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The argument against a reductionist approach for measuring sustainable development performance and the need for methodological pluralism

Alexandros Gasparatos *, Mohamed El-Haram, Malcolm Horner

Construction Management Research Unit (CMRU), Division of Civil Engineering, University of Dundee, Fulton Building, Dundee, DD1 4HN, Scotland, UK

Abstract

Both sustainability and sustainable development continue to remain elusive concepts even now, 20 years after the Brundtland Commission report that brought them into prominence. This situation most likely stems from the fact that sustainability science encompasses the need to address a wide set of issues over different time and spatial scales and thus inevitably accommodates opinions from diverse branches of knowledge and expertise. However, despite this multitude of perspectives, progress towards sustainability is usually assessed through the development and utilisation of single sustainability metrics such as monetary tools, composite sustainability indices and biophysical metrics including emergy, exergy and the ecological footprint. But is it really justifiable to assess the progress towards sustainability by using single metrics? This paper argues that such a choice seems increasingly unjustifiable not least due to these metrics' methodological imperfections and limits. Additionally, our recent awareness of economies, societies and ecosystems as complex adaptive systems that cannot be fully captured through a single perspective further adds to the argument. Failure to describe these systems in a holistic manner through the synthesis of their different non-reducible and perfectly legitimate perspectives amounts to reductionism. An implication of the above is the fact that not a single sustainability metric at the moment can claim to comprehensively assess sustainability. In the light of these findings this paper proposes that the further elaboration and refinement of current metrics is unlikely to produce a framework for assessing the progress towards sustainability with a single metric. Adoption of a diverse set of metrics seems more likely to be the key for more robust sustainability assessments. This methodological pluralism coupled with stakeholder involvement seems to offer a better chance of improving the outcome of the decision making process.

Keywords: Sustainability assessment; Sustainability metric; Reductionism; Value

1. Introduction

Governmental bodies, non-governmental organisations, academics and the public are engaged worldwide in policy discussions trying to envision and operationalise a development path that can meet the needs of present and future generations in an equitable manner. The goal of increasing the economic welfare of a population over time is not a new policy objective. However, the acceptance during the past two decades that the state of the environment and the functioning of society are equally as important has led to the formulation of more elaborate policy questions.

* Corresponding author. Tel.: +44 1382 386560; fax: +44 1382 384861.
E-mail addresses: a.gasparatos@dundee.ac.uk (A. Gasparatos), m.elharam@dundee.ac.uk (M. El-Haram), r.m.w.horner@dundee.ac.uk (M. Horner).

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The desired development path that ensures the economic welfare of present and future generations by further considering environmental and social issues has come to be known as sustainable development and was brought into prominence by the Brundtland Commission (WCED, 1987). Even though there is no universally accepted clear cut definition for the term there is a consensus that economic, environmental and social issues together with intra- and inter-generational equity ought to be considered within the framework of sustainable development (Gibson, Hassan, Holtz, Tansey, & Whitelaw, 2005). Furthermore, the importance of considering the significant uncertainties associated with the design of strategies and particularly of those strategies that will span well into the future has been widely acknowledged by academics and policy makers. Incomplete knowledge in social and natural sciences coupled with evolving human preferences and values make a case for acting with a precautionary bias by implementing the precautionary principle (Gibson et al., 2005). Another key element is the involvement of stakeholders, especially those directly affected by a plan/policy/programme, in the planning and decision making process (Meppem, 2000; Meppem & Gill, 1998).

Not surprisingly, measuring sustainable development performance and quantifying the progress towards sustainability is currently at the centre of an ongoing debate that has strong policy implications and is thus progressively moving beyond the academia. Tools and methodologies based on the reductionist paradigm have been used over the past years to measure the progress towards sustainability but very few of them seem to be able at the moment to assess sustainability in a holistic manner (Gasparatos, El-Haram, & Horner, 2008). Tools and descriptive models falling within this reductionist paradigm, according to Munda (2006), make use of a single:

- measurable indicator (e.g. GDP per capita);
- dimension (i.e. one of the economic, environmental or social dimension);
- scale of analysis;
- objective (e.g. maximisation of economic efficiency);
- time horizon.

The majority of such reductionist sustainability assessment methodologies seem to fall within three major categories: monetary tools, biophysical models and sustainability indicators/composite indices (CIs). The advantage of such tools lies in the fact that they can reduce and integrate the diverse issues affecting the progress towards sustainability to a small set of numbers. Such tools can be invaluable to policy makers as they can be used to understand various natural and human systems and summarise a large volume of information to non-experts thus simplifying the decision making process. Understanding a system by simplifying it and offering aggregated information for decision making are in our view the two most critical functions of the reductionist tools that will be discussed. As a result, relevant insights from two new scientific paradigms, complexity theory and post-normal science, will be discussed in Section 2 of our study in order for the reader to appreciate the context within which sustainability assessments are made.

Monetary tools, based on the neoclassical paradigm, have formed the backbone of most sustainability assessment exercises especially for policy making during the past years. However, the most commonly used monetary tools were not conceived specifically for assessing the progress towards sustainability but were rather developed and have matured before the sustainable development debate erupted. Examples include evaluation tools such as market valuation, Contingent Valuation Method (CVM), Hedonic Pricing, Travel Cost Method and aggregation tools such as Cost Benefit Analysis (CBA). The adaptation of extant monetary tools to assess the progress towards sustainability had the great advantage of building from strong theoretical foundations in neoclassical economic theory which has been the dominant paradigm of Economics from the beginning of the 20th Century. However, it soon became obvious that such tools are inadequate in certain situations given that positive progress towards sustainability goes beyond economic efficiency to include equity considerations. Another concern arose through the monetisation of certain environmental and social issues with several criticisms targeting the methodological, conceptual and philosophical aspects of the monetisation procedures adopted.

Such criticisms made the case for developing models with solid foundations in the natural sciences that can quantify resource consumption and subsequent environmental impacts more reasonably (Ecological Economics, 1999; Munasighe & Shearer, 1995). Biophysical models based on a reductionist perspective attempt to elucidate the metabolism of different systems (e.g. production/consumption patterns) by making use of common denominators other than money such as available energy (emergy synthesis and exergy analysis) and land (ecological footprint). Changes