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POLICY PAPER

**Recognising environmental issues
in performance measurement**

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Recognising environmental issues in performance measurement

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Abstract :

This report is divided into three sections.

In section 1, we discuss why the term “performance” (in general) is difficult to define and look specifically at the thorny concept of “corporate global performance”, exploring its links with corporate social responsibility (CSR) and sustainable development. We look at the interactions between environmental performance, financial performance and overall corporate performance, discuss performance measurement, and examine how the introduction of environmental issues has made it harder to assess performance in general (and overall corporate performance in particular). We conclude this section by stressing the importance of accounting and financial reporting systems as a way to help organisations incorporate ecological entities¹ into their performance measurement and reporting.

In section 2, we begin with a general discussion of how environmental issues are recognised in accounting and financial reporting systems. Next, we explore the types of accounting and financial reporting systems that are traditionally used to measure and assess performance and/or to account for ecological entities (beginning with the systems set out in French accounting standards and IAS/IFRS).

We then work through a number of challenges, issues and questions surrounding the recognition of ecological entities in accounting and financial reporting systems and in performance measurement more generally.

In section 3, we set out a series of proposals and recommendations that address these issues and the topics covered in the previous two sections.

¹ In cursory terms, an “ecological entity” is a standalone, non-human, “natural” entity (“natural” is a vague term with many different meanings, which we do not intend to address here (Larrère & Larrère, 1997; Latour, 1999; Pilgrim & Pretty, 2010)). The term may therefore refer to a living organism (animal or plant), an inanimate object (such as a mountain), or a more “conceptual” entity (such as biodiversity or ecosystem).

1. Overview

1.1 Concepts and definitions: “expanded” performance and accounting and financial reporting systems

1.1.1 Expanded performance

Before exploring how environmental issues are recognised in performance measurement, we must first seek to define “performance” as a stand-alone concept. Authors such as (Renaud & Berland, 2007) argue that the term “performance” has different meanings in French and English. France’s National Centre for Textual and Lexical Resources (CNRTL) claims that the French term “*performance*” is a loan word from English that first appeared in the 19th century, when it was adopted into horse-racing vocabulary to denote the “*results and accomplishments of a racehorse*”. In French, therefore, “*performance*” is associated almost exclusively with outcomes and achievements (Capron & Quairel, 2015; Renaud & Berland, 2007). The word “performance” has a much broader meaning in English, referring to both actions and results (including exceptional results). It is therefore associated with other concepts such as competitiveness and benchmarking (Capron & Quairel, 2015) and covers an entire process from start to finish. The English (rather than the French) meaning of “performance” is used in management science.

Traditionally, organisational performance was measured against financial criteria only (Renaud & Berland, 2007; Zahm, Alonso Ugaglia, & Del’Homme, 2013). The notion has given rise to a profusion of theoretical and applied research, and there have been no end of attempts to pin down a definition. In spite of these efforts, “performance” is still a complex and multi-faceted concept and a comprehensive definition remains elusive. This complexity arises from the fact that “performance” is a construct – a relative, non-objective² concept (Capron & Quairel, 2015; Naro, 2005). Any attempt to define the term is therefore influenced by the observer’s value system and rationale (implicit or explicit, conscious or subconscious) (Capron & Quairel, 2015).

In its English interpretation, (financial) “performance” is generally associated with the triptych “objectives, means, results”³. Bouquin (2010) takes this analysis a step further, breaking the concept down into separate components as follows :

- organisational resources/inputs and management of the associated costs (“savings”)
- the process of an action, i.e. the actual outputs of an organisation as measured against its inputs (“efficiency”)
- the results of an action, i.e. attainment of the organisation’s objectives (“effectiveness”).

² “Performance” is “non-objective” precisely because there is, by definition, no objective “truth” behind its meaning. This does not mean, however, that “performance” is a vague notion devoid of reportable, observable or justifiable facts. Rather, it is a nuanced interplay between subjective and objective (justifiable) facts and protagonists.

³ Performance may therefore be defined as “[...] the attainment of organisational objectives, irrespective of the nature and variety of these objectives. Here, “attainment” may be understood in its literal meaning (result, outcome) or in a broader sense, i.e. as a process that leads to a result (action)” (Bourguignon, 1997).

In the late 1980s, the accepted definition of “performance” began to expand as other extra-financial elements started to come into play (Essid, 2009) and attentions turned to the concepts of corporate social responsibility (CSR) (including stakeholder theory) and sustainable development. This shift reflected a realisation that a company’s “general” performance could not be expressed in financial terms alone. Alongside financial performance came new concepts where the emphasis was on environmental and social action. The two leading models of so-called “expanded performance” that emerged during this period were “overall corporate performance” and “corporate social performance” (CSP).

CSP was the first of these two models to emerge, reflecting a North-American approach to CSR. Overall corporate performance, the European model, came later (Chauvey, Naro, & Seignour, 2015; Essid, 2009; Renaud & Berland, 2007; Zahm et al., 2013). There is no watertight definition of CSP (Acquier & Aggeri, 2008; Gond, 2006). Instead, it is a concept that seeks to draw together a number of different – often diverging – theories and models (Acquier & Aggeri, 2008). There are two leading definitions of CSP. The first sees it as a “*configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm’s societal relationships*” (Igalens & Gond, 2003) (after (Wood, 1991)). According to the second, more concise and direct definition, CSP has to do with “*a company’s performance in managing its relationships with its stakeholder groups*” (Igalens & Gond, 2003) (after (Clarkson, 1995)). Here, CSR has a definite “contractarian” flavour and is treated as something separate from the company’s core business activity. This definition places a clear divide between financial and extra-financial performance. Under this model, CSP covers extra-financial performance only and concerns the company’s conduct as measured against a set of social demands (e.g. environmental), its performance against regulations and standards, how it responds to pressures from society (so-called “corporate social responsiveness” (Carroll, 1999)) and markets, and how proactive it is at anticipating these challenges (Germain & Trébuq, 2004; Zahm et al., 2013).

Gond (2006) argues that CSP reflects a “*growing trend towards managerialism in CSR*”. In other words, CSR is becoming a standard management tool like any other, and CSP is the associated (quasi-financial) performance measurement tool. As we explained above, CSP may be defined as a company’s ability to manage relationships with its stakeholder groups. Yet, as (Steurer, 2006) argues, this “contractarian” view of CSR (which underlies CSP) implies a “hub-and-spoke” relationship with stakeholders (Freeman, 1984), where the company is the “hub” of the wheel and the stakeholders are the “spokes”. The challenge facing companies is therefore to keep the hub turning as quickly as possible (i.e. generating maximum profit) while giving due consideration to the spokes (the stakeholders). Under this model, CSR ups the wheel speed, while CSP determines how quickly a company can accelerate via CSR. In this sense, it is a “traditional” management paradigm.

Overall corporate performance, meanwhile, describes an organisation’s combined financial, social and environmental performance (Baret, 2006; Essid, 2009; Germain & Trébuq, 2004; Renaud & Berland, 2007). More specifically, it is a “holistic, integrated performance model [...] that implies that the three component dimensions [social, environmental and financial] are interconnected and suggests a causal relationship between factors across *different dimensions*” (Capron & Quairel, 2006). Overall corporate performance reflects a European

view of CSR, i.e. an integrated approach that encompasses the three pillars of sustainability⁴. Here, CSR is understood as a set of internal policies designed to achieve corporate sustainability⁵ and sustainable development in society at large. This is the model put forward by both the French Centre for Young Business Leaders (CJD) and the French Institute of Chartered Accountants' Sustainable Development Club⁶.

One of the cornerstones of overall corporate performance, when viewed in this sense, is the linkage between different types of performance. This is precisely the point made by (Capron & Quairel, 2006) in the citation above, when they refer to a causal relationship.

⁴ In its 2001 Green Paper on CSR, the European Union defined CSR as "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis".

⁵ Here, "corporate sustainability" is understood as the application of sustainable development principles to business.

⁶ In its booklet entitled *Responsabilité sociétale : comment répondre aux attentes de vos clients* (Corporate social responsibility: keeping your customers happy), the club gives the following explanation: "Corporate social responsibility (CSR) is defined in standard ISO 26000, published on 1 November 2010. This concept encompasses and replaces the term "sustainable development", seeing it as an essential component of a successful overall performance strategy. In that sense, CSR is akin to a business response to sustainable development challenges [...] The CJD prefers not to use "sustainable development", but instead to employ the term "OVERALL PERFORMANCE" because it does not place a clear divide between financial performance on the one hand and social environmental concerns on the other. Instead, it adopts a balanced, integrated approach to money, society and the environment – hence the term "overall" performance" (Club Développement Durable - Ordre des Experts-Comptables, 2011).

Maurel and Tensaout (2014) use the following diagram (adapted from their article) to address this question :

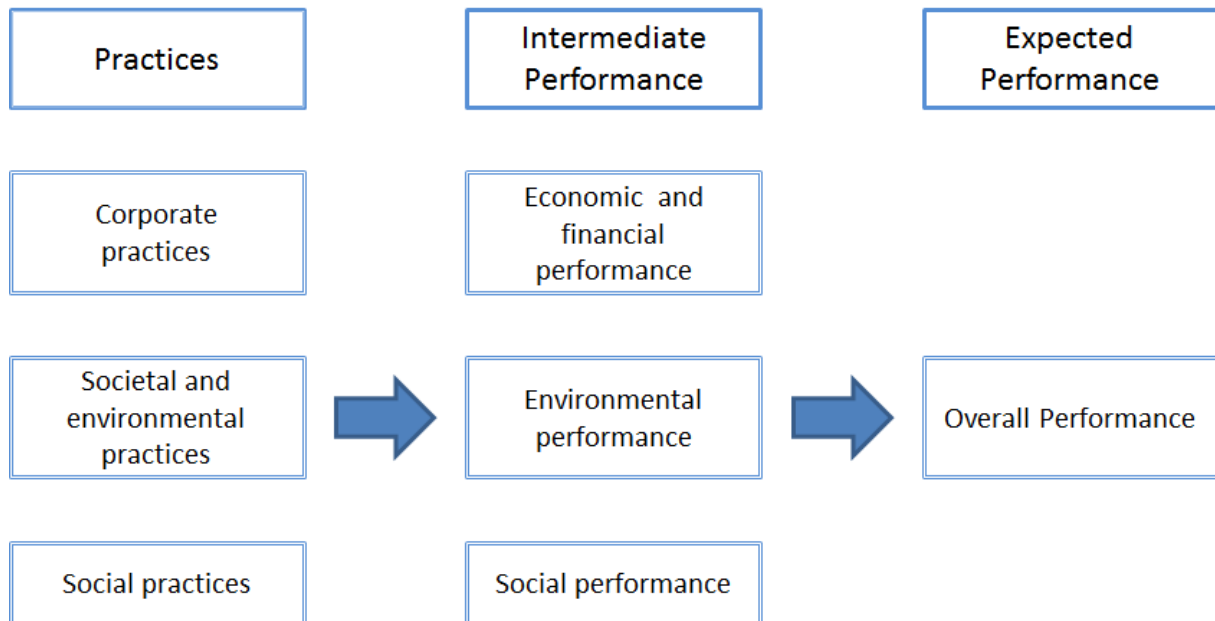


Figure 1 (adapted from (Maurel & Tensaout, 2014))

Practices – Intermediate performance – Overall performance

Scholars regularly look at the linkage between societal practices, environmental/social performance and financial performance (Saghroun & Eglem, 2008) in research focusing (explicitly or implicitly) on overall corporate performance. Various authors have established a positive *causal* relationship between environmental/social performance and financial performance (Allouche & Laroche, 2005; Dhaliwal, Li, Tsang, & Yang, 2011; Hillman & Keim, 2001). This view, while accepted in principle by managers (Déjean & Gond, 2002), is contested by other studies (Clemens & Bakstran, 2010; Trébucq & D’Arcimoles, 2003). Current thinking is that this causal relationship does not exist, or at least that its existence has yet to be proven (Vogel, 2006). Instead, it is claimed that organisations that adopt a CSR/overall financial performance strategy “[...] create a mindset that can, ultimately, affect behaviour – akin to a *causal myth*” (Capron & Quairel, 2007) rather than *mechanically* improving financial performance *per se*.

