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Regulation for Sustainability:
Promoting an Ecology-based
Approach

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Abstract: The paper argues for the need to rethink and revise the current regulatory system in order to promote a new ecology-based approach to sustainability. It first focuses on the fundamental question of the true meaning of sustainability. The historical origin of the term sustainability is traced and analysed. An essential research question is then investigated, namely what should be sustained by sustainability. This is a crucial issue, since despite widespread use of the term sustainability, it is evident that a general understanding of the object and aim of sustainability is lacking. Thirdly, the issue of how to rethink and revise regulation in order to promote a new regulatory regime based on the concept of ecological sustainability is tackled. Thus a triple change in perspective is proposed, with the aim of contributing to a shift from the current economic model, based on the mantra of infinite economic growth, to a more balanced approach, aimed at pursuing ecological integrity and promoting human development in harmony with nature.

1. Introduction

In the last few years, we have witnessed a sharp increase in use of the term *sustainability* in political debate, leading up to adoption of the Sustainable Development Goals and the related 2030 Agenda for Sustainable Development (UNGA 2015; Montini and Volpe 2015). However, the recent political success of the terms *sustainability* and *sustainable* has not refined understanding and consciousness of their true meaning by policy-makers and the public at large. Engelmann aptly refers to the current age as “*the age*

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of sustainababble, a cacophonous profusion of uses of the word sustainable to mean anything from environmentally better to cool” (Engelmann 2013).

In order to salvage these “*overused and misunderstood*” terms (Engelmann 2013), it is necessary to understand the true nature of sustainability and its scope. This should allow us to assess its current limits and shortcomings and rethink the regulatory system in a way that may effectively pursue sustainability, beyond political slogans and mere planning objectives. In our opinion, the preliminary focus should be on the fundamental question: What is the true meaning of sustainability? In order to answer this question, the historical origin of the term sustainability will be traced and analysed. This should reveal whether a true meaning of the concept of sustainability exists or whether there are several possible meanings, as suggested by current political debate and widespread use of the term in so many different contexts and ways.

On the basis of the findings of this preliminary analysis, our focus will shift to the essential question: What should be sustained by sustainability? The relevance of this question is demonstrated by recognition that the major problem with regard to its current use is that it is not immediately evident *what* should be sustained. Today, we are in the paradoxical situation that almost everybody agrees that everything should be sustainable and that sustainability should be pursued in all contexts (Engelmann 2013). However, it is not at all clear what should be sustained. In other words, there is no general understanding of what should be the object and aim of sustainability.

Finally, on the basis of the outcomes of our analysis of the above two questions, namely the true meaning of sustainability and what should be sustained by sustainability, we should be able to address another key issue, namely the need to rethink and revise the current regulatory system, which has so far been strictly linked to promotion of the dominant economic model, based on the paramount objective of economic growth. As we shall see, rethinking regulation also implies promoting a sharp, triple change in perspective (see below). In our opinion, only if the regulatory system is thus substantially revised will it be possible to shift towards a more balanced approach aimed at promoting human development in harmony with nature.

2. What is the true meaning of sustainability?

In order to adequately define what sustainability is, it seems necessary to focus first of all on the question of the historical and cultural origin and the main characteristics of this concept. It is particularly useful to start with the accurate analysis of its origin by Grober (Grober 2010) who traces it back to the writings of a scientist and expert in forestry management, Hans Carl Von Carlowitz. Von Carlowitz used the term

“sustainable” (*Nachhaltig*, in the original German language) to refer to forestry management practices advocated in his magisterial work *Sylvicultura Oeconomica (or A Guide to the Cultivation of Native Trees)*, published in 1713 (Von Carlowitz 1713). Von Carlowitz’s work criticises the forestry policies in use in that period as being excessively focused on short-term economic gains instead of looking at a true long-term policy of forestry management and harvesting. He notes that common practices “*use wood wastefully, believing it to be inexhaustible*”. Learning from the wrong practices of his contemporaries, he proposes what Grober defines an “*iron rule against over-exploitation of forests*”. He argues that “*wood should be used with care*” (“*pflöglich*”) (Grober 2010) and proposes a way of organising the “*conservation and cultivation of wood ...to enable continuous, steady and sustaining use*” (“*nachhaltende Nutzung*”) (Grober 2010). According to Grober, this is the first time the concept of sustainability, or more precisely sustainable use, is “*used in its modern meaning*” (Grober 2010).

