Journal of Cleaner Production 105 (2015) 146–156

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Incorporating values into sustainability decision-making

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ARTICLE INFO

Article history:
Received 17 September 2014
Received in revised form
2 February 2015
Accepted 6 April 2015
Available online 14 April 2015

Keywords:
Values
Decision science
Sustainability
Multi-criteria
Phronesis

ABSTRACT

This paper explores rigorous methods to transparently incorporate values in sustainability decision-making. Empirical, normative and other decision-making methods are discussed using a conceptual architecture borrowed from the Aristotelian ideas of Episteme, Techne and Phronesis. The application and limits to positivist reasoning for decision-making is explored through discussions of wicked and tame problems (where the introduction of values is discussed), the analytic-deliberative framework (that characterizes most assessment methods), and post–normal science. An example examining air quality regulation and enforcement is used to explore concepts. Recognizing the continuum of quantitative to qualitative decision-making calculus, and how to apply it constructively to decision-making is an area of needed inquiry for scientists, policy-makers, consultants and corporate leaders concerned about helping to effect the transition to more sustainable societal patterns. This necessitates researchers and decision makers acknowledge that sustainability preferences are driven by values. This author concludes that decision-making methods that provide a transparent means to value outcomes and to integrate disparate information and perceptions (and values) have been demonstrated to be the most useful in settings with a variety of stakeholders that value different outcomes. Such conditions are typical in natural resource and sustainability problems where trade-offs are often necessary.

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1. Introduction

This paper is a theoretical and methodological exploration of the incorporation of values in sustainability decision-making. In general, the incorporation of value-based judgment occurs on a continuum from analytical and objective to biased and subjective. Science has an interesting history of grappling with where to draw the line on what value-judgments will be validated and what will be dismissed as unsubstantiated. Sustainability, in contrast to fluid dynamics, for example, is subject to greater subjectivity by the researcher – from problem formulation and the selection of data, to interpretation of results. Sustainability and sustainable development follow from policy and judgments very much informed by values. Sustainability decisions are contextual, value laden, and often focused on social action. In the quest for relevance and persuasive power, researchers seek to design studies and to explain results and recommendations with as great a rigor as possible. Understanding the utility and productive use of values in the context of the science of decision making and sustainability science can aid the practice of sustainability decision-making through the deliberate, judicious and transparent use of informed value-based judgment.

This paper is organized as a selective review of decision science and sustainability science literature, highlighting features of both that are relevant to the use of value judgment in sustainability decision-making. By weaving together elucidation of key concepts and the use of an example, systematic methods are described for anchoring judgment based on values into sustainability decision-making with rigor and transparency.

The science of decision making and sustainability science each have rich literatures, *decision science* in particular having mushroomed with applications throughout business, research and the social sciences. *Sustainability science* has also grown tremendously in recent years as governments and other institutions have worked to incorporate sustainability objectives into their decision-making. This paper is focused on how to incorporate the normative, values dimension of sustainability into decision-making for sustainable outcomes. It explores the Aristotelian concept of phronesis, the incorporation of values into judgments. The author acknowledges a normative framework that advances environmental resource and ecosystem management as primary to sustainability decision-making, predicated on the belief that ecosystems are the primary source for all resulting social and economic conditions. This idea

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http://dx.doi.org/10.1016/j.jclepro.2015.04.014
0959-6526/Published by Elsevier Ltd.

was explored in the book, *For the Common Good*, by Daly and Cobb (1994).

This author examined decision-making method, which is distinguished from decision support or "problem analysis" (Kepner and Tregoe, 1965). Good decision-making begins with the proper framing of the problem and selection of decision support tools to inform the analysis (NRC, 2009). This is typically a recursive and deliberative process between framing the problem, considering decision support studies or methods to inform the analysis, and criteria by which the decision is made.

In contrast, decision support is less a process, and more a discrete tool, model, or data set. Consider the difference in use of environmental indicators and environmental accounting.

The System of Integrated Environmental and Economic Accounting (SEEA) was introduced in 2003 to standardize environmental indicators and accounting methods for national accounts. It is available as the Handbook of National Accounting: Integrated Environmental and Economic Accounting – An Operational Manual.[1] Ziegler and Ott (2011) observed that the SEEA covers a wide range of conceptual and empirical issues relevant to sustainability; and the use of indicators can be useful to measure weak and strong sustainability. Indicators provide useful measurement of data, and are thus valuable as decision support tools. A decision-making method is then used to place the data measurements (or other information) into a context, such as an accounting framework, to inform a decision. Ideally, such a framework provides transparency on what criteria were used to make the decision. The SEEA provides both a library of decision support indicators, as well as an accounting framework to evaluate the data in the situation under study. A decision-making method is still required to use the information productively to inform a decision.