The interaction between the various forms of “intermediate performance” (as indicated in figure 1) and overall corporate performance raises another series of interesting questions. Is overall corporate performance a genuinely integrated model, or is it simply a set of juxtaposed concepts (as suggested by the large body of research into the linkage between social/environmental performance and financial performance) (Maurel & Tensaout, 2014; Quairel, 2006)? And similarly, is there an established hierarchy between the types of performance in the overall performance model (Capron & Quairel, 2015; Chauvey et al., 2015; Gray, 2010), with financial performance sitting at the top of the pile? In their study, (Saghroun & Eglem, 2008) conclude that overall corporate performance lies outside the current remit of financial analysts because “*it is not part of market discourse*” (Saghroun & Eglem, 2008), despite the fact that overall corporate performance is a central component of corporate discourse and that “*investor demand will determine the extent to which a company recognises and reports on sustainable development issues*” (Saghroun & Eglem, 2008).

Some authors go even further, claiming that overall corporate performance is a utopian *myth* (Chauvey et al., 2015; Quairel, 2006) on the grounds that it is prohibitively complex to incorporate different types of performance into a coherent whole. On one side of the debate are those who see it as a *positive* myth that serves to raise awareness and encourage action (Capron & Quairel, 2005; Renaud & Berland, 2007) (especially, for the purposes of this report, around the linkage between the environment and corporate performance). Others, meanwhile, assert that overall corporate performance is a *negative* myth – a sort of “*depoliticised concept*” (Chauvey et al., 2015) that masks the underlying structural conflicts between different notions of performance (and the associated rationales).

1.1.2 Performance measurement

Having addressed the concept of “performance”, we must now turn our attention to how performance is *measured*. Financial performance is extremely difficult to quantify and this complex issue remains unresolved (Bouquin, 2010; Renaud & Berland, 2007). The measurement system used differs according to needs, and to how the term “performance” is understood (see Bouquin’s (2010) performance model above). For example, input-output ratios (including traditional profitability ratios) are employed to measure “efficiency”. For organisations that adopt an overall corporate performance (or CSP) strategy, measuring and assessing performance (or types of performance) becomes an even more convoluted process. In their reports to the French Planning Commission, Capron and Quairel (2001) stated that “*as things currently stand, it is not truly possible to assess a company’s overall, integrated performance*”. Pesqueux (2004) recalls that “performance” is a vague concept and argues that the addition of the adjective “overall” – itself a vague notion – simply muddies the waters even further⁷. There are as many measurement systems as there are expanded performance models (Bardinet, 2016), and each of these systems has its own benefits and limitations.

⁷ “The term “overall performance” does nothing to add any “substance” to the concept of “performance”, instead exacerbating the existing state of confusion” (Pesqueux, 2004).

There is nevertheless a widely held view that other types of “performance” (and especially environmental performance) can improve overall corporate performance assessment and measurement. The concept of expanded performance, as we explained above, was born out of a realisation that a company’s “real” performance cannot be measured using financial indicators alone, and that any attempt to gauge “real” performance had to encompass other, extra-financial aspects (Renaud & Berland, 2007). As far back as 1987, Kaplan and Johnson (cited in (Löning, Malleret, Méric, Pesqueux, & Sole, 2013)) argued that: *“short-term financial measures will have to be replaced by a variety of non financial indicators that provide better targets and predictors for the firm’s long-term profitability goals”*.

Figure 1 raises a number of important questions around the measurement of environmental performance in particular. How do we measure environmental aspects ? How do these measurements and aspects impact on corporate practices? How do we then measure environmental performance? And how do we use this information to measure overall corporate performance? This final question brings into play the difficulties associated with quantifying overall corporate performance, as discussed previously. Environmental aspects are measured using “indicators” (Essid, 2009). Yet, as (Essid, 2009) explains, there has been very little research into how environmental indicators are used and structured in environmental performance measurement systems. This particular author’s analysis raises a number of important points.

The first point concerns the relationship between environmental measurement and organisational practices. The evidence points to a direct, positive relationship between a company’s decision to adopt an environmental strategy and the extent to which it includes environmental indicators in its performance measurement systems (Hartmann & Perego, 2005). Moreover, these indicators are only practicable if they are readily available, accurate and easy to use (Hartmann & Perego, 2005).

The second point has to do with how these indicators are used. It would appear that environmental indicators are employed more as a way to encourage action than to measure attainment against predefined objectives (and, therefore, to measure environmental performance and overall corporate performance) (Caron, Boisvert, & Mersereau, 2007).

The third point is that environmental indicators tend to remain isolated from (and are therefore not integrated into) organisational performance assessment systems. This means that, as things currently stand, they have no bearing on the accepted definition of “performance”.

The fourth and final point is that, despite these reservations, measuring environmental performance has the effect of diffusing tension around environmental performance management within an organisation: *“the information produced by environmental performance indicators can help to dissipate the inevitable tension that this process causes, provided that this information is both robust (i.e. it is produced by a credible internal performance management system) and workable (i.e. the company can adapt this information to its own context)”* (Caron et al., 2007).

Having addressed environmental issues and performance in general terms, we must now turn to the concept of accounting and financial reporting systems to further our analysis. According to (Richard, Collette, Bensadon, & Jaudet, 2011), an accounting and financial reporting system may be defined as a "*set of subjective, politically negotiated reporting systems used to assess the value of an organisation's means and results*"⁸. By virtue of this definition, an organisation's performance is structured – and therefore defined – by the nature of the accounting and financial reporting systems it employs.

Each accounting and financial reporting system imposes specific analysis methods and metrics. It determines what entities are included and how these entities are represented (thereby creating both areas of clarity and blind spots), implies systems of accountability (who is accountable for what, and to whom), and structures communication and discussion around this information (Rambaud & Feger, 2014). As such, accounting and financial reporting systems are central to how an organisation thinks about, defines and co-constructs its performance (or types of performance). It is within its accounting and financial reporting systems that an organisation negotiates its measurement and quantification methods (Chenhall, Hall, & Smith, 2013). And it is through its accounting and financial reporting systems that an organisation can explore new perspectives (Deegan, 2013), chiefly by restructuring its accounts (Gray, Brennan, & Malpas, 2014).

The current trend in the literature is to use specific accounting and financial reporting systems (to which we will return later) to address and measure overall corporate performance (Quairel, 2006; Renaud & Berland, 2007). The main protagonists in this respect are the Sustainability Balanced Scorecard (SBSC) model, the Global Reporting Initiative (GRI) framework, the Integrated Reporting (<IR>) framework, and the Triple Bottom Line (TBL) framework – all of which, to differing degrees, bear similarities to standard accounting and financial reporting systems used in finance and management.

⁸ Importantly, this definition implies that accounting and financial reporting systems cannot be denominated in monetary values.

If we are to consider how environmental issues are recognised in performance measurement, we must therefore look at how these same issues are recognised in accounting and financial reporting systems⁹. The relationship between these components can be summarised as follows :

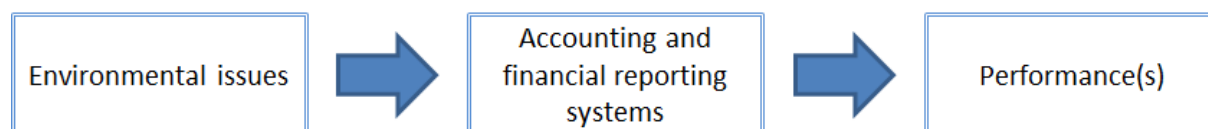


Figure 2

The role of accounting and financial reporting systems in the relationship between environmental issues and performance

In the section that follows, we shed light on the history of environmental accounting to give a deeper insight into how environmental issues are recognised in accounting and financial reporting systems.

1.2 Accounting and financial reporting systems and the environment: a historical overview

The concept of environmental accounting first gained prominence in the 1960s and 1970s (Antheaume & Teller, 2001; Gray, Adams, & Owen, 2014; Mathews, 1997b; Vàn, 2012), at a time when people were questioning the “institutionalised” relationship between the economy, society and the environment. This was a process that began with a challenge to the very notion of economic growth¹⁰. The late 1960s also saw the emergence of a new school of economic thought, later baptised the “green economy” (Georgescu-Roegen, 1971; Daly, 1974), which saw a link between the economy and the environment. Unsurprisingly, these new paradigms unfolded to a large extent in the corporate and private accounting spheres (Linowes, 1968; Mobley, 1970). The late 1960s and 1970s was a period of upheaval, as people came to terms with new living conditions and new social and psychological demands came to the fore. This meant that private accounting had to follow suit and encompass new aspects that fell outside traditional, institutionalised economic thinking. Environmental accounting emerged from this necessity to rethink time-served beliefs about how the economy and businesses worked – a process that would later re-emerge, albeit in a very different format, with the concept of expanded performance.

⁹ Readers with an academic or research interest in expanded performance and the linkage between environmental (and social) aspects and accounting and financial reporting systems may wish to consult the resources and regular conference proceedings published by the Centre for Social & Environmental Accounting Research (CSEAR) (and its French section, CSEAR France), the *Réseau International de recherche sur les Organisations et le Développement Durable* (RIODD), and the *Association pour le Développement de l'Enseignement et de la Recherche sur la Responsabilité Sociale de l'Entreprise* (ADERSE) (and others besides). The relevant website addresses can be found at the end of this report.

¹⁰ A report entitled *The Limits to Growth* (Meadows & Meadows, 1972) was published in 1970. It was the first study to shed light on the potential environmental risks of economic growth.