Since publication of *Sylvicultura Oeconomica*, Von Carlowitz’s work has exercised great influence on the development of sustainable forestry management policies and practices (Grober 2010). However, although the term itself was not yet in use, the roots of the concept of sustainability may be said to date back to experiences that occurred even earlier in several European countries, between 15th and 17th centuries. The most pertinent of these experiences, emerging in connection with the development of correct forestry management practices, are well documented by Grober, who analyses the cases of the Republic of Venice, England and France (Grober 2010).

The first example of evolution towards sustainable forestry management regards the Republic of Venice. Although at first glance it may not appear so evident, Grober correctly recalls that wood was the “*principal raw material*” that enabled Venice to maintain power in the Mediterranean region for several centuries (Grober 2010). In fact, wood was the main construction material for Venetian ships and for the foundations of Venice itself. It is therefore no surprise that in 1458 the Venice Senate instituted the office of “*Provveditori sopra boschi*” (Officers in charge of woods) and about 20 years later, in 1476, passed comprehensive legislation regulating the use of forests on the mainland under Venetian control, which has been described as “*the most significant piece of forestry law ever passed by the Senate*” (Appuhun 2009). The forestry management legislation conceived by the forestry officers enabled the Republic of Venice to introduce sustainable forestry practices and maintain them for many centuries. As Grober notes, however, over time the growing affluence of Venetian society unfortunately caused a sharp increase in the demand for wood, that ended up causing progressive deterioration of the forests controlled by the republic, gradually exceeding “*the carrying capacity of the ecological systems*” (Grober 2010).

The second example analysed by Grober concerns England. Here, the development of sustainable forestry management was due to John Evelyn, an influential intellectual and founding member of the

Royal Society (Royal Society of London for Improving Natural Knowledge, established in 1660). He is the author of *Sylva (or a Discourse of Forest Trees and the Propagation of Timber)* (Evelyn 1664), a treatise on correct management of woods and timber based on a paper presented two years earlier at the newly established Royal Society. In his work, John Evelyn focused on the urgent question of how to prevent the foreseeable shortage of timber in England, which would have direct repercussions on the possibility of maintaining a great naval fleet. To this effect, he advocated the systematic and orderly planting of new trees as the best way to increase the stock of wood in the long term. A recurring theme of his work was the expected benefit for posterity. In particular, he seems to anticipate the modern theme of intergenerational equity by recalling that each generation is “*non sibi solus natus*”, i.e. “*not born for itself alone, but rather born for posterity*” (Grober 2010). Evelyn proposed precise sustainable management of forestry in a long-term perspective and in line with the principle of respect for nature. As noted by Grober, the publication of *Sylva* was a great success and planting trees became a sort of national sport in England. Notwithstanding this, most of the country’s subsequent policies took different directions, focusing mainly on importing timber from all over the globe and gradually substituting wood with other raw materials (Grober 2010).

The third example examined by Grober regarded France. In 1669, Louis XIV (the Sun King) issued the *Ordonnance sur le fait des Eaux et Forêts*, prepared under the direction and inspiration of Jean-Baptiste Colbert (Grober 2010). The new comprehensive forestry laws aimed at repairing “disorder” in forest management and restoring State control of Crown forests, so as to avoid foreseeable timber shortage and to ensure enough wood for the national ship-building industry. The laws introduced wisely regulated management to ensure that “*the fruits will be passed on posterity*”. The French reform did not share the broad vision of John Evelyn’s proposals, taking a rather managerial perspective of forestry management. In spite of this, it promoted wise and sustainable forestry and maintenance of forest capacity to regenerate (Grober 2010). Again, however, its concrete effects fell short of the expected result and as a consequence, Grober concludes: “*On the eve of the Revolution in 1789, there was less woodland in France than in 1669*” (Grober 2010).

