

The “Triple Depreciation Line” instead of the “Triple Bottom Line”:

Towards a genuine integrated reporting

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Abstract:

The “Triple Bottom Line” (TBL) is a major and increasingly used socio-environmental accounting framework. However academic critical examinations of this model have remained scarce and most importantly, no real alternatives have been developed. Thus this theoretical paper provides a contribution to fill this gap. Firstly from a critical analysis of the TBL approach, we argue that this one suffers severe limitations. In particular, it does not protect human and natural capitals. As an answer to these problems, we propose and discuss an other accounting framework, the “Triple Depreciation Line” (TDL), which extends the powerful tool of capitalist accounting for preserving the financial capital, the Historical Cost Accounting and its planned depreciation, to human and natural capitals. To this end, we analyse and redefine the concept of capital in an ecological accounting context. We clearly specify the hypothesis on which the TDL relies, to facilitate comparisons and dialogues with other accounting models.

Keywords: Capital, Depreciation, Historical Cost Accounting, Sustainable Development, Triple Bottom Line

1. Introduction.

The concept of “Triple Bottom Line” has been proposed by Elkington in 1997 in his book “Cannibals with forks” (Elkington 1997) for progressing toward a sustainable development. Since the publication of this book the concept has seemingly gained a tremendous notoriety not only among businesses but even in other circles such as NGOs. According to a recent book promoting the merits of this concept “thousands of companies around the world have been measuring and reporting their performance in the environmental, economic, and social spheres” and even a “growing number of institutional and individual investors, consumers, and workers are beginning to evaluate companies according to the Triple Bottom Line” (Savitz and Weber 2006). This success is also recognised by the critical literature. For example Robins asserts that “TBL is the format most commonly chosen by business for GRI’s objective” and that “despite its imprecise meaning and flawed pretension as an accounting mechanism the TBL does seem to reach into society’s deep concerns” (Robins 2006). In a similar vein Norman and MacDonald (2004) stress that even governments and many NGOs take the TBL as an “article of faith”. Face to this overall recognition the number of critical articles specifically devoted to the concept is astonishingly weak. Norman and Mac Donald (2004) regret the surprising “passivity of academic analysis” which induces them to “fill this academic lacuna” with their article “Getting to the bottom of TBL”. This article, which can be considered as a milestone against the TBL, has been published only in 2004. Since this year the production of critical authors has remained very scarce: if we except the contributions of Robins (2006) it does not seem that there is other significant progression into the critical analysis of the TBL. This is again astonishing as far as meanwhile other works have been published on the part of defenders of the TBL notably a book of 300 pages entirely devoted to the praise of the TBL (Savitz and Weber 2006). The weakness of the critical side is all the

more regrettable than, to our knowledge, no one of the critics propose an alternative to the TBL. In a sense even the critics seem to be impressed by the TBL. The main criticisms mainly deal with the difficulties of the TBL: difficulty (if not impossibility) to value the social line (Norman and MacDonald 2004) and difficulty to serve different masters at the same time (Robins 2006). This is this situation which motivates our article.

In these conditions, the goal of this article is

- to propose a critical analysis of the TBL, highlighting its limitations and its deadlocks,
- then to give an alternative to this accounting framework, as an attempt to answer its issues: the “Triple Depreciation Line” (TDL) model, based on a theory radically different from the TBL's one.

Part 2 will come back to the very significance of the TBL and comment the previous critical articles devoted to this concept. Part 3 will present the concept of TDL, which is a development of the CARE model of Richard (2012a), and its originality in comparison of similar attempts to take account of the degradation of environmental and human capitals.

2. Analysis of the TBL model.

2.1. What is the TBL?

As already underlined by Norman and MacDonald, “there is no careful definition of the concept” and “only vague claims about the aims” (Norman and MacDonald 2004). This imprecision is, according to us, one the main reasons of its success: it gives the firms the possibility to make people believe that they are in search of one objective while pursuing another quite different one. We will first present the appearance of the TBL, then show that there are two main different versions.

2.1.1. The appearance of TBL: an equal conservation of three capitals.

Elkington presents TBL as key concept for getting a sustainable world where instead of focusing exclusively on economic prosperity the focus will also be directed on “environmental quality, and –the element which business had preferred to overlook–social justice” (Elkington 1997). This has been popularised as the famous three pillars approach. This three pillars approach has an important consequence in terms of concept of capital(s). Elkington is logically conducted to recognize that within the frame of his philosophy of the TBL “the concept of economic capital will need to absorb much wider concepts, such as natural capital and social capital” (Elkington 1997). Thus, seemingly, at least three capitals, not only the economic capital, are to be protected: this should be the reason why a triple bottom line is needed in order to check the reality of the conservation of the different economic, human and natural capitals. At this stage of reasoning the reader could be persuaded that the TBL is an instrument of systematic conservation of three capitals: a revolution in the management philosophy! This belief is apparently comforted by the fact that Elkington presents its innovation under the form of three parallel (bottom) lines with equivalent importance presumably indicating the reality of respect of the different types of capitals. (*cf.* schedule page 73 in (Elkington 1997))

But this presentation is a deceitful one. We will show that there is no question here to conserve in a systematic way the natural and the human capitals. The focus is at best only on a possible decrease of their level of absolute degradation (if we take for granted that, on the whole, today the state of natural and even for a large part human capital are unsatisfactory). But according to another interpretation of the TBL it could be even more deceitful as allowing the possibility of a rise of the degradation of these capitals. We will start with the optimistic case.

2.1.2. The optimistic version of the TBL: a possible decrease of the absolute degradation of the natural and human capitals.

This version of the TBL is notably promoted by Savitz and Weber (2006). In spite of the fact that they recognise that the “financial bottom line is not the only one or even the most important measure of success” (Savitz and Weber 2006) they place the TBL under the umbrella of creation of profit for shareholders. This is reflected in their definition of a sustainable corporation: “one that creates profit for its shareholders while protecting the environment and improving the lives of those with whom it interacts” (Savitz and Weber 2006). This definition clearly implies that the decision to take measures in favour of the betterment of the absolute situation of the natural and the social capitals is conditioned by the conservation of the level of profits of shareholders¹. This is confirmed not only by numerous examples of firms that apply this rule of management² but by the recognition that a “win-win” strategy is not always possible: in that case it is “impossible for a company to act against its own financial interests” (Savitz and Weber 2006). This interpretation of the TBL is illustrated by the use of the classical representation of overlapping circles: in the case of Savitz and Weber they have recourse to only two overlapping circles symbolizing the conjunction of the interests of shareholders and stakeholders (p. 23), but more often the representation is based on three overlapping circles symbolizing the case according to which it is possible to preserve the interests of the three main types of capital. Savitz and Weber express the belief that “sustainability enhances profitability for the vast majority of companies” (p. 39). As an illustration of this win-win strategy we can give the example of a farmer who produce 500 tons of a product for 50000\$ while injecting 100 tons of chemical fertilizers in the soil at a global cost of 10000\$ and realizing a normal profit of 40000\$. But he could rent for 2000\$ a special machinery allowing a scientific spreading of the fertilizer and economize 40 tons of fertilizer so that its net profit could jump to 42000\$. The TBL could show a first financial line

¹ In the same sense of (Robins 2006)

² For example, E. I. du Pont de Nemours and Company is “creating shareholder and societal value... while reducing [its] footprint throughout the value chain” (Dupont 2013)

indicating the profit of 42000 \$ and a second environmental one showing a decrease of the “impact”³ on the soil by 40 tons of chemical fertilizer. The limits of this kind of reasoning are obvious. If the cost of the spreading machinery has been more than 4000 \$ the farmer should have renounced to invest because its profit would decline. As we have said the goal is not to conserve the natural capital but to raise the profit while reducing the impact on the environment. Nevertheless this kind of reasoning can have favourable consequences and use a kind of reporting which is informative of the progress of the firm in all directions. This is not the case of the second interpretation of the TBL.

2.1.3. The pessimistic version of the TBL.

The preceding version of the TBL is founded on the decrease of the absolute amount of the impacts on the environment. This conception is generally qualified as aiming to the rise of “effectiveness”⁴. But another conception of the TBL is possible based on the concept of “eco-efficiency”. In his seminal book Elkington, at the difference of Sawitz and Weber (2006)⁵, gives a fundamental role to eco-efficiency for the construction of the TBL. According to him the TBL has been permitted by the development of the concept of eco-efficiency which has saved business men from ecological communism as it can be shown from these eloquent quotes: “like the ancient Trojans dragging the vast wooden horse through a great gap torn in the walls of their long-besieged city, some of the world’s best business brains spent the 1990s struggling to take on board the emerging sustainability agenda. Many of their colleagues warned that success would end in disaster, just as it has done for the Trojans. Sustainable development, they argued, was a treacherous concept; basically, communism in camouflage.

³ Normally the impact is the consequence of the use of chemical fertilizers on the quality of the soil and its environmental functions. We simplify here while assuming that there is a correspondence between the quantities of fertilizers and the impacts.

⁴ Environmental effectiveness consist in reducing the total of impacts on environment as measured in absolute quantities; in our example the quantities of chemical fertilizers have been reduced by 40 tons.

