Brief for GSDR 2015

Weak Sustainability versus Strong Sustainability

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The fundamental debate regarding sustainable development is whether we choose to adopt a strong or a weak conception of sustainability. Weak sustainability postulates the full substitutability of natural capital whereas the strong conception demonstrates that this substitutability should be severely seriously limited due to the existence of critical elements that natural capital provides for human existence and well-being. The following science digest provides an overview of scientific findings to support informed debate among decision-makers regarding the need to adopt a strong sustainability position for the discussion and implementation of the post-2015 sustainable development policies.

Introduction

Weak sustainability assumes that natural capital and manufactured capital are essentially substitutable and considers that there are no essential differences between the kinds of well-being they generate (Ekins et al., 2003; Neumayer, 2003; Neumayer, 2012). The only thing that matters is the total value of the aggregate stock of capital, which should be at least maintained or ideally increased for the sake of future generations (Solow, 1993). In such a perspective: "*it does not matter whether the current generation uses up non-renewable resources or dumps CO_2 in the atmosphere as long as enough machineries, roads and ports are built in compensation*" (Neumayer, 2003, p1). Such a position leads to maximising monetary compensations for environmental degradations. In addition, from a weak sustainability perspective, technological progress is assumed to continually generate technical solutions to the environmental problems caused by the increased production of goods and services (Ekins et al., 2003).

Authors writing on strong sustainability demonstrate that natural capital cannot be viewed as a mere stock of resources. Rather natural capital is a set of complex systems consisting of evolving biotic and abiotic elements that interact in ways that determine the ecosystem's capacity to provide human society directly and/or indirectly with a wide array of functions and services (Noël and O'Connor, 1998; Ekins et al., 2003; De Groot et al., 2003; Brand, 2009). The proponents of strong sustainability invoke several reasons to demonstrate the non-substitutability of natural capital.

- Firstly, there is a qualitative difference between manufactured capital and natural capital. Manufactured capital is reproducible and its destruction is rarely irreversible, whereas the consumption of natural capital is usually irreversible (for instance species extinction is irreversible, whereas the destruction of material goods or infrastructures is not) (Ekins et al., 2003). In addition, due to our lack of knowledge about the functioning of natural systems we cannot be sure of the effects on human well-being of destroying natural capital (Dietz and Neumayer, 2007). Acknowledging irreversibility and uncertainties should lead us to implementing a precautionary principle regarding the use of natural capital.
- Secondly, since manufactured capital requires natural capital for its production, it can never be a complete substitute for the biophysical structures of natural capital (Ekins et al.). In addition, the contribution of natural capital through the delivery of services to human well-being is multidimensional. The Millennium Ecosystem Assessment (2005) captures these multiple linkages through the

identification of four types of contributions that ecosystem services make to human well-being: security, basic materials for a good life, health, and good social relations. Therefore, ecosystem services provided by natural capital play an important role in determining the freedom of choice and action for human beings (ibid.). In this view, natural capital is instead seen as being complementary to manufactured capital and other forms of capital (human and social capital, etc.) in producing human well-being (Brand, 2009) and so manufactured capital cannot be a complete substitute for it.

- Thirdly, an increase of future consumption is not an appropriate substitute for losses of natural capital (see among others see Toman, 1992; Dedeurwaerdere, 2013). The following exemple helps to grasp our point: "*Today's generation cannot ask future generations to breathe polluted air in exchange for a greater capacity to produce goods and services. That would restrict the freedom of future generations to choose clean air over more goods and services*" (UNDP, 2011, p.17). This raises the key issue of conserving natural capital for the sake of future generation, i.e., intergenerational justice issue.

Thus strong sustainability holds that certain elements of natural capital are « critical » due to their unique contribution to human well-being (Ekins et al., 2003; Dedeurwaerdere, 2013). These potentially "critical" elements for human existence and well-being can be conceptualised as ecosystem services provided by natural capital (Brand, 2009). This leads us to defining the notion of critical natural capital. Critical natural capital highlights the need to maintain the ecological functioning of natural systems above certain thresholds of degradation in order to conserve the capacity of natural capital to provide the services which are critical for human existence and well-being (Noël and O'Connor, 1998; Ekins et al., 2003; Chiesura and de Groot, 2003, de Groot et al., 2003; Dietz and Neumayer, 2007; Brand, 2009). Therefore critical natural capital corresponds to the particular configuration of natural capital that provides a particular set of critical ecosystem services.