In the 1970s, experimental work and normative models were the prevailing themes in environmental accounting (Gray, 2002; Mathews, 1997b). These models came both from the business world¹¹ and from academia¹². Questions also focused on extra-financial metrics (Gray, 2002; Mathews, 1997b). A series of new extra-financial accounting models began to emerge from the early 1970s onwards, alongside other, more traditionally “financial” proposals¹³. The late 1960s also saw the emergence of two major new environmental accounting models that used non-monetary units – environmentally extended input-output analysis (Ayres & Kneese, 1969) and life cycle analysis (Christophe, 1995; Ciambrone, 1997).

The pace of innovation in environmental accounting slowed in the 1980s. (Gray, Adams, et al., 2014; Mathews, 1997b). However, the decade was famous for the so-called “Green Rush” (Mouhot & Mckay, 2012) – a period of heightened interest in environmental concerns.

The late 1980s was a boom period for environmental accounting, as sustainable development rose to the top of the global agenda (World Commission on Environment and Development, 1987)¹⁴ and the concept of environmental reporting emerged (Ordre des Experts Comptables, 2008).

In the wake of the Pearce Report, (Pearce, Markandya, & Barbier, 1989) a series of new environmental economics models came to light in the 1990s. These included total economic value (TEV) (Gray, 1990) – a neoclassical economic concept that purported to aggregate all values (including environmental values) derived from a resource. Other examples included the notion of natural capital (Akerman, 2005) and the capital-based approach to sustainable development (Turner, Perrings, & Folke, 1996). This emphasis on “capital” led to a rethink of what sustainable development actually meant, turning it into a much more “hands-on” concept. This new paradigm was then transposed into accounting by two authors in particular – Rubenstein (1992) and Gray (1990, 1992, 1994) – albeit in two starkly different ways. Rubenstein’s model was very much “financial” and integrative in nature, while Gray looked outside the balance sheet and focused on natural capital from a physical and material perspective. Other, more recent authors such as (Burritt & Welch, 1997) and (Richard, 2012) have made the case for the capital-based approach to sustainable development, and it is also a fundamental tenet of the triple bottom line (TBL) model (Elkington, 1997). Yet the capital-based approach remained largely the reserve of economics until recently.

¹¹ Such as the model developed by consulting firm Clark C. Abt (Estes, 1976).

¹² Such as the Corporate Environmental Accounting System (CEAS) model (Ullmann, 1976).

¹³ In 1972, R. Müller-Wenck developed a new accounting and financial reporting system based on non-monetary units (“eco-points”). This model, which is currently used in Switzerland, marked a major milestone in environmental accounting (Richard, 2012).

¹⁴ The publication of *Our Common Future* (also known as the Brundtland Report) in 1987 is widely seen as the official starting point for sustainable development. This report meant that environmental accounting had, as a bare minimum, to address questions surrounding sustainable socio-economic development (Gray, Adams, et al., 2014; Gray, 1994). A manifesto entitled *Blueprint for a Green Economy* (Pearce et al., 1989), more widely known as the Pearce Report, was published two years later. At the time, this was seen as a political watershed moment and marked a major leap forward in thinking on sustainable development.

Under the new Integrated Reporting framework (Eccles & Krzus, 2010) – a model based entirely on the notion of capital – this way of thinking is now gaining wide currency.

While the 1990s was a time of theoretical advances, a major paradigm shift in environmental accounting thinking came with the birth of the stand-alone report (Gray, Adams, et al., 2014) (i.e. the separate environmental report that would go on to become the “sustainable development report”) (Ordre des Experts Comptables, 2008)¹⁵. Although the 1990s never reached the heady heights of the 1970s in terms of innovation (Mathews, 1997b, 2000), the decade saw the emergence of several new social and environmental models. These models came from the academic world¹⁶, from businesses (such as BSO/Origin) and from civil society (such as the TBL framework developed in (Elkington, 1997)). The 1990s also saw the development of a battery of “corporate sustainability” models and frameworks, although this vision was largely driven by neoclassical economics models (Banerjee, 2007). Alongside TBL (now one of the most commonly used extra-financial reporting frameworks) (Rambaud & Richard, 2015b), other concepts came to prominence in the 1990s, including the idea of “eco-efficiency” (Schmidheiny & Business Council for Sustainable Development, 1992), the “natural-resource-based view of the firm” (Hart, 1995) and Michael Porter’s theory of competitive advantage¹⁷ (Porter & Van Der Linde, 1995). There were also efforts to develop, structure and standardise some of the accounting frameworks developed in the 1960s and 1970s, such as the life cycle analysis model (which was standardised in 1998) (Richard, 2012) and the environmentally extended input-output analysis concept.

The 1990s also saw public institutions take an interest in social and environmental reporting (Mikol, 2003). Council Regulation (EEC) No. 1836/93 of 29 June 1993 allowed companies in the industrial sector (and later any company with an environmental impact) to participate voluntarily in the European Community’s Eco-Management and Audit Scheme (EMAS)¹⁸. In 1996, the French Institute of Chartered Accountants published a report on financial and environmental information (Ordre des Experts Comptables, 1996). In the same year, the French National Accounting Council (CNC) issued a recommendation “*to account separately, in dedicated accounts, for “environmental investments” (e.g. clean-up operations) or to identify the proportion of taxes and levies attributable to the environment (waste tax)*” (Petit, Belet, & De Saint-Front, 2013). The 1990s was therefore a decade in which environmental accounting became institutionalised and normalised, both through official standards and regulations, and through a series of concepts and frameworks that have stood the test of time. As a result, environmental accounting is based primarily on prevailing socio-economic theory (such as neoclassical economics). Mathews (2000) argues that this situation helped to bolster a counter-

¹⁵ There are some now-famous examples of early experiments with these types of report (Norsk Hydro, Noranda, etc.). The pioneer in this field was BSO/Origin (Huizing & Dekker, 1992) which, from 1991 onwards, included green “net value added” in its reports (where “net” meant “net of certain environmental impacts”).

¹⁶ Such as “balance sheet of accounting for ecological holism” (Birkin, 1996) or “Mega-Accounting Theory” (Mathews, 1997a).

¹⁷ Michael Porter’s theory states that “proper designed environmental standards can trigger innovations that lower the total cost of a product or improve its value” (Porter & Van Der Linde, 1995).

¹⁸ The EMAS was revised in 2002 and 2004.

model of environmental accounting – one that first emerged in the late 1980s – that “[was] much more willing to engage with environmental issues pointing out the dangers of capture by dominant interests and also [...] highlighting the manner in which some perspectives are privileged over others” (Mathews, 2000).

The “institutionalisation” of environmental accounting has continued in the early 21st century. In France, the new decade opened with the passing of the 2001 New Economic Regulations (NRE) Act¹⁹, applying to companies whose securities are admitted to trading on a regulated market. The Act states that *“the report submitted by the board of directors or by the management gives an account of the impact of the company’s activities on the environment, detailing the nature of these activities and their effects [...]”* (Ordre des Experts Comptables, 2008), although it does not impose an audit requirement. The Act therefore represents an initial, if limited, attempt to standardise environmental reporting through legislation (Antheaume & Christophe, 2005). In the same year, the European Commission adopted the Recommendation of 30 May 2001 “on the recognition, measurement and disclosure of environmental issues in the annual accounts and annual reports of companies” (notified under document number C(2001) 1495). The Recommendation clarifies the EU accounting rules on environmental information. The CNC recommendation of 21 October 2003 (which remains in force) harmonised the French NRE Act and the Commission Recommendation in French accounting standards. This trend towards greater recognition of environmental issues in accounting was closely tracked by the IASC (and subsequently the IASB) from the late 1990s onwards (Barbu, Feleaga, & Feleaga, 2011).

As authors such as (Richard, 2012) explain, one of the more notable features of environmental accounting in its current form (and based on a “traditional” accounting model (Richard, 2015)) is how present value is gaining currency in environmental measurements for some types of accounting and financial reporting systems (those with a financial emphasis). The International Integrated Reporting Council (IIRC), for example, adopts this very principle in its “Integrated Reporting” (<IR>) model (de Villiers, Rinaldi, & Unerman, 2014; Eccles & Krzus, 2010; Flower, 2015; IIRC Council, 2013), which is widely tipped as a potential universal approach to corporate reporting in the future (Sjåfjell & Wiesbrock, 2014). Actuarial value is also a prominent feature of theoretical academic models such as the Omniscient Critical Accountant (OCA) concept (Thornton, 2013). The <IR> model is also reflective of two other environmental accounting trends – the emphasis on the notion of “capital” (especially natural capital), and the shift from stand-alone reports to an integrated reporting model that encompasses both financial and extra-financial disclosures (and is aligned with the “overall corporate performance” principle). The linkage between environmental accounting and extra-financial capital, as we explored above, is reflected in several current initiatives, all of which show how this concept is gaining traction in environmental accounting. Under the <IR> framework, for example, organisations disclose information about six capitals (financial, manufactured, intellectual, human, social and relationship, and natural). Meanwhile, in a joint report entitled *Is natural capital a material issue?*, KPMG, Fauna & Flora International and the Association of

¹⁹ French Act no. 2001-420 of 15 May 2001 concerning new economic regulations.

Chartered Certified Accountants (ACCA) (KPMG, Fauna & Flora International, & Association of Chartered Certified Accountants, 2012) explain how organisations and users of financial accounts are showing increasing concern for natural capital.

Theoretical initiatives, experiments and models are also helping to shape modern-day environmental accounting. Here, the conceptual frameworks are split into two camps. On one side are what we might term “neoclassical” models, where the emphasis is on internalising externalities; examples include Puma/Kering’s non-accounting indicators (as analysed in (Richard, 2012)), and models that hinge on present value, such as <IR> and OCA (Thornton, 2013). On the other side are more critical frameworks, such as the “Comptabilité Universelle (Universal Accounting)” model (de Saint-Front, de Saint-Front, Schoun, & Veillard, 2012) and the CARE/TDL model²⁰ (Rambaud & Richard, 2015b; Richard, 2012). Spence, Husillos and Correa-Ruiz (2010), and Parker (2014) (echoing Gray (2002) and reflecting on environmental accounting in the late 1990s), argue that, as alternative critical models currently stand, there is insufficient theory (or indeed meta-theory) (Gray, 2002) to “counter the implicit tendency towards managerialism” (Spence et al., 2010).

