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# How accounting can reformulate the debate on the Natural Capital and help to implement its ecological conceptualisation?

Working paper

Ecological Accounts Stream

9th International Conference in Critical Management Studies

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## I. Introduction

The notion of capital and the debates about its maintenance have become the standard basis to grasp sustainability today. Indeed, at the end of the 1980s, this concept was interpreted in terms of natural capital maintenance, thanks in particular to the work of David Pearce ((Pearce, 1988), (Pearce, Markandya, & Barbier, 1989), (Pearce & Turner, 1990)). From this perspective, which we can call the “capital approach” (Ruta & Hamilton, 2014), “*sustainability requires at least a constant stock of natural capital [...]*” (Pearce, 1988), where natural capital is defined as “*a stock of natural assets serving economic functions*” (Pearce, 1988). Robert Gray ((Gray, 1990), (Gray, 1992), (Gray, 1994)) and Daniel Rubenstein (Rubenstein, 1992) then proposed a “[...] *bridging between these emerging green concepts [capital approach of sustainability] and bottom line financial reporting*” (Rubenstein, 1992): they adapted the economic and macro interpretation of sustainability in terms of natural capital maintenance to organisations, giving a “natural capital approach” basis to sustainable corporate (financial) accounting. This perspective was then enlarged by the addition of other types of capital to be maintained and managed in a manner similar to the way in which human and social capital are maintained and managed (Costanza et al., 2013). For instance, the “Triple Bottom Line” (TBL) model (Elkington, 1997) relies on three types of capital (financial, human and natural ones), the “System of Integrated Guidelines for Management” (SIGMA) Project<sup>1</sup> (The SIGMA Project, 2003) relies on five types of capital (manufacturing, financial, human, social and natural), and the Integrated Reporting (International Integrated Reporting Council, 2013) <IR> framework is based on six types of capital (financial, man-made, natural, human, social and intellectual)<sup>2</sup>. The financial sector has also been strongly influenced by the capital approach: sustainable finance is more and more defined through the investment, management and protection of natural and human types of capital ((Hawken, Lovins, & Lovins, 2010), (Burrett, 2012)). For instance, the Natural Capital Declaration<sup>3</sup> (Natural Capital Declaration, 2012), launched at the United Nations Conference on Sustainable Development (Rio+20) in 2012 and which enjoins financial institutions to “*prepare to help deliver a green economy and a sustainable development*

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<sup>1</sup> This sustainability accounting project was launched in 1999 with the support of the UK Department of Trade and Industry and led by three associations: the British Standards Institution, Forum for the Future (a non-profit think tank), and Accountability, with funding from the Chartered Institute of Management Accountants. It was notably influenced by Ekins and Howes.

<sup>2</sup> In this paper, we only use two extra-financial types of capital, the human and natural capital, in order to simplify the presentation and because, according to us, it does not make the substance of the capital approach simpler : social and intellectual types of capital can be seen, for instance, as a part of human capital.

<sup>3</sup> Signed by 28 international financial institutions.

*financing*”, is an initiative “*about the materiality of natural capital to the health of financial institutions*”<sup>4</sup> (Natural Capital Declaration, 2012). This problem of the materiality of the natural capital is also a concern of the so-called “*Is natural capital a material issue?*” report, written by KPMG, Fauna & Flora International and the Association of Chartered Certified Accountants (ACCA) (KPMG, Fauna & Flora International, & Association of Chartered Certified Accountants, 2012), which indicates that “*there is evidence that interest in [natural capital] issues among the traditional users of financial accounts is growing*”. Moreover, the international financial reporting standards (IAS/IFRS) include specific standards for natural capital reporting for financial purposes, in particular the IAS 41 standard, dedicated to biological assets (IASB, 2001). In fact, we can note that today’s understanding of sustainability mainly rests on financial and extra-financial capital management and maintenance. The capital approach allows economics, finance and accounting to tackle (corporate) sustainability in a quite natural way: because these disciplines are structured around the concept of capital (from a classical viewpoint), if sustainability is seen as requiring financial and extra-financial capital management and maintenance, the extension of classical economic and accounting theories and instruments to non-financial types of capital can achieve sustainability at a social and business level. With this way of thinking, the manner in which we conceptualize financial capital, as well as related concepts such as income, is extended to extra-financial types of capital, and the manner in which these new types of capital are managed and maintained becomes the central issue as soon as sustainability is concerned. This means that, in the capital approach, a given theory of (classical) capital corresponds to a specific conceptualisation of sustainability: thus, finally, the fundamental question is to determine if the type of sustainability obtained is “really” sustainable (Wilson, 2010). In other ways, on the one hand, the classical economic, financial and accounting *performative* ((Callon, 2007), (Mackenzie, Muniesa, & Siu, 2007), (Ezzamel, 2009)) representations of our socio-economic system rely on particular capital theories and the way the capital is protected and managed: each theory and its specific implementations lead to different types of consequences, wanted or not, foreseeable or not. Now, on the other hand, in the capital approach, the economic, financial and accounting *performative representations* of sustainability rest upon the extension of these classical capital theories to human and natural concerns, and the way to maintain these new types of capital: each classical capital theory corresponds to some particular extra-financial types of capital theories, and the implementation

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<sup>4</sup> “*The NCD [Natural Capital Declaration] [... is] looking to clarify how financial institutions are exposed to material natural capital risks through companies, and to encourage financial institutions to allocate capital to ‘natural capital positive’ business opportunities*” (Natural Capital Declaration, 2012).

of these last ones lead to different types of outcomes, which can be judged as desirable or not in building a “sustainable” society.

In this paper, we do not challenge the capital approach – in particular in accounting – which constitutes a very interesting perspective for grasping sustainability issues, but we assert that a careful analysis of the different concepts of capital and the corresponding meanings of “natural capital” is necessary. Therefore, in a first part, we study the mainstream notion of capital (what we call the *capitalist* approach) and its consequences on the definition of a natural capital. As an outcome, we provide another perspective on weak and strong sustainability (Neumayer, 1999). Moreover, we claim that this prevailing conceptualisation of natural capital is opposed to an ecological perspective and leads in fact to an unsustainable society. In particular, we argue that even the standard strong sustainability approach is not well designed to tackle sustainability from an ecological point of view. In these conditions, the utilization of the notion of natural capital by ecologists gives raise to *confusion*, because it does not rely on this capitalist perspective. In fact the ecological conception of natural capital (ENC) is not “*welfare-based*” but “*stuff-based*” (Norton, 2005), *i.e.* ENC is really another type of capital, whose role is to focus on the preservation of environmental entities.