Nevertheless, strong sustainability does not state that all ecosystem services everywhere have to be sustained exactly as they are. Some assessments must be made of those services that play a particularly important role in supporting life and generating human well-being. And so, policies for sustainability must be geared accordingly (Ekins et al. 2003). However, strong sustainability proponents recognize that the uncertain state of knowledge about ecosystems and ecosystem services, makes very difficult to judge which services are critical and which are not.

Scientific debate

Brand (2009) identifies six domains in which natural capital and so ecosystem services can potentially be critical: socio-cultural, ecological, sustainability, ethical, economic and human survival. This intrinsic multidimensionality makes it very difficult to assess the level of criticality and substitutability of natural capital. Indeed, acknowledging that natural capital and human well-being are both complex and multidimensional, implies having to deal with multiple meanings, and with measurements that are not necessarily either comparable or commensurable (Scheidel, 2013). Moreover, it has to be noted that in addition to the "objective" ecological criteria (safe minimum standards, minimum ecosystem size, maximum sustainable yield, ecological footprint, etc.), societal values and perceptions, ethics and attitude to risk, also play important roles in the determination of what aspects of natural capital can be considered "critical" (Ekins et al., 2003; De Groot et al., 2003; Chiesura and De Groot, 2003; Brand, 2009; Dedeurwaerdere, 2013). Hence, the definition of critical natural capital relies not only on our capacity to provide factual knowledge about socio-ecological systems but also implies discussing the normative values that underline our use of the natural capital (Dedeurwaerdere, 2013). Therefore, the definition of what constitutes an intolerable loss, and so what is critical and

for whom, requires both relevant factual knowledge about the interactions between natural capital and human well-being and a normative basis to assess the sustainability of these interactions. Consequently, there is a need to move beyond the technical and expert-based calculation of critical thresholds of natural capital only (ibid.). As long as there are multiple value involved in the definition of critical natural capital and given the irreducible uncertainties that characterise complex socio-ecological systems, public deliberation and stakeholders participation (Van den Hove, 2000) seem to be required for the definition of criticality of natural capital (De Groot et al., 2003; Dedeurwaerdere, 2013).

Main differences between weak and strong sustainability

	Strong sustainability	Weak sustainability
Key idea	The substitutability of natural capital by other types of capital is severely limited	Natural capital and other types of capitals (manufactured etc.) are perfectly substitutable
Consequences	Certain human actions can entail irreversible consequences	Technological innovation and monetary compensation for environmental degradation
Sustainability issue	Conserving the irreplaceable « stocks » of critical natural capital for the sake of future generation	The total value of the aggregate stock of capital should be at least maintained or ideally increased for future generation
Key concept	Critical natural capital	Optimal allocation of scarce resources
Definition of thresholds and environmental norms	Scientific knowledge as input for public deliberation (procedural rationality)	Technic/scientific approach for determining thresholds and norms (instrumental rationality)

Source: Adapted from Mancebo, 2013

In sum, implementing strong sustainability requires a trans-disciplinary approach for identifying and conserving critical natural capital. The knowledge provided by natural science constitutes crucial contributions for identifying ecological thresholds and planetary boundaries but they are not sufficient on their own. Natural science research needs to be combined with social sciences and their interactions need to be embedded in a broad societal debate about (i) levels of risk acceptable to all populations (especially the most vulnerable populations) and (ii) values that underlie human development.

Issues for further consideration

- In terms of scientific methodology, strong sustainability is to be greatly preferred as the *a priori* position of full substitutability of natural capital which appears improbable for the aforementioned reasons.
- Improve multidimensional and integrated assessment of the interactions between the natural environment and human well-being (e.g. improve the integrated assessment of ecosystem services).
- Advance the construction of a normative basis to assess the sustainability of these interactions in a strong perspective.

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