Ultimately, the major currents that emerged in the 1990s have taken root in the early 21st century. Environmental accounting has become increasingly institutionalised, standardised and embedded in managerialism and neoclassical economics. According to authors such as Jones (2010), Vàn (2012), and Gray, Adams et al. (2014) (among others), the principal current trends and initiatives in environmental accounting may be summarised as follows:

- more regular use of life cycle analysis and environmentally extended input-output analysis models, continuing the trend observed since the inception of environmental accounting
- research into how environmental costs are calculated, structured and identified, addressing the underlying economic and accounting theories (total economic value (Pearce et al., 1989), sustainable costs (Gray & Bebbington, 2001), etc.), the scope of these costs (recognition of direct or indirect costs (Herbohn, 2005)), the factors that influence these costs (Alcouffe, Berland, & Drevetton, 2013), how these costs are classified for accounting purposes (Houdet, Trommetter, & Weber, 2010), etc.
- an increase in the production of social and environmental reports (integrated or otherwise, with monetary or non-monetary units), and the development of associated theories and models
- social and environmental reporting audits (Gray, Adams, et al., 2014)
- research into the linkage between these points and their social and environmental impacts (Thomson, 2014)
- critical analysis of the prevailing accounting frameworks that shape environmental accounting thinking (de Saint-Front et al., 2012; Owen & Lehman, 2000).

²⁰ CARE: Capital Approach Resting on Ecological-based sustainability / TDL: Triple Depreciation Line (as opposed to TBL).

Having explored the historical context of our subject matter (how environmental issues are recognised in accounting and financial reporting systems), we will now look at a number of key accounting and financial reporting systems in greater detail. We will begin by examining the relationship between current financial accounting standards and environmental issues, before giving an overview of the accounting and financial reporting systems that are used at present to measure overall corporate performance.

1.3. Accounting and financial reporting systems, environmental performance and overall corporate performance: a present-day snapshot

1.3.1. Financial accounting standards

As a rule of thumb, present-day financial accounting standards make little or no room for environmental issues²¹. Moreover, those standards that actually address environmental issues do so in a questionable manner (Richard, 2012). Accounting standards give companies a standardised vocabulary to talk about their existence and their relationship with their external environment (socio-economic, natural, etc.). Yet this vocabulary is blind, or at best short-sighted (de Saint-Front et al., 2012), when it comes to environmental issues. How, then, can organisations use these standardised frameworks to give a true reflection of their performance?

A) French standards

Before addressing the standards in detail, we must first look at the general legal framework in France as it currently stands. The NRE Act of 2001 (as discussed above) has now been transposed into Article L.225-102-1 of the French Commercial Code (as amended by the Grenelle II Act of 2010). This article states that the annual report "*referred to in Article L.225-102*", i.e. the report "*submitted to the routine meeting by the board of directors or the management, as the case may be*" (Article L.225-102), "*also includes information concerning the manner in which the company deals with the social and environmental consequences of its business, including the climate change consequences of its activities and the manner in which the goods and services that it produces are used, as well as information about how it promotes sustainable development and the circular economy, tackles food waste, combats discrimination and promotes diversity through its societal engagements*". The same article also states that "*the social and environmental information appearing, or required to appear, in such report pursuant to legal and regulatory requirements shall be audited by an independent third-party organisation in accordance with the procedures laid down in a Conseil d'Etat decree. A copy of the corresponding audit report shall be made available to*

²¹ "*As things currently stand, an organisation's financial reports give only a cursory indication of its impact on society or the environment [...] This unapologetically short-sighted accounting model leaves many important subjects out in the cold [...] Current accounting practice reveals an obsession with financial aspects that often omits what is really important.*" (de Saint-Front et al., 2012) (Excerpt from the *Manifeste pour une Comptabilité Universelle* (Universal Accounting Manifesto), based on research carried out by the French Institute of Chartered Accountants' Sustainable Development Club [work that does not reflect the institute's official position (de Saint-Front et al., 2012)]).

shareholders or partners at the routine meeting along with the report submitted by the board of directors or the management". Implementing decree no. 2012-557, published in April 2012, clarifies the companies to which these provisions apply and the information they are required to disclose. The order of 13 May 2013, meanwhile, sets out the terms of reference for the independent third-party auditor²².

This piece of legislation marks an important leap forward in efforts to change practices and stimulate reflection. Yet, as Capron and Quairel (2015) argue, there is no standardised method for calculating and producing social and environmental information. Moreover, audits do not seek to assess whether the chosen indicators are appropriate, or how they are constructed (instead focusing solely on how the published information is collected and whether it gives a truthful picture of the situation). In that sense, the legislation fails properly to address the key issues surrounding recognition of environmental issues.

The evidence shows that environmental issues are now better recognised in French accounting standards than was the case in the 1990s. The CNC recommendation of 21 October 2003 marked an important turning point in this respect, since it set out a definition of environmental expenditure, assets and liabilities and clarified how to value and account for these elements. The French Institute of Chartered Accountants also took an early interest in these questions (Ordre des Experts Comptables, 1996) (see above), publishing an environmental management guide (Ordre des Experts Comptables, 2008) in conjunction with the French Environment and Energy Management Agency (ADEME) and carrying out research into environmental accounting (chiefly within its Sustainable Development Club and a dedicated working group set up in 2015²³).

Despite these advances, the *Plan Comptable Général* (PCG) (France's generally accepted accounting principles) makes little mention of specific, identifiable environmental information. There are no dedicated accounts for reporting this type of information, and environmental "assets" and "liabilities" are therefore treated as generic, non-standardised terms. The only account that deals specifically with environmental information is code 449 ("Emissions liability"). At present, this is still treated as off-balance-sheet information.

Moreover, the "main purpose [of the PCG (and of the IAS/IFRS standards)] is to inform investors and other stakeholders about an entity's level of (financial) investment in the environment and the nature of such investment" (Richard, 2012) (chiefly through the recognition of site decommissioning, clearance and restoration costs in property, plant and equipment, without specific reference to environmental objectives). As Séguret explains, it is "investor demand for better control over environmental liabilities and more reliable financial

²² In 2014, the European Union adopted Directive 2014/52/EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. We do not plan to address this Directive here because current French legislation is more restrictive and, as such, the Directive has little impact in France.

²³ The group's work focuses in particular on the universal accounting (de Saint-Front et al., 2012) and CARE/TDL (Rambaud & Richard, 2015b; Richard, 2012) models.

information [that] is likely to alter the course of accounting practice [in France]" (Séguret, 2008). In their current format, French accounting standards tend to focus on investor financial risk from environmental exposure (Séguret, 2008), with much less emphasis on reporting of an organisation's environmental impacts, or on localised or wide-reaching societal risks arising from its activities (in the short, medium and long terms).

B) IAS/IFRS standards

The same general rule of thumb applies to the IAS/IFRS standards. As is the case in France, some headway has been made in these international standards (Firoz & Ansari, 2010; Negash, 2012; Thistlethwaite, 2011). Examples include IAS 37 (Provisions, Contingent Liabilities and Contingent Assets, published in 1998), IAS 41 (Agriculture), and several IFRIC Interpretations including IFRIC 1 (Changes in Existing Decommissioning, Restoration and Similar Liabilities), IFRIC 3 (Emission Rights) and IFRIC 5 (Rights to Interests arising from Decommissioning, Restoration and Environmental Rehabilitation Funds). A more detailed examination of the linkage between IAS/IFRS standards and environmental reporting is given in (Barbu et al., 2011).

In the same article, however, (Barbu et al., 2011) point to a failure to back stated socio-political and economic ambitions around environmental protection with adequate, concrete tools, particularly in the IAS/IFRS framework. In their (critical) conclusion, (Barbu et al., 2011) offer two proposals to address this disconnect:

- improve existing standards by clarifying the presentation of environmental issues and setting minimum environmental impact disclosure obligations
- create a new environmental reporting standard and require organisations to produce a mandatory financial statement covering all monetary and non-monetary elements with an environmental impact.

Similar criticisms are levelled by (Negash, 2012).

Having addressed these two problems (the shortage of specific environmental information in these standards and the lack of clear measurement objectives), we must now turn our attention to the thorny question of "fair value measurement". Often, the present value method is used to determine the "fair value" of environmental disclosures (in line with IFRS 13) (Elad, 2007; Herbohn & Herbohn, 2006; Thistlethwaite, 2011).

Yet applying the present value principle to environmental information is not without its problems (Neumayer, 2010; Rambaud & Richard, 2015a) – a fact borne out by the controversy surrounding IAS 41 in general (Elad, 2007; Herbohn & Herbohn, 2006), and more specifically its application to oil palm plantations in Malaysia²⁴.

Moreover, the general emphasis of the IAS/IFRS standards is to maximise a company's shareholder value (Bromwich, Macve, & Sunder, 2010; Chiapello, 2005; Elad, 2007; Müller, 2014) and therefore, in a similar way to French accounting standards, to favour the shareholder/owner (and relative environmental risk/reward for the shareholder/owner) to the detriment of other stakeholders. In this sense, environmental performance becomes a question of shareholder value – an attempt to measure potential risks and opportunities offered by the environment.

1.3.2 Other accounting and financial reporting systems

We will now give a brief overview of the other accounting and financial reporting systems that are commonly used to measure overall corporate performance and to address environmental issues (GRI, SBSC, TBL and <IR>).

A) The Global Reporting Initiative (GRI)

The GRI (Capron & Quairel, 2001; Chauvey et al., 2015; Ordre des Experts Comptables, 2008; Richard, 2012) is an international non-profit organisation that promotes sustainable development and has developed a CSR reporting framework. It was founded in 1997 by the Coalition for Environmentally Responsible Economies (CERES), in partnership with the United Nations Environmental Programme (UNEP). The GRI framework features a series of indicators and guidelines to help organisations report on their financial, environmental and social performance, providing a standardised template for CSR reports. The current version of the guidelines, dubbed "G4"²⁵, came into effect in 2013. GRI is the standard CSR reporting framework recommended by the French Institute of Chartered Accountants.

²⁴ Suzuki notes that "IAS 41 [...] negatively affects the sustainable development of the most important industry [palm oil] in the [South East Asian] region" (Suzuki, 2012). T. Suzuki and Jain Jaypal (Suzuki, 2012; Suzuki & Jaypal, 2010) conducted research and interviews in Malaysia and India and found, for example, that "96% of the respondents believe that IAS 41 was significantly damaging to the sustainable development of the plantation industries" (Hanim, 2010). In view of this, "the AOSSG [Asian-Oceanian Standard-Setters Group] noted that concerns had been raised by investors (as well as preparers) about the relevance and usefulness of information provided to users for certain biological assets accounted for at fair value. Specifically the paper included a survey performed by the Malaysian Accounting Standards Board (MASB) in 2010 that found that a group of analysts specialising in plantation did not find fair value information for BBAs [bearer biological assets] useful, particularly the presentation of changes in fair value within the profit or loss – which in some instances can be large and distort profits" (IASplus, 2015). The IASB therefore decided to amend IAS 41 and bring "bearer" biological assets into the scope of IAS 16 (i.e. accounted for in the same manner as property, plant and equipment) with effect from 1 January 2016.

²⁵ It contains a total of 79 indicators (49 "core" indicators and 30 "additional" indicators), divided into seven categories: economic, environmental, human rights, labour practices, decent work, product responsibility, and society.

