A Historical Overview of the Ecological Integrity Concept

David Manuel-Navarrete[1], Dan Dolderman[2], and James J. Kay[3]
[1]Faculty of Environmental Studies, Department of Geography, University of Waterloo
[2]Department of Psychology, Faculty of Arts, University of Waterloo
[3]Faculty of Environmental Studies, Department of Environment and Resource Studies, University of Waterloo

Abstract

A narrative about the historical development of the concept of Ecological Integrity in North America is presented. This development can be described as an on-going interactive and complex interchange where managers and scientists try to influence and adapt their own agendas and the other's agendas. Finally, two main currents of thought in this conceptualisation exercise are identified: (1) a normative one; based on the separation of humans from ecosystems, and (2) an integrative, holonistic, or ecogenic; which see humans as an inseparable part of ecosystems.

Background

Ecological Integrity (EI) has become a central concept in Conservation policies and programmes around North America and other parts of the world. This paper narrates the historical development of this concept. Two main positions in the literature are identified. One has more to do with the normative aspects of conservation, while the other focuses on re-thinking the relationships between humans and the ecosystems of which they are part.

Historical overview

The political foment and social action of the 1960s were spawned, among other reasons, by an awakening of individuals to the ideals of social justice, based on the concern with a desire for equity amongst individuals, regardless of their gender, race, nationality, or other categorical distinction. These growing social justice movements were a response to the perception of inequities between different groups in society, a response which fitted naturally with the emerging concerns for environmental protection and conservation, and the extension of rights to future human generations, as well as to other species. There was a recognition that our current treatment of natural ecosystems will have consequences for the rights of future generations, and an acknowledgement that the basic right to survive should be shared by the rest of the living world in its own natural course of evolution.

It was in this arena of social conflict and clashing value systems that an integrated concern for social equity and environmental protection arose. Within this arena, the concept of integrity became associated with a state corresponding to the goals of equity and fairness, over both the short and long terms. Integrity has been conven-

tionally used to describe the moral standing of human beings; to have integrity is to be dependable and responsible, with a clear sense of what is good and what is not good. In this way, integrity is linked to moral autonomy and refers clearly to questions of moral good. Integrity also implies integration, and the perceived need for integrity arose from the emerging post-modern recognition that there are multiple valid perspectives that need to be voiced, considered, and integrated in order to understand, and strive for, integrity. Integrity as an ecological and social concept came from the realization of multiple truths, and the movement away from the sort of universalistic thinking that had dominated Western science and the military-industrial machine. Thus, integrity provided a conceptual clarification of the goals of social justice, and the realization of living in a post-modern reality. These philosophically and ethically driven concerns led to a discussion within society at many levels, resulting in many forms of change, from individual attitudes and lifestyles, to legislative and political efforts. In the environmental arena, an early manifestation of this change was the 1968 UNESCO Conference on the Conservation and Relational Use of the Biosphere, which resulted in the Man and the Biosphere Program where international cooperation led to the protection of large numbers of biosphere reserves. This program was instrumental in explicitly recognizing at an international level that the movement towards integrity in the environmental domain required a great deal of cooperation between conflicting interests in society, based on differing economic, social, political, and ethical value systems.

This focus on conflict and oppositional discourse has provided a basic framework in which to understand integrity. This framework has led to a tension between those who see the discussion of integrity as being a largely subjective exercise of expressing and promoting certain values and ethics, and others who see the discussion as a largely technical and scientific debate. This is clearly seen for example, in the tension between those who use traditional science as a way of understanding the biophysical integrity of natural ecosystems, and those who believe that integrity is inseparable from values and ethics; this latter perspective believes that understanding integrity requires understanding how to promote a society based upon social justice principles, where the discussion of integrity itself can unfold in a manner that reflects integrity, where the interests of all are represented and acknowledged.

The 1972 U.S. Water Pollution Control Act Amendments introduced the term "ecological integrity" into legislation (Frey, 1977; Davis, 1995). This Act included the idea of a social and cultural dimension to integrity, but focused on the integrity of water systems as an objective property determined by a variety of chemical and biological indicators of water quality. This illustrates how the discussion of integrity, even while being based on social justice ideologies, has still been primarily conceptualised as a technical problem to which traditional science can provide answers and solutions. However, these 1972 Amendments were instrumental in introducing the concept of EI into the environmental discussion, promoting the notion that integrity has to be understood as a holistic quality involving ecosys-

tems as wholes, and suggesting the need to elucidate ecological principles to guide human behaviour (Jackson and Davies, 1994; Westra, 2000). This highlights the central idea that EI is fundamentally about the interconnections and interdependencies between humans and the environment.

