Pages/default.aspx*

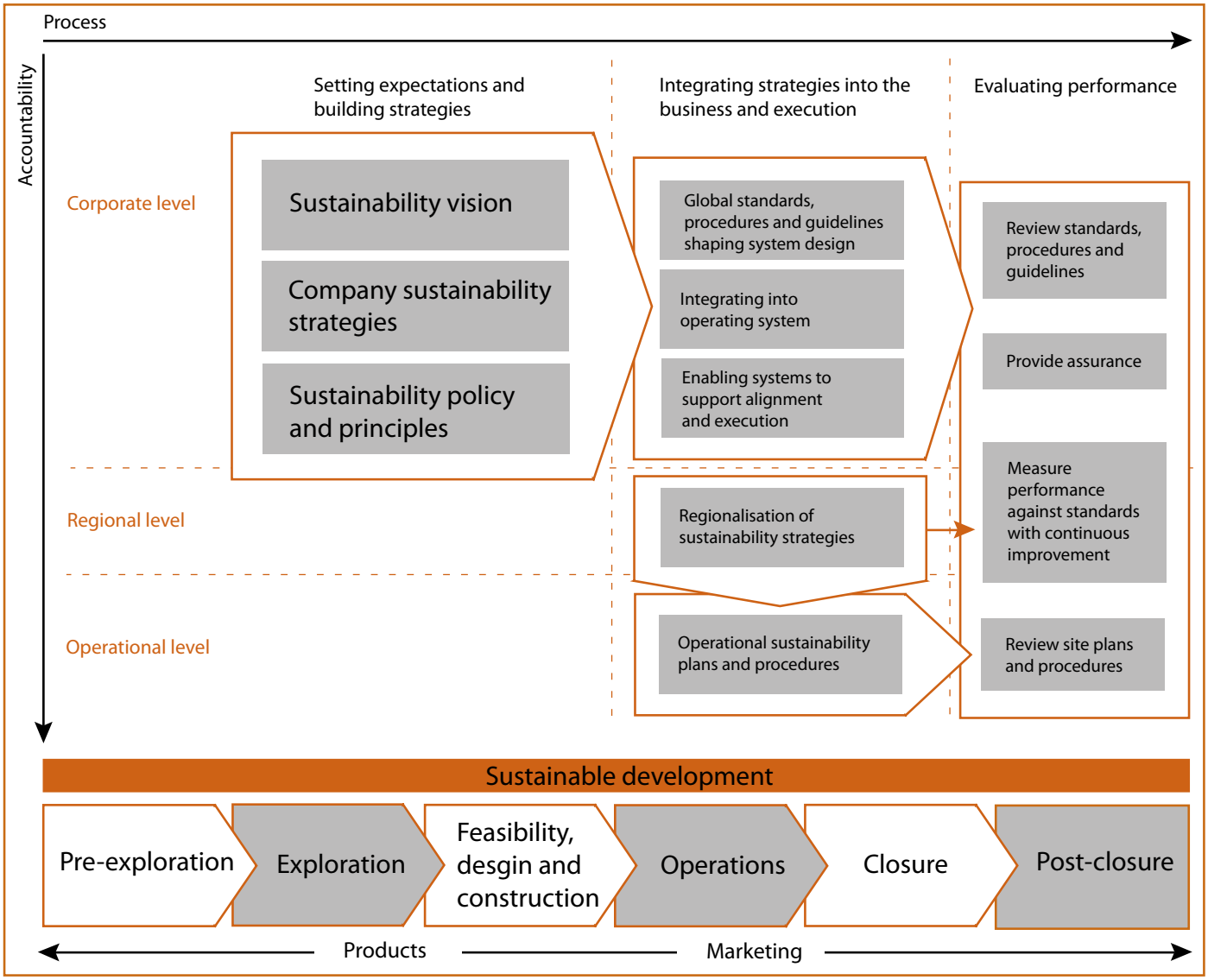
[7] *URL : https://www.globalreporting.org/reporting/g4/Pages/default.aspx*

[8] *URL : https://www.cdproject.net/en-US/Pages/HomePage.aspx*

[9] *The concept of eco-efficiency links monetary and physical EMA for decision making in a systematic manner. An eco-efficiency indicator relates 'product or service value', in terms of turnover or profit, to 'environmental influence' in terms of energy, materials and water consumption, as well as waste and emission in terms of volumes (Verfaillie and Bidwell, 2000).*

[10] *US$2.15 trillion of environmental damages to society were caused by the world's 3000 largest publicly-listed companies in 2008 (Mattison et al., 2011). These costs remain unpaid to this date, and thus directly and indirectly supported by impacted stakeholders (e.g. increase in health costs due to the degradation of air quality).*

Figure 1.1: *AngloGold Ashanti's sustainability framework (extract AGA's 2012 sustainability report).*



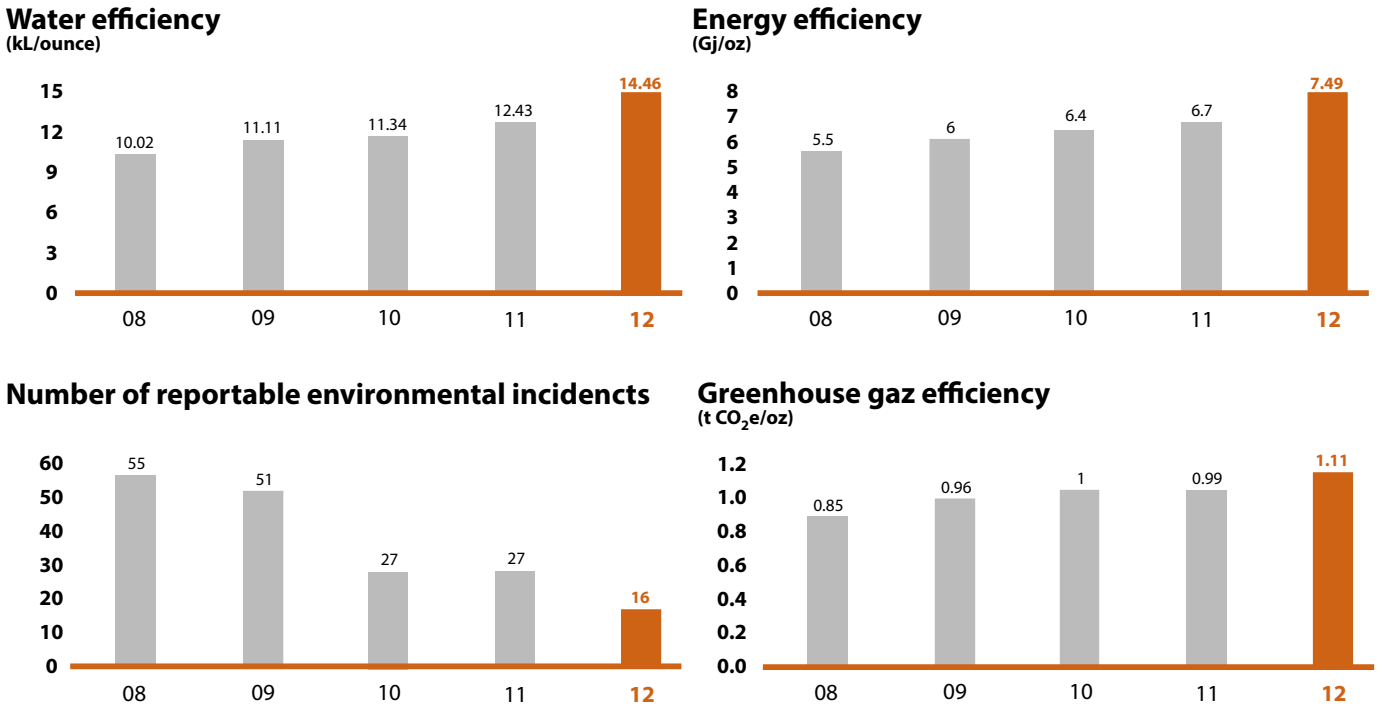


Table 1.6: *Examples of environmental KPI from AngloGold Ashanti's 2012 sustainability report, as per the GRI's guidelines.*

same for its 2011 activities (Danish Environmental Protection Agency 2014) while the Otto Group disclosed environmental externalities in its 2013 sustainability report[11]. The focus was on the monetary valuation of their combined carbon footprint, water use, land use change, waste generation and other air pollution[12], for the core company operations and their supply chains. Though the total negative externalities were quantified, the amounts were not deduced from PUMA / Novo Nordisk / Otto Group's conventional value-added and no comprehensive disclosure of impact mitigation expenses was made.

Although expressed in the reporting entity's monetary currency, disclosed negative externalities cannot satisfy the recognition criteria for recording expenses or liabilities. They represent sacrifices of future economic benefits to third parties the organisation is not required to make, by contract or by law. It must also be noted that there are uncertainties and limitations inherent to the use of monetary valuation tools for assessing negative and positive externalities (Braat and ten Brick, 2008; Chevassus-au-Louis et al., 2009; Farrell, 2007; Milne 1996; Nelson et al., 2009). This is a key reason why externality values would not be recognised under the rules of financial accounting: i.e. lack of precision in the amount to be paid or received so as to record, respectively, a liability or a receivable. Among these challenges and limitations, one can also mention (a) controversies with respect to the underlying assumptions of valuation techniques (e.g. discount rate, sample representativeness, neutrality of questions asked), (b) prohibitive costs of undertaking comprehensive

[11] *Though to a lesser extent and with much less details. See pp. 14 & 15 at URL: http://www.ottogroup.com/media/docs/en/Nachhaltigkeitsbericht/1_Current-edition--Otto-Group-CR-Report_ENG_2013.pdf*

[12] *These first results have revealed that the total negative externalities of PUMA's operations and supply chains are equivalent to €145 million. By putting a monetary value on the environmental impacts, PUMA is allegedly preparing for potential future legislation such as disclosure requirements. Though these costs will serve as a metric for the company when aiming to mitigate the footprint of PUMA's operations and all supply chain levels, they will not affect PUMA's net earnings because they correspond to amounts that the company does not have to pay, by law or contractual agreement (URL: http://about.puma.com/wp-content/themes/aboutPUMA_theme/financial-report/pdf/EPL080212final.pdf).*

Costs of environmental effects (thousands of guilders, Dfl.)	Emissions	Unit cost	Dfl.	Total
Water treatment waste production:				
Sludge	4 ton dry matter	500Dfl/ton dry matter	2	
Total waste				71
Grand Total				2209

Environmental expenditures (thousands of guilders, Dfl.)	Dfl.	Total
Fuel levies		
Natural gas (heating)	1	
LPG (cars)	18	
Power station fuel	8	
	27	
Water treatment and refuse collection charges		
sewerage charges and other environmental taxes	138	
Private-sector waste processors	51	
Total		216

Value lost (thousands of guilders, Dfl.)	
Cost of environmental effects	2209
Environmental expenditures	-216
Value lost	1993

Net value added (thousands of guilders, Dfl.)	
Value added	255614
Value lost	-1993
Net Value added	253621

Table 1.7: *Extract from BSO / Origin's sustainability P&L (Huizing and Dekker, 1992).*

The environmental profit and losss							
EUR Million	Water use	GHGs	Land use	Other air pollution	Waste	TOTAL	% of total
	33%	33%	25%	7%	2%	100%	
TOTAL	**47**	**47**	**37**	**11**	**3**	**145**	**100%**
PUMA operations	**<1**	**7**	**<1**	**1**	**<1**	**8**	**6%**
Tier 1	1	9	<1	1	2	13	9%
Tier 2	4	7	<1	2	1	14	9%
Tier 3	17	7	<1	3	<1	27	19%
Tier 4	25	17	37	4	<1	83	57%

Table 1.8: *Extract from Puma's initial sustainability P&L (year ended at December 31, 2010), focused on negative externality assessment of its operations and supply chains.*

assessments, (c) issues of scale and temporality for assigning impacts to company actions and (d) the impossibility of financially quantifying all the company's ecological effects. This latter is due to what O'Connor et al. (2001) call the monetisation frontier. This concept refers to the variation in the capacity to put monetary values on non-marketed ecosystem functions and services according to the importance or scale of the issue at stake and the type of values involved.