So much can be said for the historical roots of the term sustainability. On the other hand, the “cultural” roots of the concept can be traced to two centuries before the forestry reforms mentioned above. According to Grober, it can be argued that the idea of sustainability can already be found in St. Francis’s *Cantico delle Creature (Canticle of the Sun)* dated 1224, where humans, other living beings and nature are described on an equal footing. This vision was quite revolutionary and at odds with the traditional idea of human dominance over nature typical of mainstream Christian culture through the centuries (and unfortunately persisting thereafter). The mainstream culture of dominance, rejected by St. Francis in 13th century, was only recently abjured by Pope Francis in his encyclical *Laudato Sì (On Care For Our Common*

Home) (Pope Francis 2015), clearly inspired by St. Francis's *Cantico delle Creature*. The papal encyclical proposes that humans take a more responsible approach towards other creatures and the Earth as a whole (Montini and Volpe 2016). It harshly criticises the idea of human dominance over nature and observes that it is not realistic “to hope that those who are obsessed with maximizing profits will stop to reflect on the environmental damage which they will leave behind for future generations” (Pope Francis 2015). It calls for redefinition of the notion of progress, stating that: “it is not enough to balance, in the medium term, the protection of nature with financial gain, or the preservation of the environment with progress. Halfway measures simply delay the inevitable disaster. Put simply, it is a matter of redefining our notion of progress. A technological and economic development which does not leave in its wake a better world and an integrally higher quality of life cannot be considered progress” (Pope Francis 2015).

From this analysis of the historical and cultural roots of the term sustainability it clearly emerges that the concept is deeply rooted in an ecological dimension. It requires wise management of natural resources and a harmonious relationship with nature. This major finding paves the way for our next question.

3. What should be sustained by sustainability?

The starting point for analysis of this question ought to be recognition that the term sustainability is used in many different ways and for different and sometimes conflicting objectives. In fact, it may be given different meanings depending on the context and scientific domain in which it is discussed (Engelmann 2013; Gatto 1995). In our opinion, this variety should be reduced or at least rationalised. However, pursuit of a correct understanding of sustainability essentially depends on the answer to the question: What should be sustained by sustainability?

In order to answer this question, we analyse the concept of sustainability in connection with sustainable development. We start from the Brundtland Report (*Our Common Future*), because since its adoption, the concept of sustainable development has gained centre stage in the political and scientific debate. In the Brundtland Report's definition of sustainable development, the strong historical connection of sustainability with the ecological dimension is already blurred. Thus, despite the explicit statement “sustainable global development requires that those who are more affluent adopt lifestyles within the planet's ecological means”, sustainable development is identified with the well-known type of development that meets the needs of the present (intra-generational equity) without compromising the ability of future generations to meet their own needs (inter-generational equity) (WCED 1987). Any meaningful reference to environmental quality, ecological integrity, ecosystem health or biodiversity is omitted (Callicott and Mumford 1997).

While economic growth and resource depletion are named by the Brundtland Report as causes of environmental and social problems, growth is advocated as the solution to poverty and degradation

(Korten 1992). According to Bosselmann, the vagueness of the definition of sustainable development in the Brundtland Report “*opened up the possibility of downplaying sustainability*” (Bosselmann 2016). It also failed to properly recognise that “*human needs can only ever be met within ecological boundaries*” (Bosselmann 2016). In the understanding of sustainable development, this paved the way for a progressive departure from the ecological core which originally characterised the concept of sustainability. In fact, since the 2002 Johannesburg Declaration, a three-pillar compromise for sustainable development based on environmental, economic and social dimensions has gradually replaced the original Brundtland definition. Within this tripartite structure, the environmental dimension tends to be dominated and marginalised by the other two dimensions (Montini 2015). Thus sustainable development lost its original power, which in the words of Herman Daly consisted in its capacity to reflect and evoke “*a latent shift in our vision of how the economic activities of human beings are related to the natural world – an ecosystem which is finite, non-growing, and materially closed*” (Daly 1996).

Furthermore, conflation of the concept of sustainability with sustainable development has led to misunderstanding of sustainability itself. This may be related to the fact that sustainability is used more as an adjective than as a noun. In fact, if the emphasis is placed on the noun *development* rather than on the adjective *sustainable*, it suggests that what should be sustained is development as such, which is often understood as referring mainly, if not exclusively, to economic growth and increasing GDP. This is not, however, the correct interpretation. In our view, *sustainable development* should not be taken to mean *enduring economic development* but human development that is capable of promoting and achieving economic objectives as well as social and environmental goals. This interpretation involves “*replacing the economic norm of quantitative expansion (growth) with that of qualitative improvement (development), as the path of future progress*” (Daly 1996). This may give a significant role to the term *sustainable* in the context of sustainable development. In fact, if sustainable is intended in a qualitative rather than a quantitative sense, it immediately becomes clear that what should be sustained is not economic development (or growth) at all costs, but a type of human development based on the objective of maintaining the ecological integrity and health of ecosystems (Westra 2016). In this context, the quest for sustainability is a quest for a steady state of ecosystems that support any form of life on the Planet.