⁵ The references to the concept of Eco-efficiency are sparse in the Savitz and Weber’s book (2006); see pages 34 and 35 with an example of eco-efficiency in the Swiss firm ST Microelectronics inspired by Holliday et al. (2002). In this example eco-efficiency clearly appears as a ratio comparing profit and impacts on environment.

By the middle of the last decade of the 20th century, however, their fevered brows were being soothed by the concept of “eco-efficiency”, promoted by the World Business Council for Sustainable Development (WBCSD)” (Elkington 1997, p. 70). As we have seen before the representation of the TBL by Elkington gives the priority to three parallel lines. But this representation is a deceitful one. As a matter of fact Elkington insists that “some of the most interesting challenges.. are found not within but *between* the areas covered by economic, social, and environmental bottom lines” (p. 70) and that “one area where we see a growing degree of overlap between a company’s economic and environmental performance is “eco-efficiency” (p. 75). So, as a conclusion, the TBL can be based and must be based on the concept of eco-efficiency, but what is eco-efficiency? Here again we face to a difficulty because this concept is possibly linked with two main understandings. If we refer to the works of the founders of the WBCSD and the literature of this organization we find two totally different definitions. The first one given by the WBCSD, expresses itself as follows: “Eco-efficiency is achieved by the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level in line with the earth’s estimated carrying capacity “ (Verfaillie et al. 2000). If we take this first version we are in the same situation as before when handling the *optimistic* version of the TBL: the eco-management is oriented towards effectiveness with at the same time, this is an outstanding element here, the necessity to situate the progression in the frame of the “earth’s estimated carrying capacity”. But this definition is totally deceitful if we look, in the same document, at the concrete measure of eco-efficiency: it is said that “eco-efficiency brings together the two dimensions of economy and ecology to relate product or service value to environmental influence” ((Verfaillie et al. 2000, p. 8) and that it can be represented as the ratio:

Product or service value/ Environmental influence

In spite that there can be different ways of calculating the numerator and the denominator the main fact is that we deal here with a ratio and not an absolute number as a goal for management: in other terms the focus is not on effectiveness but efficiency. The other fact is that it is possible to use mixed data with the denominator expressed in term of prices and the denominator in term of quantities. This solution is notably advised for higher managers: “the product manager could calculate an indicator on the basis of economic value per kilo joule of manufacturing energy consumed”⁶. If such a definition of eco-efficiency is taken as the basis of the TBL there is a considerable change in comparison with the previous philosophy. It can be demonstrated that the TBL can show a positive picture in spite of the degradation of environmental condition as expressed in absolute terms. The reason for this situation is notably linked to the well known rebound effect. Let us take again the case of our farmer and assume that, after seeing the advantages of the new spreading machinery, he decides to buy 120 tons of chemical fertilizer in order to raise the volume of product sold to 700 tons. In this case he will reach a profit of 57800\$: 70000\$ (sales) minus 12000\$ (fertilizer) minus 2000\$ (rent of machinery). If we compare its eco-efficiency for the two periods we get the following table:

Table 1

Example of an eco-efficiency calculation

	First Year	Second Year
Eco-efficiency	400 = 40000/100	481 = 57800/120

⁶ In the same vein: “process engineers may want to evaluate eco-efficiency in terms of the number or mass of products being manufactured .Financial analysts or business managers may want to analyse eco-efficiency in terms of a company’s total turnover or earnings to assess economic risks/benefits” (Elkington 1997, p. 14)

Eco-efficiency is rising. But this is detrimental to the use of fossil elements and also probably detrimental to the quality of the soil (see part 3.2.1). Nevertheless, if the manager fills the environmental line of the TBL on the basis of eco-efficiency he will show a progress.

The conclusion is that the TBL based on eco-efficiency is not a guarantee of progress for environmental problems. It can be even a motivation for stronger degradation. As far as the denominator of the ratio is dependant of the fluctuation of the prices there is no possibility to correct in a realistic way the positive image by “playing” on the denominator side with coefficients of degree of scarcity or of toxicity unless changing them for every change of prices: eco-efficiency seems to be condemned by construction to misrepresent the degradation of the capital natural⁷. Contrary to the hopes expressed by Elkington eco-efficiency will not save capitalism.

3. An alternative to the Triple Bottom Line: The Triple Depreciation Line

As shown before the promoters of the TBL insist on the fact that in the “changing course” (to take an expression used in (Schmidheiny and Business Council for Sustainable Development 1992)) the novelty is to consider at least three types of capitals to be conserved: not only the financial (or man made) one but also the environmental and human ones. But this recognition is only a piece of rhetoric devoid of any concrete appliance. As a matter of fact the only one capital which is systematically protected under the TBL is the financial capital: the other capitals do not benefit of the same level and means of protection and, as demonstrated before, still under the risk of a degradation. This dichotomy will be for us the starting point to ask a fundamental question: why not *take seriously the existence of different types of capital* and

⁷ If efficiency is measured in pure quantitative units (ecological efficiency) the conclusions are similar ones. For the first year efficiency is equal to 5 (500/100) and for the second to 5,83 (700/120). This favourable result diverts the attention from the rising consumption of non renewable resources unless having recourse to coefficients (eco-points) growing with scarcity. The same remark applies for the measure of impacts on the quality of the soil: to counteract the positive result one should take account of the rise of toxicity with the growing use of chemical fertilizers. Here, at the difference of eco-efficiency, ecological efficiency could theoretically be “saved” by the use of eco-points but it is difficult to believe that firms will engage in such difficult measures.

apply to *all of them* the same instruments of protection as used in the case of the financial capital? This will lead us to promote the Triple Depreciation Line instead of the TBL as an effective instrument for solving the urgent problems of today's capitalism. In short, take one of the most famous weapons of capitalist accounting and turn it on financial capitalists: a new anti-capitalists capitalism! To present this proposal we will first analyse the main instrument of conservation of the financial capital then show how it can be used for other types of capitals, notably the environmental and the human ones. We will conclude this part by a comparison of this proposal with main competing proposals

3.1 The main instrument of conservation of traditional capitalism

This instrument is the *depreciation concept*, a concept invented by accountants. Under the reign of the financial capitalism beginning in the 1960s-70's a systematic attack against this concept is launched under the umbrella of the theory of finance: accounting depreciation is considered as a bad instrument for the measurement of profit and void to be replaced by *financial* depreciation (Beaver 1979; Brealey and Myers 2003; Solomon and Laya 1967). In spite of this attack, backed by the IAS/IFRS, the accounting depreciation goes on dominating the scene for a large part of assets notably tangible assets such as machinery and buildings as well in official standards as in practice (Richard et al. 2008). But financial depreciation is progressing as we will see after examining the concept of accounting depreciation.

Accounting depreciation is not a simple and unified concept. It has changed all along the different periods of capitalism. Of course its main goal is always to admit and take in consideration the inevitable death of every component of the man made capital so as to deduct this part as an expense from the revenues and be able to calculate a "true" profit it means, as said by Hicks, "a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning" (Hicks

1946, p. 172). This formula, which has been applied by most accountants without knowing it well before the time of Hicks⁸, means that if the capitalist will have a sustainable firm he must set aside every year, if not every week, an amount representative of the depreciation of its assets in order to be able to regenerate its capital. But if the principle is a simple one the appliance is more difficult and can vary not only for technical reasons but also for political and social reasons as it is the case for any concept of capitalist accounting. According to (Richard et al. 2008) and (Richard 2005), it seems that since the industrial revolution two main types of accounting depreciations for long term assets have been employed. The first one who has been known as early as the 14th century at the time of Tuscan merchants (Lemarchand 1993) consists in calculating the depreciation of fixed assets on the basis of their market price in the frame of a fictitious liquidation of the firm. This mode of calculation has obviously dominated the scene in theory and probably in practice until the last part of the 19th century. If it has been accepted by traditional capitalist undertakers it has been rejected by short sighted capitalist at the time of the formation of big Joint Stock companies in the 1870s, 80s because the profits and the dividends were too much fluctuating with the market prices and above all were condemned to appear only after several years (Richard 2012b). This is the reason why another theory of accounting depreciation was proposed in the 1880s to satisfy both the capitalist undertakers and the financial capitalists: the Historical⁹ Cost Depreciation system. Under this new system the initial cost of a long term asset is distributed along the period of anticipated activity (life) of the assets concerned until their presumable death¹⁰. In practice, the most common solution is to divide the initial purchase price by the number of

⁸ Even at the time of Roman people there is a distinction between “substantia” (the capital) and “fructus” (the profit), only the latter being consumable so as to preserve its source.

⁹ We suppose here, in order to simplify the presentation, that there is no inflation so that the cost to be taken in consideration is the initial cost, it means the “historical” cost; if the *purchase* price (or replacement cost) of the assets were to be higher or lower (independently of a technological change) the historical cost depreciation system should be replaced by a more complicated system as promoted by Schmidt (1921): the replacement cost depreciation (RCD) system.