Both decision and sustainability science share an investigation of the proper role for (or balance of) a positivist, scientific process versus purposeful inclusion of subjective values into decision-making. Considered on a spectrum, the information considered can range from fully reproducible physical science to a time and place-specific opinion survey. The means to incorporate values into the decision-making process while preserving rigor constitutes the primary dimension of this review. It was not intended that this review should provide a survey of the full range of theories or methods employed in either decision or sustainability science. It provides grounding in both fields, with a particular focus on how information can be used to advance sustainability in environmental decision-making and resource management.

1.1. An introduction to decision science

Seminal works in decision science are considered to include von Neumann and Morgenstern's *Theory of Games and Economic Behavior* (1944), Savage's *The Foundations of Statistics* (1954), and Luce and Raiffa's *Games and Decisions* (1957). Other important works include De Groot's *Optimal Statistical Decisions* (1970) and Berger's *Statistical decision theory and Bayesian Analysis* (1985). *Decision Sciences: An Integrative Perspective* by Kleindorfer et al. (1993), offers a comprehensive survey of the numerous disciplines contributing to the formation of a decision science (e.g. economics, political science, sociology). They observed that the science is focused on descriptive and prescriptive attributes of decision-making that is distinguishing between understanding how humans typically make decisions, in contrast to developing and refining rational models of choice (e.g. utility theory). The authors noted that these two areas of research are integrated, largely through the descriptive studies informing prescriptive decision-making methods.

The focus in this inquiry is less on understanding how people make decisions, and accordingly, more on the theory and methods available to *make* decisions (prescriptive decision-making methods). Rational Choice Theory has been the most prominent and influential approach for shaping the social sciences, which evolved from the naturalist-positivist tradition (Hausman, 2013). The fundamental theory holds that patterns of behavior develop within society that reflect individuals' choices as they maximize benefits and minimize costs (Hausman, 2013). The theory has been widely translated into predictive models, most significantly and successfully in economics to describe markets.

An Introduction to Decision Theory by Peterson (2009) is notable for the author's attention to theory, and for his philosophical grounding which is not widely found emphasized in other texts that discuss methods. Peterson observed that decision theory is commonly understood to be comprised of three largely separable topics: individual decision-making where the theory of maximizing expected utility is the dominant paradigm, game theory with its characteristic concern with concepts such as equilibrium strategies, and social-choice theory, which is largely the theme focused upon in this literature review.

A social choice decision-making method of used for addressing environmental problems that may have multiple (and sometimes competing) variables for optimization is multi attribute utility theory (MAUT). A useful survey of this approach was written by Figueira et al. (2005) in *Multiple Criteria Decision Analysis: State of the Art Surveys*. Because authors of this book explored various dimensions of MAUT, the reader receives a broad understanding of issues such as decision-maker's strength of preference, judging riskiness, and additive and multiplicative forms of MAUT.

Hossein Arsham, in his web-based matrix of decision science companion sites,[2] described how quantitative models can incorporate values by positing them as quantifiable problems (e.g. *sustainable* fishery = recruitment > or = to harvest (+mortality). The values must be reflected in construction of the model itself. Arsham's discussions on decision science are organized on-line, searchable, and include an inventory of quantitative decision-making methods with notes on their applicability.

1.2. An introduction to sustainability science

Kates et al. (2001) and twenty-two colleagues published a policy forum piece in *Science* that outlined sustainability science in broad strokes as: "A new field … that seeks to understand the fundamental character of interactions between nature and society and to encourage those interactions along more sustainable trajectories." Seven core questions were proposed by Kates et al. to guide the study in sustainability science with an emphasis on understanding the systems complexities associated with sustainability. Sustainability science was presented as studying and representing the interactions, behaviors and emergent properties of natural and social systems, and providing decision-makers with improved information on the effects of various forms of behaviors or interventions (Swart et al., 2004). Of the seven questions, two are key for this inquiry – "what are the principle tradeoffs between human well-being and the natural environment," and "can there be meaningful limits that would provide "warning" for human-environment systems?" The other questions are second order pertaining to matters of measurement, model development,

[1] http://unstats.un.org/unsd/pubs/gesgrid.asp?id=235 Accessed 3/7/2014.

[2] http://home.ubalt.edu/ntsbarsh/business-stat/opre504.htm Accessed on 1.25.2015.