In order to promote a correct understanding of sustainable development, it is first necessary to recognise that the economic system is a subsystem of the ecological system. Daly noted that the original notion of the *environmental sustainability of the economic subsystem* has been buried under other (not so helpful) extensions such as “*social sustainability, political sustainability, financial sustainability, cultural sustainability and on and on*” (Daly 1996). In other words, recognition that the economic system is a subsystem of the ecological

system, on which it depends for raw material inputs and as a sink for waste outputs, has not been given proper and adequate consideration (Daly 1996). This is because mainstream economic theory is still anchored in the traditional view that ecological and natural resource constraints are irrelevant, and persists in the belief that the economic system is effectively isolated and independent of ecosystems (Daly 1996). A model calling for limitless economic growth ignores its roots in the biosphere: a “*safe-operating space*” characterised by limited natural resources and limited sinks for waste and pollution (Rockström et al 2009a; Rockström et al 2009b; Daly 1996; Costanza and Daly 1992; Tiezzi 1984). Instead, the economy is correctly understood as a subsystem of the global ecosystem and humans should bear in mind that “*no subsystem can expand beyond the capacity of the total system of which it is a part*” (Porritt 2007).

We can therefore conclude that there are ecological reasons why infinite economic growth on a finite planet is physically impossible (Capra and Luisi 2014; Daly 1996; Georgescu-Roegen 1986; Daly 1977; Schumacher 1973). This seems to provide a clear answer to our second question, namely: What should be sustained by sustainability? In fact, it seems evident that only if human development is based on protecting the health and integrity of the ecosystems that sustain life on the Planet, and is promoted in a way that recognises the necessity of wise, prudent, rational use of the limited natural resources available on Earth, will it be possible for humanity to flourish within these limits and achieve truly sustainable development (Jørgensen 2015). Moreover, as rightly noted by Bosselmann, “*The concern for social justice and economic prosperity are valid and important, but secondary compared to the functioning of the Earth’s ecological systems. Ecological sustainability should be understood as a prerequisite for development and not a mere aspect*” (Bosselmann 2016). It therefore emerges quite clearly that the quest for a correct understanding and interpretation of the term *sustainable*, within the complex concept of sustainable development, is not merely an academic question, but an absolute practical necessity to be recognised in order to take sustainability seriously and give it a meaningful role.

4. Rethinking regulation for sustainability

After these considerations on the meaning of sustainability and what should be sustained, it is now time to address the issue of how to achieve ecological sustainability. Science, in fact, can demonstrate the need for ecological sustainability but alone is not sufficient to pursue sustainability in operational terms. The priority of the ecological core of sustainability should be acknowledged, and consequently promoted, primarily at political and regulatory level. Therefore, a revision of the current regulatory system is needed to manage human activities so that they do not harm the health and integrity of ecosystems. As we have clearly seen, the quest for sustainability should essentially refer to maintenance of a steady state of ecosystems that support life on the Planet. If this is a correct interpretation, it follows that sustainability

as such cannot be “regulated” but merely preserved by human activity through conservation of the health and integrity of ecosystems.

What then should (or could) be regulated in order to promote sustainability? There is wide scope for regulation aimed at the promotion of sustainability and it regards the regulation of economic activity, or more generally development, to ensure that it does not have negative effects on the health and integrity of ecosystems. Thus we now address the issue of “regulation for sustainability”. In the framework of an ecology-based interpretation of sustainability, we discuss the characteristics that a regulatory system aimed at pursuing sustainability should have. We specify the meaning of the expression “regulation for sustainability”, what we intend by regulation and what the scope and reach of such regulation should be. First of all, the expression “regulation for sustainability” does not refer to a legal system aimed at regulating the sustainability of ecosystems. Ecosystems are intrinsically sustainable and do not need any kind of human intervention to regulate themselves (Capra and Luisi 2014; Patten and Odum 1981). Instead, regulation for sustainability refers to a new normative system aimed at regulating human activities so that they do not damage ecosystems. In other words, within such a system, human activities should be regulated so as to pursue and guarantee maintenance of ecosystem sustainability. This explains why we choose the expression “regulation *for* sustainability” instead of the more obvious “regulation *of* sustainability”.