To date, reporting organisations have made use of the different approaches to very different extents:

- EFR has seen its implementation limited in scope (i.e. only for major penalties related to environmental law breaches) and extent (very limited number of companies);
- EFER's uptake has progressively increased in both scope (i.e. number of environmental KPI) and extent (GRI statistics[13]) over the past decade; while
- DEE has only a couple of publically available examples (BSO / Origin, PUMA, Novo Nordisk).

1.3. Natural Capital Reporting & Disclosure – What is missing?

Among the many limitations to current NC reporting practices, one can mention:

- The limited geographic, time and thematic scopes used for disclosure by reporting organisations.
- The lack of quality in environmental data disclosed (e.g. WWF Greece 2009): e.g. partial information or information available only at a global level[14]. This is partially because of the lack of globally agreed and mandatory third-party assurance standards for sustainability data disclosed. On the other hand, independent third-party assurance is mandatory for the financial statements produced by certain companies. Somehow the data quality and assurance gaps need to be bridged, especially from an integrated reporting perspective.
- The three approaches mentioned in section 1.2 have been designed and

[13] *Global Conference on Sustainability and Reporting - NGO Round Table – GRI Reporting Statistics ; Accessed on January 17, 2014 - URL: https://www.globalreporting.org/SiteCollectionDocuments/Global-CoEFERence-2013/slides/NGORTSlides.pdf*

[14] *This is often not relevant for understanding trends and performance at a meaningful scale: e.g. disclosing global water consumption is not sufficient to understand the impacts of water abstraction within a specific catchment.*

implemented independently: i.e. there is limited linkage between them, apart from the fact that DEE makes use of biophysical data which can also be used for EFER. Yet, to make informed decision about the corporate implications of a specific NC-related event (e.g. an oil spill), stakeholders would need a full picture of the situation which would entail knowing the nature, extent and gravity of the event in non-monetary quantitative terms (EFER approach), the associated tangible firm level expenses and liabilities (EFR approach) and estimated additional costs to stakeholders and to society at large so as to better understand whether the company's response is commensurate to the issue at stake (DEE approach) (Houdet & Germaneau, 2010; Houdet et al., 2011).

- None of the current NC reporting approaches is based on comprehensive accounting rules allowing for the monitoring over time and space of NC use and impacts and associated corporate performance. In financial reporting, a statement of financial performance provides a summarised "picture" of all revenues and expenses attributable to the company during a financial year while a statement of financial position provides a picture of the financial situation of the company on all financial accounting journal entries from business inception up to a specific date (i.e. financial reporting covers all past financial events of a company). In other words, there is no accounting framework and associated rules for developing:

  - Comprehensive Statements of NC performance: i.e. NC profit & loss statement, which corresponds to the annual net NC uses and / or impacts by the reporting organisation; and
  - Comprehensive Statements of NC position: i.e. NC balance sheet, which corresponds to the accumulated NC uses and impacts from the date of inception of the reporting organisation.

This discrepancy between financial and natural capital accounting and reporting is arguably the key barrier to producing meaningful and robust NC disclosure and accountability. Indeed, there is limited use in knowing that a company's trend in annual GHG emissions per unit of good sold over three years has decreased by 9% if no one knows the accumulated GHG emissions since the opening of the business or, at least, from the date GHG Footprint assessments have been carried out by the reporting organisation[15]. Similarly, the impact that this reduction may have on company performance can only be assessed if these data are linked with other data on the impact this has on global GHG concentrations and the impact that a rise or drop in GHG emissions is likely to have on the company's market position and income.

[15] *Can one imagine international negotiations as regards to the Kyoto Protocol without any historical country GHG emissions records but data only for the last couple of years?*

2. TOWARDS AN INTEGRATED FINANCIAL-NC ACCOUNTING & REPORTING FRAMEWORK

2.1. The emergence of Integrated Reporting – an opportunity for meaningful NC disclosure?

As argued in the introduction to this paper, recent IR guidelines (IIRC 2013; IRC of SA, 2011) support the information needs of long-term investors, by promoting the disclosure of the information that reflects how a corporation creates value. They provide the framework for disclosing the interactions between different forms of capital that contribute to the value creation process. Yet, to be meaningful to stakeholders, integrated reporting must be based and developed on accounting rules allowing for the connectivity of information (Houdet et al., 2011): So far, the International Integrated Reporting Framework is based on general reporting principles, not on any specific integrated accounting framework. The robustness of resulting reports is thus questionable, in particular when compared with current financial statements which satisfy comprehensive International Financial Reporting Standards (IFRS), International Public Sector Accounting Standards (IPSAS) or Generally Accepted Accounting principles (GAAP) applicable to different countries.

In order to produce reliable and robust NC disclosure to stakeholders, we argue that the three reporting approaches previously discussed (i.e. EFR, EFER and DDE) need to be fully integrated by reporting entities. Indeed, for stakeholders to understand the benefits and costs of a company's past, present and future NC endeavours (i.e. the way in which natural capital affects value creation), the reporting entity would need to disclose the following (Houdet et al., 2011):

- NC impacts and dependencies in non-monetary biophysical units (EFER approach);
- The financial impacts of its NC dependencies and impacts (EFR approach);
- The economic costs and benefits of its NC impacts and dependencies to stakeholders and to society at large (i.e. its externalities), and
- How and at what costs it is going to reach its future sustainability targets (as per IR guidelines), for instance in terms of expected reductions in NC impacts (quantitative non-monetary data), improved efficiency in using NC, reductions in negative externalities and / or increases in positive externalities.

This approach would allow reporting organisations to operationalise NC accounting and reporting from an integrated reporting perspective. However, as pointed out above, this would require the development of a reasonably well standardised integrated accounting framework designed to facilitate disclosure of both NC dependencies and impacts.

2.2. Theoretical foundations

A comprehensive Integrated Financial – NC Accounting & Reporting Framework should be based on the following principles:

- All NC impacts and dependencies of the company must be recorded, using the most widely accepted NC classification system (e.g. the Common International Classification for Ecosystem Services – CICES, Haines-Young & Potschin, 2013 ; the Final Ecosystem Goods and Services Classification System (FEGS-CS), Landers & Nahlik, 2013);
- Both NC impacts and dependencies must be recorded and reported, as is done in financial accounting: i.e. as a balance sheet represents a summary of all transactions made by the reporting organisation up to date. In the case of NC accounting, a NC balance sheet (i.e. NC Statement of Position) must summarise, annually, all NC

dependencies and impacts up to date (i.e. the accumulated net NC dependencies and impacts). A NC Profit & Loss Statement (i.e. NC Statement of Performance) would account annually for NC dependencies and impacts that occurred during the reporting year, as is done for financial statements of performance.

- NC impacts and dependencies must also be recorded and reported over space: i.e. NC accounting must distinguish between NC under the direct control of the company (Scope 1, see Houdet 2012) vs NC under indirect control (under influence), with respect either to ecosystems surrounding company assets and activities, which the company may impact or depend on (Scope 2, see Houdet 2012), or with respect to NC dependencies and impacts along the company's supply chains, including the use and end of life of its products and services (Scope 3, see Houdet 2012). This framework would differ from IFRS or GAAP in this respect, because the latter only provide for the financial accounting journal entries the reporting organisations is directly responsible for (e.g. no company accounts for the sales and expenses of its suppliers).
- As previously discussed, use of and exposure to impacts on NC cannot be expressed only in monetary terms. Furthermore, because ecosystem services are both location and use specific, the structure of data sets concerning NC can vary from geographical to monetary information. For instance, water consumption information for a company could include volumes of water used, from different catchments and different countries, with different purchasing costs and different negative water quality-related externalities accruing to several local stakeholder groups. Accordingly, an innovative way must be found to link financial data with non-financial data. As argued by Houdet et al. (2009), an opportunity lies in using the individual transactions recorded in financial accounting systems as the focal point to link such disparate data: i.e. associating geographic coordinates to a transaction (e.g. sale of a good) and its associated NC dependencies (e.g. origin and amount of raw materials) and impacts (e.g. spatial, water and GHG footprints). This is because such transactions are readily available and expected to be of high reliability due to independent third party assurance. This would bring the additional benefit of not having to quality financial journal entries as proposed by Ijiri & Lin (2006). In their double-entry framework, financial journal entries are classified as «goods» or «bads», depending on whether the impact is negative or positive from the organization's perspective, which can be highly subjective.

Although developing such information systems will take both time and money, the authors believe it would contribute to the way forward towards meaningful NC performance disclosure. Building a robust IT infrastructure, including GIS capabilities and new XBRL (eXtensible Business Reporting Language)[16] taxonomies should go in hand with the later[17]. Indeed, an IT infrastructure supportive of an Integrated Financial – NC Accounting & Reporting Framework would be a pre-requisite to successful integrated reporting.

Furthermore, we propose that developing an Integrated Financial – NC Accounting & Reporting Framework requires:

- Using the established principles and rules of standard financial accounting (i.e. International Financial Reporting

[16] *XBRL helps organize data, transport it and to reduce mapping. This will force new approaches in data validation and assurance (Ramin 2013).*

[17] *According to Chouinard et al. (2011), we have moved from sustainability 1.0 (accounting for the operational footprints, with emphasis on cost reductions) to sustainability 2.0 (mapping the impacts of business models/products/services, more strategic approach), and are now tackling sustainability 3.0, which involves imbedding sustainability into the DNA of day-to-day business operation.*

Standards - IFRS, Generally Accepted Accounting Principles - GAAP) for recording standard accounting journal entries.