In this sense, the GRI framework is a non-monetary accounting and financial reporting system (in this case, the units are “indicators”). Its purpose is not to produce an overall “result” (Richard, 2012) or to deliver integrated sustainability (sustainable development) indicators (Renaud & Berland, 2007). Instead, it offers a practical series of quantifiable values, leaving it to experts to determine whether these values are relevant and how to construct them (and to deal with the underlying conflicts that arise from this process). While the framework is not without controversy, such debates tend to be swept under the carpet (Chauvey et al., 2015). The system nevertheless provides a useful framework for thinking about performance in terms of ecological entities (Richard, 2012). Notably, while the majority of accounting and financial reporting systems are shareholder-oriented, the GRI framework places greater emphasis on the full spectrum of an organisation’s stakeholders. Having said that, the framework is tainted by heavy Anglo-American bias and, as such, is not the universally applicable model that it purports to be (Capron & Quairel, 2003). By the same token, the very nature of the model means that senior managers and directors, as the main participants in the process, end up “*producing, themselves, the very indicators by which their performance is assessed, via a process of self-legitimation*” (Chauvey et al., 2015).

Most of the GRI framework’s environmental indicators have no associated targets (i.e. environmental “limits”). This means that performance is measured through changes in indicator values, with no robust environmental benchmark (Richard, 2012). Finally, as authors such as (Moneva, Archel, & Correa, 2006) and (Richard, 2012) argue, it is unclear whether the GRI framework allows for relative substitutability between indicators. This, in turn, creates an internal hierarchy between different indicators. We will come back to this issue later in our discussion of “weak” and “strong” sustainability.

B) The Sustainability Balanced Scorecard (SBSC)

The SBSC (Schaltegger & Burritt, 2000) is a variant on Kaplan and Norton’s balanced scorecard (BSC) concept from the early 1990s. As such, it differs from other, more traditional accounting systems such as GRI, TBL and <IR>. An organisation can use the SBSC model to measure its environmental (or social) performance in one of three ways (Quairel, 2006) :

- it can add environmental indicators to the four traditional components of the BSC model (Learning and Growth, Internal Business Processes, Customer, and Financial)
- it can include a fifth component (Society) in the BSC causal chain, placing it between Internal Business Processes and Customer
- it can produce a standalone SBSC in the same manner as a traditional BSC but for the purpose of tracking CSR strategy deployment – in other words, the SBSC becomes a specific tool for monitoring environmental or social performance (rather than financial performance).

The key benefit of the SBSC framework is that it is based on a well-established model. Its main drawback, however, is that it is not truly “integrated” (Renaud & Berland, 2007). Under the first two methods, for example, the emphasis remains on purely financial performance and ecological entities are included for the sole purpose of bolstering this performance. The third method, meanwhile, places a dividing line between different types of performance and makes no provision for assessing the interactions between them.

Moreover, the addition of new entities serves to exacerbate the known shortcomings of the BSC model. According to (Quairel, 2006), organisations tend to focus on the indicators that are “easier” to measure (i.e. monetary indicators), often overlooking more qualitative slants and generally failing to examine causality.

C) The Triple Bottom Line (TBL)

The TBL model, developed by (Elkington, 1997), is an accounting framework divided into three parts: financial, social and environmental (also known as 3P, for people, planet and profit). This model is the Anglo-American variant of “overall corporate performance”.

It bears many similarities with traditional accounting systems, but with more so-called “bottom lines”. The model is extremely popular among businesses, NGOs and public authorities (Norman & MacDonald, 2004; Rambaud & Richard, 2015b) on account of its simplicity and the fact that it directly represents the three pillars of sustainable development. Yet TBL is not immune from criticism, chiefly because uncertainty remains about how the model is defined and applied (Norman & MacDonald, 2004). It is unclear whether extra-financial information should be expressed in monetary or non-monetary units. Moreover, such information is neither standardised nor transparent (the model makes no reference to environmental standards, for example). If non-monetary units are used, it becomes difficult to establish linkages between the three bottom lines. Where information is expressed in monetary units, meanwhile, organisations will need to consider how to measure monetary value and how to aggregate data across the three bottom lines.

The TBL model is good at identifying so-called “win-win” situations, i.e. where performance improves across the board. But what happens if this is not the case? Under the TBL model, performance is measured in terms of “eco-efficiency”. This concept, championed by Elkington (1997) in particular, may be defined as the ratio between the economic gain and environmental loss (as a result of this gain). In this sense, it is an efficiency ratio that encompasses all three bottom lines (strictly speaking, we might talk about “socio-eco-efficiency”). Yet eco-efficiency is not the same as environmental performance. It is entirely conceivable that an organisation could achieve a positive ratio simply by ensuring that environmental gain outstrips environmental loss. As such, the model favours financial performance over other types of performance (Robins, 2006) and, in any event, does not paint a genuine picture of overall corporate performance (Renaud & Berland, 2007). In their assessment of the TBL model, Savitz and Weber (2006) argue that, in the end, it is “*impossible for a company to act against its own financial interests*”.

D) Integrated Reporting (<IR>)

It is important to make a clear distinction between <IR> and the concept of “integrated reporting”: <IR> is a specific type of integrated reporting. The framework’s roots can be traced back to the revision of the King II report²⁶ on corporate social governance in South Africa. Following the UN World Summit on Sustainable Development, held in Johannesburg in 2002, the South African government pushed ahead with plans to integrate governance, strategy and sustainability. It commissioned the King III report, which introduced a new type of reporting: “A key challenge for leadership is to make sustainability issues mainstream. Strategy, risk, performance and sustainability have become inseparable; hence the phrase ‘integrated reporting’ which is used throughout this Report”. The International Integrated Reporting Council (IIRC) was formed in 2010 to oversee the development of this new model, and (Eccles & Krzus, 2010) – an authoritative reference work on integrated reporting – was published in the same year. The International Integrated Reporting Framework (the official <IR> framework) was published in 2013, following a 2011 pilot phase involving 90 global companies and a string of “drafts” and “discussion papers”. The primary purpose of the <IR> framework is to explain “*how an organization creates value over time*” (IIRC Council, 2013).

²⁶ Named after South African corporate governance expert Mervyn E. King.

The figure below indicates the structure of the <IR> framework :

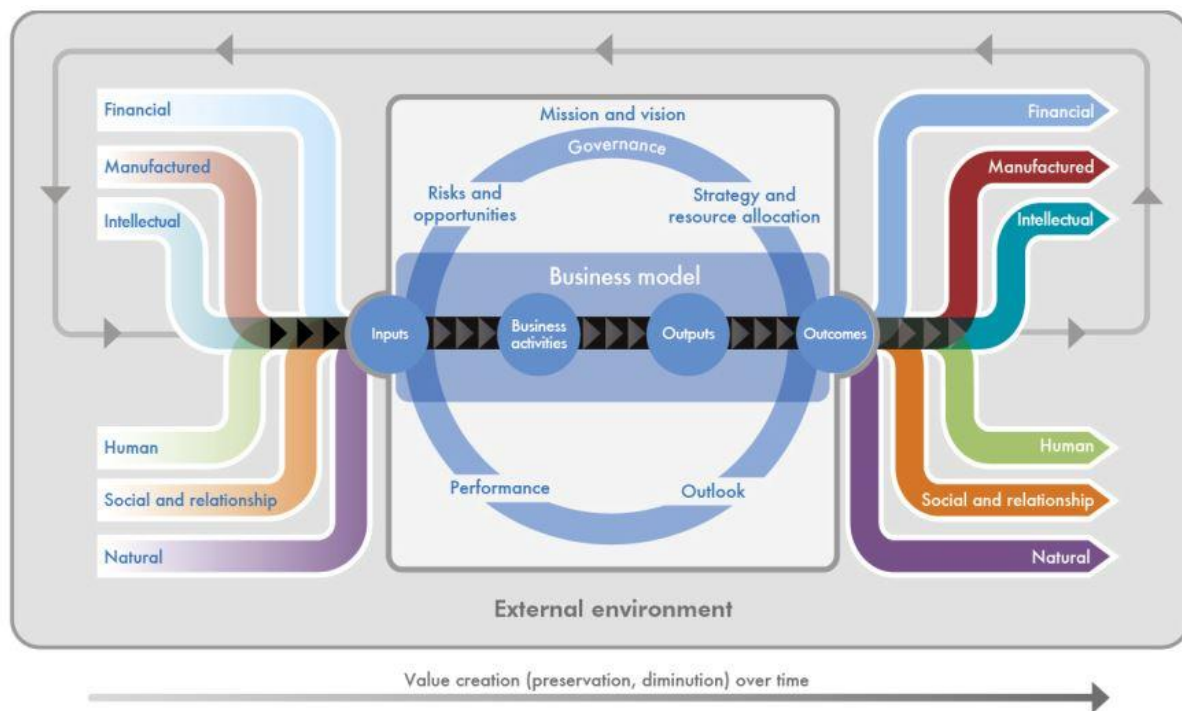


Figure 3 (from (IIRC Council, 2013))

The value creation process according to <IR>

Figure 3 shows how the <IR> framework is based on six capitals (including natural capital). This model is at the forefront of global emerging trends in environmental accounting and financial and extra-financial performance, and the literature abounds with examinations of the <IR> framework. An entire section of the March 2015 volume of *Critical Perspectives on Accounting* was devoted to the model, and it is the subject of an August 2016 book (*Integrated Reporting: A New Accounting Disclosure*, Mio, Chiara (Ed.), Palgrave Macmillan).

Many of the criticisms of <IR> are similar to those levelled at the other three accounting and financial reporting systems covered in this chapter – that ecological entities are not properly incorporated into the model, that it fails to paint a truly “integrated” picture of performance, that it makes no reference to environmental standards, or that it is investor-oriented by design (Barker & Kasim, 2016; de Villiers et al., 2014; Thomson, 2015). Notably, the <IR> framework defines capitals as “stocks of value that are increased, decreased or transformed through the activities and outputs of the organization” (IIRC Council, 2013). In this sense, capitals are not conceived as real-world biophysical entities, but rather as “stocks of value”. Ultimately, <IR> focuses on extra-financial information as a way to understand and optimise the internal value creation process and to drive shareholder value. Accordingly, it remains firmly rooted in the paradigm of traditional financial accounting and financial performance (Barker & Kasim,

2016). In this sense, although <IR> purports to be a sustainability reporting framework, it is in fact the direct opposite of what Barker and Kasim (2016) call “sustainability reporting”²⁷.

Having completed our overview of accounting and financial reporting systems, we will now look at the key issues, challenges and questions surrounding the recognition of ecological entities in these systems and, in turn, in performance measurement.