Secondly, a clarification of the concept of regulation, which we take as the reference point for our analysis, seems to be necessary. In the scientific literature, the issue of regulation has mainly been addressed from a legal and economic point of view, often with different methodologies and outcomes. The work of Ogus, who tried to combine legal and economic theory, is a fundamental reference point in this context (Ogus 1994). The analysis of Ogus is grounded in the definition of regulation provided by Selznick, according to which regulation can be defined as “*sustained and focused control exercised by a public agency over activities that are valued by a community*” (Selznick 1985). This definition stresses the role of the subjects in charge of regulating, usually public authorities, as well as the role of the activities that are regulated, namely the major activities in a given territory. Arguing from this definition, Ogus maintains that “*regulation is a fundamentally politico-economic concept and, as such, can best be understood by reference to different systems of economic organization and the legal forms which maintain them*” (Ogus 1994). He notes that “*in all industrialised societies there is tension between two systems of economic organization*”, namely the market system and the collectivist system, whose difference essentially lies in the different degree of State intervention embedded in the system (Ogus 1994). From Ogus’s perspective, the term *regulation* is therefore the reference concept for describing and analysing the different relationships that the legal system may have with the underpinning economic system in a given context. Accordingly, we can say that the importance of regulation lies in the

leading role it can play in the establishment and evolution of a legal system comprising a set of policies and laws aimed at attaining certain objectives.

With specific reference to the issue of regulation for sustainability, we may therefore argue that the starting point of the analysis should be acknowledgement that it is not possible to pursue sustainability unless the whole legal and economic regulatory system is correspondingly re-assessed, adequately amended and properly revised. The current regulatory system is structured so as to promote maximisation of growth. However, as mentioned, the mainstream economic and development model aimed at potentially limitless economic growth clashes with the biophysical limits of Planet Earth, which is a finite system that cannot grow beyond its physical boundaries (Meadows, Meadows and Randers 2004; Cleveland and Ruth 1997; Meadows, Meadows and Randers 1992; Daly 1987; Tiezzi 1984; Daly 1973; Meadows, Meadows, Randers and Behrens III 1972; Mill 1857). Hence the need to promote establishment of a new regulatory system for sustainability, aimed at pursuing the long-term objective of sustainability and focused on recognising its ecological core, in connection with the promotion of social and economic goals.

By way of example, let us try to test the above definition of regulation for sustainability with regard to the current regulatory system in place for environmental protection. The international and national legal regime developed so far is not inspired by attainment of sustainability. Quite to the contrary, it seems to be substantially aimed at managing the negative externalities caused by the production and consumption processes of the current economic system (Pearce 2002; Coase 1960; Pigou 1920). The main shortcoming is its piecemeal approach, which is mainly designed to cope with emergencies instead of promoting comprehensive, integrated, long-term management of the environment. The result is a high level of complexity and excessive bureaucratic burden on economic actors, often not coupled with effective attainment of environmental objectives.

Moreover, the critical features of the current regulatory system for environmental protection have worsened in the last 20 years through deregulation, which has proceeded in parallel with the progressive globalisation of markets. This deregulatory trend was initially fostered in the 1980s by the liberal agenda promoted by Margaret Thatcher in the United Kingdom and Ronald Reagan in the United States (Bosselmann and Richardson 1999; Rehbinder 1999). Fear is at the root of the deregulatory trend: fear that excessive regulation may hamper the competitiveness of companies by imposing unnecessary bureaucratic burden on business activities, and fear that the traditional command and control system may not be so effective for environmental protection, since if the regulatory burden on the business sector is not correctly tuned, it does not necessarily bring about an improvement in environmental quality. So in the last few years there has been substantial “involution” of the regulatory system for environmental