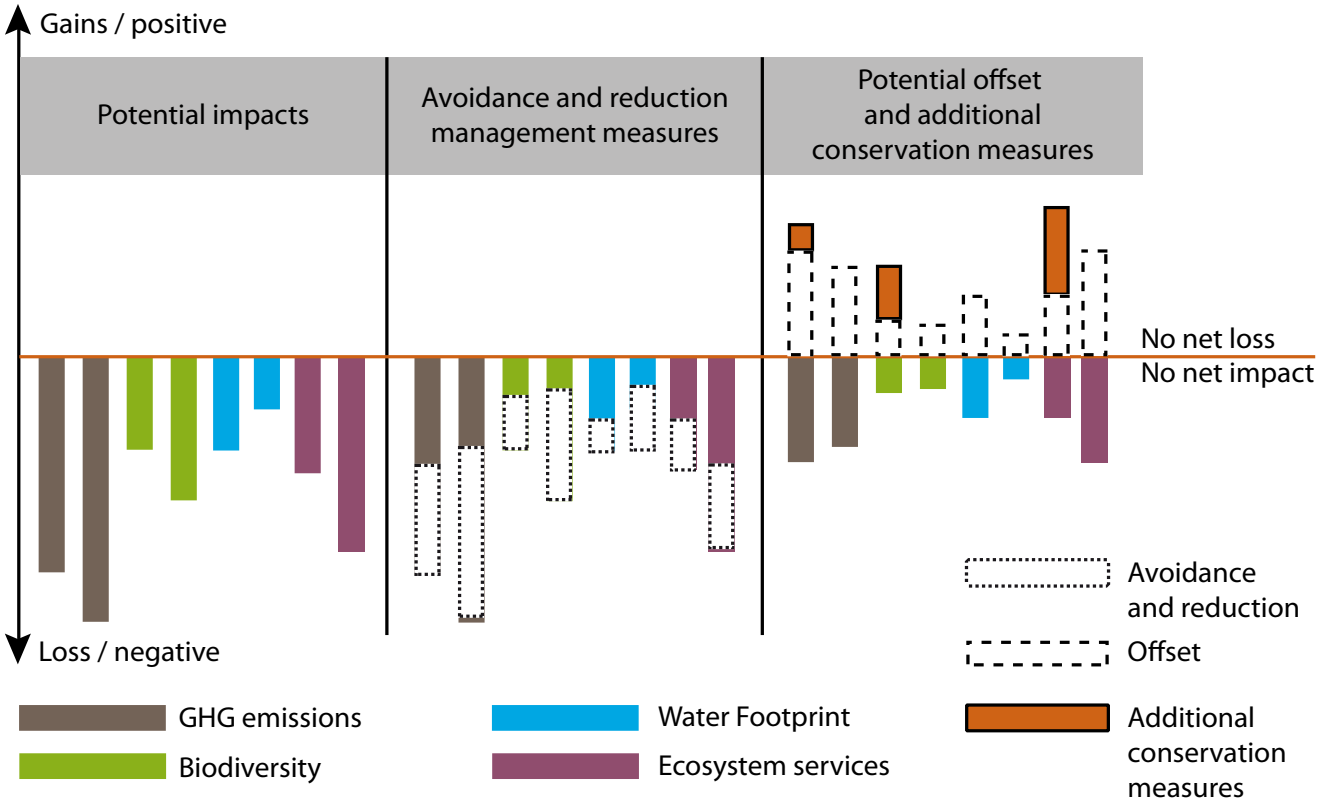
- Creating NC "mirror" accounts for each standard financial account used when recording financial accounting journal entries, so as to link financial and NC data related to the underlying transactions. In other words, NC "mirror" accounts correspond to NC accounts linked to specific financial accounts, which hence enable the simultaneous recording of financial accounting journal entries and the associated NC impacts and / or dependencies accounting entries. For instance, purchasing 10 fishes for €100 in cash would involve (a) debiting the "expenses" account by 100 and crediting Cash at bank by 100 (financial accounting journal entries) and (b) debiting the NC "expenses" account by 10 and crediting NC Cash at bank account by 10 (NC impacts and / or dependencies accounting entries).
- Developing accounting rules and double-entry based equations for a comprehensive set of plausible NC dependency and impact types, taking into account generally recognised specificities (e.g. renewable vs. non-renewable resources, spatially relevant data vs. data which can be expressed as aggregates). These standard equations must be able to account for both positive and negative NC events of the reporting organisation, so that annual and accumulated net NC dependencies and impacts can be calculated: i.e. annual Statements of NC Position and Performance. A no-net-loss NC accounting framework can provide the accounting foundations for this (see Figure 2.1) and would provide the accounting foundations for ACCA's proposal for "net positive natural capital ambitions" (ACCA 2014). Originally developed for calculating biodiversity offset measures, no-net-los accounting has been based in the principle of ecological equivalency between residual impacts and offset measures. More specifically:
  - Non-renewable provisioning ecosystem services (minerals, hydrocarbons) consumed or impacted during the financial year accumulate over time (increase in NC account) and hence financial years. Because they are exhaustible resources, one cannot record a journal entry to reduce annual consumption (i.e. no offset measure is possible).
  - Renewable provisioning ecosystem services (fish, wood, cereals) consumed or impacted during the financial year accumulate over time (increase in NC account) and hence financial years. Because they are renewable resources, one can record a journal entry to reduce annual net consumption by demonstrating that the reporting organisation has effectively replaced or contributed to the effective replacement of the resources consumed (e.g. consumption volumes minus volumes offset or net results of NC maintenance), ensuring proper recording of balances related to, e.g. protection of wild fish stocks, reproduction of farmed animals or the mix of forest products generated from planted vs non-planted natural forests.
  - For regulating and cultural[18] ecosystem services used or impacted, the situation can be more complex (apart from GHG emissions impacting on global climate regulation) as they often relate to specific locations and surfaces, ecological functions and processes which need to be assessed and monitored in terms of quality and quantity over time, for instance so as to demonstrate their sustainable use or management. However, here too, both positive and negative changes in quality and quantity could be recorded in the relevant NC account so as to generate annual and accumulated net balance information.

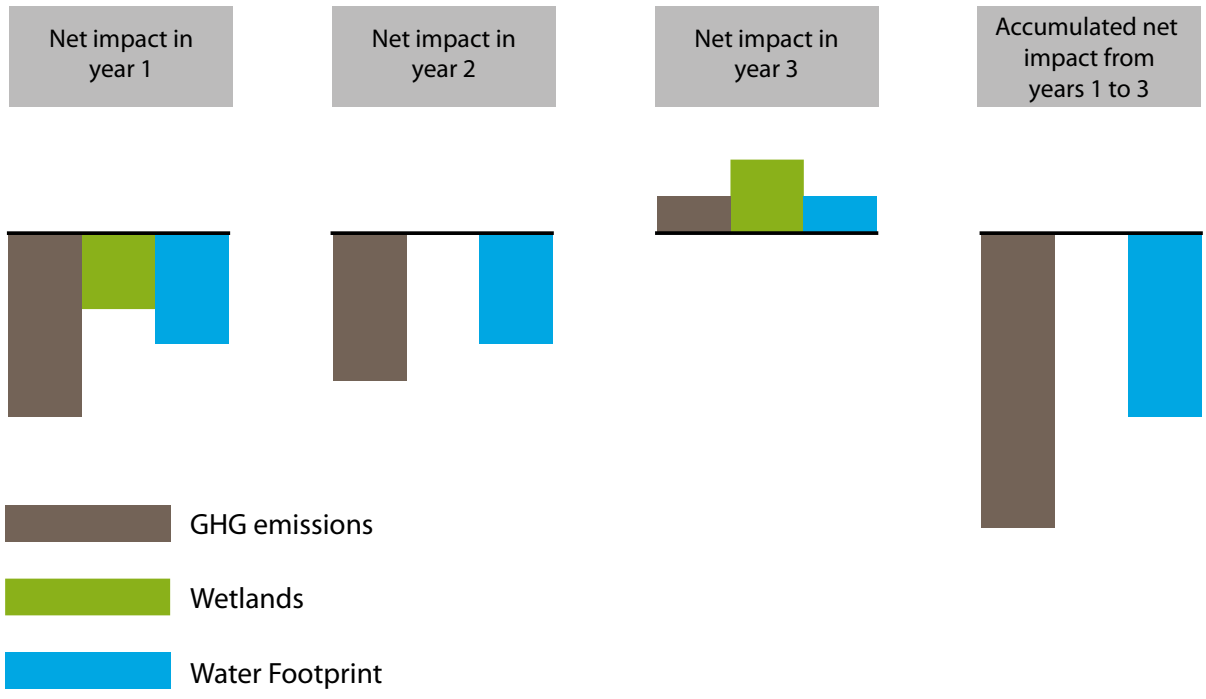
[18] *Finding appropriate metrics for cultural ecosystem services can be very difficult however.*

- Artificial surface areas (infrastructures, buildings, monocultures) result in persistent biodiversity and ecosystem services loss. The impacts of such areas, whether under the direct control of the reporting organisation or arising from its activities (e.g. through its supply chain and product end-of-life) accumulate over time (increase in NC account) and hence over financial years. To reduce its stock of such surface areas, the reporting organisation must demonstrate annually that its mandatory and / or voluntary offset measures continue to be in force: i.e. that they are, year on year, undertaken on the basis of ecological equivalency between what is lost and what is offset. From that perspective, there will be as many NC accounts as there are relevant biodiversity attributes impacted (e.g. population of protected species, habitats), depending on applicable national legislation and / or generally accepted offset standards (Quétier et Lavorel, 2011); hence enabling the company to work towards no-net-loss or even net positive impact for each type of biodiversity attribute, as per best practice (BBOP 2012). This effectively means that forest loss (100 ha) to the construction of an office block cannot be offset by the creation of a wetland (100 ha) somewhere else (notwithstanding the quality of what has been lost): i.e. only another forested area with comparable ecological attributes to the lost forest could be used for offset purposes. Nonetheless, ecologically-designed artificial green infrastructure (e.g. green roofs and walls) could potentially work as offset in urban landscapes.

Section 3 of this paper aims to apply these accounting principles and rules to a simple integrated accounting example involving a limited number of accounting events and NC dependencies and impacts over three years.

***Figure 1.2**: The no-net-loss / no-net-impact accounting principle applied to natural capital accounting and used as the basis for the development of NC Statement of Performance (over one reporting period) and Position (over time, for at least 1 reporting period) (adapted from Germaneau et al., 2012).*





3. MODELING THE PROPOSED FRAMEWORK

The following theoretical case study aims to provide practical guidelines for developing an Integrated Financial – NC Accounting Framework and Integrated Financial – NC Disclosure Models, based on French Generally Accepted Accounting Principles ("GAAP"). Though these would also apply to generate Integrated Cash Flow - NC Statements and the associated journal entries, the focus here has been on modelling Integrated Financial – NC Statements of Position and Performance.

To that end, we have selected a limited number of NC accounts for simplicity purposes (i.e. widely used indicators)[19], namely:

- Greenhouse Gas emissions expressed in T eq. CO_2;
- Blue and Grey Water Footprints[20] expressed in m^3;
- Wood consumption in m^3 for 1 species of pine;
- Habitat loss in Hectares (Ha) for 2 different wetland types.

Amounts were selected for illustration purposes (i.e. kept small) and do not reflect a true case study. For instance, NC dependencies and impacts would often occur at the level of the supply chain and at the end of life of products sold. In such cases, one could also classify NC journal entries according to their scope[21].