2. Recognition of ecological entities in accounting and financial reporting systems: key issues and challenges

Our overview of the key issues, challenges and questions draws on our analyses in the preceding sections of this report. We have also examined how these issues are categorised using specific models in the literature (Bartolomeo et al., 2000; Jones, 2010; Mathews, 2004; Nikolaou & Evangelinos, 2010; Richard, 2009). Our work builds in particular on the detailed model set out in (Richard, 2012) and perfected by other authors such as (Altukhova, 2013) and (Rambaud, 2015).

In our view, there are five key areas that underpin these issues and challenges, as follows: (i) accounting and financial reporting system structure; (ii) intended user(s)/purpose; (iii) spatial and temporal positioning; (iv) relationship with the world; and (v) measurement. As shown in table 1, each of these areas can be divided into sub-areas.

The purpose of this categorisation exercise is to establish a structure underpinning the debates, controversies, key points and other issues surrounding the recognition of ecological entities in accounting and financial reporting systems. This structure is intended to help researchers compare and critically analyse environmental accounting systems, helping to frame opinion and stimulate discussion and detailed examination of the key underlying issues.

The structure draws on our previous analysis in this report, with particular reference to figure 2. In other words, each area and sub-area concerns a specific issue or challenge associated with the linkage between performance measurement and environmental issues. Consequently, these areas (and sub-areas) provide a structured framework for *descriptive*²⁸ and *normative*²⁹ analysis of environmental accounting and the associated notion of performance (or types of performance). At the end of section 2, we give an example of a descriptive analysis (in this case, the <IR> framework). Section 3, meanwhile, constitutes a normative analysis based on these areas and sub-areas.

²⁷ A form of reporting that paints a picture of an organisation's *sustainability*, i.e. that indicates whether the organisation can safeguard the conditions necessary for its own activities and its natural (and societal) environment, both in time and in space (geography).

²⁸ Descriptive analysis: How does a particular environmental accounting model address the questions posed by these areas and sub-areas? How do these areas and sub-areas model a given type of performance, as defined or shaped by a particular environmental accounting model ?

²⁹ Normative analysis: What should the response be to the issues raised by these areas and sub-areas, according to the objective(s) in question (specific visions of sustainability, CSR, the company, the economy, etc.)? And what are the consequences of different responses to these issues?

		AREA					
		System structure	User(s)/purpose (Who is it for? What is it for?)	Spatial and temporal positioning		Relationship with the world	Measurement
				Spatial positioning	Temporal positioning		
SUB-AREA							
		<ul style="list-style-type: none"> - Similarity to (or difference from) standard systems - Overall “result” (or not) - Degree of complexity - Specificity of information 	<ul style="list-style-type: none"> - Internal/external use - Main user(s) - Purpose - Benchmarks 	<ul style="list-style-type: none"> - Scope of consolidation - Activity/product scope - Linkage between micro and macro information 	<ul style="list-style-type: none"> - Observed/anticipated events - Short/medium/long term (past or future) - Rationale (flows or states) - Timescales - Periodic review (or not) 	<ul style="list-style-type: none"> - Perspective (“external-internal” or “internal-external”) - Strong/weak sustainability - Traditional system with social/environmental component, or Accounting for Sustainability - Theory (or theories) of the firm - Standard world views 	<ul style="list-style-type: none"> - Types of unit of measure - Purpose of units of measure - Quantification as “replacement” or as “expression”

AREA							
	System structure	User(s)/purpose (Who is it for? What is it for?)	Spatial and temporal positioning		Relationship with the world	Measurement	
SUB-AREA			Spatial positioning	Temporal positioning			
						Cost	Value
						<ul style="list-style-type: none"> - Restoration cost - Preservation cost - Replacement cost - Maintenance cost 	<ul style="list-style-type: none"> - Market value - Market value + non-market value (total economic value) - Present value

Table 1

Diagram showing the areas and sub-areas that shape descriptive and normative analysis of environmental accounting and the linkage between performance and ecological entities

Detailed overview of the areas and sub-areas that shape descriptive and normative analysis of environmental accounting and the linkage between performance and ecological entities

1) System structure

How is the accounting and financial reporting system designed (i.e. how does it account for and recognise information, including environmental information) ?

1.a) Similarity to (or difference from) standard systems:

Is the accounting and financial reporting system structured in the standard way³⁰ ? Or, on the contrary, does it recognise that some traditional models are at odds with environmental reporting³¹ ?

1.b) Overall “result” (or otherwise):

Is the accounting and financial reporting system intended to produce an overall “result”³² or not³³ ? Is the overall “result” divided into sub-results (like a GIS) or not ?

1.c) Degree of complexity:

How complex is the accounting and financial reporting system ? Is the information it produces (too) simplistic³⁴ or is it reworked for a specific purpose ?

1.d) Specificity of information:

Is there a clear divide between different types of information (environmental information in particular)³⁵ or not³⁶ ?

³⁰ Example: full cost accounting (including environmental costs) (Herbohn, 2005) (Bebbington, Gray, Hibbitt, & Kirk, 2001).

³¹ Environmental reporting casts doubt on the accounting entity and double-entry bookkeeping principles (Deegan, 2013) due to issues surrounding the organisation’s control over potentially polluted resources.

³² Example: green net value added (BSO/Origin).

³³ Example: GRI framework.

³⁴ Example: SBSC

³⁵ Example: dedicated accounts (e.g. universal accounting (de Saint-Front et al., 2012)).

³⁶ Example: French and IAS/IFRS accounting standards.

2) User(s)/purpose (Who is it for? What is it for?)

An accounting and financial reporting system will always be designed with specific objectives and users in mind. These factors will determine how performance is measured.

2.a) Internal/external use:

The same internal/external principle that governs accounting (management accounting vs. financial accounting) also applies to accounting and financial reporting systems. Is the system intended for internal³⁷ or external³⁸ use?

2.b) Main user(s):

Is the accounting and financial reporting system designed primarily for shareholders (like most of the systems covered earlier in this report), for managers, or for other stakeholders³⁹?

2.c) Objectives:

Following on from point 2.b, what is the ultimate purpose of the accounting and financial reporting system (implicit or explicit)? To maximise shareholder value? To drive investment? To encourage people to act? To stimulate discussion of issues? To engage with stakeholders? To track activities? To monitor environmental targets? Or something else?

2.d) Benchmarks :

Does the accounting and financial reporting system include information (including environmental information) benchmarks and standards⁴⁰? In return, these benchmarks shape the notion of performance. How are these benchmarks set (by independent experts, by the company, by someone else)?

3) Spatial and temporal positioning

An organisation, its activities and its impacts occupy a particular spatial and temporal location. What impact do these factors have on the accounting and financial reporting system?

³⁷ Example: GRI framework.

³⁸ Example: <IR> framework (or at least part thereof).

³⁹ Example: GRI framework or universal accounting.

⁴⁰ Example: the "eco-points" accounting system initially developed by R. Müller-Wenck and later used by the (now defunct) Swiss Agency for the Environment, Forests and Landscape (SAEFL) (OFEFP, 1991) and its partner organisations. The Swiss Federal Office for the Environment (FOEN) regularly publishes a list of eco-factors (OFEV, 2013), which measure the environmental impact of pollutant emissions or resource extraction activities in eco-points per unit of quantity. Organisations use these environmental standards (published by FOEN, a government body) to calculate the eco-points attributable to their activity. This means that the resulting life cycle assessment (based on total eco-points) is weighted to account for FOEN's accepted environmental limits. Swiss supermarket chain Migros is one of many firms to adopt this model.

3.a) Spatial positioning

3.a.1) Scope of consolidation:

What entities does the accounting and financial reporting system include (similar to the “scope of consolidation” question in traditional accounting)?

3.a.2) Activity/product scope:

Should the accounting and financial reporting system focus solely on information (including environmental information) relating to internal impacts (e.g. CO₂ emissions of a production facility), or should it cover the entire life cycle of the products that the company produces⁴¹ ?

3.a.3) Linkage between micro and macro information:

Is the accounting and financial reporting system consistent with other information, potentially including information from external systems (similar to the relationship between internal accounting and national accounting standards, for example)⁴² ?

3.b) Temporal positioning

3.b.1) Observed/anticipated events:

Is the information produced by the accounting and financial reporting system based on observed or future events (similar to the present value of future cash flows principle in traditional accounting) ?

3.b.2) Short/medium/long term (past or future)

3.b.3) Rationale (flows or states):

Does the information produced by the accounting and financial reporting system hinge on variations in a given state over time (balance sheet model) or on flows over a given period (income statement model)⁴³ ?

3.b.4) Timescales:

Do the timescales covered by the accounting and financial reporting system align with the specific timescales of the ecological entities it includes⁴⁴ ?

⁴¹ Example: life cycle analysis.

⁴² At the very least, do the accounting and financial reporting system’s greenhouse gas disclosures align with Intergovernmental Panel on Climate Change (IPCC) reports?

⁴³ The Puma/Kering non-accounting indicators model is an example of a flow-based accounting and financial reporting system.

3.b.5) Periodic review (or not):

Are the data (including environmental data) reviewed on a regular basis? If so, how?

4) Relationship with the world

An organisation's world view, and its relationship with the world (in the broadest sense of the term), have a major impact on the design of accounting and financial reporting systems and on the linkage between performance and ecological entities. Yet the importance of this fact is often overlooked. There are several different ways to analyse these relationships, and an organisation must consider these findings when deciding how to recognise ecological entities in its accounting and financial reporting systems.

4.a) Perspective ("external-internal" or "internal-external"):

Does the accounting and financial reporting system look at how the environment affects (positively or negatively) the organisation's operations ("external-internal" perspective), or does it address the organisation's impacts on its environment ("internal-external" perspective) (Schaltegger, Müller, & Hendricksen, 1996) ? Under the first model, the organisation uses environmental information (and the underlying notion of performance) to determine the constraints/risks (biophysical and institutional) and opportunities associated with the environment. In the second model, this information is also used to assess the organisation's environmental impacts. The majority of popular accounting and financial reporting systems are "external-internal" by design.

Yet, in the view of many authors, only systems that adopt the "internal-external" model can accurately be described as "sustainability" systems.

4.b) Strong/weak sustainability :

This is one of the central questions of ecological economics (Neumayer, 2010). The main thrust of this issue is whether one type of capital can be substituted for another. In other words, can an organisation offset environmental loss through economic or technical gain (i.e. can it replace natural capital with financial or manufactured capital) ⁴⁵ ? The term "weak sustainability" (Hartwick, 1977) implies a broad interpretation of "preservation", encompassing financial/manufactured capital, natural capital and human capital. Under the "weak sustainability" model, an organisation can devise a sustainable development strategy that involves substituting

⁴⁴ "Over what timescale does the organisation want to measure its chosen indicators? Within what timeframe does the organisation expect to attain the desired results for one (or more) of these indicators? The full effects of environmental initiatives [...] are rarely seen within 12 months [...] An organisation will therefore determine its environmental and social timescales according to its needs, even if that means working to several different timescales [...]" (de Saint-Front et al., 2012)

⁴⁵ Example: eco-efficiency is an example of weak sustainability.

one type of capital for another (e.g. manufactured capital for natural capital), provided that the total “sum” of its capitals remains at least constant. In other words, an organisation can destroy natural resources yet still be considered “sustainable” if its financial, technological or productive gains offset or outweigh these losses⁴⁶. Proponents of “strong sustainability” (Daly & Farley, 2004) take the opposite view, arguing that an organisation cannot be “sustainable” unless each type of capital (financial/manufactured, natural and human) is preserved separately. Most of the standard environmental accounting frameworks in use today tend towards the “weak sustainability” model.