In a second part, we use the language of accounting (and notably the double entry bookkeeping principle) to reformulate the debate on capital and on natural capital and we explain the fundamental difference between a capitalist and a “traditional” accounting conception of capital. As a consequence, we finally argue that the capital approach of sustainability based on the “traditional” accounting perspective on capital leads to a genuine sustainability, in line with the ecological “stuff-based” conceptualisation of natural capital.

## **II. The mainstream and the ecological approach of Natural Capital**

What is “capital”? Our purpose here is not to (re)-open the Pandora’s Box of the ontology of capital, but to understand precisely what is hidden behind this central concept. A first answer to this question would be “money”, but as Say claimed, “*it would be a great mistake to suppose that the capital of a community consists solely in money*” (Say, 2008). Bastiat also explained, for instance, that “*there are some persons who imagine that capital is money, and this is precisely the reason why they deny its productiveness*” (Bastiat, 2007). In these conditions, what is “capital”?

## II.1 Capital, Capitalism and Modernity

In fact, it is not possible to understand this notion without analysing the concept of Modernity. Indeed, the socio-economic meaning of “capital” as well as the capitalisation principle appeared at the beginning of the Modern period (14<sup>th</sup> – 15<sup>th</sup> century) ((Goetzmann, 2004), (Nitzan & Bichler, 2009)). Moreover, since in particular Weber (Weber, 2012), Capitalism and Modernity are clearly interrelated in a way or another<sup>5</sup>.

Modernity is not only a specific period but is particularly an “*attitude*” (Foucault & Dekens, 2004), which corresponds to the prevailing one in today’s western societies (and more and more in other countries). One the most accomplished presentation and systematic analysis of this “attitude”, from an anthropological, philosophical and sociological perspective, can be found in the work of Latour ((Latour, 2004), (Latour, 2010), (Latour, 2012)). According to him, the Modern attitude can be summed up through two processes: the work of purification and the one of mediation (translation). Purification is related to the Modern dualism between Culture and Nature ((Birkin, 1996), (Santas, 1999), (Everett, 2004), (Descola, 2013)), whereas mediation corresponds to the creation of mixtures (hybrids) of human and non-human entities. More precisely, with Modernity, two levels of “reality” appear: the *real* one and the “purified” one. The first type of reality is never outside of an ideal inside – a “*brain-in-a-vat*” (Latour, 1999b) – which dominates or is dominated by this reality; this reality is not subjective or objective but is rather fundamentally a full life experiment (Debaise, 2007), a source of surprises (Latour, 2004), which is always a coexistence with a multitude of other entities, human or not, in a common world (Latour, 2004). This reality is a process permanently renews by all these entities whose actions and experiments constitute *by definition* reality. In this reality, everything is a network of mediations<sup>6</sup>: the basis of reality is a relational ontology (Slife, 2004), where the existence of things is defined by its relations with the rest of the other entities.

The second type of reality is an idealized one, a theoretical one, made by and for humans. In this reality everything is reinterpreted in terms of Objectivity and Subjectivity:

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<sup>5</sup> See for instance (Robertson, 1959), (Castoriadis, 1976), (Wood, 2002), (Goody, 2004), (Nitzan & Bichler, 2009) or (Weber, 2012) on this issue.

<sup>6</sup> *A mediation is a human or a non-human (living or not) which cannot be defined with precision by its inputs and its outputs* (Latour, 1999b).

« the Moderns [... have] to choose between a ‘conjecture’ – primary objective qualities – and a ‘dream’ – the secondary qualities [...] The result of this bifurcation has been the creation of an idealistic definition of matter where all the agencies encountered in daily life had to answer only the following question: ‘Are you objective, that is, material, that is real; or, are you subjective, that is probably meaningful but unreal?’ » (Latour, 2014)

The Modern attitude defines two ontological areas that are representable as a set of particular ideal attributes. The area of the Subject is by definition the domain of the Source of the action, where “I”, the Actor, Create, thanks to my infinite Will and Freedom, this action; the area of the Object is the exact opposite one ; it is where we find the Purpose of the action, the mere Means subjected to this action. The area of the Subject corresponds to the idealized attributes of what should constitute the essence of humanity (Freedom, Ends-in-themselves, Creativity, Power, Mastery, etc.); symmetrically, the area of the Object represents the set of all the attributes that constitutes what is not this idealized humanity (Predictability, Means, Submission, etc.). Modernity reshapes our reality, based on uncertainties, surprises, non differentiations between human and non-human entities, to obtain another purified reality, where it is possible to perfectly delimitate what can be attributed to the area of Subjects or of Objects. Moreover, all these attributes are radical and absolute one<sup>7</sup>: it means for instance that Subjects are supposed to be totally Free and to have a perfect Power over Objects, which are totally Predictable and Means. From an ontological point of view, Objects for instance are therefore simple Forms and it is possible to Faithfully Represent them, through a set of indicators, variables, and/or types of inscriptions (Latour, 1985). Furthermore, as these Objects are Means for Subjects, they are not only Faithfully Representable but also thought as being Controllable and Predictable.

In this condition, the purification is a process which splits the *real* reality into two parts, the Objective one and the Subjective one, and then recomposes a (fictive) Reality with this binary grammar (Proctor, 2009). It means that the Modern attitude is a way to redefine reality in mere human terms and so to decompose real issues, into, on the one hand, Scientific and Predictable ones, and, on the other hand, Ethical and Subjective ones (and these two types of issues are disconnected). Through this work of purification (and re-composition), the “hybrids”, the mixtures of human and non-human entities, which constitute the real world are simply unthinkable and ignored. Where there is a complex network of different types of entities, which

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<sup>7</sup> We use a capital letter to represent the absolute and so fictive characteristics of the elements of the domains of Objects and Subjects.

are interwoven in also complex interrelations, where there are a multitude of different modes of existence, Modernity only sees Objective and Subjective things, Objective and Subjective issues. But at the same time, this re-composition of our common reality allows to increase mediations (hybridizations), without having to think at them and their consequences directly: as Objects are mere Means, it is possible to use them without restriction – only technical limitations must be taken into account –; as Subjects are totally Free, the fundamental question of responsibility becomes a problem of delimitation of Rights and Duties between Subjects, a problem of delimitation of inter-Subjective Powers. Therefore, « *the moderns have thus, on one hand, produced self-confident spokespersons for nature who freely experiment in their laboratories without regard to given social orders ; and on the other hand, a society unafraid to accommodate new techno-scientific constructions because it is fully convinced that it shapes its own destiny* » (Blok & Jensen, 2011).