3.1. NC accounting equations and rules for selected impacts and dependencies

GHG accounts

- Increases in GHG emissions (T eq. CO_2) correspond to debits while GHG offsets correspond to credits.
- Statement of GHG Performance includes two types of journal entries: credits correspond to any increase in GHG emissions while debits correspond to any GHG emission offset (e.g. purchased of verified offset credits).
- The Statement of GHG Performance is finalised at the end of the financial year in the "Net GHG emissions" account which constitutes the accumulated (positive or negative) GHG emissions since the opening of the reporting organisations (i.e. Total of accumulated GHG emissions minus total of accumulated GHG offsets).
- This generates an overall equation for GHG "mirror" accounts that is different to the general financial accounting equation where *Assets = Owner's Equity + Liabilities* (i.e. Assets of the reporting entity are financed from capital, retained profits and / or liabilities): i.e. the net GHG emissions of all financial years since business inception is equal to sum of all GHG "mirror" asset and liability accounts since business inception, that is:

$Assets_{GHG} + Liabilities_{GHG} = Owner's\ Equity_{GHG} = net\ GHG\ emissions\ since\ T_0$

[19] *Ecosystem services for which no widely-used measurement units are available (e.g. cultural ecosystem services) have not been selected.*

[20] *The **water footprint** of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business.*

[21] *For instance, the GHG Protocol distinguishes three scopes, the first dealing with direct GHG emissions, the second with those related to the production of the electricity purchased and the third with all indirect emissions (e.g. supply chains, air travel).*

In other words, the "net GHG emissions" of the reporting organisation correspond to all GHG emissions that it is responsible for via its activities generating financial accounting journal entries. It can also be understood as the net GHG emissions generated by its assets and liabilities since business inception[22].

Blue and Grey Water Footprint (WF) accounts

- Increases in m^3 of WF correspond to debits while WF offsets correspond to credits.
- Statement of WF Performance includes two types of journal entries: credits correspond to any increase in WF while debits correspond to any appropriate WF offset (e.g. volumes of water made available in the catchment through alien tree removal or wetland restoration for Blue WF, wastewater treatment measures for Grey WF).
- The Statement of WF Performance is finalised at the end of the financial year in the "Net WF" accounts which constitute the accumulated (positive or negative) Blue and Grey Water Footprints since the opening of the reporting organisation (i.e. Total of accumulated Blue and Grey WF minus total of accumulated Blue and Grey Water Offsets).
- This generates an overall equation for WF "mirror" accounts that is different to the general financial accounting equation where *Assets = Owner's Equity + Liabilities*: i.e. the net WF of all financial years since business inception is equal to sum of all "mirror" WF asset and liability accounts since business inception, that is:

$Assets_{WF} + Liabilities_{WF} = Owner's\ Equity_{WF} = net\ Water\ Footprint\ since\ T_0$

In other words, the "net Blue and Grey WF" of the reporting organisation constitutes all the Blue and Grey WF that it is responsible for via its activities generating financial accounting journal entries, and hence the net WF attributable to its assets and liabilities since business inception.

Wood consumption accounts

- Increases in m^3 of wood correspond to debits while wood resource replacement corresponds to credits, for each species purchased or used.
- Statement of Wood Consumption Performance includes two types of journal entries: credits correspond to any increase in wood use while debits correspond to any appropriate offset (e.g. volumes of wood grown during the year).
- The Statement of Wood Consumption Performance is finalised at the end of the financial year in the "Net Wood Consumption" accounts which constitute the accumulated wood consumption since the opening of the reporting organisations (i.e. volumes of wood consumed per species minus volumes of wood offset).
- This generates an overall equation for Wood Consumption "mirror" accounts that is different to the general financial accounting equation where *Assets = Owner's Equity + Liabilities*: i.e. the net Wood Consumption of all financial years since business inception is equal to sum of all "mirror" Wood Consumption (WC) asset and liability accounts since business inception, that is:

$Assets_{WC} + Liabilities_{WC} = Owner's\ Equity_{WC} = net\ Wood\ Consumption\ since\ T_0$

[22] *For practical reasons, this can be applicable from the time the company has started NC accounting.*

In other words, the "net Wood Consumption" of the reporting organisation constitutes all the Wood Consumption that it is responsible for via its activities generating financial accounting journal entries, and hence the net WC due to its assets and liabilities since business inception.

Habitat accounts

- Increases in habitat loss in hectares (ha) correspond to debits while habitat gains correspond to credits, for each type of habitat.
- Statement of Habitat Performance includes two types of journal entries: credits correspond to any increase in habitat loss while debits correspond to any appropriate habitat offset (e.g. avoided loss, restoration and / or creation of a wetland).
- Accounting for habitat quality as per relevant habitat quality assessment standards or guidelines (e.g. Macfarlane et al., 2013) will be useful towards taking into account the quality of habitat lost and / or gained towards ensuring ecological equity. For simplicity purposes, the unit used here is 'hectare equivalent' (ha eq.).
- The Statement of Habitat Performance is finalised at the end of the financial year in the "Net Habitat" accounts which constitute the accumulated habitat gains or losses since the opening of the reporting organisations (e.g. hectares of wetland lost per wetland type minus hectares of wetland offsets per wetland type).
- This generates an overall equation for Habitat "mirror" accounts that is different to the general financial accounting equation where *Assets = Owner's Equity + Liabilities*: i.e. the net habitat loss / gain of all financial years since business inception is equal to sum of all "mirror" habitat loss / gain asset and liability accounts since business inception, that is:

$$\textbf{Assets}_{\textbf{Hab}} + \textbf{Liabilities}_{\textbf{Hab}} = \textbf{Owner's Equity}_{\textbf{Hab}} = \textbf{net habitat gain or loss since } T_0$$

In other words, the "net Habitat gain or loss" of the reporting organisation constitutes all the habitat losses or gains that it is responsible for via its activities generating financial accounting journal entries, and hence the net habitat loss or gain due to its assets and liabilities since business inception.

3.2. Financing phase

Company A is created on March 1st, 2013. It receives €10000 from its shareholders and obtains a loan of €7200 (Table 3.1).

	€		€
Bank	17200.00	Liabilities	7200.00
		Owner's Equity (OE)	10000.00
		Reserve (P/L)	
Total Assets	**17200.00**	**Total Liabilities / OE**	**17200.00**

Table 3.1: *Financial Statement of Position at March 1st, 2013.*

3.3. Investment phase

On March 2nd, after the financing operations, Company A buys land (debit €5000) and equipment (debit 4 800 €) in cash (credit Bank €9800). 50 T eq. CO_2 have been emitted by the supplier of equipment to construct the latter (scope 3, as per GHG Footprint Standard). Accordingly, we debit the "Equipment GHG" mirror account by 50 and credit the "Bank GHG" mirror account by 50 as well. This increases the Statement of GHG Performance account by 50.

Between March 3rd and 10, Company A pays in cash contractors (debit expenses €5000, credit bank €5000) to clear the land and build its factory and associated infrastructures. We assume that 20 T eq. CO_2 have been emitted by land clearing (scope 1) and 80 by the construction works (scope 3). Accordingly, we debit the "Factory GHG" mirror account by 100 and credit the "Bank GHG" mirror account by 100 as well. This increases the Statement of GHG Performance account by 100 (Tables 3.2).

In addition, 2 different types of habitats were cleared, 5 ha of type A and 10 ha of type B. While A is protected by law (i.e. a wetland), type B is not (e.g. a meadow), so that offset measures are only mandatory for wetland type A. We assume that both habitat types had medium levels of ecological condition due to past uses and impacts so that, effectively, only 2.5 ha eq. of type A (wetland) and 5 ha eq. of type B (meadow) were lost due to land clearance and factory construction. Accordingly, we debit the "Land Habitat" mirror account by 2.5 and 5 respectively for each habitat type and credit the "Bank GHG" mirror account by 2.5 and 5 for each habitat type as well (Tables 3.2).

Net GHG emissions account - 10.3.2013

Bank GHG	50.00
Bank GHG	20.00
Bank GHG	80.00
TOTAL	**150.00**

Net Habitat Gain / Loss account - 10.3.2013

Bank - Type A Wetland	2.50
Bank - Type B Meadow	5.00
TOTAL	**7.50**

Table 3.2.1: *Net GHG emissions & Habitat Gain/ Loss accounts - 10.3.2013.*

	€	T eq CO_2	Habitat (Ha)			€	T eq CO_2	Habitat (Ha)	
			Type A	Type B				Type A	Type B
Current assets									
Bank	2400.00				Liabilities	7200.00			
Property, plant & equipment									
Land	5000.00	20.00	2.50	5.00	Owner's Equity (OE)	10000.00			
Equipment	4800.00	50.00			Reserve (P/L)				
Factory	5000.00	80.00					150.00		
								2.50	5.00
Total Assets	**17200.00**	**150.00**	**2.50**	**5.00**	**Total Liabilities / OE**	**17200.00**	**150.00**	**2.50**	**5.00**

***Table 3.2.2**: Integrated Financial - NC Statement of Position at March 10, 2013.*

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Equipment GHG		50.00	
	Bank GHG		50.00
Emissions due to the production fo equipment			
Factory GHG		80.00	
Land GHG		20.00	
	Bank GHG		100.00
Emissions due to the clearing of land and construction of factory			

Journal entries - Habitat "mirror" accounts

Debit	Credit	Ha	Ha
Land - Type A Wetland		2.50	
Land - Type B Meadow		5.00	
	Bank - Type A Wetland		2.50
	Bank - Type B Meadow		5.00

***Table 3.2.3**: Journal Entries - 10.3.2013.*

Current assets		Liabilities	7200.00
Bank	2400.00		
Property, plant & equipment		Owner's Equity (OE)	10000.00
Land	5000.00	Reserve (P/L)	
Equipment	4800.00		
Factory	5000.00		
Total Assets	**17200.00**	**Total Liabilities / OE**	**17200.00**

***Table 3.2.4**: Financial Statement of Position at March 10, 2013.*

3.4. Supply phase

On March 12, Company A buys cash €220 of raw materials (500 m^3 of pine wood) which the accountant considers as consumed straight away (debit expenses, credit bank). To produce such materials, 5 T eq. CO_2 have been emitted and 500 m^3 of Blue Water Footprint and 20 m^3 of Grey Water Footprint were used. This generates the following journal entries and integrated Financial – NC Statement of Position (Tables 3.3).

As per the general GHG "mirror" accounts equation explained in 2.3.1, net GHG emissions (155 T eq. CO_2) are equal to the GHG emissions of Asset (150 T eq. CO_2), Liability (0 T eq. CO_2) and Owner's Equity GHG accounts (5 T eq. CO_2). Similarly, as per the general WF "mirror" accounts equation explained in 2.3.1, net Blue WF (500m^3) and Grey WF (200m^3) are equal to the WF of Asset (0m^3 of pine wood), Liability (0m^3 of pine wood) and Owner's Equity WF accounts (500m^3 of Blue WF + 200m^3 of Grey WF in reserve / P&L accounts). Finally, as per the general Wood Consumption "mirror" accounts equation explained in 2.3.1, net Pine Wood use (500m^3) are equal to the Pine Wood recorded for Asset, Liability and Owner's Equity (500m^3 of pine wood as raw materials expenses) Pine Wood accounts. This allows the Integrated Financial – NC statement of Position to show GHG emissions, WF and Pine Wood consumptions for total assets and total liabilities / OE that are equal (Table 3.3.3).