4.c) Traditional system with social/environmental component, or “accounting for the environment”:

This question bears many similarities with point 4.a above, and with Barker and Kasim’s (2016) analysis of the <IR> framework. Are social and environmental issues treated simply as “additions” to a traditional accounting and performance measurement system? Or, conversely, does the inclusion of this information reflect a broader paradigm shift in accounting practice⁴⁷? Gray and Bebbington (2001) use the term “accounting for the environment” to denote an accounting system that aims to drive long-term social and ecological change within an organisation, and across society as a whole.

4.d) Theory (or theories) of the firm:

What is a firm (and how do we understand its “performance”)? Views on this matter are traditionally split into two camps: an “institutional” model (the prevailing current in continental Europe), and a “contractarian” vision (which dominates Anglo-American thinking). Some authors (Banerjee, 2007) argue that “accounting for the environment” demands a fundamental rethink of our perception of the firm (Segrestin & Hatchuel, 2012)⁴⁸.

⁴⁶ “It does not matter whether the current generation uses up non-renewable resources or dumps CO₂ in the atmosphere as long as enough machineries, roads and ports are built in compensation” (Neumayer, 2010).

⁴⁷ In other words, should environmental accounting frameworks promote a set of *recommended* values and principles that will help to drive social and ecological change within our society?

⁴⁸ Consequently CSR, at least in part, involves thinking about what a firm *is* (and what it *should be*). These are *ontological* questions that have to do with the very nature of the firm (Segrestin, Baudoin, & Stéphane, 2014).

4.e) Standard world views:

More generally, how does the organisation (or, in some cases, the society in which it exists) perceive ecological entities (Milne, 1996)? Does it see them as stocks of value (e.g. the <IR> model), as future cash flows (e.g. IAS 41 in its original incarnation), or as reserves for potential human exploitation? Do these entities have rights or intrinsic value ⁴⁹ ? Do they form part of a complex system of interconnected relationships, where they are at once a “means” and an “end” ⁵⁰ ?

5) Measurement

The final set of issues and challenges concerns the thorny subject of measurement.

5.a) Types of unit of measure :

Does the accounting and financial reporting system use monetary or non-monetary units (e.g. the biophysical units used by the GRI framework) ?

5.b) Purpose of units of measure :

For what purpose are these units chosen ? Are they indicators, designed to place ecological entities in the spotlight ? Are they basic accounting units, intended to attribute particular environmental costs? Are they integrated units of measure ? Or are they something else ?

5.c) Quantification as “replacement” or as “expression”:

Is the purpose of quantification to replace ecological entities with sets of indicators/values, or is the ambition to let the ecological entities “speak for themselves”? Do the indicators/values signify *detachment* from the real world, or do they seek to *connect* with it ⁵¹ ?

5.d) Cost vs. value :

Does the accounting and financial reporting system assess monetary units in terms of cost (restoration, preservation, etc.) or value (future cash flows, market value, etc.)?

⁴⁹ This world view is known as “ecocentrism” (Callicott, 2007; Rolston III, 2007) – a philosophical theory that posits that ecosystems have intrinsic rights and that humans must respect these rights. Some environmental accounting frameworks try to capture this approach, with varying degrees of success (Samkin, Schneider, & Tappin, 2014).

⁵⁰ This model has to do with ecological (relational) theory (Latour, 1998) and reflects what the literature tends to define as a “genuine” ecology-oriented approach (Eckersley, 2004; Forsyth, 2004; Leary, 1985; Pilgrim & Pretty, 2010). It also brings into play the very definition of “ecology” itself (Dajoz, 2006).

⁵¹ In their critical examination of the GRI framework, (Chauvey et al., 2015) make a similar point. In their view, because the indicators are devised by experts with no connection to the organisation’s reality, they are “black boxes” – off-the-shelf packaged concepts that have little to do with the ecological entities they purport to address. Consequently, organisations need to open these “black boxes” and establish *direct contact* with the entities in question (and devise accounting and financial reporting systems that *connect* the organisation to these entities, rather than *disconnecting* them).

The inclusion of environmental issues adds a further layer of complexity to the debate between “historical cost” and “fair value” accounting (see above).

5.d-i) Cost model: restoration cost, preservation cost, replacement cost, maintenance cost, etc.

5.d-ii) Value model: market value, market value + non-market value⁵² (total economic value), present value

By way of an example, we will now apply this structure to the <IR> framework. We accept that some of the analyses given below are not absolute truths. However, one of the benefits of this type of framework is that it can be used to structure debates.

<IR>		
SYSTEM STRUCTURE		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Similarity to (or difference from) standard systems	Similarity	
Overall “result” (or not)	Overall “result”	Overall value created by the activity
Degree of complexity	?	
Specificity of information	Yes	Natural capital

⁵² In neoclassical economics, non-market value is determined by consumer preferences and is calculated as a function of market value. Studies have shown that most of the value of an ecological entity is made up of non-market value.

<IR>		
USER(S)/PURPOSE		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Internal/external use	External and internal	
Main user(s)	Investors	
Purpose	Optimise the value creation process Maximise shareholder value	
Benchmarks	No	

<IR>		
SPATIAL POSITIONING		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Scope of consolidation	Traditional	
Activity/product scope	Broad (value chain)	
Linkage between micro and macro information	? (mostly no)	No provision for linkage with public bodies in particular (environment or tax authorities, for example)

<IR>		
TEMPORAL POSITIONING		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Observed/anticipated events	Anticipated	
Short/medium/long term (past or future)	?	Decision left to the organisation
Rationale (flows or states)	Both	
Timescales	Timescales based on investment cycles, strategy, and dominant stakeholder needs and interests	No environmental entity-specific timescales
Periodic review (or not)	?	

<IR>		
RELATIONSHIP WITH THE WORLD		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Perspective (“external-internal” or “internal-external”)	“External-internal”	
Strong/weak sustainability	Weak	
Traditional system with social/environmental component, or “accounting for the environment”	Traditional system with social/environmental component	
Theory (or theories) of the firm	Contractarian	
Standard world views	Ecological entities as “simple” means (utilitarianism?)	Capital as stocks of values Confusion between capital and resource

<IR>		
MEASUREMENT		
SUB-AREA	POSITIONING OF THE <IR> FRAMEWORK	
	ANALYSIS	COMMENTS
Types of unit of measure	Non-monetary Qualitative/monetary	
Purpose of units of measure	Indicators (KPIs) Value created	
Quantification as “replacement” or as “expression”	Mostly “replacement”	
Value	Present value ⁵³	

⁵³ *“The IIRC makes clear that value creation manifests itself in financial returns to providers of financial capital [...] This approach may do little to alter the perception of value beyond the traditional view that it is the present value of expected future cash flows” (Sjåfjell & Wiesbrock, 2014).*

3. Proposals and recommendations

In this section, we set out a series of proposals and recommendations to address some of the issues and challenges set out above⁵⁴. Many of these proposals are drawn from an environmental accounting research project that uses the CARED/TDL model (Altukhova, 2013, 2015; Gbégo & Janvier, 2015; Gbégo & Richard, 2015; Rambaud, 2015; Rambaud & Richard, 2015a, 2015b, 2017; Richard, 2012).

At a time of increasing concern about the sustainability of our societies and growing consensus that we have entered a new geological epoch (the Anthropocene⁵⁵), there is a demonstrably pressing need:

- to make ecological entities a more visible component of organisations' accounting and financial reporting systems and to change corporate discourse so that organisations talk more about their relationships with these entities
- to embed ecological entities within organisations' principal accounting and financial reporting systems (commencing with balance sheets and income statements) and, in doing so, to change the way in which organisations view concepts such as performance (including financial performance), profit and wealth
- to move, in some shape or form, towards accounting and financial reporting systems that are designed for sustainability, that draw on the "internal-external" and "strong sustainability" models, and that address our relationship with the world and our environment. For those organisations that continue to see environmental issues through the prism of risk/reward or tend to internalise externalities, the goal of genuine sustainable management is nothing but a pipe dream⁵⁶.

⁵⁴ In other words, our proposals constitute a normative, critical analysis of the areas and sub-areas detailed in section 2.

⁵⁵ The term, coined by chemist and Nobel laureate Paul Crutzen (Crutzen, 2002), refers to a new geological epoch, immediately following the Holocene (which began around 10,000 years ago) and is characterised by massive human-driven environmental change: "*the Anthropocene implies that the human imprint on the global environment is now so large that the Earth has entered a new geological epoch; it is leaving the Holocene, the environment within which human societies themselves have developed. Humanity itself has become a global geophysical force, equal to some of the "great forces of Nature" in terms of Earth System functioning [...]*" (Steffen et al., 2011).

Official recognition of the Anthropocene epoch is still up for debate. At the 34th Session of the International Geological Congress, held in Brisbane (Australia) in 2012, a working group was set up to examine this question and was instructed to deliver its verdict in 2016. The "Anthropocene Working Group"

(<http://quaternary.stratigraphy.org/workinggroups/anthropocene/>) is a sub-division of the Subcommittee on Quaternary Stratigraphy (SQS), which itself is part of the International Commission on Stratigraphy (ICS). The ICS is a member of the International Union of Geological Sciences (IUGS).

The working group published its conclusions in August 2016, as follows: "*The Anthropocene concept [...] is geologically real. The phenomenon is of sufficient scale to be considered as part of the International Chronostratigraphic Chart, more commonly known as the Geological Time Scale [...] Human impact has left discernible traces on the stratigraphic record for thousands of years -- indeed, since before the beginning of the Holocene. However, substantial and approximately globally synchronous changes to the Earth System most clearly intensified in the 'Great Acceleration' of the mid-20th century. The mid-20th century also coincides with the clearest and most distinctive array of signals imprinted upon recently deposited strata*" (taken from the University of Leicester's (UK) report on these conclusions – "Anthropocene: Potential new geological time interval" (<http://www2.le.ac.uk/offices/press/press-releases/2016/august/media-note-anthropocene-working-group-awg>)). As yet, there is no official position on the precise starting date of the Anthropocene, although the majority view in the working group is that the epoch commenced in or around the 1950s.

⁵⁶ The Pearce model (Godard, 2010; Pearce, 1976), for example, clearly shows how internalising externalities blocks progress towards genuine sustainable management. It demonstrates that, although this "external-internal" model may slow the pace of environmental damage, it can never stop it completely. It is for this reason that economists recommend focusing on costs (restoration, maintenance, preservation, etc.) rather than values (gains and losses) (Godard, 2010; Levrel et al., 2014).