We highlight the fact that the Modern attitude is absolutely not similar to the Liberal or Capitalist one: the Marxist theory, for instance, is also a Modern political theory (Latour, 2012)<sup>8</sup>. In fact, the binary grammar of Modernity can be used in a lot of ways to recompose reality in a given way and to provide particular lines of arguments<sup>9</sup>. Therefore, Modernity itself does not impose a choice, between what must be considered as Objective and what should be Subjectified<sup>10</sup>. In these condition, we argue, in line with a kind of “Weberian” tradition (Weber, 2012), that Capitalism does correspond to a specific set of Modern choices. As explained by Castoriadis<sup>11</sup>, who extended a part of the Weberian analysis (Castoriadis, 1988), Capitalism is an institution of the society whose central imaginary signification is the unlimited expansion of the rational mastery (Castoriadis, 2013). If we use the terminology introduced here, Capitalism is therefore a Modern system of choices to purify and recompose reality, in such a way that Objectification (related to Modern Rationality and Mastery) is always chosen, as soon as Subjects are clearly identified. It means that our common world must be purified in such a way

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<sup>8</sup> The difference between Marxism and Liberalism relies only on what is considered as Subjective or Objective. For instance, in Liberalism, Society is seen from a Nominalist point of view: Individuals are Subjects, whereas Society is a set of Subjects and therefore is a mere Object, controllable by Subjects. In Marxism, some communities, like Classes, are partially Subjectified: the Class receives some attributes of the Subject (the Power in particular) and individuals which constitutes this Class are partially Objectified (they exist because of their appurtenance to this Class). Collectivism is also a partial Subjectification of a group (Society) and a partial Objectification of individuals.

<sup>9</sup> That is why we can « choose » to be a realist or a constructivist, for instance.

<sup>10</sup> Environmental Ethics provides an interesting example of a utilization of the Modern grammar to protect some non-human entities with the notion of intrinsic value, which is a Subjectification of these non-human entities ((Norton, 1991), (Katz, 1997)).

<sup>11</sup> another representative, with Latour, of the French political ecology “school”.



that reality becomes as Predictable, Controllable, and Determinable as possible, in order to guarantee the increase of the Power and the Goals of Subjects. In these conditions, it is now possible to understand what is fundamentally a Capital: as explained by Nitzan and Bichler (Nitzan & Bichler, 2009) (who partially based their work on the one of Castoriadis), Capital *is* Power. It means in particular that Capital is not something which generates Power, or is in conflict with Political Power. Capital is the symbolic representation of Power, but not just any power, the Modern Power of the Subject. Therefore, we can assert that Capital is the print of the area of the Subject: Subjects are, by definition, those who have the Capital and the Capital defines who is a Subject in Capitalism.

Thus, on the one hand, Capital defines Subjects and the relative measure of Capital allows to determine *inter-Subjective* delimitations and, on the other hand, Subjects can use Objects<sup>12</sup> – mere Means – to increase their Goals, their Power, and so their Capital. The Reality of Capitalism relies on struggles between Subjects whose stake is the level of Capital (Power), on conflicts to have an access to this Power (it means to become a Subject), and on unlimited Objectification of all the parts of our reality which is not associated to Subjects in order to have unlimited sources of Power.

The next question is therefore: how to operationalize this concept of Capital? It means how to measure Capital and to know precisely what can increase (or decrease) it? Hicks argues that there is two fundamental conceptions of Capital: the materialist one and the fundist one<sup>13</sup><sup>14</sup> ((Hicks, 1974), (Pekkarinen, 1979), (Hawke, 1980), (Tarascio, 1993), (Scazzieri, 1999)).

## **II.2 Materialist and Fundist Capital**

In fact, Modernity gives two (and only two) possible ways to basically understand what is a thing: this thing is either defined by its components, from the inside (this is the Nominalist

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<sup>12</sup> We stress the fact that workers, even if they are human, are partially Objectified.

<sup>13</sup> “*There are some for whom Real Capital is a Fund – I shall call them Fundists; and there are some for whom it consists of physical goods. [...] I shall [...] call them Materialists. Anyone, indeed, who uses a Production Function, in which Product is shown as a function of labor, capital and technology, supposed separable, confesses himself to be (at least while he is using it) a Materialist. [...] If Production Function is a hallmark of Materialism, the, capital-output ratio is a hallmark of modern Fundism*” (Hicks, 1974)

<sup>14</sup> This classification is not recognized by all economists, like a majority of those of the Austrian School (Kirzner, 1976), even if, according to Hicks, all the Austrian authors are fundist (Tarascio, 1993).

perspective<sup>15</sup>), or by its consequences, from the outside (this is the Realist perspective<sup>16</sup>). Therefore, Capital can be either understood through the Objects which allow the development of the Power of the Subjects, or through the consequences of the exercise of this Power. The first orientation is what Hicks calls the materialist conception of Capital whereas the second perspective is what this author calls the fundist approach. It is possible to sum up these two viewpoints in the following table 1:

	<b>Materialist Perspective</b>	<b>Fundist Perspective</b>
Capital as...	A stock Capital is represented by a stock (set) of things (Objects) “ <i>of limited life which are periodically worn out or used up and reproduced</i> ” (Knight, 1935), and which generate Utility or more generally Power	A fund Capital is represented by a fund invested in “ <i>durable instruments of production which are used as an indivisible entity<sup>17</sup> over and over again in a temporal sequence</i> ” (Pekkarinen, 1979)
Capital-Income relation	Production function	Capital-Output ratio
Relation between Capital and Subjects	Rights of ownership	Rights of utilization (Nitzan & Bichler, 2009)
Temporality	Static	Dynamic
Dependency on the production structure	No	Yes
Global economic structure	“ <i>[...] economic structure [is considered] as a set of realized and interdependent processes of production (circular flow) [...]</i> ” (Scazzieri, 1999)	“ <i>[...] switch from a space of virtual production possibilities to the set of realized technical practices</i> ” (Scazzieri, 1999)
Evaluation of Capital	Aggregation of the market prices and/or Willingness To Pay <sup>18</sup> (To Accept <sup>19</sup> ) of each element of the stock which represents the Capital	Discounted value of future cash-flows generated by the fund which represents the Capital
	First Neoclassical Economists (e.g. Marshall or Pigou) Solow Hartwick	Classical and Austrian economists Fisher Keynes Marx

### Materialist and Fundist perspectives of the Capital

Table 1

<sup>15</sup> Where elements of Subjectified because they Determine what is the whole thing, which is Controllable by the knowledge of the elements.

<sup>16</sup> Here, elements are Determinable by the whole, which is Subjectified.

<sup>17</sup> This indivisible entity is precisely the Capital.