Net GHG emissions account - 12.3.2013		
	Bank GHG	50.00
	Bank GHG	20.00
	Bank GHG	80.00
	Bank GHG	5.00
	TOTAL	**155.00**

Net Pine Wood account - 12.3.2013		
	Bank - Wood Res.	500.00
	TOTAL	**500.00**

Net Water Footprint account - 12.3.2013		
	Bank - Blue WF	500.00
	Bank - Grey WF	20.00
	TOTAL	**520.00**

***Table 3.3.1**: Net GHG emissions, Pine Wood and Water Footprint accounts - 12.3.2013.*

Journal entries - GHG "mirror" accounts

Debit	**Credit**	**T eq.**	**T eq.**
Raw materials expenses - GHG		5.00	
	Bank GHG		5.00
Emissions due to the production of raw materials			

Journal entries - Wood Resources «mirror» accounts

Debit	**Credit**	**m^3**	**m^3**
Raw materials expenses - Wood Res.		500.00	
	Bank- Wood Res.		500.00
Wood resources consumed (pine wood)			

Journal entries - Water Footprints «mirror» accounts

Debit	**Credit**	**m^3**	**m^3**
Raw material expenses - Blue WF		500.00	
Raw material expenses - Grey WF		20.00	
	Bank - Blue WF		500.00
	Bank - Grey WF		20.00
WF due to the production of raw materails (pine wood)			

***Table 3.3.2**: Journal Entries - 12.3.2013.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities	7200.00						
Bank	2180.00														
Property, plant & equipment															
Land	5000.00	20.00	2.50	5.00				Owner's Equity (OE)	10000.00						
Equipment	4800.00	50.00						Reserve (P/L)	-220.00	5.00 (B)			500.00 (J)	500.00 (D)	20.00 (F)
Factory	5000.00	80.00						Net GHG emissions		155.00 (A)					
								Habitat Loss / Gain			2.50	5.00			
								Net WF						500.00 (C)	20.00 (E)
								Net Wood Consumption					500.00 (I)		
Total Assets	**16980.00**	**150.00**	**2.50**	**5.00**	**0.00**	**0.00**	**0.00**	**Total Liabilities / OE**	**16980.00**	**150.00 (A-B)**	**2.50**	**5.00**	**0.00 (I-J)**	**0.00 (C-D)**	**0.00 (E-F)**

***Table 3.3.3**: Integrated Financial - NC Statement of Position at March 12, 2013.*

3.5. Production phase

During the next few weeks up to the end of June, Company A pays €60 in cash for services (debit service expenses, credit bank) and recruits employees which it will pay €620 (debit salary expenses, credit salaries payable) later during the year (for simplicity purposes).

4 T eq. CO_2 are emitted by the service provided in the course of its work (scope 3) and 6 T eq. CO_2 are emitted by employees travelling from home to work and vice versa (scope 3). These events generate the following journal entries and integrated Financial – NC Statement of Position (Tables 3.4).

Net GHG emissions account - 30.6.2013

	Bank GHG	50.00
	Bank GHG	20.00
	Bank GHG	80.00
	Bank GHG	5.00
	Bank GHG	4.00
	Salaries payable GHG	6.00
	TOTAL	**165.00**

***Table 3.4.1**: Net GHG emissions account - 30.6.2013.*

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Service expenses - GHG		4.00	
	Bank GHG		4.00
Emissions due to work by service provider			
Wages expenses - GHG		6.00	
	Salaries payable GHG		6.00
Emissions due to employees commuting from home to work			

***Table 3.4.2**: Journal Entries - 30.6.2013.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities	7200.00						
Bank	2120.00							Salaries payable	620.00	6.00 (B)					
Property, plant & equipment															
Land	5000.00	20.00	2.50	5.00				Owner's Equity (OE)	10000.00						
Equipment	4800.00	50.00						Reserve (P/L)	-900.00	9.00 (B)			500.00 (J)	500.00 (D)	200.00 (F)
Factory	5000.00	80.00						Net GHG emissions		165.00 (A)					
								Habitat Loss / Gain			2.50	5.00			
								Net WF						500.00 (C)	200.00 (E)
								Net Wood Consumption					500.00 (I)		
Total Assets	**16920.00**	**150.00**	**2.50**	**5.00**	**0.00**	**0.00**	**0.00**	**Total Liabilities / OE**	**16920.00**	**150.00 (A-B)**	**2.50**	**5.00**	**0.00 (I-J)**	**0.00 (C-D)**	**0.00 (E-F)**

***Table 3.4.3**: Integrated Financial - NC Statement of Position at June 30, 2013.*

3.6. Selling phase

From July 2013 to end of January 2014, Company A sells €1800 of products (debit account receivables, credit sales) and owes €200 to its water utility (debit water expenses, credit accounts payable) and €150 to its electricity supplier (debit electricity expenses, credit accounts payable). Producing these products resulted in 70 T eq. CO_2 of scope 1 emissions, 50 T eq. CO_2 of scope 2 emissions (electricity), 30 T eq. CO_2 of scope 3 emissions (water supply), 250 m^3 of Blue WF and 1500 m^3 of Grey WF. This results in the following journal entries and integrated Financial – NC Statement of Position (Tables 3.5).

Net GHG emissions account - 31.1.2014		
	Bank GHG	50.00
	Bank GHG	20.00
	Bank GHG	80.00
	Bank GHG	5.00
	Bank GHG	4.00
	Salaries payable GHG	6.00
	Sales GHG	70.00
	Electricity expenses GHG	50.00
	Water expenses GHG	30.00
	TOTAL	**315.00**

Net Water Footprint account - 31.1.2014		
	Bank - Blue WF	500.00
	Bank - Grey WF	20.00
	Sales - Blue WF	250.00
	Sales - Grey WF	1500.00
	TOTAL	**2270.00**

***Table 3.5.1**: Net GHG emissions & Water Footprint account - 31.1.2014.*

Journal entries - GHG "mirror" accounts

Debit	**Credit**	**T eq.**	**T eq.**
Accounts receivable - GHG		70.00	
	Sales GHG		70.00
Emissions due to production of goods sold (scope 1)			
Electricity expenses - GHG		50.00	
	Accounts payable GHG		50.00
Emissions due to electricity purchased (scope 2)			
Water expenses - GHG		30.00	
	Accounts payable GHG		30.00
Emissions due to water purchased (scope 3)			

Journal entries - Water Footprints «mirror» accounts

Debit	**Credit**	**m^3**	**m^3**
Accounts receivable - Blue WF		250.00	
Accounts receivable - Grey WF		1500.00	
	Sales - Blue WF		250.00
	Sales - Grey WF		1500.00
WF due to the production of good sold			

***Table 3.5.2**: Journal Entries - 31.1.2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities	7200.00						
Bank	2120.00							Salaries payable	620.00	6.00 (B)					
Accounts receivable	1800.00	70.00				250.00	1500.00	Accounts payable	350.00	80.00 (B)					
Property, plant & equipment															
Land	5000.00	20.00	2.50	5.00				Owner's Equity (OE)	10000.00						
Equipment	4800.00	50.00						Reserve (P/L)	550.00	9.00 (B)			500.00 (J)	500.00 (D)	200.00 (F)
Factory	5000.00	80.00						Net GHG emissions		315.00 (A)					
								Habitat Loss / Gain			2.50	5.00			
								Net WF						750.00 (C)	1700.00 (E)
								Net Wood Consumption					500.00 (I)		
Total Assets	**18720.00**	**220.00**	**2.50**	**5.00**	**0.00**	**250.00**	**1500.00**	**Total Liabilities / OE**	**18720.00**	**220.00 (A-B)**	**2.50**	**5.00**	**0.00 (I-J)**	**250.00 (C-D)**	**1500.00 (E-F)**

***Table 3.5.3**: Integrated Financial - NC Statement of Position at February 1st, 2014.*

3.7. Transport phase

On February 1st, 2014, Company A contracts the service of a transport company (truck) to deliver its products to its clients for €40; which it will pay later (debit transport expenses, credit accounts payable). This truck transport service is expected to emit 50 T eq. CO_2 of scope 3 emissions. The resulting journal entries and integrated Financial – NC Statement of Position as at February 1st are as follows (Tables 3.6).

Net GHG emissions account - 01.2.2014

	Bank GHG	50.00
	Bank GHG	20.00
	Bank GHG	80.00
	Bank GHG	5.00
	Bank GHG	4.00
	Salaries payable GHG	6.00
	Sales GHG	70.00
	Electricity expenses GHG	50.00
	Water expenses GHG	30.00
	Transport expenses GHG	50.00
	TOTAL	**365.00**

***Table 3.6.1**: Net GHG emissions account - 01.2.2014.*

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Transport expenses - GHG		50.00	
	Accounts payable GHG		50.00
Emissions due to transport services (scope 3)			

***Table 3.6.2**: Journal Entries - 01.2.2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities	7200.00						
Bank	2120.00							Salaries payable	620.00	6.00 (B)					
Accounts receivable	1800.00	70.00				250.00	1500.00	Accounts payable	390.00	130.00 (B)					
Property, plant & equipment															
Land	5000.00	20.00	2.50	5.00				Owner's Equity (OE)	10000.00						
Equipment	4800.00	50.00						Reserve (P/L)	510.00	9.00 (B)			500.00 (J)	500.00 (D)	200.00 (F)
Factory	5000.00	80.00						Net GHG emissions		365.00 (A)					
								Habitat Loss / Gain			2.50	5.00			
								Net WF						750.00 (C)	1700.00 (E)
								Net Wood Consumption					500.00 (I)		
Total Assets	**18720.00**	**220.00**	**2.50**	**5.00**	**0.00**	**250.00**	**1500.00**	Total Liabilities / OE	**18720.00**	**220.00 (A-B)**	**2.50**	**5.00**	**0.00 (I-J)**	**250.00 (C-D)**	**1500.00 (E-F)**

***Table 3.6.3**: Integrated Financial - NC Statement of Position at February 1st, 2014.*

3.8. Receivable and liability payments phase

On February 2nd, 2014, Company A:

- Receives payments of €1800 (debit bank, credit accounts receivable);
- Pays €620 to its employees (debit salaries payable, credit bank);
- Pays €390 to its supplies (debit accounts payable, credit bank);
- Repays €200 of its loan's principal balance (debit liabilities loan, credit bank), and pays €200 of interest (debit interest expenses, credit bank) which it pays on the date

No NC impact or use occurs at this stage. However, transfers must be made to various "mirror" accounts as follows (Tables 3.7).