¹⁰ Theoretically the final scrap or resale value should be taken in account but in practice it is seldom the case.

years concerned. This system is also said to be based on a planned linear depreciation which relies on the hypothesis that the depreciation concerns an equipment that produce an equal quantity of the same production over its life. It can be adjusted in a very flexible way by *extraordinary depreciations* to take account of different physical modifications (but not market prices) such as modifications of the period, level and rhythms of production, of the environment (temperature, wetness..) and of different accidents (breakdowns). These ordinary and extraordinary depreciations are yearly deducted from the revenues and will reduce the profit. Normally if the sales cover the full cost of production including the depreciation the undertaker should be able to renew its assets it means to maintain its capital. This system has been adopted as a compromise between the capitalists- undertakers and the capitalists at the end of the 19th century: for the former it was an assurance to maintain their capital and distribute real profits; for the latter it was the possibility to get regular dividend even, in many cases, at the beginning of the investments. We highlight that the Historical Cost Accounting corresponds to the genuine (if existing) accounting interpretation of the Hicksian profit defined above. Indeed, “Hicks himself believed that the proper basis of valuation in the financial statements of a firm is historical cost” (Brief 1982). The introduction of his profit in accounting by Alexander in the 1950s (Alexander 1950) notably led to some misunderstandings about the relation between accounting and economics, and finally a justification of the use of the fair value. This “capitalist pact” has been legalised in most countries of the globe at the beginning of the 20th century. A crucial element for this evolution has been the entry in scene of a new actor: the tax administration. As soon as the latter has begun to tax the profits the capitalists have understood that the deduction of the depreciation as a tax expense was a necessity to protect their capital. If we add that in a majority of countries it has been decided by the lawyers, at the beginning of the 20th century,

that it is very difficult if not impossible to reimburse the capital and to distribute the retained earnings we can conclude that the capitalist system of the 20th century has invented and legalised a system that oblige its members to save and conserve their capital, it means its financial capital. This extraordinary institution, which has even an influence on the most liberal institutions like the GATT is a fundamental aspect for our question.

But this institution has been challenged by the tenants of the financial capital. A new type of depreciation, the financial depreciation, has been proposed during the 1970-80s by "modern" accountants such as Beaver (1979) armed with the finance theory promoted by Fisher. According to this theory the depreciation of a capital is the decrease of its actuarial value it means the decrease of the present value of the flow of services rendered by this capital. Some appliance of this theory is already made in the frame of the IFRS notably in matter of intangible assets such as goodwill (Richard et al. 2008). The consequences of the use of such a theory on the management of firms and especially on the conservation of the financial capital are fundamental ones. With this theory there is no more yearly planned depreciation: depreciation of fixed assets becomes an "impairment" conditioned by a decrease of the value of fixed assets, it means of the present value of future services rendered by these assets. Practically, in a context of expansion or belief of expansion, the mere appliance of these principles will produce at the beginning of investments the registration of a distributable net present value based on expected data. If this net present value is distributed, any reversal of the economic situation will end in the distribution of fictitious dividends and an increase the risks of failure: the sub-prime crisis is an illustration of this kind of situation. But finance people want to destruct the principle of historical depreciation to give more liberty to the shareholders. Schaltegger and Figge eloquently speak of this decrease of freedom for shareholders: "contrary to free cash flows the net accounting income concept does not take

account of the fact that by obliging the firm to reuse a part of the income for the sake of self financing it reduces the disponible part for the shareholder” (Schaltegger and Figge 2004). Finance people also want to destruct the concept of legal capital and its fixity (Armour 2008). All in all, in the field of traditional capitalist management, as said by Neumayer, “present value maximisation and sustainability can strikingly conflict with each other” (Neumayer 1999).

As a conclusion of this point we have seen that traditional capitalist accounting has produced a powerful instrument of conservation of the financial capital: the concept of Historical Cost Depreciation (HCD). This concept is under attack today by the theoreticians of finance for the sake of hurried shareholders (Chiapello 2005). It remains however in use for a majority of assets notably fixed tangible assets. The question now is the following one: what has the HCD to do with our inquiry on the TBL?

3.2 The use of HCD for natural and human capitals: towards a TDL.

The presence of a concept of obligatory HCD in traditional official accounting all over the globe sheds a new light on the concept of TBL. In spite of the assertions of the promoters of the TBL there is no equilibrium in the status of the different lines and capitals. Only the financial line is provided with a system which can guarantee a systematic conservation of its corresponding financial capital. The two other lines are not fitted with such a mechanism. Why? Simply because the aim of traditional capitalism has never been to conserve the human and the natural capitals: it has on the contrary largely prospered on the basis of their destruction. Our thesis here is that this situation will only change when the equivalent of the concept of HCD for natural and human capitals will be rendered obligatory in the same way as it is today obligatory for the sake of the conservation of the financial capital. But what

could be such a concept for natural and human capital? We will distinguish the case of the two capitals.

3.2.1 The foundations of the TDL model

In order to detail the construction of the TDL model, we will specify, and refine, as we go along, the hypothesis which underlines it, as well as their consequences. By proceeding in this way, we hope to facilitate comparisons and dialogues with others accounting models and norms, notably the IAS/IFRS, that we will use here as a benchmark to discuss the different proposals of our model. This recourse to the international norms does not entail an *a priori* compatibility between the TDL model and these norms, and neither a predominance of these ones over others accounting systems: we simply need an admitted and used accounting standard to strike up a debate and clarify our model.

We point out that these premises are *societal* premises, it means that these hypothesis are requirements, from a societal point of view, for comprehending corporate activities in a sustainable way. Thus the firm is grasped as an active unit embedded in the society and its environment (Perez 2007). Then we will analyse the interpretation of these societal requirements in accounting. First of all, as explained before and in accordance with what we would be entitled to expect of the TBL model, our first assumption is the following one:

(H1) the use of some particular HNCs by a firm implies an obligation for this one to maintain these HNCs

Let us notice that (H1) can be seen as the cornerstone of an ecological conceptualisation of economics and accounting (Lamberton 2005; Milne 1996). Let us focus on three keywords in this postulate: “*some particular*”, “*capitals*” and “*obligation*”. We will detail these terms in this part and in part 3.2.2. Besides this assumption, we add another essential hypothesis which

is the recognition of the impacts on human and natural capitals caused by a recurring use of them:

(H2) the repeated use of these HNCs implies their systematic degradation.

(H1) concerns the maintenance of HNCs for all types of uses. But, a clear distinction must be done between punctual and habitual (or repeated) uses of capitals. Indeed, most of socio-environmental degradations stem from this last kind of uses ((International Labour Organization 2013), (German Advisory Council on Global Change 1994), (Swedish Society for Nature Conservation 1999)). Daily and common habits of consuming and doing business lead slowly but surely to massive deteriorations of humans and their environment, although the spotlights are turned on accidental or one-shot degradations. This difference of treatment relies upon well-known cognitive biases, like focusing effect, duration neglect (Hirata 2011), or problems of intention attribution (Cova et al. 2012). In these conditions, we emphasize the importance of the recognition in corporate reporting of repeated uses of natural and human capitals. These kinds of uses cannot be treated as a mere successions of punctual or accidental events, but have to be recorded in a way which highlights, and eventually anticipates, the systematic characteristic of them.

To hypothesis (H1) and (H2), we add another premise which directly concerns the form of the corporate reporting, in order to be able to discuss accounting implications of (H1) and (H2).

(H3) the reporting concerning these HNCs has to be integrated in the standard financial statements

This hypothesis is a controversial one, regularly discussed (Jones 2010). Generally speaking, this debate focuses on two main dichotomies: monetary/non-monetary recording of socio-environmental impacts and, if the monetary option is chosen, incorporation or not in financial

statements of these events. As explained in part 2, the TBL model maintains some confusions as for the options to be retained. (H3) clearly lifts this indetermination: the TDL model is based on a monetary valuation of socio-environmental degradations that must be integrated in the standard financial statements. Indeed, a first argument for this choice is summed up by Sherman, Steingard and Fitzgibbons: “in light to the disproportionate attention that monetary values are given by both internal (managers) and external (investors and creditors) users of information, [socio-environmental] accounting needs to use monetary values, however difficult to calculate, to give greater transparency to a corporation's efforts and achievements, costs and failures – and to tie those numbers into the face of the financial statements.” (Sherman et al. 2002). Moreover, as stated above, the TDL model notably relies on the assumption that socio-environmental accounting needs to strike up a debate with today accounting norms and is not doomed to stay on the sidelines. This positioning entails an obligation to compare on common tenets the generally accepted accounting norms with their socio-environmental challengers. In these conditions, we claim that (H3) is a necessary gateway to make these comparisons possible. Lastly, the financial statements “should reflect the true values of assets and liabilities [,] should be designed so that all of the company's stakeholders can utilize the information.” (Gorman 1999) and so should also report one and only one profit, which would be the genuine reflection of the whole corporate activities. This assumption is completely in contradiction with the TBL structure. In part 2, we notably showed that the presence of three different types of profits is finally a trick which allows a green-like reporting while keeping the usual habits of disclosures and management. This crucial point will be detailed in part 3.3.

