

Operational research and sustainable development: Tackling the social dimension

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Abstract

Sustainable development is increasingly being seen as a major challenge in global terms. Operational Research (OR) has yet to be fully utilised in this area. To date, where it has been mostly used, it tends to deal with the relationships between environmental management and product supply chain and rarely focuses on the social dimension. This article seeks to discuss the potential of OR in the wider arena of sustainable development. It first explores the issue of widening OR responses to an inter-generational ethic. A case study is then described using a more holistic approach to explore sustainable development in the context of a city. The paper finishes with a discussion of the implications of this approach in relation to sustainable development more generally.

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1. Introduction

Four years of study and debate by the World Commission on Environment and Development (WCED) led to the Brundtland Report called *Our Common Future* (WCED, 1987). The report argued that the time had come to couple economy and ecology so that the wider community could take responsibility for both the causes and the consequences of environmental change. Sustainability became the watchword and sustainable development came to be defined in terms of an inter-generational ethic. The WCED defined sustainable development as:

“Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations

imposed by the state of technology and social organization on the environment’s ability to meet present and future needs” (World Commission on Environment and Development, 1987).

More recently, sustainability has been the subject of renewed interest and debate (Rao, 2000). At the 2002 World Summit on Sustainable Development in Johannesburg, the strapline ‘people, planet, prosperity’ was adopted to reflect the requirement that sustainable development implies the balancing of not just economic with environmental protection, but also social development: the so-called “Three Pillars”. The balance between these pillars will be the main focus of this paper. The issue addressed here is how do we move thinking beyond seeing the three elements as incompatible?

Today, sustainable development has assumed considerable salience in policy and research. Socio-economic and socio-cultural linkages have become increasingly prominent (Lehtonen, 2004; Robért et al., 2002), and social concerns have crept into the terminology of policy makers (George and Kirkpatrick, 2006; OECD, 2001; UNDESA,

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2002). Here, there is not only a stress on the importance of an inter-generational ethic, but also on the value of engaging the public as a pre-requisite for achieving sustainable development.

Operational Research (OR) has yet to be fully utilised in the area of sustainable development. To the extent it has been used, it has mostly dealt with the reciprocal relationships between environmental management and product supply chain (e.g. Bloemhof-Ruwaard et al., 1995; Daniel et al., 1997; Kleindorfer et al., 2005). Recent OR literature suggests shifting to a more holistic or systems conception of sustainable development (Midgley and Reynolds, 2004), which focuses on the social dimension. This article will therefore seek to discuss the potential of OR in the wider arena of sustainable development. It will do so in relation to a social context, specifically a city. The paper will begin with a review of the types of OR interventions that could be relevant to sustainable development. This will be followed by a description of a case study with a focus on a ‘sustainable city’ initiative involving a wide range of stakeholders. The paper will end with reflections on the context of very specific issues to do with OR, sustainable development and the social dimension.

2. OR responses to sustainable development

Midgley and Reynolds (2004) argued that, for every paper on sustainability and management that is explicit about using OR methods there are at least five making claims to methodological innovation that are using the same or similar methods without any reference to OR. More generally, the label ‘OR’ appears to have a low profile in the discourse about appropriate methodologies and methods in sustainability and management (Bloemhof-Ruwaard et al., 1995; Daniel et al., 1997). With regards to the environmental, economic, and social pillars of operational-level sustainable development, most of the OR focus has remained on the environment. Notably, Bloemhof-Ruwaard et al. (1995) consolidated initial contributions into an early discussion on the reciprocal links between the supply chain and the ‘environmental chain’. They suggest the adoption of various OR interventions in specific processes of the supply chain to reduce final waste emissions and negative feedback effects from damage in the environmental chain. Their model has been utilised and referenced in many subsequent analyses of environmental management and planning (e.g. Daniel et al., 1997).

The emphasis on supply chains has ensured that production, operations and manufacturing foci have therefore formed the bulk of contributions. A useful review of early material can be found in Jiménez and Lorente (2001), while specific recent contributions include Curkovic (2003), González et al. (2003), Hill (2001), and various papers in OR Spectrum Special Issue on Operations Research in Environmental Management (2001).

An attendant focus on the economic dimension can also be seen in some OR contributions (e.g. Gil et al., 2001;

González-Benito and González-Benito, 2005; Kelly, 1998; Nijkamp and van den Bergh, 1997; Oliveira and Antunes, 2004), although it is less prominent. This is partly due to some overlaps between the economic and OR literatures in this area.

The social sustainability dimension has largely been absent in OR contributions (Lehtonen, 2004), with the exception of some areas investigating the health impacts of institutional operations (Daniel et al., 1997). Other social sustainability contributions are rare, with exceptions such as Munda (2004) and Kelly (1998) dealing with multi-criteria decision-making and information systems respectively. It should also be noted that most of the contributions are also somewhat narrower than the broader social sustainable development agenda in that they generally focus on elements and interactions of the product supply chain. Labuschagne et al. (2005) discuss the need to broaden this focus (also see Labuschagne and Brent, 2006). Therefore it is asserted that OR requires an expansive scope to deal especially with the sub-elements of social sustainability and links with the other operational environmental and economic elements. Thus, there is a need for research not only addressing the issues of products and location but also the social dimension and the broader inter-generational context.

In our view, OR has the potential to become a broad-based, dynamic, applied practice of central relevance to sustainable development. This is reinforced by Midgley and Reynolds (2004). Their study prompted them to argue that OR and sustainable development share three characteristics: first, both have *wide boundaries* in terms of clientele, range of methodological approaches used, and attention to multiple (and often conflicting) values; second, both traditions have an interest in fostering *interdisciplinarity*; third, both traditions are concerned with the *implementation*, as well as the *design*, of planning strategies. They go on to show that three generic issues were found to recur: *complexity and uncertainty* (regarding the unpredictability of natural and social phenomena); *multiple and often conflicting values* (of those involved in environmental planning); and *political effects* (on those not involved in planning processes). Their study is the most comprehensive in stressing the importance of using OR/systems in addressing the social sustainability dimension. A similar position is taken by DeTombe (2001a,b, 2002). Here, it is argued that complex problems with a focus on the societal dimension must be handled with a requisite approach that takes into account knowledge, power and emotions. It is also argued that problems on issues such as the environment must be handled cooperatively and with careful facilitation. The next section will therefore seek to discuss the possible areas for expansion.

3. Holistic framework for sustainable development

Lehtonen (2004) states that “the social dimension has commonly been recognised as the weakest ‘pillar’ of sus-

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