Net GHG emissions account - 2.2.2014

	Bank GHG	50.00
	Bank GHG	20.00
	Bank GHG	80.00
	Bank GHG	5.00
	Bank GHG	4.00
	Bank GHG	6.00
	Bank GHG	70.00
	Bank GHG	50.00
	Bank GHG	30.00
	Bank GHG	50.00
	TOTAL	**365.00**

***Table 3.7.1**: Net GHG emissions account - 2.2.2014.*

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Salaries payable GHG		6.00	
	Bank GHG		6.00
Emissions due to employees commuting from home to work			
Bank GHG		70.00	
	Accounts receivable - GHG		70.00
Emissions due to production of goods sold (scope 1)			
Accounts payable GHG		50.00	
	Bank GHG		50.00
Emissions due to electricity purchased (scope 2)			
Accounts payable GHG		30.00	
	Bank GHG		30.00
Emissions due to water purchased (scope 3)			
Accounts payable GHG		50.00	
	Bank GHG		50.00
Emissions due to transport services (scope 3)			

***Table 3.7.2**: Journal Entries - 2.2.2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities	7200.00						
Bank	2510.00							Salaries payable							
Accounts receivable								Accounts payable							
Property, plant & equipment															
Land	5000.00	20.00	2.50	5.00				Owner's Equity (OE)	10000.00						
Equipment	4800.00	50.00						Reserve (P/L)	310.00	215.00 (B)			500.00 (J)	750.00 (D)	1700.00 (F)
Factory	5000.00	80.00						Net GHG emissions		365.00 (A)					
								Habitat Loss / Gain			2.50	5.00			
								Net WF						750.00 (C)	1700.00 (E)
								Net Wood Consumption					500.00 (I)		
Total Assets	**17310.00**	**150.00**	**2.50**	**5.00**	**0.00**	**0.00**	**0.00**	**Total Liabilities / OE**	**17310.00**	**150.00 (A-B)**	**2.50**	**5.00**	**0.00 (I-J)**	**0.00 (C-D)**	**0.00 (E-F)**

***Table 3.7.3**: Integrated Financial - NC Statement of Position at February 2nd, 2014.*

3.9. Depreciation phase

On February 10, 2014, Company A calculates the depreciation of its equipment and factory over 10 years at an annual rate of 10%: i.e. €480 for equipment (debit depreciation expenses, credit equipment) and €500 for the factory (debit depreciation expenses, credit equipment). Nothing else happens at this stage as the associated GHG emissions cannot be depreciated (their life-span runs for decades / hundreds of years) (Table 3.8).

Current assets		Liabilities - Loan	7000.00
Bank	2510.00	Salaries payable	
Accounts receivable		Accounts payable	
Property, plant & equipment		Owner's Equity (OE)	10000.00
Land	5000.00	Reserve (P/L)	-670.00
Equipment	4320.00		
Factory	4500.00		
Total Assets	**16330.00**	**Total Liabilities / OE**	**16330.00**

***Table 3.8**: Financial Statement of Position at February 10, 2014.*

3.10. Stock-taking & profit and loss calculation phase

On February 28, 2014, Company A first calculates the variation in raw materials by:

- Eliminating the initial stock (0 in this case) by debiting raw material expenses and crediting raw material stocks.
- Adding the final stock to the Statement of Financial Position (€100), by debiting raw material stocks and crediting raw materials stock variance.

Then, it calculates the variation in finished products by:

- Eliminating the initial stock (0 in this case) by debiting sales and crediting finished products stock.
- Adding the final stock to the Statement of Financial Position (€600), by debiting finished products stock and crediting finished products.

This effectively means that:

- About 227 m^3 of pine wood is remaining in the stock while the remainder is contained in products (204 m^3 sold or 68.18 m^3 stocked).
- Stocked raw materials are responsible 2.27 T eq. CO_2 of scope 3 emissions, 227.27 m^3 of Blue WF and 9.09 m^3 of Grey WF;
- Stocked finished goods are responsible 17.50 T eq. CO_2 of scope 1 emissions, 62.50 m^3 of Blue WF and 375 m^3 of Grey WF.

The company can then finalise its Statement of Financial Position, with a profit before tax of €30 and a net profit after tax of €20.001 (33.33% tax rate in France) which it will pay next year. It thus debits tax expenses and credits accounts payable.

To conclude, company A did not pay for any offset measure during the year. Mandatory wetland offset for which negotiations are ongoing as at year end (i.e. no proof of wetland offset secured).
These events generate the following journal entries and Integrated Financial – NC Statement of Position (Tables 3.9).

Current assets		Liabilities - Loan	7000.00
Bank	2510.00	Salaries payable	0.00
Raw materials	100.00	Accounts payable	9.999
Finished products	600.00		
Property, plant & equipment		Owner's Equity (OE)	10000.00
Land	5000.00	Reserve (P/L)	20.001
Equipment	4320.00		
Factory	4500.00		
Total Assets	**17030.00**	**Total Liabilities / OE**	**17030.00**

***Table 3.9.1**: Financial Statement of Position at February 28, 2014.*

Sales		1800.00
Finished goods stocked (600 - 0)		600.00
Raw materials expenses	220.00	
stock variation - raw materials (100 - 0)		100.00
Wages	620.00	
Production expenses	450.00	
Depreciation expenses	980.00	
Interest expenses	200.00	
Profit before tax	30.00	
Tax on profit (33.33%)	9.999	
Net result	20.001	

***Table 3.9.2**: Statement of Financial Performance at February 28, 2014.*

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Raw materials (stock) GHG		2.27	
	Raw materials (P&L) GHG		2.27
Emissions attributable to stocks of raw materials (scope 3)			
Finished products (stock) GHG		17.50	
	Finished products (P/L) GHG		17.50
Emissions attributable to stocks of finished goods (scope 1)			

Journal entries - Water Footprints "mirror" accounts

Debit	Credit	m³	m³
Raw materials (stock) - Blue WF		227.27	
Raw materials (stock) - Grey GF		9.09	
Finished goods (stock) - Blue WF		62.50	
Finished goods (stock) - Grey WF		375.00	
	Raw materials (P&L) - Blue WF		227.27
	Raw materials (P&L) - Grey WF		9.09
	Finished goods (P&L) - Blue WF		62.50
	Finished goods (P&L) - Grey WF		375.00
WF due to stocks of finished goods			

Journal entries - Wood Resources "mirror" accounts

Debit	Credit	m³	m³
Raw materials (stock) - Wood Res.		227.27	
Finished doods (stock) - Wood Res.		68.25	
	Raw materials (P&L) - Wood Res.		227.27
	Finished doods (P&L) - Wood Res.		68.25
Pine wood contained in stocks of raw materials and finished goods at year end			

***Table 3.9.3**: Journal Entries - 28.2.2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities - Loan	7000.00						
Bank	2510.00							Salaries payable							
Raw materials	100.00	2.27			227.27	227.27	9.09	Accounts payable	9.999						
Finished products	600.00	17.50			68.18	62.50	375.00	Owner's Equity (OE)	10000.00						
Accounts receivable								Reserve (P/L)	20.001	195.23 (B)			204.55 (J)	460.23 (D)	1315.91 (F)
Property, plant & equipment								Net GHG emissions		365.00 (A)					
Land	5000.00	20.00	2.50	5.00				Habitat Loss / Gain			2.50	5.00			
Equipment	4320.00	50.00						Net WF						750.00 (C)	1700.00 (E)
Factory	4500.00	80.00						Net Wood Consumption					500.00 (I)		
Total Assets	**17030.00**	**169.77**	**2.50**	**5.00**	**295.45**	**289.77**	**384.09**	**Total Liabilities / OE**	**17030.00**	**169.77 (A-B)**	**2.50**	**5.00**	**295.45 (I-J)**	**289.77 (C-D)**	**384.09 (E-F)**

***Table 3.9.4**: Integrated Financial - NC Statement of Position at February 28, 2014.*

GHG emissions	Habitat loss / gain (ha)		Pine wood	Water Footprint (m^3)	
(T eq. CO_2)	Type A (wetland)	Type B (meadow)	(m^3)	Blue	Grey
365.00	2.5.00	5.00	500.00	750.00	1700.00

***Table 3.9.5**: Net Natural Capital result accounts at February 28, 2014.*

3.11. Accounting for NC offset measures

To account for NC offset measures, we choose to select key NC events occurring over the next 2 reporting cycles (up to February 29, 2016). No additional financial accounting events are recorded (*which is not realistic of course*) so as to simplify the modelling.

Accordingly, in year 2 (as at June 30, 2014):

- Company A secures 2 ha of mandatory wetland offsets, as well as 10 ha of voluntary meadow offsets. To do so, it purchased and secured another property of 15 ha for €1000 (debit land, credit accounts payable). The property comprises 2 ha of wetlands of similar quality to what had been cleared (5 ha in total, but with a quality value of 4 out of 10) and 10 ha of meadows of similar quality to what had been lost. As a result, the company has a net positive impact (5 ha secured) in terms of habitat type B (meadows). Annual or biennial audits would be required to verify the efficacy of offset measures.
- Company A further decides to restore the wetlands on its newly acquired property for €500 (debit expenses, credit accounts payable), with expected benefits, in year 3, to include additional wetland offsets (5 ha with a score of 8 out of 10), 300m^3 of additional Blue Water available per year (via alien tree clearing) and 500m^3 of Grey Water treated per year from the stream going through the property.
- It also builds a small biogas plant for €800 which is expected to save GHG emissions of about 50 T eq. CO_2 of verified carbon credits per year (debit equipment, credit accounts payable).
- Company A decides to plant trees in its property for €100 in cash so as to store carbon in soil and woody biomass (debit trees expense, credit bank). No carbon offset has been secured and verified in year 2 but it is expected that 100 T eq. CO_2 can be secured after 10 years.
- Its wood supplier confirmed that 90% of wood consumed last year (in volume) had been replaced by pine tree growth within its plantations, so that the net impact on wood resources is 10% of 500 m^3 of wood consumed in year 1 (up to February 28, 2014).
- This generates the following journal entries and Statements of Position (Tables 3.10).

Furthermore, in Year 3 (as at February 29, 2016):

- As expected, the wetland restoration measures resulted in additional wetland offsets (5 ha with a score of 8 out of 10), 300 m^3 of additional Blue Water available for year 3 (via alien tree clearing) and 500 m^3 of Grey Water treated during the year from the stream going through the property. As a result, Company A has generated net positive impacts (i.e. residual accumulated habitat gains) on both types of habitats (1.5 ha of additional wetland secured / restored and 5 ha of additional meadow secured), and reduced by its residual accumulated Blue and Grey Water Footprints to 450 m^3 and 1200 m^3 respectively.
- Company A found that only 40 T eq. CO_2 of verified carbon credits were offset in year 2 by its biogas plant while 48 T eq. CO_2 were offset in year 3, so that the residual net GHG emissions equal to 277 T eq. CO_2 at the end of year 3.
- No carbon was stored by the planted trees as yet.
- No further wood resources were purchased and the supplier did not replace the remaining net 50 m^3 of pine used by company A.

These events result in the following journal entries, NC Statements of Position and NC result accounts (N.B.: a negative number indicates a positive NC impact) (Tables 3.11).