From an accounting point of view, (H1) and (H3) would involve a recognition of a liability linked to these HNCs in the financial balance sheet. Indeed, for example, for the IAS/IFRS,

“an essential characteristic of a liability is that the entity has a present obligation” (IASB 2010). This type of liability is regularly examined by environmental accounting. It is possible to argue that the concept of capital maintenance is related to “equity”, as explained in the part “Concepts of capital and capital maintenance” of the IASB's conceptual framework: we will discuss this point in part 3.2.5; for the moment, we only stress the notion of “obligation”.

The credit of this liability implies the debit of an expense or an asset. The first proposition is the most classical one and is partially implemented in some accounting norms. The IAS/IFRS recognize for example some environmental liabilities recording as provisions, like “the decommissioning costs of an oil installation or a nuclear power station to the extent that the entity is obliged to rectify damage already caused.” (IAS 37). Nevertheless, environmental expenses are not recognized as they are. Generally speaking, in this first case, the liability corresponding to HNCs is an outcome of degradations occurred during the accounting period and recorded through expenses. Besides considerable issues concerning the evaluation of these expenses (Gorman 1999), we highlight that this procedure is incompatible with the hypothesis (H2). Indeed, firstly, this method is unable to render an account of systematic deteriorations which stretch beyond one period: the firm merely notices that its past activity led to negative socio-environmental effects. In these conditions, anticipation of future impacts is not comprehended as a central information for stakeholders. Moreover, these impacts are only considered as costs, *i.e.* loss of profits, and not as consequences of the use of some specific resources, essential for value creation and the firm survival (*cf.* hypothesis (H4) in part 3.2.2). In these conditions, let us examine the second proposition, which is also regularly investigated by authors in socio-environmental contexts. Accounting norms recognize more and more environmental assets, incorporated in some cases as a capitalization of costs, although the trend is to assess them through their fair value. Thus on one hand, according to

IAS 16, “the cost of an item of property, plant and equipment comprises [amongst others] the initial estimate of the costs of dismantling and removing the item and restoring the site on which it is located”: these costs are capitalized and depreciated during the useful life of the concerned asset. On another hand, IAS 41 states that biological assets must be evaluated using their fair value. Now, as far as the literature is concerned, some illustrative examples of capitalization of HNCs can be found¹¹. We can mention the proposals of Richard (2012a) for human and natural capitals, of which this article is a development, Dobija (1998) for the human capital, Rubenstein (1992) for the natural capital and Magness (1997) for the presentation of a firm experience (an “oil and gas company in western Canada” (Magness 1997)) concerning a part of its natural capital. In these examples the valuation of the corresponding asset is not merely based on fair value and partially meet the objectives of this paper. In fact, as far as sustainable issues are concerned, capitalisation is the well-adapted procedure. Indeed, “capitalisation facilitates amortisation over a number of years and therefore enhances long-term thinking” (Schaltegger and Burritt 2000), based on (Williams and Phillips 1994). Thus we claim that the only way to take into account the hypothesis (H2) is to debit an asset account. The systematic degradation would be expressed through a HCD, in a way described in part 3.1 and detailed in part 3.2.5.

Nevertheless, it remains a central point concerning the hypothesis (H1). Let us suppose that a firm F follows these latest recommendations and so records for instance this operation in its journal:

Environmental asset	V	
Environmental liability		V

Then, F decides to settle its environmental liability using its cash account. The outcome of this operation would be that F does no longer render an account of its obligations towards the

¹¹ Cf. also part 3.3

environment even though it continues to use it since the environmental asset (corresponding originally to the environmental liability) still remains in the balance sheet. This situation is clearly in contradiction with the hypothesis (H1). Thus (H1) and (H2) imply that the settlement of a liability corresponding to a human or natural capital must result in an outflow of the associated assets. This assumption can be compared with the strong sustainability premise (Neumayer 1999): no substitutability between financial, human and critical natural capitals.

At this point, we have established the foundations of the TDL model. In order to go deeper into its construction, we need to linger on the notions of capitals and resources. Indeed, on the one hand, the central notion of capital, on which the TDL model relies, must be analysed. On the other hand, as this model recognizes new types of assets, we have to discuss their validity in comparison to standard notions of asset, notably the one of the IAS/IFRS for which assets are resources, “controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity” (IASB 2010). As we will see, these two notions are completely connected and allow to understand the principles at stake in the TDL model.

3.2.2 The notion of capital and resource

In this article, we do not want to (re-)open the Pandora's box of the capital ontology. We just want to obtain working definitions of capitals and resources which would be consistent with an ecological accounting approach. What is a capital is a central question in economics and accounting and remains a significant issue. The diversity of its definitions meets the variety of economic schools so much so that in 1836, Senior already claimed that “the term capital has been so variously defined, that it may be doubtful whether it could have any generally received meaning.” (Senior 1836). A stabilized but still disputed definition of a financial

“capital” is given by Hulten in 1988 (but published in 1991): “Two aspects of capital (including human capital) differentiate it from a primary input like labor: capital is a produced means of production, and capital is durable.” (Hulten 1991). This definition does not include other types of capital that must be taken into account as far as CSR and sustainability are concerned. Indeed, “corporate social responsibility has to accept changing definitions of capital, which in turn are defined by new concepts of the markets, goods and services, and value itself.” (Breen 2007). Besides man-made capital and financial capital, we have to add natural and human capital, in an extensive meaning (Hawken et al. 2010). So, in a comprehensive meaning (which is used in this article), human capital “consists in each person's capacity for work as well as the body of knowledge accumulated by human societies: culture, science, and other forms of learning.” (Lambin 2007). The concept of natural capital was really introduced in (Pearce 1988) and can be defined as a “stock that yields a flow of natural services and tangible natural resources.” (Costanza and Daly 1992) Generally speaking, the different kinds of capitals are described separately and it seems to lack a more global conceptualization of this notion, notably encompassing the financial, human and natural capitals.

Now, from an accounting point of view, the definition of capital is also a matter of disagreements and of confusions. Firstly, there is a gap between the point of view of economists and businesses men concerning the notion of capital (Rambaud and Richard 2013). Moreover, the term capital is used in so many ways in accounting that it is difficult, in a first phase, to clearly identify its meaning. In fact, the concept of capital is linked to most of the elements of the balance sheet. Thus at first, capital is always viewed as connected to equity: roughly speaking, this meaning is a common point among authors and practices in accounting. But, the term “capital” can also encompasses liabilities, as it happens in the

standard notion of “capital structure”. Capital also refers to assets: “capitalizing” for instance means recording a fixed (or capital) asset. Moreover, when debates about the incorporation of new forms of capitals into the balance sheet are initiated, their recognition as assets is a standard way to tackle these issues, as illustrated by the case of the intellectual capital (Abeysekera 2007; Brännström and Giuliani 2009). However, Hicks recalls that “it is not true accountants will insist, that the plant and machinery of a firm are capital; they are not capital, they are assets. Capital, to the accountant, appears on the liabilities side of the balance sheet; plant and machinery appear on the assets side.” (Hicks 1974). This distinction is a crucial one between economics and accounting: “in economics capital is an asset [-] money is the most familiar form of capital, but natural resources [...] and human resources [...] are also capital assets” (Rose 2008) - and so is concerned by the left side of the balance sheet while in accounting, capital is related to the right side¹² of the balance sheet. In these conditions, when accounting deals with the notion of capital maintenance, it inherently means maintenance of what is on the right side of the balance sheet and not conservation of the assets (for a more detailed discussion on this point see (Lee 1983)). As explained in part 3.1, the purpose of depreciation in accounting is to preserve the capital in the accounting meaning of this term. This philosophy can be summed up by this old but still topical adage: “for the purposes of book-keeping treat capital as a liability – treat it just as if it were a debt payable” (Snailum 1926). We claim that the central paradigm of accounting is “maintain to gain” opposed to “gain to maintain”: a profit is achieved if and only if the capital is maintained and its maintenance is not conditional on the identification of potential gains.

So, how to bring together economics, accounting and sustainability issues as far as the notion of capital is concerned? As from an economic point of view, a capital is an asset, it means a resource for IAS/IFRS notably, we propose to tackle this issue through the distinction

¹² in a horizontal presentation

between a capital and a resource. Indeed, if we come back to a basic examination of these concepts, the anthropologist Paine claims that his “working definition of capital is *a resource in respect of which one controls its reproductive value*. [...] the distinction between *resource* and *capital* [is] seen as reposing in the matter of control over reproductive value.” (Paine 1971) Thus in accordance with the definition of Hulten, a capital would be a resource which is seen as being able to be maintained somehow. Now, as from a corporate point of view a “resource is a capacity that the firm controls” (Verstraete and Jouison-Laffitte 2011), we finally propose a comprehensive definition of a resource and a capital: a resource consists in a capacity (or a set of capacities), directly available for uses, while a capital is a capacity (or a set of capacities) which *is recognized as having to be maintained*. This approach of capital through capacities is connected to the one of (Klamer 2002) for instance.

Therefore, a financial resource is merely available money, so is a capacity of exchanges. As for it, the concept of natural resource encompasses several types of capacities, like a capacity of agricultural production or of livestock farming. Moreover, Daly defines a natural capital as “the capacity of the ecosystem to yield both a flow of natural resources and a flux of natural services.” (Daly 2006). In the same way, human capital can be defined as a capacity: a capacity of people “to be creative and to think, dream, and develop new ideas” (Audretsch 2007) or more generally, “to accomplish their goals” (Kofinas and Folke 2009). Let us specify that a capacity can be instantiated in a physical or immaterial entity: for instance, a banknote or a diamond can be an instance for a capacity of exchange; a battery can be seen as an instance for an energetic capacity.