In view of this, we recommend :

- 1) increasing both the volume and quality of environmental information included in current and future accounting and financial reporting systems, and ring-fencing this information to make it as clearly identifiable and specific as possible (e.g. by using separate accounts)
- 2) incorporating environmental standards and limits into accounting and financial reporting systems and performance measurement frameworks (both environmental and general)
- 3) moving from an “external-internal” to an “internal-external” rationale
- 4) abandoning weak sustainability in favour of strong sustainability and focusing on the preservation of so-called “critical” natural capital (Ekins, 2005; Gray, 1994)
- 5) designing accounting and financial reporting systems that, instead of being investor-centric, serve a broad range of stakeholders
- 6) viewing accounting and financial reporting systems as a way to strengthen (rather than weaken) the connections between an organisation and its environment (just as accounting principles have always sought to connect an organisation with its economic environment).

The proposals set out below are intended to achieve these goals, notably by promoting a type of integrated reporting based on accounting principles (i.e. on the notions of balance sheet and income statement) :

- Treat ecological entities (or at least some of these entities⁵⁷) as liabilities, not assets. The traditional accounting model uses the notions of liability and asset to establish a relationship between an organisation’s resources and its obligations. Yet one of the key challenges of sustainability is how we relate to the world and how we tend to see ecological entities as nothing more than “means” that we can use as we wish (in other words, as “assets”). If we treat these entities as liabilities, organisations will see them as something they “borrow” and therefore have to “repay”. This, in turn, means that it is in the organisation’s interest to “maintain” these entities. This model reflects the *traditional accounting paradigm*, under which an organisation “maintains” financial resources from its shareholders, banks, suppliers (“negative” capital by virtue of payment terms), etc.

⁵⁷ It is impossible – and not necessarily appropriate – to try to maintain all environmental entities. Organisations must therefore assess the materiality of each entity and identify those “critical” entities (as determined by the organisation and by its external environment, i.e. society, scientists, NGOs, etc.) that it needs to preserve.

- Think of (environmental) **assets** not as the ecological entities themselves, but rather as the **ways in which these entities can be used**. Once again, this rationale tallies with traditional accounting logic, which sees an asset as a use of financial resources (i.e. a liability)⁵⁸. Like the standard balance sheet, this reporting model allows organisations to set out, in minute detail, how environmental entities are used (e.g. recurring or one-off use, following the logic of fixed and liquid assets on a traditional balance sheet), areas of high and low risk, etc.
- Consider profit as a **surplus above and beyond the current (i.e. maintained) state** of an organisation's inputs (both financial and extra-financial).
- Think of value (and therefore measurement) in **monetary terms**, based on **maintenance costs** (see footnote 56) rather than values (market value, fair value, etc.). Under this model, integrated reporting therefore becomes a natural extension of financial reporting.
- Conversely, think of systematic loss (i.e. consumption) of environmental entities in terms of (foreseeable) **depreciation**. This approach has the benefit of maintaining the liability (rather than the asset).
- Account on the basis of different types of financial and extra-financial capital [here, "capitals" become "entities" (financial or otherwise) that need to be maintained], and monitor how these "capitals" are managed, degraded, etc. (again, in a similar manner to traditional financial accounting).
- Designate "**spokespeople**" ("representatives") for these ecological entities (i.e. environmental capitals). These spokespeople (scientists, NGOs, local communities, public bodies, etc.) (Latour, 1999; Rambaud & Richard, 2015b) would be responsible for engaging *with* the organisation *on behalf* of these capitals, with a view to reconnecting the organisation with these entities. This "capital-centric" spokesperson concept would replace the "stakeholder" paradigm which, in reality, represents nothing more than the organisation's interests and risks. The stakeholders would also have a duty to spark **debate**, within an organisation (or within the organisation's sector/ecosystem more generally) about how ecological entities are defined and understood, about their place in our socio-economic system, etc.

⁵⁸ To take Ijiri's example: when an organisation purchase a machine, the asset is not the machine itself but the "purchase of the machine" (Ijiri, 1967).

- Take a **pragmatic** view of book value (Demeestère, 2005), i.e. see it as an institutional construct that is neither purely objective nor wholly subjective. Focus attention not on whether a figure is objective (a concept that is difficult to reconcile with the complexity of the environment (Allenby, 2005; Berkes, Colding, & Folke, 2002)), but instead on the process by which the figure was arrived at. In other words, ask who determined this process and, critically, whether this process is up for regular debate.
- Use “traditional” financial metrics (in the form of restructured balance sheets and income statements) to measure **performance**. This, in turn, will produce detailed accounting and financial information systems and ratios that are truly reflective of environmental issues. For example, organisations could calculate **environmental debt ratios** to express the ratio between their environmental capital (recognised as liabilities) and their total liabilities.

By way of an example, the appendix below contains a sample balance sheet and income statement template. These templates have been reworked using the CARE/TDL model and incorporate all of the recommendations and proposals set out above.

Appendix

Balance sheet and income statement under the CARE/TDL model

Assets (financial, human, natural): Reporting of different generic **types of uses** of concerned types of capital
 Ex: Machine (purchase of the machine) = use of financial capital to buy a machine

Fixed assets: continuous/repeated uses
 Current assets: "one-off" uses

→ Assessment in proportion to the different capital maintenance costs according to the types of uses

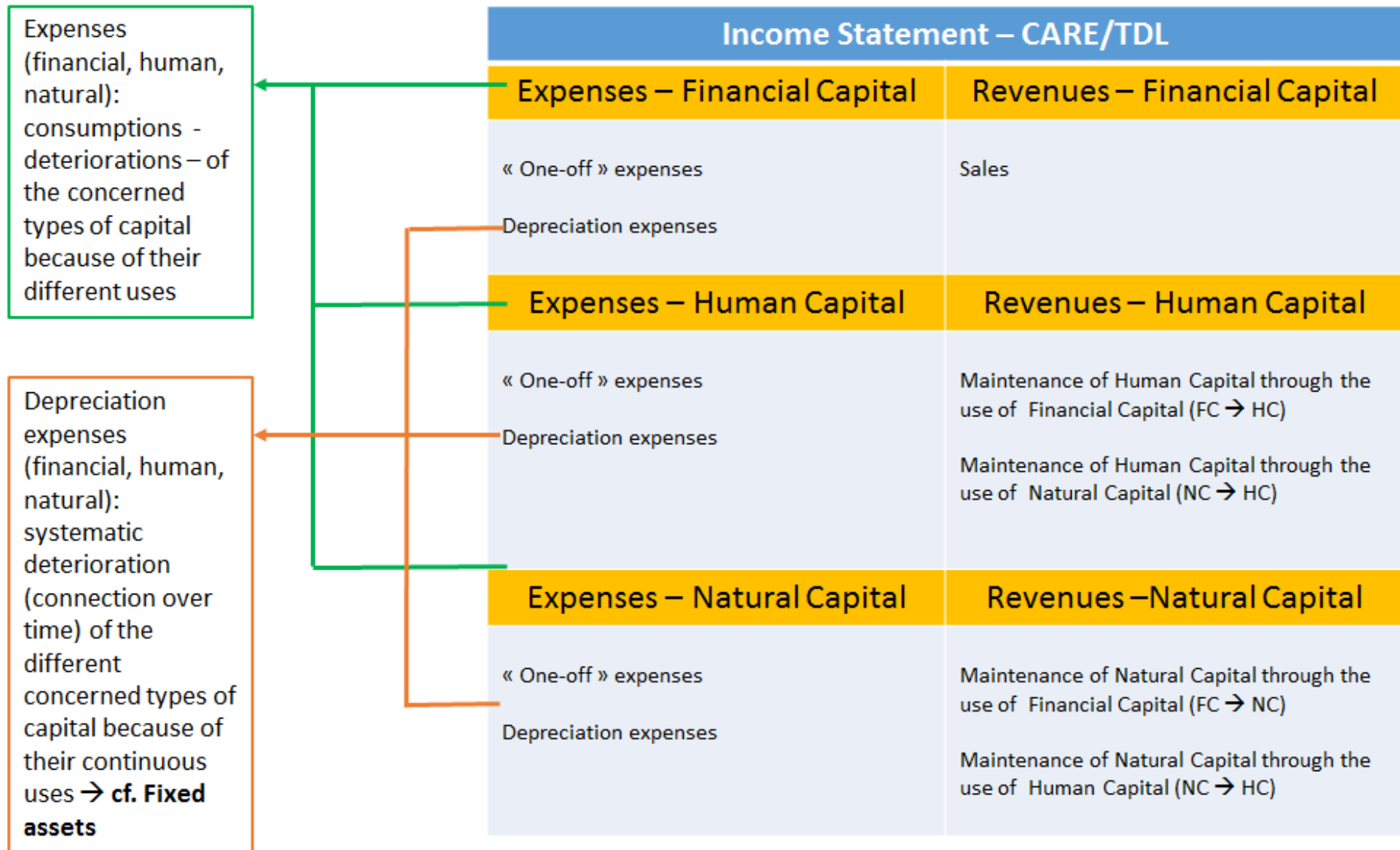
Balance Sheet – CARE/TDL				
Financial Capital				
	Gross	Dep.	Net	
Fixed assets (standard) ... Cash and cash equivalents (standard)				Equity (standard) Liabilities (standard)
Types of Human Capital				
	Gross	Dep.	Net	
Fixed assets Usual/continuous farm work Usual Childcare				Workers (concerned by profit-sharing) (and representatives of workers – trade unions, medical staff, etc.) Workers (not concerned by profit-sharing) Childs (ex: Childcare centre) ...
Current assets One-off farm work				
Available Human Capital				
Types of Natural Capital				
	Gross	Dep.	Net	
Fixed assets Usual/continuous farm work Repeated pollution of a river				Fields (or/and representatives – scientists, NGOs, etc.) Ecosystems (or/and representatives – scientists, NGOs, etc.) ...
Current assets One-off pollution				
Available Natural Capital				
Mixed assets				
	Gross	Dep.	Net	
Fixed assets				
Current assets Inventory (Wheat)				
				Income
Total Assets			Total (Equity &) Liabilities	

« Things » recognized as having to be maintained because « capital » (essential)
 Ex: financial capital = money to refund
 → Assessment through maintenance costs

(Equities &) Liabilities (financial, human, natural): For who and why maintaining the different types of capital

Mixed assets: types of uses which involve different types of capital

Global income: surplus after capital maintenance



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<http://csear-france.essec.edu/>

Réseau International de recherche sur les Organisations et le Développement Durable (RIODD):

<http://riodd.net/>

Association pour le Développement de l'Enseignement et de la Recherche sur la Responsabilité Sociale de l'Entreprise (ADERSE):

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