<sup>18</sup> WTP

<sup>19</sup> WTA

From a materialist viewpoint, Capital is represented by a stock of Objects, which has no time dimension and does not depend on the structure of production: therefore, the state of this stock at a given time is the only relevant information necessary to manage it and to predict future incomes (a given state of the stock will always generate the same flow of income). From a fundist perspective, Capital is a fund, which can regenerate itself: it is for instance money which generates money<sup>20</sup>. A fund is time, techniques and production dependent: funds provide services in a specific manner which is characteristic of the fund. Objects used are simple supports for the generation of a stream of incomes.

To be clear, Capital is Power and this Power can be analysed from a materialist or fundist perspective. Now, as explained for instance in (Nitzan & Bichler, 2009), the fundist approach corresponds to the very spirit of Capitalism. Indeed the materialist viewpoint is not enough flexible to understand the whole possibilities of Capitalism: materialism was developed by the first neoclassical economists, at the time of the Industrial Revolutions, and thus, the assimilation of the Power of Subjects with an industrial material basis was quite natural. Nevertheless, fundism, initially created by the Italian merchants during the 14<sup>th</sup> century (Nitzan & Bichler, 2009) and really developed by Fisher at the beginning of the 20<sup>th</sup> century ((Fisher, 1906), (Chambers, 1971), (Rimbaud & Richard, 2015a)), allows all the facets of our world to be subjects to Quantification and automatic comparability. Moreover, the Cambridge controversy (Lazzarini, 2011), that Hicks explained as a controversy between fundists (Keynesian economists like Robinson and neo-Ricardian economists like Sraffa), led to the victory of fundism, in particular because of the impossibility to assess the value of Capital-as-a-stock.

### **II.3 Strong and Weak Sustainability**

What are the implications of this approach of Capital for sustainability? From a general viewpoint, it means that the “extension” of the notion of Capital to Natural Capital, as explained in the introduction, is absolutely not related to the taking into consideration of some natural entities “for themselves”. The emergence of the concept of Natural Capital is only the recognition that the Subject’s Power can be increased or maintained thanks to some non-human entities, that nature is a real source of Power: Natural Capital is in fact a (Natural) Capital, *i.e.*

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<sup>20</sup> “the fact that capital returns a revenue has led to the conclusion that capital has not only the faculty of maintaining itself, but has actually a power of increase [...] Money is always idle capital” (Bilgram & Levy, 1914)

the “natural” part of the Capital-as-Power. The emergence of environmental awareness in the 1960s-1970s and of the Sustainable Development in the 1980s led to the recognition of the potential of natural entities to develop this Power. Therefore, Norton claims that most of the today’s economists use the notion of natural capital as being “welfare-based”: “*[from an] Economistic position [...] all environmental values are ultimately related to impacts on the welfare of individuals and aggregations thereof*” (Norton, 2005). And welfare is a mere translation of the attributes of the Subject: (Modern) welfare is therefore directly linked to the Power of Subject. For instance, it is clear in the Pearce’s definition of natural capital given in introduction that nature is only a support for individuals’ welfare. Therefore the taking into account of non-human entities is purely at the margin and remains based on the Modern assumptions about their (purified) ontology; we can adapt the remark of Latour concerning the sociology of scientific knowledge in our context: “*if you make a list of all the roles that things [non-human entities] [...] play in [standard Natural Capital]’s narratives, you will be struck by the fact that they don’t do very much. [...] They are like hosts at a party where all the food has been brought by the [Subjects...] to stand up as tokens, but they are not there to eat and certainly not to bring their own doggy bags*” (Latour, 1999a). In fact, real non-human entities are only traces (Favereau, 2011) in the theory of natural capital, mere ghosts. And we can extend the quotation of Latour, by saying that, from the 1970s, nature has been progressively recognized as having some tickets for this “party” where the Subjects want to go: thus, the stake has become to get these ticket but, of course, without fully accepting nature at the party. At the end, what is clear, is that the standard concept of Natural Capital is not an extension of the notion of Capital but only the adaption of the concept of Capital to integrate non-human entities. Instead of creating a new tool for tackling new issues, related to non-human entities, standard Natural Capital is based on the same concept of Capital as the one used since the Italian merchants: the only difference is the source of the Power. That is precisely why we can talk to a Natural Capitalism (Hawken et al., 2010) which is a new step of the development of Capitalism: the first prevailing sources of Power was merchandises and agriculture, then industry, then finance, and now nature itself.

But it is possible to argue that what we are talking about is only “weak sustainability” (Neumayer, 1999), where the whole Capital must be maintained. We argue that even the standard very strong sustainability (Turner, 1999) is also based on this perspective. Indeed, the Hicksian analysis of Capital makes possible to understand the premises of weak and strong sustainability ((El Serafy, 1991), (Kyriakou, 1995), (Kyriakou, 2006), (Leandri, 2009), (El

Serafy, 2013)). The situation is quite clear: we have *one and only one* Capital that we have to at least maintain, but we have new sources for the development of Capital. Therefore, on the one hand, from a materialist perspective, Capital is represented as a set of different Objects which constitutes the basis of this Power. The recognition of Natural Capital implies the *systematic* integration of non-human entities in this set. Therefore, the materialist approach entails that Capital is interpreted as the aggregation of natural Objects, which represent the natural source of Capital, and of other types of entities, as human-made Objects, which generate Welfare, Utility and more generally Power. On the other hand, the fundist approach of Capital is not based on an enumeration of Objects but represent it as a stream of future receipts (Hicks, 1946) or services (Fisher, 1906): the stake is not to establish a list of all the elements which are the support of the Subjects' Power but to assess directly what is the level of services generated by the utilisation of different types of Objects. Therefore, the fundist perspective on Natural Capital considers that future receipts or services are partially provided by some natural entities, but it is not relevant or possible to determine the contribution of a particular natural Object. What is important here is to consider that Power comes from particular combinations of different types of Objects, and that the presence of natural Objects in these combinations is more and more relevant, important and constitutes even a "*material issue*" (KPMG et al., 2012).

Therefore, fundism leads to very weak sustainability. In fact, from this point of view, the substitutability between natural Objects or human-made Objects is not a key question. Substitutability is a fundamental presupposition which is already included in the conceptualisation the Modern Power of Subjects: every Object in this world can be used in a way or another, and the only thing which is relevant is the level of Welfare or Power generated. The combination of different types of Objects is seen as a black-box: only the outputs are important. A true fundist approach is for instance at the basis of IAS 41 ((IASB, 2001), (Suzuki, 2012)): as soon as Natural Capital is assessed through present value, the fundist perspective appears.