These two definitions emphasize several points: resources and capitals entail an enlargement of the capabilities of their users, notably the firms; the concept of maintenance is at the core

of the notion of capital; maintenance is a relative concept, which depends on some subjective and may be conflicting points of view.

The first point stresses that, as soon as a firm uses a capital, this one provides it with new capacities (resources) which contribute to its activities. Now, beyond a simple support for this activity, human and natural capitals play a key role for the existence and development of a firm. Thus we add a last hypothesis to the TDL model:

(H4) the HNCs used by a firm are necessary for achieving its goals, notably its profit.

The recognition of (H4) is a central stake in sustainability. More and more research programs tend to highlight and make firms fully aware of this point (Houdet et al. 2009a, 2009b, 2010). For instance, in a recent report (ACCA 2012), the Association of Chartered Certified Accountants published the outcomes of a survey sent to their members concerning their views and activities on natural capital. Thus “60% of respondents agreed that the natural world was important to their business [...] 49% identified natural capital as a material issue for their business and linked it to operational, regulatory, reputational and financial risks”.

The second point builds a bridge between economics and accounting. A capital used by a firm is according to our definition what this one must maintain and so must be recorded on the right side of the balance sheet. Moreover the use of this capital provides the firm with capacities, the resources, which are intended for transformations and/or consumptions and not for maintenance: these elements will be recorded on the left side of the balance sheet. In these conditions, the rule “maintain to gain” applies for all types of capitals. In particular, in line with (H1), a profit can not be achieved without the conservation of the used human and natural capitals.

Let us focus on the third point. If we consider the significant example of lands, we saw that their recognition as an element of capital was disputed. A land was considered by many economists as a simple factor of production, freely given by nature, and not directly destined for being preserved. When Fisher incorporated it in its definition of a capital, it was from the point of view of a business man, it means, according to him, that a land was not a capital *per se* but an avatar of the business man's financial capital. Lands became a genuine elements of capital when some actors (scientists, NGOs, etc...) pointed out the importance of their existence and the necessity to preserve them. Thus we can claim that lands acquired a genuine statute of capital when they became *matters of concerns* (Latour 2005). In the same way, a capacity of exchange is considered as a capital because someone, its owner, decides to preserve it, otherwise this capacity is simply a resource. Therefore, a capital is a capital because some actors, that we can call its representatives or its spoke-persons (Latour 2004a), demand its existence, and the preservation of it, to be taken into account. So a capital is a capital because it is capital! Table 2 shows some possible representatives for several types of capitals and illustrates the fact that the notion of spoke-persons enlarge the concept of owners.

Table 2

Examples of representatives according to different types of capitals

Type of capital	Possible spokes-persons
Natural capital	Scientists (biologists, ecologists, <i>etc.</i>), NGOs, public organisms (UNEP, ...)
Human capital	Concerned humans themselves, medical staff (physicians, psychologists, ergonomists, <i>etc.</i>), trade-unions, NGOs, ...
Financial capital	Shareholders, creditors, NGOs of owners, <i>etc.</i>

This point of view automatically involves for the firm which uses some capitals to render accounts to and to regularly discuss with the representatives of these used capitals. While classical accounting was notably designed, as explained in part 3.1, for the owners of financial capitals, the TDL model is elaborated to encompass the representatives of natural and human

capitals. We can now make explicit the term “some particular” used in the hypothesis (H1): this expression becomes unnecessary in fact or more precisely, redundant. Indeed, “some particular human and natural capitals” must be understood in this way: “human and natural capitals such that someone can support the necessity of their maintenance”. Therefore, as this meaning is already embedded in our conception of a capital, the expression “some particulars” is no longer required. This approach allows a very flexible and pragmatic understanding of the term “maintenance”, because this one relies on a deliberation between the concerned spokes-persons and the firm (see (Brown 2009) or (Brown and Dillard 2013) for a discussion on the incorporation of a genuine democratic deliberation in accounting). Therefore this concept of maintenance can integrate modifications and evolutions of the considered capitals. For instance, let us consider a piece of natural capital which is transformed notably by uses in such a way that its original state can not be recovered. Its representatives can come to an agreement on a new level of maintenance, which takes into account this new reality of the capital. It does not mean that every modification of a capital can be accepted but it rather entails a possible periodical revision of what means “maintaining a capital” (so there is no *a priori* understanding of this concept but rather a pragmatic one). Furthermore, this methodology not only allows regular re-assessment of the ontology of a considered capital, but it also involves a regular re-evaluation of the spoke-persons which are convoked to discuss the conservation of this capital. We will give some details on these points in parts 3.2.4 and 3.2.5 but a deeper exploration of these questions can be found in (Latour 2004a) or in (Ornaf and Rambaud 2012). This point of view entails another consequence: the maintenance of a capital is not a continuous concept but a periodical one. Indeed, if a representative of an used capital wants it to be permanently *-i.e.* at each instant- preserved, it

is easy to deduce that this capital can not be consumed¹³. A periodical approach implies a pre-determination of a period at the end of which, the capital will be examined in order to decide if it is preserved or not: this method is obviously in accordance with the notion of accounting period. The difference with this last one is that the duration of this period, as far as human and natural capitals are concerned, will be based on the intrinsic characteristics of them¹⁴ (De Sain-Front et al. 2012) and so will be collectively and deliberately co-determined by the spokes-persons of the capital and the firm. After having suggested an interpretation of the notion of “capital” and “resource” which seems to fit to an ecological accounting conceptualization of them, let us now come back to the liabilities and assets introduced at the beginning of part 3.2. Indeed, we can now claim that the considered liabilities corresponding to the human and natural capitals are in fact these capitals themselves, according to our definition of a capital. However, it is possible to indicate in the balance sheet the representatives of these capitals and so make explicit towards whom the firm is liable. The corresponding assets can be interpreted as the uses of these capitals, in accordance with the conception of assets in the Historical Costs approach (Richard et al. 2011). But these uses of HNCs provide also the firm with new types of capacities and so they can be also viewed as resources in our meaning. In order to illustrate this point, let us consider the following example.

Example 1

<p>An entrepreneur E creates a firm F with a financial capital, a capacity of exchange, CpEx, assessed at 1000 units of money. E wants its CpEx (1000 units) to be preserved and so records 1000 on the right side of the balance sheet of F, in the equity account. This capital is used to provide F with a CpEx (1000 units), which is not intended to be preserved, given that F will transform and/or consume it. So this usable CpEx is simply a resource (according to our definition) which is recorded in the cash account: in this case, there is not difference of types of capacities between the capital and its use. Then F buys a machine M for 1000 units.</p>
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¹³ This extreme limitation, which would be close to an ecocentrist conceptualization (Gladwin et al. 1995), makes almost every corporate activity impossible.

¹⁴ For instance, “pasture land has always been perceived as having intrinsic time of use and recovery time” (Bastianoni et al. 2012).

In these conditions, the financial capital is used to obtain M. In the same time, M provides F with a new type of usable capacity: a capacity of production CpPr. So there is an equivalence between the use of the financial capital to buy M and the appearance of the CpPr generated by M. Let us point out that this CpPr is not designated for being maintained: indeed, F has not only no obligation to keep its CpPr, but can also eventually abandon it, depending on its managerial orientations for instance. Therefore this CpPr is a resource instantiated in M. Thus M is an asset from our point of view because, as explained above, the left side of the balance sheet is concerned by resources. Furthermore, M is also an asset from the classical point of view of the Historical Costs approach, given that M corresponds to the use of a capital. Finally, M partially meets the definition of an asset for IAS/IFRS on condition that we assimilate the notion of resource used by the IAS/IFRS with ours. Therefore M is recorded in a fixed asset account, *i.e.* an account which reports repeated uses.

3.2.3 The structure of the modified financial statements according to the TDL model

We can sum up some of the main points developed above in the modified financial statements presented in Table 3 and corresponding to the TDL model.

Table 3
Modified financial statements according to the TDL model

Balance Sheet						
Fixed assets	$F_0 - D_0$	Equity	E	Financial Capital	Standard Balance Sheet	Balance Sheet of the TDL model
Other assets	$A_0 - \Delta$	Income	$R - Ex - D_T$			
		Liabilities	L			
Repeated uses of the Human Capital	$F_1 - D_1 + \Delta_1$	Human Capital	H			
Punctual uses of the Human Capital	A_1	Possibility to detail the different concerned groups of spoke-persons				
Repeated uses of the Natural Capital	$F_2 - D_2 + \Delta_2$	Natural Capital	N			
Punctual uses of the Natural Capital	A_2	Possibility to detail the different concerned groups of spoke-persons				
Long term mixed assets	$F_3 - D - D' - D''$					
Current mixed assets	A_3					

Profit and Loss Statement							
		Expenses (except of depreciations expenses)	E	Revenues	R	Standard P&L Statement	P&L Statement of the TDL model
Triple Depreciation Line		Depreciations expenses (of the asset(s) related to the Financial Capital)	$D_0 + D$				
		Depreciations expenses of the asset(s) related to the Human Capital	$D_1 + D'$				
		Depreciations expenses of the asset(s) related to the Natural Capital	$D_2 + D''$				

where F_i ($i=0,1,2$ or 3) refers to the historical cost of the corresponding assets, while D_i ($i=0,1,2$ or 3), D , D' and D'' represent depreciations. D_T stands for the total depreciation and is equal to $D_0+D_1+D_2+D+D'+D''$. $\Delta=\Delta_1+\Delta_2$, where Δ_1 and Δ_2 correspond to de-depreciations, as explained in the example 5. Moreover the balance sheet is balanced: the total value of the three accounting categories on the right side of the balance sheet is equal to the total value of the four accounting categories on the left side.