protection, caused by progressive implementation of the deregulatory agenda, associated with the risk of subjugating environmental considerations to other types of goals, especially economic interests. In this context, the traditional absence of a unifying vision on general goals, which has always characterised environmental regulation, has been coupled with the “involutionary” features of the deregulatory trend. The progressive implementation of deregulation is creating the following paradoxical situation: environmental legislation, although correctly applied from a formal point of view, is likely to generate negative effects from a substantial (environmental protection) perspective. In fact, environmental regulation designed with deregulation in mind may permit or even protect behaviour which is not sustainable. This is well expressed by Westerlund, who observes that *unless law is made sustainable, it will protect unsustainable conducts* (Westerlund 2008). Westerlund was one of the first scholars to point out that a complex system of laws is not sufficient to protect the environment if environmental regulation is not framed within a system aimed at pursuing ecological sustainability (Westerlund 2008). Drawing from his analysis, we can argue that new regulation for sustainability should first reinstate the true ecological meaning of sustainability and then consistently develop a new regulatory system.

We can therefore conclude that there is an absolute necessity to rethink and revise the current regulatory regime. This is urgently needed in order to enable clear identification of which practices are sustainable and which are not. The change should help promote a type of regulation that truly aims at achieving sustainability and at promoting sustainable patterns of human development. However, as we explain in the next section, in order to successfully rethink and revise regulation and introduce an ecologically-oriented regulatory regime, it is first necessary to promote a preliminary change of perspective in the general approach to regulation.

5. Promoting a triple change of perspective

In order to make it meaningful and effective, the new process of regulation for sustainability advocated above must necessarily be based on a triple change involving the methodological, temporal and substantial perspectives.

Regarding the methodological perspective, the need to reverse the current trend arises from acknowledgement that ecological problems cannot be tackled and solved with the traditional disciplinary approach. This attitude is derived from the Cartesian scientific paradigm that characterises our society and has promoted a mechanistic analysis of the world in which nature is reduced into parts, breaking science up into specialised domains (Capra and Luisi 2014). Quite to the contrary, the sustainability challenge requires an end to disciplinary fragmentation and the combination of specialist insights with a holistic view through an inter- and trans- disciplinary approach. Thus the correct method to use in the

regulation for sustainability should aim to create a comprehensive system that gathers all the issues related to the promotion of sustainability in a single conceptual and methodological framework. A trans-disciplinary methodology, based on an interplay between “*integrative tendency*”, which conceives every element as part of the whole, and a “*self-assertive tendency*”, which values the unique features of each element (Capra and Luisi 2014), is a necessary prerequisite for the promotion of a new system of regulation for sustainability, with which to solve the traditional fragmentation of environmental regulation.

With regard to the temporal perspective, the new regulatory system for sustainability requires a sharp shift from the current short-term approach to medium- to long-term planning. The current regulatory system is shaped by a short-term attitude due to its “emergency-solving” approach. It is designed to tackle major negative externalities, usually without a medium- or long-term framework or vision. This short-termism, coupled with the absence of a comprehensive view, is recognised as a major shortcoming and one of the main reasons for the lack of effectiveness of environmental law (Montini, 2014; Bodansky 2010). To properly address this critical feature, the new regulatory system should aim to pursue sustainability in the medium- to long-term.

The third change advocated here regards the substantial perspective: regulation for sustainability should promote a shift from the currently dominant neoclassical economic system, which is essentially aimed at growth of GDP, to a new ecology-based regulatory regime. This also implies the need to revise the current approach towards environmental regulation, characterised by excessive anthropocentricity, as demonstrated by the outcomes and follow-ups of the 1972 Stockholm Conference, 1992 Rio Conference and 2012 Rio +20 Conference (Pineschi 2012; UNCED 2012). This anthropocentric approach should be gradually replaced to shape a regulatory system for sustainability, the primary objective of which should be the protection of ecosystems and promotion of a mutually beneficial coexistence between human activities and ecosystem health and integrity.