Now, when sustainability is discussed, fundism is generally not invoked: what is debated, is the problem of substitutability between Natural and Human-Made Capital. Thus, it is the materialist perspective which is generally mobilized in sustainability. From a materialist viewpoint and in line with the table 1, maintaining Capital means maintaining the aggregation of the WTP/WTA of consumers of each element of the stock which represent the Capital. If we do not suppose anything else, this maintenance corresponds to a weak sustainability approach.

But we claim that strong sustainability is also based on the same premises, but with an addition of particular suppositions, *not about the natural Objects themselves, but about the Subjects*. Indeed, when Daly (Daly & Farley, 2004) or Pearce (Pearce, 1988) for instance explain that it is necessary to maintain natural capital itself, it is absolutely not for reasons related to the natural entities themselves, but because of suppositions about the structure of production functions, and utility functions of consumers. For instance, Daly and Farley rewrite “[...] *the utility function as:  $U = F(N; x, y, z, . . .)$  [N for Natural Capital][Thus] if x is a pair of hiking boots, then its utility depends on places worth hiking in (N). If y is a snorkeling mask, its utility depends on reefs and clean water (N)—not to mention prior dependence on breathable air, drinkable water, sunlight filtered of enough of its UV rays so we won’t get melanoma if we go snorkeling, and so on. N provides a complementary service without which the utilities of most consumer goods are not very great. Consumers may be able to maintain the same level of satisfaction in the face of a reduction in x by simply consuming more y and z, which to some degree are substitutes. But N is a complement to x, y, and z, and their increase will usually not compensate for a decline in N. In fact, their utility will fall with a decline in N. For example, you won’t enjoy your new hiking boots very much if there are no pleasant hiking trails*” (Daly & Farley, 2004). Here, what is central is the problem of maintenance of the consumers’ level of satisfaction: as N and the other elements of the utility function are *supposed* to be complementary and not substitutable, *then* we have to maintain the Natural Capital itself. The maintenance of (materialist) Natural Capital is not based on a taking into consideration of non-human entities but is directly based on the same perspective on natural Objects as the one of the fundist or weak sustainability approach, and more generally as the Capitalist perspective; the only difference is the addition of hypothesis *on the Subjects themselves*<sup>21</sup>.

Some authors propose also not only to maintain the Natural Capital, *i.e.* to maintain the aggregation of WTP/WTA of the *natural entities* which constitute the stock which represent the Capital, but also to maintain some of these natural entities “themselves” (Neumayer, 1999). Here again, generally speaking, the reason for this particular maintenance is a direct consequence of suppositions *on the Subjects themselves*. For instance, Hueting proposes such

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<sup>21</sup> In the same way, Norton claim that « Pearce and Barbier think of their position as strong because they doubt that risks to ecological systems and the ‘ecological services’ they offer can be calculated using the marginal analysis of cost-benefit accounting. They believe that the standard methods of cost-benefit analysis [...] ultimately will have to be supplemented with other policy instruments in order to take into account the importance of ecological thresholds and irreversibilities. The key point, however, is that these new approaches, which involve the use of threshold instruments, are all considered as means to estimate welfare effects, given uncertainty and variation in risk aversiveness. What they value, and what they count, is welfare » (Norton, 2005).

an approach, because the precise calculation of shadow prices seem to be very difficult or impossible ((Hueting & Preston, 1980), (Hueting, Bosch, & de Boer, 1992)). It means that the maintenance of natural entities “themselves” is only based on particular hypothesis which have no direct relations with these entities themselves. The maintenance of a critical natural capital (Turner, 1999) rests also in general on this perspective. What is always important is the maintenance of the Power and Welfare of Subjects: Objects are just at worst unavoidable constraints or at best good opportunities to achieve this goal. But it would be possible to argue that the maintenance of Objects “for themselves”, from this (materialist) strong sustainability perspective, would achieve at least a good level of sustainability and is in line with the ecologist demands, for instance. According to us, it is not the case. Firstly, the point is that the expression “for themselves” has a very particular meaning because of the reasons of this type of maintenance: from the beginning of this part to now, we never abandon the main and central purpose and Modern suppositions of the standard Capital approach of sustainability, it means the fact that (natural) Objects are Means for Subjects and are Controllable and Predictable, because they are only Forms, Objectively Representable. Therefore, even standard very strong sustainability keeps this viewpoint on our common world: maintaining natural entities “for themselves” from a strong sustainability perspective means maintaining a set of Forms whose the only reason of existence is to be a Mean for Subjects. This supposition has of course very strong implications on the level and quality of maintenance of these entities<sup>22</sup>. This is why Norton claims that “*all Economists [...] are weak-sustainability theorists*” (Norton, 2005). Furthermore, this way of conceptualising non-human entities is completely opposed to a genuine ecological and sustainable perspective ((Latour, 1998), (Latour, 2004), (Norton, 2005), (Rambaud & Richard, 2015a)). In fact, we argue that ecology is much concerned by the study of the interrelations of the real reality and therefore by the exploration of the different modes of existence of (human and non-human) entities in this world. Therefore, the recourse to the notion of “natural capital” by (in particular) ecologists is very different from the standard Capital approach of sustainability, even the strongest sustainability perspective. What is important for ecological natural capital is the complex and always singular interactions between human and non-human entities without any presuppositions about an eventual moral centre. Here, it is possible to talk about natural capital because non-human entities are “*matters of*

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<sup>22</sup> “[...] protecting natural capital [...] requires that we both understand and agree on what natural capital should be safeguarded. For example, Callicott and Mumford (1977) argue that our concern with the management of natural capital in ‘humanly occupied and exploited’ settings is primarily focused on issues of ecosystem health [...], while in biological reserves, attention shifts to questions related to ecological integrity [...]” (McCool & Stankey, 2001).

*concerns*” (Latour, 2004), and so are *capital* to conceive a common world. It is precisely what Norton calls a “stuff-based” capital approach (Norton, 2005): a capital approach of sustainability where stuffs are not just Objective, Controllable and Determinable Means, but are partners for a common coexistence.

### **III. Accounting and the Natural Capital**

In these conditions, what is the contribution of accounting in this debate on natural capital – and the confusions about it? According to us, accounting allows at the same time to restructure this question and provides a relevant way to define a sustainable natural capital approach.