In order to highlight the depreciation expenses, expenses are classified by nature. Furthermore, the horizontal presentation facilitates the connection between the capitals and their uses. In compliance with the non-substitutability principle deduced from our hypothesis, as explained at the end of part 3.2.1, this presentation, reinforced by the clearly separated boxes, also stresses the fact that the settlement of a human or natural capital must result in an outflow of the associated assets.

Most of the accounting elements gathered in these statements have been discussed in parts 3.2.1 and 3.2.2. Only the de-depreciation principle and the “mixed assets” remain unexplained. The first notion will be presented in part 3.2.5. So let us focus on the mixed assets. These ones appear during the production process, while some “pure” financial, human and natural resources are necessary to create new resources: these latter are therefore obtained through a mixing of several different types of resources and can be characterized as “mixed assets”.

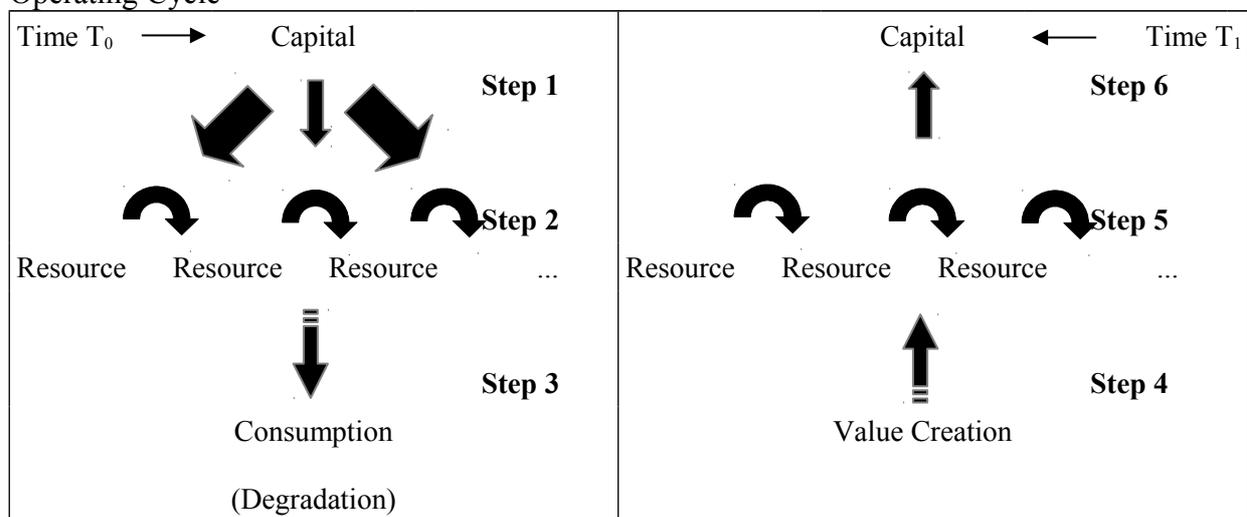
3.2.4 The evaluation of capitals

Let us now assess these natural and human capitals and their corresponding assets. The hypothesis (H3) forces us to use money as unit of measurement. In fact, we can also interpret money as the measure of capacities of exchanges. Therefore as conventional accounting is designed to maintain the financial capital, *ie* the capacity of exchange, it is necessary to

evaluate it and to follow its avatars over the course of the operating cycle. In these conditions, money is the normal unit to assess the different accounts. Difficulties occur when more than one capacity must be evaluated, like in the case of the TDL model. In order to solve this problem, we need to detail the operating cycle of a firm, making appear the capitals and resources at stake:

Table 4

Operating Cycle



Let us explain this table through an example.

Example 3
<p>We slightly modify the example 1.</p> <p>Step 1. The firm F is now only financed by a bank B. Thus F is created at time T_0 and the given loan¹⁵ (assessed at 1000 units of money) must be refunded at time T_1 fixed by B in agreement with the entrepreneur E. As in example 1, this financial capital provides F with an usable CpEx, recorded in the cash account.</p> <p>Step 2. F buys the machine M to the amount of 1000 units. We suppose that M can be used until T_1 and not after. As we saw, M is a resource according to our meaning.</p> <p>Step 3. The purchase of M degrades the CpEx of F and so the capital. Whatever the way chosen to report this degradation, there is a consumption of the CpEx, in such a way that at time T_1, all the CpEx deteriorated by M will have been recorded. For instance, if this consumption is distributed over the course of the existence of the CpPr generated by M, F regularly records a depreciation expense.</p>

¹⁵ The access to this financial capital can be costly. In the case of a loan, a bank does not provide a firm with a financial capital for free. These expenses, corresponding to the loan rate, can be allocated to different accounting periods but are not included in the value of the borrowed capital. This comment is also valid for other types of capitals.

As explained above, this method, which correlates the reporting of the consumption of the CpEx included in M with the degradation of the CpPr of M, offers the crucial advantage to focus on the systematic deterioration of the capital caused by its use.

Step 4. However this consumption allows F to sell its production to the amount of 1000 units. We assume that this production only needs the machine M and the work of the owner *i.e.* E.

Step 5. Thanks to this revenue, a new CpEx appears for 1000 units, recorded in the cash account.

Step 6. Finally, F will be able to refund its loan, *i.e.* to maintain the capital provided by B, by means of these new resources.

This example shows that the value of the initial financial capital is equal to the amount of the resources necessary to maintain this capital, since all the resources provided by the initial capital are consumed. We can generalize this mechanism to others types of capitals. We draw on another example, using Table 4, to explain this process of assessment in the case of a piece of natural capital, a field.

Example 4

A farmer buys a field at time T_0 .

The representatives of this field are scientists and a local NGO, involved in environmental protection. These spokes-persons, jointly with the farm, set up a level of maintenance of the field. This maintenance is based for instance on several co-determined indicators. They also decide that this field must be examined at time T_1 to ascertain if it is preserved or not, according to the chosen indicators.

Step 1. Thus, at time T_0 , this field provides the farm with particular capacities, especially with a capacity of fertility, CpFe. The farmer records in the natural capital account an amount C, in monetary units, that we want to determine.

This CpFe, from the farm point of view, is now a resource that the farmer can use. So he reports an asset, called for instance “Capacity of Fertility” to the same amount C.

Step 2. The farmer transforms this CpFe into a usable capacity of production of wheat, CpPW, for example, because he wants to use this field only to produce this cereal. This operation settles the previous asset account and creates a new asset account, called for instance “Production of wheat”, recorded as a repeated use asset. Indeed, we assume that this field will be used for this production until time T_1 (and not after). The value of this account is still C.

Step 3. The recurring use of this field for this production implies a consumption of the CpFe of the initial natural capital. As explained before, we correlate this degradation with the deterioration of the CpPW, and so we have to report systematic depreciations expenses. At time T_1 , all the CpFe embedded in the asset “Production of wheat” will be consumed.

Step 4. Between time T_0 and time T_1 , this degradation of the CpFe allows the farmer to sell its wheat.

Step 5. This sales creates new CpEx, recorded in the cash account. This CpEx will be used by the farmer for the maintenance of the field, in accordance with what was decided with the spoke-persons of the field. The total financial costs involved in this procedure are assessed to the amount of CoM (Costs of Maintenance). This operation corresponds to a transformation of a financial resource into a natural resource, the CpFe. Therefore the farmer credits its cash account to an amount of CoM and debit the CpFe asset account with the same amount.

Step 6. The representatives of the field determine if it is preserved or not. Let us suppose that in this case, they validate the maintenance operated by the farmer. Thus the natural resources, ie the natural assets CpFe and “Production of Wheat”, are used to refund the natural capital.

We notice that the net value of the “Production of Wheat” account is equal to 0, because we assumed that we totally consumed this resource, while the net value of the “capacity of fertility” account is equal to CoM. As the natural capital is refunded by means of this account, we can claim that

$$\text{CoM} = C$$

Costs of Maintenance = Value of the Capital

We find again the rule deduced from the example 3 in the case of a financial capital.