The main reference criterion of the new regulatory system for sustainability should be the concept of ecological sustainability (Bosselmann 2016; Montini 2015; Montini 2014; Westerlund 2008). In this respect, a few words on the content and functions of the concept are necessary. Regarding content, it has been argued in the literature that ecological sustainability “*is related to environmental quality and natural resources*” (Westerlund 2008). The principle of sustainability has also been defined as “*the duty to protect and restore the integrity of the Earth’s ecological systems*” (Bosselmann 2016). Despite the absence of a commonly agreed definition of the concept, a certain convergence on its ecological core can be discerned in the literature. In our opinion, drawing from these sources, ecological sustainability may be defined as “*the need for the human civilization to live in harmony with nature and preserve the ecosystems which enable life on Planet Earth and support human development*” (Montini 2014). Regarding functions, the concept of ecological sustainability

may be apt to play all the possible functions that have been ascribed to environmental principles in the literature (De Sadeleer 2004). In more detail, ecological sustainability can be assigned an “enabling function”, insofar as it allows the formation of new policies and new legislation; a “directing function”, insofar as it may steer public authorities in the discharge of their discretionary powers; an “interpretative function”, insofar as it may help courts to interpret laws in a more flexible way; a “balancing function”, insofar as it may play a balancing role between divergent and possibly conflicting interests (De Sadeleer 2004).

Adoption of ecological sustainability as the founding principle and main reference concept for the new regulation for sustainability may enable a more balanced relationship between human beings and nature. This could give full effect to the new approach advocated *inter alia* by the 2000 Earth Charter, that includes respect for the Earth and life in all its variety among its leading principles (Bosselmann and Engel 2010; Earth Charter 2000). The need for a new approach of this kind is also stated in similar terms in Pope Francis’s encyclical *Laudato Si (On Care For Our Common Home)*, which calls for a new alliance between humans and the environment (Pope Francis 2015, Montini and Volpe 2016).

The change of substantial perspective also entails the need to assess and revise the regulatory instruments used so far for environmental regulation. The current regulatory scenario is characterised by two main types of instruments: *command and control* and *market-based* instruments. In the last few years, we have witnessed a gradual shift from a rather simple command and control system to a more complex regime, in which the traditional command and control instruments are coupled with or replaced by market-based ones (Bosselmann and Richardson 1999). This process has mainly been driven by growing concern about the lack of effectiveness and excessive bureaucratic and economic costs so often associated with the implementation of command and control instruments. These critical features opened the way for gradual introduction of market-based instruments for the control of major environmental externalities, in the framework of the deregulatory trend mentioned above.

In our opinion, the new regulatory system for the promotion of ecological sustainability should start from a complete re-assessment and revision of the regulatory instruments used so far, in order to improve the balance between command and control and market-based instruments. How can this be approached? The starting point ought to be acknowledgement that the new regulatory system should be based on a holistic paradigm that builds on the findings of disciplinary analysis, but is inspired by trans-disciplinary vision. This does not necessarily imply rejection or profound revision of all the current regulatory instruments. Rather, it means that their re-assessment and revision, as well rebalancing between different types of instruments, should be conducted by a new approach and in the framework of a new comprehensive vision. Moreover, the success of the various instruments should not be judged from a



merely formal point of view but assessed from a substantial perspective that aims at verifying the effective contribution of every single regulatory instrument towards attainment of the overall sustainability objective (Montini 2013).

6. Conclusions

The plethora of different and often contrasting uses of the term sustainability generates confusion and can paradoxically lead to legitimisation of all kinds of allegedly sustainable conduct. Hence the absolute necessity of recovering and reinstating the true meaning of sustainability in order to set a clear divide between sustainable and unsustainable policies and practices. As emerges from the analysis conducted above, the core objective of sustainability ought to be ecological, aiming at conservation of the health and integrity of the ecosystems that support life on Planet Earth. This finding, which is recognised and demonstrated by the scientific literature (see Section 3), should also be acknowledged at political and regulatory level. As science alone is not sufficient to achieve sustainability, a new regulatory system for sustainability is urgently needed to manage human activities so that they do not harm the health and integrity of ecosystems.

This objective can only be attained if the regulatory system is conceived and designed on the basis of the concept of ecological sustainability so as to promote mutually beneficial coexistence between human activities and ecosystem health and integrity. The introduction of such a regulatory system requires a triple change of perspective: methodological, temporal and substantial. The disciplinary, piecemeal and short-term approach of the current regulatory system should be replaced by a comprehensive, trans-disciplinary, long-term perspective and a new balance between market-based and command and control instruments. Only in this way can humanity flourish on the Planet (Jørgensen 2016) and the so-called sixth mass extinction be avoided (Kolbert 2014).

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