Current assets		Liabilities - Loan	7000.00
Bank	2410.00	Salaries payable	0.00
Raw materials	100.00	Accounts payable	2309.99
Finished products	600.00		
Property, plant & equipment		Owner's Equity (OE)	10000.00
Land	6000.00	Reserve (P/L)	-579.99
Equipment	5120.00		
Factory	4500.00		
Total Assets	**16330.00**	**Total Liabilities / OE**	**16330.00**

***Table 3.10.1**: Financial Statement of Position at June 30, 2014.*

Journal entries - Habitat "mirror" accounts

Debit	Credit	Ha	Ha
Accounts payable - Type A Wetland		2.00	
Accounts payable - Type B Meadow		10.00	
	Land - Type A Wetland		2.00
	Land - Type B Meadow		10.00

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Accounts payable	GHG	50.00	
	Equipment GHG		50.00
	Emission credits due to biogas plant		

Journal entries - Wood Resources "mirror" accounts

Debit	Credit	m³	m³
Supplier Wood replacement		450.00	
	Raw materials (P&L) - Wood Res.		227.27
	Finished goods (P&L) - Wood Res.		68.18
	P&L - Wood resources		154.55
	Pine wood replaced by supplier through plantations		

***Table 3.10.2**: Journal Entries - 30.6.2014.*

Net Habitat Gain / Loss account - 30.6.2014

		Bank - Type A Wetland	2.50
		Bank - Type B Meadow	5.00
Accounts payable - Type A Wetland	2.00		
Accounts payable - Type B Meadow	10.00		
		TOTAL - Type A	**0.50**
		TOTAL - Type B	**-5.00**

Net GHG emissions account - 30.6.2014

		Bank GHG	50.00
		Bank GHG	20.00
		Bank GHG	80.00
		Bank GHG	2.73
		Bank GHG	4.00
		Bank GHG	6.00
		Bank GHG	52.50
		Bank GHG	50.00
		Bank GHG	30.00
		Bank GHG	50.00
		Raw materails stock GHG	2.27
		Finished goods stock GHG	17.50
Biogas plant GHG	50.00		
		TOTAL	**315.00**

Net Pine Wood account - 30.6.2014

		Bank - Wood Res.	500.00
Supplier Wood replacement	450.00		
		TOTAL	**50.00**

***Table 3.10.3**: Net Habitat Gain/Loss, GHG emissions & Pine Wood accounts - 30.6.2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities - Loan	7000.00						
Bank	2410.00							Salaries payable							
Raw materials	100.00	2.27				227.27	9.09	Accounts payable	2309.99						
Finished products	600.00	17.50				62.50	375.00	Owner's Equity (OE)	10000.00						
Accounts receivable								Reserve (P/L)	-570.99	195.23 (B)			50.00 (J)	460.23 (D)	1315.91 (F)
Property, plant & equipment								Net GHG emissions		315.00 (A)					
Land	6000.00	20.00	0.50	-5.00				Habitat Loss / Gain			0.50	-5.00			
Equipment	5120.00	0.00						Net WF						750.00 (C)	1700.00 (E)
Factory	4500.00	80.00						Net Wood Consumption					50.00 (I)		
Total Assets	**18730.00**	**119.77**	**0.50**	**-5.00**	**0.00**	**289.77**	**384.09**	**Total Liabilities / OE**	**18730.00**	**119.77 (A-B)**	**0.50**	**-5.00**	**0.00 (I-J)**	**289.77 (C-D)**	**384.09 (E-F)**

***Table 3.10.4**: Integrated Financial - NC Statement of Position at June 30, 2014.*

	€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)			€	T eq CO_2	Habitat (Ha)		Pine wood (m^3)	Water Footprint (m^3)	
			Type A	Type B		Blue	Grey				Type A	Type B		Blue	Grey
Current assets								Liabilities - Loan	7000.00						
Bank	2410.00							Salaries payable							
Raw materials	100.00	2.27				227.27	9.09	Accounts payable	2309.99						
Finished products	600.00	17.50				62.50	375.00	Owner's Equity (OE)	10000.00						
Accounts receivable								Reserve (P/L)	-570.99	195.23 (B)			50.00 (J)	460.23 (D)	1315.91 (F)
Property, plant & equipment								Net GHG emissions		277.00 (A)					
Land	6000.00	20.00	-1.50	-5.00		-300.00	-500.00	Habitat Loss / Gain			-1.50	-5.00			
Equipment	5120.00	-38.00						Net WF						450.00 (C)	1200.00 (E)
Factory	4500.00	80.00						Net Wood Consumption					50.00 (I)		
Total Assets	**18730.00**	**81.77**	**-1.50**	**-5.00**	**0.00**	**-10.23**	**-115.91**	**Total Liabilities / OE**	**18730.00**	**81.77 (A-B)**	**-1.50**	**-5.00**	**0.00 (I-J)**	**-10.23 (C-D)**	**-115.91 (E-F)**

***Table 3.11.1**: Integrated Financial - NC Statement of Position at February 29, 2016.*

GHG emissions	Habitat loss / gain (ha)		Pine wood	Water Footprint (m^3)	
(T eq. CO_2)	Type A (wetland)	Type B (meadow)	(m^3)	Blue	Grey
277.00	-1.50	-5.00	500.00	450.00	1200.00

***Table 3.11.2:** Net Natural Capital result accounts at February 29, 2016.*

Journal entries - Habitat "mirror" accounts

Debit	Credit	Ha	Ha
Accounts payable - Type A Wetland		2.00	
	Land - Type A Wetland		2.00

Journal entries - Water Footprints "mirror" accounts

Débit	Crédit	m³	m³
Accounts payable - Blue WF		300.00	
Accounts payable - Grey WF		500.00	
	Land - Blue WF		300.00
	Land - Grey WF		500.00
WF improvements due to the restoration of wetlands			

Journal entries - GHG "mirror" accounts

Debit	Credit	T eq.	T eq.
Equipment GHG		10.00	
	Accounts payable GHG		10.00
Un-realised emission credits due to biogas plant in Year 2			
Accounts payable GHG		48.00	
	Equipment GHG		48.00
Emission credits due to biogas plant in Year 3			

***Table 3.11.3**: Journal Entries - 29.2.2016.*

Net Habitat Gain / Loss account - 29.2.2016

		Bank - Type A Wetland	2.50
		Bank - Type B Meadow	5.00
Accounts payable - Type A Wetland	2.00		
Accounts payable - Type B Meadow	10.00		
Accounts payable - Type A Wetland	2.00		
		TOTAL - Type A	**-1,50**
		TOTAL - Type B	**-5.00**

Net GHG emissions account - 29.2.2016

		Bank GHG	50.00
		Bank GHG	20.00
		Bank GHG	80.00
		Bank GHG	2.73
		Bank GHG	4.00
		Bank GHG	6.00
		Bank GHG	52.50
		Bank GHG	50.00
		Bank GHG	30.00
		Bank GHG	50.00
		Raw materails stock GHG	2.27
		Finished goods stock GHG	17.50
Biogas plant GHG	50.00		
		Un-realised - Biogas plant GHG	10.00
Biogas plant GHG	48.00		
		TOTAL	**277.00**

Net Water Footprint account - 29.2.2016

		Bank - Blue WF	500.00
		Bank - Grey WF	20.00
		Sales - Blue WF	250.00
		Sales - Grey WF	1500.00
Accounts Payable - Blue WF	300.00		
Accounts Payable - Grey WF	500.00		
		TOTAL	**1470.00**

***Table 3.11.4**: Net Habitat Gain/Loss, GHG emissions & Pine Wood accounts.*

3.12. NC intensity of financial accounts, for different scopes

Implementing such an Integrated Financial – NC Accounting Framework provides many benefits, including allowing the reporting organisation and stakeholders to quantify the NC intensity of specific types of transactions and / or accounts over time and space. For instance, GHG intensities of different financial accounts (stocks, land, equipment, liabilities, sales) can be further divided according to their scope as per the GHG Protocol: e.g. products sold would generate Scopes 1 to 3 GHG emissions. This involves dividing the biophysical value of a NC "mirror" account, globally or per scope, by the monetary value of its corresponding financial account. Table 3.12 (page 51) provides the NC intensities of land purchased by Company A over 3 reporting periods.

3.13. NC externality accounting and reporting - To what end and how? Improving discloses and driving organisational change

After generating NC accounts and Integrated Statement of Financial – NC Position and Performance, what can the reporting organisation do? Different types of NC dependencies and impacts would involve different types of business actions, ranging from more sustainable use and / or impact avoidance, minimisation / reduction / offset measures. As argued in section 1.3, to make informed decision about a specific NC-related event, stakeholders of a reporting organisation would require knowing the nature, extent and gravity of the event in non-monetary quantitative terms (EFER approach), the associated expenses and liabilities (EFR approach) and the costs to society / stakeholders so as to better understand whether the company's response is commensurate to the issue at stake (DDE approach).

As argued in section 1.2, accounting for the external costs of NC accounts would not fall within the scope of financial accounting (uncertainty over amounts calculated via various monetary valuation models, lack of distinct contracting party, no certainty over the timing and occurrence of payment). Recording externality values within financial accounting systems would only make sense if they generate future expenses (negative externalities) or revenues (positive externalities). In keeping with financial accounting and reporting, which disclose events *that have occurred or that will occur in the future (e.g. reimbursement of a loan currently recorded as a liability)*, these proposed NC mirror accounts also record NC impacts and dependencies *that have occurred or will occur* (e.g. paid offset measures which will be validated after three years – see section 3.11). Because they are not required by law or contractual agreement, externalities thus do not readily fit within the proposed Integrated Financial – Natural Capital Accounting and Reporting Framework. But they can be estimated from NC accounts linked with specific financial accounts and should be disclosed.

Indeed, disclosing the economic dimensions of NC accounts would be needed to provide a fuller picture of the societal implications of a company's NC dependencies and impacts. Disclosures, in the form of comments appended to Annual Financial Statements, need not be "precise", and conversely "lack of precision" is not an excuse for non-disclosure. For example, *disclosure* of contingent liabilities is required by most financial reporting standards. However, contingent liabilities are mostly *litigated claims*, which, by their nature, *cannot* be "precise" because it is speculative to attach any number to a *future* settlement in or out of court. A conservative approach is to disclose the "worst case" - which may end up being inaccurate and "precisely wrong" as it represents a worst-case. In short, whilst "internalisation" (e.g. by including a future expense / revenue due to an externality in a firm's double-entry book-keeping system, hence creating a liability or a receivable) does need precision, *disclosure* needs only to pass the '*reasonableness test*' – and if *standards* were to be developed for valuing externalities,

Land	GHG intensity (T eq. CO_2 / €)	Habitat (Ha / €)		Water Footprint (m^3 / €)	
		Type A	Type B	Blue	Grey
	0.00333	-0.00025	-0.00083	-0.05000	-0.08333
Scope	Scope 1 of GHG Protocol: land clearing	Scope 1 of GHG Protocol: direct land footprint owned		No scope in Water Footprint Standard but similar to Scope 1: direct WF gains due to wetland restoration and alien tree clearing on land owned	

***Table 3.12**: The Land Asset Account NC intensities after 3 years, as at February 29, 2016 (N.B.: A negative number indicates a positive NC impact).*

the valuation can be considered reasonable and fit for disclosure if it has been validated as conforming to standards.

For illustration purposes, Table 3.13.1 shows an estimate of the costs to society (externalities) of NC accounts as at February 28, 2014. The following externality costs per NC unit were (arbitrarily) selected for modelling:

- A social cost of carbon of € 120 / T eq. CO_2;
- A restoration cost for habitats (wetlands and meadows) of €150 / ha (€1000 for land purchase and €500 for restoring habitat quality) as per the example in section 3.11;
- A replacement cost of €2 / m^3 of pine wood;
- A wastewater treatment cost of €8 / m^3 for Grey Water Footprint and a Blue Water supply costs of €3 / m^3 for Blue Water Footprint.