Let us focus on the step 5 of this example. In this step, the farmer transforms a financial resource into a natural resource. We could question this point in relation to what we claimed just before part 3.2.2 concerning the strong sustainability assumption. Does step 5 corresponds to a substitutability of capitals? The answer is clearly no. Indeed, and this is a strength of the accounting, if a firm records a capital in its balance sheet -so in the right side -, the hypothesis of conservation of this capital will be at the core of its activity. Therefore we can substitute resources and in the same time maintain the recorded capitals. In these conditions, money will be considered as a medium of exchange between financial resources and other types of resources. We stress the point that money, except in the case of financial capital, will no longer be a measure of the absolute wealth of capitals. Because we have to translate non-financial capitals into a unit which is the measurement of financial capitals, we have to abandon the possibility to obtain an absolute monetary value of these capitals. More precisely, the value of a non-financial capital is not a value but a cost, where money is used as a proxy: money is commissioned to build a bridge between financial capitals and others types of capitals. This process is obviously imperfect and need collective deliberations with the different spokes-persons as well as regular re-adjustments. This way of considering money is completely in contradiction with the concept of Present Value, which seeks to calculate an absolute wealth corresponding to non-financial resources, like in the IAS 41.

We highlight another point in the example 4: as we saw, we would need to use a natural account “Capacity of Fertility”. This account is the twin of the cash account for the capacity of exchange. In general case, it is impossible and not really desirable to list every available capacity contained in a given capital. However what is important to report is the capacities concretely used by the firm for its activity, like the “Capacity of production of wheat”. In these conditions, we suggest to only report these last types of accounts: the example 5 will notably explain how to process in the absence of the mentioned accounts.

3.2.5 Applications and consequences of the TDL model

Let us give a representative example to clarify how to use this rule of evaluation and the TDL.

Example 5

We come back to the example 4. We will detail it, modify the recording of the operations according to the previous remark and show in Table 6 a part of the modified financial statements in compliance with Table 3. We assume that time T_0 corresponds to the 1st January of year N and time T_1 , to the 31th December of year N+2. Thus the natural capital must be examined at the end of these three years. First of all, the procedures and so the costs of maintenance, which constitute the value of the natural capital, will be also determined by the spokes-persons of the field. They fix, jointly with the firm, the following schedule of these costs:

Year 1: 100 units of money

Year 2: 200 units

Year 3: 300 units

We stress the fact that these costs notably depend on the type of use of the natural capital by the farm. In these conditions, the value of the natural capital is assessed at $100+200+300=600$ units. As this field will be only used for the production of wheat during these three years, the farmer records a linear natural depreciation over the course of this period to the amount of $600/3 = 200$. As we consider a very simple example, the duration of this particular use of the natural capital (production of wheat) is the same as the pre-determined period at the end of which the natural capital must be examined: in the general case, the linear depreciation relies only on the period of use and is not directly correlated to the pre-determined period by the spokes-persons. This depreciation is recorded at the end of each year and, for this example, corresponds to the operation **(3)** of the depreciation account below.

As explained in the example 4, the cash will be transformed in natural resources. Since we do not want to resort to an account called “Capacity of Fertility” for instance, the credit of the cash account at the amount of the costs of maintenance really paid out by the farmer corresponds now to the debit of the depreciation of the “Production of Wheat” account. Thus these costs of maintenance *depreciate* the asset “Production of Wheat”. In this example, we assume that instead of spending the 100 units, initially planned, he decides, according to the reality of the state of the field for instance, to only pay out 50. The recording **(2)** below corresponds to this operation. In this way, the costs of maintenance concretely spent are no longer mere expenses but types of investment, through this depreciation: the preservation of a capital is an investment. The only expense corresponding to this

maintenance is now the depreciation expense, which symbolizes the degradation of the concerned capital. This principle is summed up in Table 5.

Table 5

Accounting translation of capital degradation and maintenance

Event		Accounting translation in the TDL model
Systematic Capital Degradation		Depreciation Expense
Capital Maintenance		Investment (De-depreciation)

Table 6

TDL statements of the example 5

Balance Sheet – 01/01/N				Balance Sheet – 12/31/N				
Field	1000	Equity	1000	Field	1000	Equity	1000	
				Cash	450	Income	300	
Production of Wheat	600	Natural Capital	600	PW ¹⁶	150	450	Natural Capital	600
				600				
				Profit and Loss Statement – Year N				
				Natural Depreciation	200 (3)	Sales	500 (1)	
Accumulated depreciation of the “Production of Wheat” account – Year N				Cash account – Year N				
(2) 50		200 (3)		(1) 500		50 (2)		

Examples 4 and 5 are based on the use of natural capital but all this procedure still remains valid for the human capital. A typical example using this one is of course given by the repeated use of workers in the framework of a contract of employment. We already described in Table 2 the possible spokes-persons in this case. The costs of “maintenance” would be interpreted in three main ways: costs directly paid to workers to ensure them worthy conditions of life as well as internal expenditures for better working conditions and for high

¹⁶ Production of Wheat

quality trainings. The precise definition of the terms “worthy”, “better” and “high quality” have to be collectively and deliberatively determined between the firm and the spokes-persons of the workers (German co-management (Potthoff 1957), for instance, could be seen as an illustration of a part of this procedure). An essential consequence of the TDL model in this case is that there are no longer wages expenses: as in the Table 5, the only expense which corresponds to the use of workers is a depreciation expense, whereas the costs of “maintenance” are still considered as investments.

Let us come back to the example 5 now. What happens at the end of the year $N+2$? Firstly, the spokes-persons of the field will examine it to decide if it is preserved or not. In the first case, the farmer will have the right to continue using this field or to refund the natural capital account by settling the “Production of Wheat” account. As mentioned before, this concept of maintenance is a pragmatic one. It notably means that the farmer could be authorized to refund its natural liability even if the original state of the natural capital is not achieved. This situation may occur in the case where the farmer would have punctiliously followed the procedures of maintenance collectively set up at 01/01/ N and despite his good will, the field would not be in a satisfying state at 12/31/ $N+2$.

In the second case, several options are possible. The farmer comes to an agreement with the spokes-persons to continue the exploitation of this field, keeping the not refunded natural capital account (or a part according to the agreement). It means that the farmer keeps in its accounts a permanent debt that he will not be able to settle and which could make more difficult its access to others capitals. Otherwise, the concerned spokes-persons can invalidate the right of the farmer to use this field. More precisely, they do not challenge her right to possess this field but the one to record again a resource corresponding to the use of this natural capital: as illustrated in the example 5, the use and the possession are dissociated in

the TDL model. This procedure can eventually lead to lawsuits which are beyond the scope of accounting and of this article. We could argue that this procedure can be assimilated to the ecological communism condemned by Elkington, especially as this farmer bought this field. A reply to this objection can be given by Coase himself, as Donaldson and Preston: “we may speak of a person owning land... but what the land-owner in fact possesses is the right to carry out a circumscribed list of actions. The rights of a land-owner are not unlimited... [This] would be true under any system of law. A system in which the rights of individuals were unlimited would be one in which there were no rights to acquire.” (Coase 1960) quoted and adapted in (Donaldson and Preston 1995). In fact, “the concepts of property rights and sustainability are often considered inherently in tension with each other.” (Grinlinton 2011). Therefore without abandoning the concept of property rights, this model, in compliance with many authors in the area of sustainability, claims that we need a more extensive comprehension of these rights. This discussion goes also beyond the scope of this paper, but the interested reader can consult Asher et al. (2005), Circo (2009), Donaldson and Preston (1995) or Grinlinton (2011).

To conclude this succinct presentation of the mechanisms of the TDL model, we assert that this model is an argumentation in favour of the fact that

- accounting is by definition a well-adapted tool to grasp corporate sustainability issues
- it is possible to create a corporate reporting, which relies on strong assumptions and which is able to strike up a debate with standard financial norms, avoiding the issues posed by the TBL approach.

3.3 The novelty of the TDL

We will here list and comment the former attempts to use the concept of depreciation in the field of environmental accounting to value the degree of novelty of the TDL. There are in our

opinion two notable contributions that can be compared with the TDL approach: those of the Sigma project and of Gray.

Gray, as soon as 1990 will like Pearce and Turner distinguish the man made and the natural capital and insists like Daly and Cobb on the importance to maintain all these types of capitals (Gray 1990, p. 68-69; 97-98). A little later he reaffirms his interest for a proposal made by Daly and Cobb to extend the concept of Hicksian income to other type of capitals (Gray 1992, p. 419). He proposes, on this basis, to assign to the environmental accounting system the task to verify that, as far as the natural capital is concerned, the situation at the end of the accounting period is not worse than it was at the beginning. He demands that the organisation will calculate the “costs necessary to return the sink to its original state or what additional cost must be borne not to leave the planet worse off”; these costs will be “deducted from profit and expended in the restoration of the biosphere” (p. 419). In 2001 he names this approach (with Bebbington) as “Sustainable Environmental Cost” (SEC). Gray has himself appreciated its own approach of environmental accounting. In (Gray and Bebbington 2001) he says, on behalf of the Mannaaki Landcare experience, that the “sustainable environmental cost does not inform on the cost that would imply a sustainable management: clearly it does not measure what a sustainable operation would cost; it only means that the clock being stopped at a point of time and that the firm will take measures so that to return to the point it was at the beginning of the accounting period” (Gray and Bebbington 2001, p. 89-90). In other terms the goal is more to measure the cost to be as unsustainable as before than to measure the cost of unsustainability (p. 94). This relatively pessimistic approach seems to rely on two main premises. The first thesis is that the capitalism could not support an alleged enormous impact on its profits. The second thesis is that it seems to be impossible to determinate any sustainability at the level of the organisation. As far as sustainability is a global concept it can

be only measured at a regional if not national or international level. In the light of these two theses, particularly the second one, the position of Gray seems to be a logical one. But are these premises admissible ones? Let us take them for a discussion.