#### **III.1 An accounting point of view on capital**

At first, we have to notice that the “traditional” accounting notion of capital is completely different from the Capitalist perspective. Indeed capital from this viewpoint is “money to be preserved”<sup>23</sup> ((Rambaud & Richard, 2015a), (Rambaud & Richard, 2015b)): capital<sup>24</sup> is money that a firm *has to* refund and thus has to maintain. In these conditions, the fundamental mechanism of accounting is simple: some investors bring money to a firm; then this firm must recognize a liability towards them to be able to refund them: “*for the purposes of book-keeping treat capital as a liability – treat it just as if it were a debt payable*” (Snailum, 1926); at the same time, this capital is used by the firm to obtain resources, assets, to achieve its goals (and in particular the creation of profit and of goods or services). The double-entry bookkeeping is structured to record this type of operation ((Ijiri, 1967), (Ijiri, 1975)): what is on the right side of balance sheet, the capital invested, must be strictly maintained to be refunded, whereas what is on the left side corresponds to the different *utilisations* of the capital (Riahi-Belkaoui, 2004). So, in “traditional” accounting, capital is a *credit* concept (Nobes, 2014), and capital maintenance is guaranteed at the *level of the firm*.

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<sup>23</sup> For instance, in his treatise about “the theory and practice of banking”, the economist Henry Dunning Macleod claimed that “[...] *the first meaning which every man in business attaches to the expression Capital, is money [...] to bring Capital into a business is to bring money into the concern*” (Macleod, 1856).

<sup>24</sup> “Capital” (with a capital letter) will be used to designate the Capitalist perspective on capital (Capital as Modern Power of the Subject) whereas the word “capital” will be used for the traditional accounting approach on capital.



What is crucial with the conception of capital in traditional accounting is that it is *independent* from the activity of the firm. More precisely, capital has an intrinsic existence that is not conditioned by its utilisation inside the firm: the essence of capital is defined outside the business. If an investor brings 1000 units of money to a firm, the intrinsic existence of her capital is clear: it is precisely these 1000 units, whatever happens during the utilisation of this capital by the firm. Thus, this investor and the firm know precisely what must be refunded to her. Changes of the very nature of capital are, in these conditions, also very clear: they correspond to modifications of the value of money itself, which means inflation or deflation. In particular, that is why inflation is so important in discussions about Historical Cost Accounting.

Furthermore, in traditional accounting, because capital has an intrinsic existence, independent from the way it is used, as its utilisations are recorded (as assets) and as these uses show the degradations of the capital embedded in them (in particular through depreciation), it is possible to know periodically what is the deterioration of the capital itself (and to distinguish it from some changes of the very nature of the capital). Maintaining the capital means guaranteeing the integrity of the capital, which implies the necessity of finding specific ways to counterbalance these degradations. Revenues correspond to the “fresh blood” able to “regenerate” the capital: a part of them will restore the capital, and the remaining part will be seen as a surplus, an income. The matching principle, which links “*the economic and monetary entity’s streams to the reference period*” (Biondi, 2007), is also directly related to the maintenance of the capital, as an independent and “material” entity. Because this maintenance must be effective because of the intrinsic reality of the capital, these revenues must also be actual: if we record unrealised gains, we simply jeopardise the integrity of the capital. Therefore, one of the fundamental roles of “traditional” accounting is to give a piece of information on the realised (or real) income (profit): this is the *principle of realisation*, which states that a profit must be the difference between the cost of obtaining an item of wealth and the price received for a *real* exchange of this item on a market. In these conditions, income is the measure of the *sustainable* surplus, generated by a firm, which does not challenge the essence of what investors brought out and which constitutes a “matter of concern” for them independently of the activity of the firm. As an outcome, the rate of return for owners is a residual concept, a mere consequence of this activity. Capital is invested to get a return, but this one is a mere “hope” which does not condition the reality of the capital itself.

What is the relation between this type of capital and the notion of Capital described before? In fact, the fundamental difference relies on the fact that, from an accounting viewpoint, Capital is a *debit concept*: Capital is defined as net assets. More precisely, net assets correspond to the Objects that are recognized as a relevant source of Power or Subjects (at the corporate level, shareholders). Therefore, from a mere Capitalist perspective, at the corporate level, double-entry bookkeeping is no longer really necessary (Barker, 2010): only assets management is required. It is possible to distinguish a materialist and a fundist approach of Capital (and Capital maintenance) in accounting: from a materialist perspective, corporate Capital is a set of assets, assessed one by one at their market values; from a fundist viewpoint, corporate Capital is a combination of assets, assessed collectively (even if it is not always the case) at their present value. A direct consequence of this analysis is that there exist three (and not two as regularly claimed (Riahi-Belkaoui, 2004)) fundamental notions of capital and capital maintenance at the corporate level, as summed up in the following table (table 2):

	<b>Capitalist Approach</b>		<b>Traditional Accounting Approach</b>
	<b>Materialist Perspective</b>	<b>Fundist Perspective</b>	
Capital & balance sheet	Capital as net assets (Debit concept)		Capital as liability (Credit concept)
Capital	Capital is virtual Capital is the representation of the Power of the Subject (shareholder) Capital is dependent on the activity of the firm		Capital is a “substantial” entity (money) Capital is independent from the activity of the firm
Evaluation of capital	Aggregation of the market values of the assets	Present value of the combination of the assets	
Capital maintenance	Maintenance as asset management Asset management and profit (value) maximisation are inter-defined (Rambaud & Richard, 2015a) Maintenance at the level of the owners/shareholders		Maintenance of an intrinsic essence of the capital, defined outside the firm Maintenance at the level of the firm Planned depreciations are recorded to guarantee this maintenance
Matter of concerns	Capital (assets) management and optimisation		Capital protection

## Capital and accounting

Table 2

### III.2 Accounting and Natural Capital

What are the implications of this analysis for the concept of natural capital? It is now possible to define two different paths to conceptualize what is a natural capital. The first one is the Capitalist Natural Capital perspective that we can define now as a *debit concept*: if the natural capital, at the corporate level, is defined through assets, then this natural capital is a Capitalist one. Therefore, as showed before, this type of natural capital is only concerned by the expansion of the Power of Subjects and absolutely by ecological issues. This approach is the prevailing one today<sup>25</sup>. IAS 41 or the Integrated Reporting <IR> (IIRC Council, 2013) are examples of this point of view. Even the concept of internalization of externalities in accounting is completely based on this type of natural capital.