We propose the following accounting rules for recording externalities:

- Positive externalities are increased by debiting them and decreased by crediting them;
- Negative externalities are increased by crediting them and decreased by debiting them;
- The Externality Statement of Performance's equation is as follows: Externalities of reporting cycle = negative externalities – positive externalities
- The Externality Statement of Performance is finalised at year end by crediting the "Total Net NC externalities" account which constitute the accumulated positive and negative externalities since the inception of the business.

The Externality Statement of Performance as at February 28, 2014, is as follows (*N.B.: positive values express negative externalities*):

Net GHG emissions	43800.00
Habitat Loss / Gain	1125.00
Net WF	15850.00
Net Wood Consumption	1000.00
Total Net NC Externalities	*61775.00*

***Table 3.13.1**: Externality statement of performance - 28.2.2014.*

Due to various offset measures undertaken by Company A, the Externality Statement of Performance as at February 29, 2016, is as follows (*N.B.: positive values express negative externalities*):

Net GHG emissions	33240.00
Habitat Loss / Gain	-975.00
Net WF	10950.00
Net Wood Consumption	100.00
Total Net NC Externalities	*43315.00*

***Table 3.13.2**: Externality statement of performance - 26.2.2016.*

	€	T eq CO_2	€120 per T eq CO_2	Habitat (Ha) Type A	Habitat (Ha) Type B	€150 / Habitat (Ha) Type A	€150 / Habitat (Ha) Type B	Pine wood m^3)	€2 / m^3	Water Footprint (m^3) Blue	Water Footprint (m^3) Grey	Water Footprint (€/m^3) 3 - Blue	Water Footprint (€/m^3) 8 - Grey	
Current assets														
Bank	2510.00													
Raw materials	100.00	2.27	272.40					227.27	454.54	227.27	9.09	681.81	72.72	
Finished products	600.00	17.50	2100.00					68.18	136.36	62.50	375.00	187.50	3000.00	
Accounts receivable														
Property, plant & equipment														
Land	5000.00	20.00	2400.00	2.50	5.00	375.00	750.00							
Equipment	4320.00	50.00	6000.00											
Factory	4500.00	80.00	9600.00											
Total Assets	**17030.00**	**169.77**	**20372.40**	**2.50**	**5.00**	**375.00**	**750.00**	**295.45**	**590.90**	**289.77**	**384.09**	**869.31**	**3072.72**	
	€	T eq CO_2	€120 per T eq CO_2	Habitat (Ha) Type A	Habitat (Ha) Type B	€150 / Habitat (Ha) Type A	€150 / Habitat (Ha) Type B	Pine wood m^3)	€2 / m^3	Water Footprint (m^3) Blue	Water Footprint (m^3) Grey	Water Footprint (€/m^3) 3 - Blue	Water Footprint (€/m^3) 8 - Grey	
Liabilities - Loan	7000.00													
Salaries payable														
Accounts payable	9.999													
Owner's Equity (OE)	10000.00													
Reserve (P/L)	20.001	195.23 (B)	23427.60					204.55 (J)	409.10	460.23 (D)	1315.91 (F)	1380.69	10527.28	
Net GHG emissions		365.00 (A)	43800.00											
Habitat Loss / Gain				2.50	5.00	375.00	750.00							
Net WF										750.00 (C)	1700.00 (E)	2250.00	13600.00	
Net Wood Consumption								500.00 (I)	1000.00					
Total Net NC Externalities														***61775.00***
Total Liabilities / OE	**17030.00**	**169.77 (A -B)**	**20372.40**	**2.50**	**5.00**	**375.00**	**750.00**	**295.45 (I-J)**	**590.90**	**289.77 (C - D)**	**384.09 (E - F)**	**869.31**	**3072.72**	

***Table 3.13.3**: Integrated Financial - NC Statement of Position at February 28, 2014, showcasing external costs to society.*

Furthermore, the externality intensity of financial accounts can be assessed[23], as shown in Table 3.14.

Land	GHG intensity (T eq. CO_2 / €)	Habitat (Ha / €)		Water Footprint (m^3 / €)	
		Type A	Type B	Blue	Grey
	0.40	-0.04	-0.13	-0.15	-0.67
Scope	Scope 1 of GHG Protocol: land clearing	Scope 1 of GHG Protocol: direct land footprint owned		No scope in Water Footprint Standard but similar to Scope 1: direct WF gains due to wetland restoration and alien tree clearing on land owned	

***Table 3.14**: The Land Asset Account NC externality intensities after 3 years, as at February 29, 2016. (N.B.: A negative number indicates a positive NC externality).*

It is also important to note that there are two main approaches to assess NC externalities. As argued by Levrel et al. (2012), the first one focuses on **opportunity cost assessment** (based on weak sustainability principles; e.g. approach used for GHG emission externality in this case study) and the second based on assessing **NC maintenance or restoration costs** (based on strong sustainability principles, as is done for wetland externalities in this example). While the opportunity cost approach can be useful to identify the most important types of costs to society due to the NC impacts or dependencies of the reporting organisation, the maintenance or restoration cost approach allows the company to assess the actual costs of achieving NC sustainable use and / or impact mitigation targets; which is information required by investors seeking to place their capital in firms that are both financially and ecologically viable. In effect, the selection of an appropriate monetary valuation method for a specific NC impact or dependency requires making use of the "fitness-for-purpose" test.

The first approach provides critical information on damages to society generated by a company's operations (see UNEP PRI / UNEP FI, 2011; TEEB & Trucost, 2013) and is also very useful to prioritise which NC issues are to be dealt with first, and complemented, for example, stakeholder engagement. It may further lead to the re-valuation of traditional financial assets (e.g. stranded fossil fuel assets, Ansar et al. 2013) and the creation of innovative one (e.g. specific ecosystem services benefitting the reporting organisation, Comello et al., 2014; wildlife as biological assets - Burritt & Cummings, 2002 ; Wentzel et al., 2009).

The second approach, if the company is intent on acting (i.e. reducing or offsetting its externalities), is likely to generate economic values that are closer to the actual costs of measures aimed at externality minimisation, reduction of offset: i.e. they could be recorded as part of financial statements (e.g. as contingent liabilities) provided the values and associated assessment methods are audited by competent third parties. This approach can therefore be used to plan for the future towards NC no-net impact or no-net-loss outcomes (i.e. choose between different offset options, of different costs and expected positive externalities). This would allow the company to disclose its plans and budgets as regards to its NC dependencies and impacts (forward-looking perspective key to integrated reporting – IRC 2013), as per the principles outlined in section 2.1. Besides, such an approach

[23] *Would this influence the value of underlying assets and hence their financial values if disclosed to stakeholders?*

prevents the business from being tangled in the controversies of putting an economic value to biodiversity (e.g. protected or threatened species) and cultural ecosystem services. What are assessed in economic terms are the costs (e.g. land purchase, habitat / species management, restoration or reintroduction costs) of reaching specific targets (e.g. species or habitat no-net-loss outcomes as per the BBOP standard). One should note however the considerable variability in restoration costs, notably due to the potential great variety of parameters affecting costs (Nesshöver et al. 2009; Spurgeon 1998).

Finally, one cannot over-emphasise the need for:

- The disclosure of impacted stakeholders - as precisely as possible, of monetary valuation methods used for each externality type - as transparently as possible (sample size, hypotheses, limitations) and of detailed externality accounts;
- Making sure that only NC non-monetary offset amounts effectively reduce NC impacts or dependencies: i.e. not amounts of money spent to offset NC impacts or dependencies.

CONCLUSION

This paper argues that a solid accounting foundation is required for IR practices to show the broader and longer-term consequences of corporate decision-making. This involves using the individual transactions recorded in financial accounting systems as the focal point to link financial and non-financial data, hence embedding NC accounting into 'every day' company data recording and management routines. This paper hence provides the key principles and methodological foundations for an Integrated Financial – Natural Capital Accounting and Reporting Framework which can be used to fulfil the aspirations of IR guidelines.

A theoretical case study involving selected natural capital accounts (GHG emissions, wood consumption, water footprint, habitat loss) illustrates the practical implications of such a framework over three years. It notably explains the integrated financial – NC accounting journal entries, and the ensuing Integrated Financial – NC Statements of Position and Performance. It also presents the main pathways for calculating and disclosing the NC biophysical and externality intensity of financial accounts.

In doing so, this proposed Integrated Financial – Natural Capital Accounting and Reporting Framework provides the concrete foundation for building up a time and space distributed "catalogue" of NC dependency and impact information, providing a useful integrated accounting application for other environmental accounting standards and guidelines, such as the forthcoming Natural Capital Protocol. It can hence be used to improve business decision-making, drive sustainable organisational changes and improve NC accountability, notably by promoting the disclosure of future-orientated information, such as NC externalities, targets, action plans, and budget forecasts, therefore helping organisations satisfy stakeholders' needs and IR guidelines.

Further research on accounting rules as regards to the *duration* of individual NC impacts and dependencies (e.g. end of life of GHG, impact of water cycle on a company's WF) needs to be emphasised. Building capacity and tools (e.g. new XBRL taxonomies, embedding GIS information into ERP software) for businesses and third-party assurance providers so that companies and auditors are fully equipped to respectively provide and verify / audit NC accounts, including the process and outcomes of offset measures (e.g. with respect to the purchase of verified emissions reductions or wetland offset credits) would also be warranted.

This Framework would generate the detailed information required by the institutional investment community. It constitutes the type of reporting which would allow companies to discharge effectively their accountability to all stakeholders.

TABLES & FIGURES

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[i] Senior Research Fellow at African Centre for Technology Studies, Managing Director at Integrated Sustainability Services & Head of Research at Synergiz, South Africa.

[ii] Professor of Accounting and Sustainability, Department of Accounting and Corporate Governance, Faculty of Business and Economics, Macquarie University, Australia.

[iii] Researcher and Lecturer, Division of Resource Economics, Thaer Institute of Agriculture and Horticulture & Berlin Workshop in Analysis of Social Ecological Systems, Humboldt-Universität zu Berlin; L'Institut de Ciència i Tecnologia Ambientals, Universitat Autònoma de Barcelona.

[iv] Senior Environmental Economist, The James Hutton Institute, University of Nottingham, United Kingdom.

[v] CFE, CPA, Director at KPR Associates, Germany.

[vi] Director at Sustain Value, United Kingdom.

[vii] Professor of Accounting & Financial Management, School Director of Research, BISA Director, Henley Centre for Governance, Accountability & Responsible Investment (GARI), Henley Business School, United Kingdom.

[viii] Consultant - Business and Biodiversity, United Nations Environment Programme, Secretariat of the Convention on Biological Diversity, Canada.

[ix] Professor of Financial Reporting and Head of Department, University of Bristol, United Kingdom.

[x] Environmental Economist, WWF Greece.

[xi] Project Manager & Senior Economist at BIO Intelligence Service (member of Deloitte Touche Tohmatsu Limited), France.

[xii] Executive Director at African Centre for Technology Studies, Kenya.

[xiii] Director - Science Policy Interface Department of Environmental Affairs, South Africa.

[xiv] Director - Business and Biodiversity Leadership, Albert Luthuli Centre for Responsible Leadership, University of Pretoria, South Africa.

[xv] Director, Sustainable Flows, United States of America.

[xvi] Founder-CEO of GIST Advisory, India.


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