To the thesis according to which the capitalist system will not bear an enormous cost of sustainability it can be answered in two different ways. The first one seeks to minimize the consequences of adopting a new accounting model in line with the TDL approach. It consists in saying that the importance of the burden on profits at the macro and the micro-economic levels remains to be proved: some studies witness to the importance of the “hole” in national income (Huetting et al. 1992)¹⁷ while other show on the contrary that the “puncture” could be relatively a modest one (Bebbington et al. 2001, p. 110-103) and more recently (Altukhova 2013), at the micro-level, for an agricultural firm. The second more brutal answer, which is sometimes put forward by Gray himself (Gray 1994), is that it is time to end up with a wrong calculation of economic performance that leads to the destruction of the planet. Let us remind that history has already known such a debate at the time of the introduction of the concept of depreciation of the man made (financial) capital: a significant number of capitalists were opposed to the systematic registration of a depreciation expense on behalf of a reduction of their profits. It has been necessary for the legislators at the national and international levels (see notably the WTO’s anti dumping rules) to take specific measures to oblige all capitalists to take account of the depreciation of the financial capital. But in the present case the question of a systematic depreciation of the natural and human capitals are much more important ones: it is a question of survival of mankind. If this view is admitted there should be no hesitation to impose a “severe” environmental accounting even at the price of a decrease of (windfall) business profits.

¹⁷ Huetting et al. (1992) are totally conscious that if the burden is a too large one it could be necessary to spread the corresponding expenditures over a number of years.

The second thesis, it means the impossibility to determine a sustainable income at the level of organizations, is contested by Turner, one of the economists who have inspired the thoughts of Gray. As Turner says “we should not be deluded into thinking that all global environmental change problems require macro-scale policy interventions. The material balance model serves to remind us that individual consumption and production units, operating at the microeconomic level, are the pollution/resource depletion agencies. There is a lot of sense in the maxim ‘Think global, act local’” (Turner 1993). One can act at the local level and determine its contribution to (un)sustainability even if the determination of sustainability at his level may be conditioned by complex influences at the regional, national or international level. As a matter of fact this situation is not a new one in matter of business management. The situation in the case of environmental accounting is not different from that one in traditional financial accounting. Let us take the case, for example, of depreciation. If it would be necessary to require a total independence of external factors to calculate a depreciation of tangible assets it would be impossible to record any kind of depreciation due to the fact that depreciation of tangibles assets is notably depending of world wide inflation and obsolescence. The presence of all these external factors does not prevent accountants to calculate in an approximate way the degradation of machinery and to calculate their replacement cost on behalf of approximate norms of wear and tear established by engineers (Gray 1990, p. 65). In conclusion on this point, contrary to the thesis defended by Gray we believe that it is possible for each organization to determine rough measures of its own sustainability by using the TDL model. This conviction seems to be shared by other specialists notably some researchers belonging to the British think tank “Forum for the Future” working on the “Sigma Project”. The Sigma Project (System of Integrated Guidelines for Management Project) has been launched in 1999 with the support of the UK department of

Trade and Industry and led by three associations: the British Standards Institution, the Forum for the Future (a think thank charity) and AccountAbility, with a funding of CIMA. It has notably been influenced by Ekins and Howes. In a similar vein with the TDL method the goal of this project, which is presented as a “key innovation in the methodology”, is to calculate a sustainable monetary profit reflecting the environmental and social performance to be linked and compared with the mainstream financial profit (The SIGMA Project 2003, p. 21). Although it ends on the presentation of a TBL (see notably (Bent 2006, p. 79)), this TBL is very different from the Elkington’s TBL notably because it tends to modify the financial profit and opposes to it another conception of profit. As far as the methodology is concerned in matter of environmental accounting the two first steps of the methodology are similar as those of the TDL model (Howes 2004, p. 109; The SIGMA Project 2003, p. 8): 1) identification and confirmation of the organisation’s most significant environmental impacts, 2) estimation of what sustainable level of impacts may be to determine relevant Sustainability targets or the Sustainability gap

The similarity at this stage of reasoning is all the more striking since the level of sustainability is considered as a scientific question not a social one (Bent 2006, p. 70). But there is a significant difference on the third step, in matter of valuation of the “gap”. Whereas in the TDL model a constant valuation method is retained -it means the cost of maintaining capitals and so for instance renewing the environmental functions- the Sigma Project Toolkit will give a value to the impacts according two different methods: either “what it would cost to avoid the impact” or “if avoidance is not possible”, “what it would cost to restore any resulting damage (using market based prices where possible)” (The SIGMA Project 2003, p. 8). It is clear that there is a possible “overlap” of the TDL and the SIGMA methods if, in the latter one, the choice of the firms is in favour of avoiding the impacts: all will depend on the

interpretation of the term “if avoidance is not possible”. If the second term of valuation is chosen the Sigma Project ends up in a neo-classical internalisation of externalities on the basis of market prices or similar values which has nothing to do with the TDL model.

In matter of valuation of the social line, contrary to the TDL approach, the potential scientific approach based on the determination of the cost for maintaining the capacities seems to be rejected to the benefit of a “stakeholder engagement method” to determine, on the basis of social dialogue, the amount of social external damages (Bent 2006, p. 70-79). Another marking differences with the TDL approach are the absence of balance sheet (and recording of natural and human capitals): hence the impossibility to use a true depreciation concept¹⁸ and the silence about the consequences in matter of governance of the registration of a capital on the liabilities side. Another importing point is the silence about the possibility to compensate the different lines of the “TBL”. In this regard the Sigma Project cannot be clearly ranged on the side of a strong conservation of the natural and human capitals: this concept is besides symptomatically not used in the texts we have referred to. As a conclusion in spite of certain common points there remain big differences between the Sigma Project and the TDL project.

5. Conclusion

To conclude, as well anticipated by Marx, Weber and Sombart and more recently underlined by Chiapello (2012), traditional accounting is a very powerful means of rationalisation of the human activity and of the construction of the economy. In this paper, from a critical analysis of the TBL model, we suggested a new accounting framework in order to achieve a genuine integrated reporting. A deconstruction of the Triple Bottom Line approach, based on the pro

¹⁸ (Howes 2004) relying on (Howes 2000) insists on the fact that firms “need to begin to account for the depreciation of natural capital in the same way that accounting rules and standards require them to account for the depreciation of manufactured capital” but does not use refer to any balance sheet and does not use the term depreciation when describing the pro-forma environmental financial statements (page 105).

and the con literature, allowed us to bring out that this classical reporting model suffers serious limitations which finally lead it to be ineffective in the absence of “win-win” strategies. Behind a “sustainable” outward appearance, the TBL proves to be an extension of a “business-as-usual” accounting model, which eventually favours and highlights situations with no real tensions between the preservation of the different capitals. Moreover its success tends to eclipse the richness and the development of other conceptualizations of socio-environmental accounting and reporting. So, as deconstruction and critique are not enough (Latour 2004b), we outlined an accounting model, the TDL model, designed to really “do the job” normally assigned to the TBL. Instead of merely observing the gains and losses of the human and natural capitals -expressed in controversial units-, we inverted the logics of the TBL by using the one of the traditional capitalist accounting: maintain (capitals) to gain (-only one- profit). The point is, if sustainability requires to preserve financial, human and natural capitals, let us create and focus on tools which maintain them, without roundabout means. As an answer to a “sustainably static” TBL, the TDL model can be seen as a (green) vehicle designed to try to progress in SD: the motor of this vehicle would be the traditional Historical Cost Accounting and its planned depreciation, whose power to protect and enhance the financial capital is undeniable; the fuel would correspond to a re-definition of the notion of capital, which extends the possibilities of this motor to other types of capitals. Moreover the quality and the assessment of this fuel is no longer a mere corporate issue but becomes a collective and deliberative societal matter of concerns. Finally, the chassis of the TDL, which allows it to be concretely usable, would be composed of four hypothesis (H1 to H4), which gather the main (and also most disputed) societal bases for achieving SD and the corresponding corporate reporting. The clarifying of these postulates not only makes a dialogue with other theories of accounting or sustainability possible, but is also an attempt to

define in a thorough way what would be a genuine integrated reporting. In other words, we detailed the construction of the TDL model in such a way that the acceptance of these four postulates, this “fuel” and this “motor” implies the development of an accounting model similar to the TDL one. In the end, in order notably to illustrate this ability to strike up a debate with other socio-environmental accounting models, we compared the TDL model to other conceptual frameworks.

The TDL model is finally a contribution, and maybe a kind of footboard, to socio-environmental accounting to struggle against sustainability failures and to offer the possibility of an other accounting imaginary (Castoriadis 1998): “social change requires more than activist campaigning and street movements [...] it requires coherent ideological articulation.” (Cooper 2005)

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