The second path is, by opposition, defined as a *credit concept*: a natural capital, in this way, is understood as a liability at the corporate level. Therefore, the relevant model to conceptualize such a natural capital is the one of the “traditional” accounting. In fact, contrary to the case of the Natural Capital, which is not a real extension of Capital, this liability-based “natural capital” is a real extension of the traditional accounting capital notion. Indeed, this last one is “money to be preserved” which is of course completely different from any non-human entities. But here, what must be extended, is not a “money”, but the fact that the traditional accounting capital is an intrinsic entity independent from the corporate activity. In these conditions, the following table illustrates the way to define a natural capital from a traditional accounting perspective:

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<sup>25</sup> For instance, the Sustainable Development Director of Nike in 2011, claimed that “*the time is fast approaching when we will jettison the language of sustainability, and simply talk about value creation; NPV [net present value], ROIC [return on invested capital], market share, innovation portfolios and shareholder returns [...] we have long said that things we have taken for free will become the new gold, water, waste, carbon. [...] The weather is not waiting to be regulated. We believe we have entered the era of climate adaptation, where we are no longer contemplating the potential but beginning to grapple with the consequences. [...] When we talk about sustainability without the context of value creation [for shareholders] we diminish the potential and the opportunity and the speed with which the transition will happen. How do we turn sustainability into a 'pull' function, not a 'push' function, within a corporation? The answer, lies in viewing sustainability as a strategic prism through which to view the resiliency, future growth trajectory and value creation potential of a company*” (Elkington, 2011).

	<b>Traditional Accounting Framework</b>	<b>Consequences for the natural capital</b>
Capital	Capital is a “substantial” entity (money) Capital is independent from the activity of the firm	Natural capital is a generic term designating a particular set of non-human, substantial and concrete entities, which need deep examinations to define them and co-exist with them <sup>26</sup> ((Latour, 2004), (Allenby, 2005)) Natural capital is “stuff-based” capital (Norton, 2005) Natural capital is independent from the corporate activity, and its “essence” exists outside the firm
Capital & income	Capital and income are strictly separated	Natural capital is strictly independent from income
Capital & balance sheet	Capital is a credit concept Focus on the liabilities-side of the balance sheet	Natural capital is a credit concept Natural capital is a liability that represents the responsibilities that a firm has towards the entities that form this capital Focus on the examination of the natural capital
Capital & Assets	Capital and assets are strictly separated Assets are utilisations of capital	The natural assets corresponding to the natural capital represent the different and generic types of utilisation of the natural capital Natural capital is not an asset: the entities inside the natural capital are not mere means and are recognized as having to be protected
Capital maintenance	Maintenance of an intrinsic essence of the capital, defined outside the firm Maintenance at the level of the firm Planned depreciations are recorded to guarantee this maintenance	Maintenance of the entities, inside the natural capital, for “themselves”, <i>i.e.</i> , according to what they are intrinsically (this last term needs to be clarified) Maintenance at the level of the firm: this one implements this particular protection Planned depreciations are recorded to guarantee this maintenance <sup>27</sup>

### Natural capital from a traditional accounting conception

Table 3

<sup>26</sup> The natural capital *really* extends the capital-as-money of the “traditional” accounting: there is no reduction of natural entities to the classical accounting capital (money), even if there is a monetary evaluation. Ontologically, a natural capital is different from the traditional accounting capital (the conception is symmetrically opposite to the conception of the FfH model).

<sup>27</sup> We stress the fact that this depreciation is not of the natural capital itself (in the traditional accounting, we do not depreciate the capital-as-money) but rather of the assets, which correspond to the utilisations of this type of capital. Nevertheless, the purpose of this depreciation is not to protect the asset but rather the natural capital itself.

### III.3 The Triple Depreciation Line (TDL) model and Ecology

Concretely, the “Triple Depreciation Line” (TDL), developed in (Rambaud & Richard, 2015b) and which constitutes an extension and a systematic theorization of the CARE<sup>28</sup> accounting framework initiated in (Richard, 2012), provides a complete accounting model that theorizes and operationalizes this conception of the natural. More precisely, this accounting framework first gives a (re-)definition of a capital (financial or not), to apply symmetrically the historical accounting principles to extra-financial types of capital. In these conditions, capital is defined as a resource recognized as having to be maintained over a predetermined period. In these conditions, a *“resource cannot be considered as capital without actors attaching an ontological description to it and having a concern to preserve it over a given period according to this ontological specification. These actors can be called the representatives or spokespersons of the capital”* (Rambaud & Richard, 2015b). These representatives<sup>29</sup>, whose numbers and qualities must be regularly re-assessed, must guarantee a non-reductionism and a plurality in the examination of what the concerned capital are. They are not real stakeholders but rather intermediaries with the concerned capital themselves.

Moreover, the TDL model is structured by six axioms. The first one (called SA1<sup>30</sup>) asserts that at least three types of resources must be recognised as capital (in the sense of being separately and systematically protected): natural, human and financial<sup>31</sup>. The second axiom (called SA2) claims that to maintain a capital it is necessary to describe it and to apprehend it in the best possible way<sup>32 33</sup>. This must be done with the recourse of the representatives. The

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<sup>28</sup> “Comptabilité Adaptée au Renouvellement de l’Environnement”

<sup>29</sup> For instance, independent scientists, local communities, public authorities, NGOs, etc... In the case of a financial capital (money), the representatives are only the investors who possess this money, whereas the ontology of the capital is only the monetary value of this capital. In these conditions, we can measure the leap in terms of the difference in complexity between a financial and an extra-financial type of capital: whereas in the first case, representatives and ontologies are very simple and well-identified, in the second case, spokespersons and ontologies are not only plural but also difficult to identify. In fact, this leap is the central and prevailing issue of sustainability and therefore should also be the central and prevailing issue of sustainable finance.

<sup>30</sup> SA means Social maintenance Assumption.

<sup>31</sup> There is, in this way, a strict equality of treatment of all these types of capital.

<sup>32</sup> An implication of this assumption is the obligation of regular re-assessment of these definitions and thus of the different types of representatives concerned.

<sup>33</sup> This attitude towards the different types of capital is clearly very different from the Capitalist and Modern attitude. In the CARE/TDL accounting framework, each capital must be truly understood in its role within the Earth’s ecosystem and not as a simple asset for shareholders. Moreover, the presence of these “spoke-persons” implies new types of governance for firms.

third axiom (called AA1<sup>34</sup>) states that the use of natural and human types of capital by a firm implies for the firm the obligation to maintain them without any possible *a priori* compensation. This is the translation of the axiom SA1 to the corporate level. A direct consequence of AA1 is the recognition of a liability, which corresponds to the natural and human capital. The next assumption (called AA2) asserts that the repeated use of the natural and human types of capital implies their systematic degradation. The remaining axioms (called AA3 and AA4) express the fact that the reporting concerning the human and the natural types of capital must be integrated in the traditional financial standards, which means in the traditional balance sheet and the profit and loss statements and that the utilisation of human and natural types of capital are necessary to achieve the goals of the firm.

These assumptions *imply* in particular four main consequences: (1) At first, the degradations of the natural and human types of capital must be recorded through the systematic and planned depreciation of the assets, which correspond to the utilisations of these capitals<sup>35</sup>. Therefore, the TDL model highlights the absolute necessity of reporting and taking into account, in a systematic way, the repeated uses that are the main sources of degradations of natural and human entities today (such as the progressive soil erosion for the natural capital and the stress and the muscular-skeletal diseases for the human capital). (2) Furthermore, the human and natural types of capital must be valued in terms of money in the balance sheet, but this monetisation has nothing to do with a valuation of capital in terms of market prices, shadow prices or discounted values. We prove in fact that the “value” of any accounting capital (*financial or not*) is the sum of the planned costs that are necessary to maintain this capital over the predetermined period of maintenance. For instance, in the case of the human capital (the employees), *“the maintenance costs can be interpreted in three main ways: costs directly paid to workers (to ensure them worthy living conditions), internal expenditures for better working conditions, and internal expenditures for high quality training. The precise definitions of the terms “worthy”, “better” and “high quality” are associated with a workers’ ontological investigation [through collective and regular debates with the representatives of the workers]”* (Rambaud & Richard, 2015b). In the general case, these costs must be collectively and regularly (re-)assessed by the representatives of the concerned capitals and the firm, according to the ontology of these capital collectively defined by these representatives. The computation of these forecasted expenditures is generally approximate and subject to revisions in the case of

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<sup>34</sup> AA means Accounting maintenance Assumption.

<sup>35</sup> Of course, in case of irregular uses, extraordinary depreciations will be registered.

unexpected events (accidents notably), but at the same time, it allows one to cope with genuine uncertainty (Rambaud & Richard, 2015b). At the same time, this practice of periodic revisions is a common task of “traditional” accountants, which is why capital evaluation is pragmatic, based on objective and subjective elements. (3) Moreover, in the TDL framework, “*capital (human and natural) maintenance costs are investments [to compensate the depreciation of the assets corresponding to the utilisations of these capital and therefore to maintain them], while the degradation due to their uses is recorded as a depreciation*” (Rambaud & Richard, 2015b). This means that there are three different depreciation lines (hence the name TDL) in the P&L statement, one for each type of capital. In this statement, wages expenses no longer have reasons to exist: “*indeed, the only expense that corresponds to worker use is a depreciation expense, whereas the maintenance costs are still considered investments*” (Rambaud & Richard, 2015b). Furthermore, because employees (human capital) are at the same “level” as the financial capital, the profit to distribute is no longer the profit for the shareholders: it is the profit of all suppliers of capital considered as a “team”. (4) Finally, contrary to models such as the Triple Bottom Line (TBL), which define several types of benefits or performances, the TDL model proposes a real integrative view that leads to a single measure of profit, a concept of profit totally transformed due to the systematic maintenance of human and natural capital but very similar in its form to the traditional profit. The TDL’s income, which sums up all of the extensions of the traditional accounting principles to extra-financial types of capital, is structured in the following way:

$$\begin{aligned}
 &+ \quad \text{Revenues (sales)} \\
 - &\quad \text{Expenses for raw material and services} \\
 - &\quad \text{Expenses for depreciation of financial capital} \\
 - &\quad \text{Expenses for depreciation of human capital} \\
 - &\quad \text{Expenses for depreciation of natural capital} \\
 - &\quad \text{Expenses for taxes} \\
 = &\quad \text{Profit of the production team}
 \end{aligned}$$

This income is a genuine measure of the surplus generated by a firm after having fully protected the different types of capital. Thus, the income is completely separated from the very nature of the concerned capital and is based on taking into account the degradation of these capital. The rates of returns are also merely residual: they are computed after realisation of the income and therefore after full capital maintenance.

The TDL model highlights the fact that there is a strong convergence between the traditional accounting framework and today's ecological approach of sustainability, which we can consider, by definition, as a *genuine* sustainability: indeed, the way the "traditional" accounting treats the capital (money) provides an accounting way to take seriously the different entities of our common world and the conception of procedures to co-exist with them, as recommended by ecological studies ((Latour, 1998), (Forsyth, 2004), (Dedeurwaerdere, 2014)). The TDL model can be seen as an operationalisation of this junction. In particular, thanks to the "traditional" accounting thinking, it is possible to design a concrete and feasible accounting system that strictly focuses on *real* natural and human entities themselves; and, if we take again and adapt the definition of the ecologisation of society to achieve a genuine sustainability according to Latour (1998), which can create procedures that make it possible to follow a network of interacting human and non-human entities (thanks to collective and regular debates with representatives) whose relations of subordination remain uncertain and which thus require a new form of corporate activity adapted to following them.

#### IV. Conclusion

By way of conclusion, we propose the following table which sums up the main ideas developed previously about the notion of "natural capital":



	<b>Capitalist (Modern) Approach</b>		<b>Ecological Approach</b>
Accounting point of view (corporate level)	Debit concept		Credit concept
Purpose	Maintaining or increasing the Power of Subjects (shareholders at the corporate level) Asset management		Maintenance of the entities, inside the natural capital, for “themselves”, <i>i.e.</i> , according to what they are intrinsically (this last term needs to be clarified)
Model (from which natural capital is conceptualized)	Economics		“Traditional” accounting
Conception of the “natural” entities related to the natural capital	Objective, Predictable and Determinable Means for the Ends of Subjects Forms Objectively Representable		Complex entities with different modes of existence, that we have to follow in their interactions
Natural capital	At the corporate level, natural capital is dependent on the corporate activity Natural capital is the recognition that the Power of the Subjects can substantially come from the use of natural entities.		Natural capital is a generic term designating a particular set of non-human, substantial and concrete entities, which need deep examinations to define them and co-exist with them <sup>36</sup> ((Latour, 2004), (Allenby, 2005)) Natural capital is “stuff-based” capital (Norton, 2005) At the corporate level, natural capital is independent from the corporate activity, and its “essence” exists outside the firm
	Materialist perspective	Fundist perspective	
	Natural capital is represented by a set of Objects (assets at the corporate level)	Natural capital is represented by a stream of future receipts generated by the use of Objects (assets at the corporate level)	
Capital maintenance	Always maintenance of the whole Capital		Natural capital and other types of capital are maintained separately, by definition
	Weak sustainability	(Very) Strong sustainability	
	Standard conception	Additional hypothesis on Subjects imply Natural Capital maintenance alone	

<sup>36</sup> The natural capital *really* extends the capital-as-money of the “traditional” accounting: there is no reduction of natural entities to the classical accounting capital (money), even if there is a monetary evaluation. Ontologically, a natural capital is different from the traditional accounting capital (the conception is symmetrically opposite to the conception of the FfH model).

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