In 1975, the U.S. Environmental Protection Agency convened a symposium to clarify the concept of integrity. The symposium was designed to interrelate two aspects of integrity: 1) as a desirable characteristic of ecosystems; 2) as a moral or cultural principle, and then applying this concept to guiding policy and regulatory practices (Cairns, 1977; Frey, 1977; Edwards and Regier, 1990). This symposium resulted in the realization that there already existed a range of interpretations of what integrity meant and what was necessary for ensuring EI, ranging from perspectives based on conservation and pollution reduction concerns, to calls for a "deep reform" of societal values regarding material consumption, economic growth, and the amelioration of social inequities on a global scale. This range of concerns promoted primarily the role of science as providing objective criteria for meeting the integrity needs of ecosystems, as well as the idea that human activities act as a stress on natural ecosystems, and that protecting these ecosystems means limiting the impacts of modern activities so that "natural" processes (i.e., the biogeochemical cycles operating in ecosystems which have been minimally impacted by modern humans), can continue at levels consistent with background rates of change in the biosphere. Therefore, by 1975, the discussion of EI revolved primarily around biophysical concerns, and the need for meeting criteria that "objectively" represent the integrity of natural systems, while the issues of social justice and the recognition of integrity as being a question of human values remained in the background of the discussion.

The 1978 Great Lakes Water Quality Agreement led to a considerable amount of work attempting to operationalise the concept of EI as it pertained to the Great Lakes ecosystems (Francis *et al.*, 1979; Vallentyne and Beeton, 1988; Edwards and Regier, 1990; Evans *et al.*, 1990; Regier, 1992; Allen *et al.*, 1993; Francis and Regier, 1995). Systems thinking brought to the foreground a questioning of traditional, reductionist scientific understandings, and a refocusing on the integrity of both natural and social systems. As well, understanding the complexity of ecosystems highlighted the inevitability of surprise in these systems; consequently, integrity must also be a property of management systems which must become adaptive in order to deal with surprise. Finally, attention started to shift towards thinking of the integrity of social systems, focusing on ideas of cultural self-regulation and self-definition, and a movement away from a problem-oriented reactionary mindset that sought to identify ecological problems and then apply largely technological fixes. Instead, the emphasis began being placed on the need for a cultural shift away from the progress ethic, a renewed understanding of the relationship between humans and nature, and the need for a decision-making process to be carried out in society in an inclusive, participatory manner that best reflects the multiple perspectives of the individuals involved in and affected by the decisions. Thus, by the 1990s, the

discussion of integrity had come full circle to some extent, returning to its original values, promoting social integration and equity.

Within science, there was a growing recognition that a scientific understanding of integrity was poorly served by the reductionistic, analytical, specialized and universalistic disciplines that have tended to make up traditional science. This traditional thinking results in the sort of piecemeal, reactionary, short-term or otherwise simplified thinking that needs to be de-emphasized in favour of systemic, transdisciplinary and contextual research. This movement towards systems thinking fundamentally highlights the interconnections between humans and "natural" systems (Kay and Regier, 2000).

By the mid 1990s, the concepts of Ecological Integrity (EI) and Ecosystem Integrity figure prominently in a large number of regulatory and legislative documents (Westra, 1995; Miller and Rees, 2000). These include from international agreements, national regulations, and constitutional texts, to reports from advisory boards, or political statements. However, these documents do not define, or vaguely define, what EI is supposed to be as a legal concept.

An important effort to define EI has been undertaken during this last decade. The most comprehensive outputs surely are the literature generated by The Global Integrity Project, initiated by Laura Westra in 1992. One of the main objectives of this project was to relate the ecosystem approach and the goal to restore integrity to moral principles and norms in a way that they might serve as a basis for public policy (Westra and Lemons, 1995). After eight years of discussion, the concept of EI has evolved considerably and several frameworks and approaches have been developed. Many conflicting aspects have been broadly discussed and some points of consensus have been reached among the scientific community. However, the scientific debate is still characterised by controversies and fundamentally different interpretations. Many papers have been devoted to find a comprehensive definition and the lack of such a definition is usually seen as a problem or drawback. One of the perceived scientific endeavours is to simplify reality in order to provide (1) an operational framework to assess the impacts of human activities on natural systems, and (2) practical measures to keep human-caused stresses within acceptable limits. This paper takes as a starting point the idea that there is not one "correct" definition. The usefulness of any one definition depends on the purpose for which it is intended. Thus EI poses the challenge of making contextual choices in an increasingly complex world.

Main position regarding the interpretation of EI

Two main choices or currents of thought are identified. These represent very different understandings of what EI means, how it should be researched and conceptualised, and what its implications are for policy, environmental management, and social organisation.

The first current, which is the most dominant, starts off dividing the planet into natural areas and zones of human occupancy. According to this mindset, the role of science is normative and consists of specifying empirical, quantitative, and operational standards useful to manage ecosystems in order to maintain their health and integrity. This current is consistent with Western cultural traditions in that they both depart from a dualism between human and nature. However, the terms of this separation goes in an opposite direction. Whereas Western traditional philosophies usually assume anthropocentrism as a given, this EI current departs from a biocentric standpoint. Both share the concern with more efficient control and management of the natural environment, but the first is for the benefit of humans, while the second advocates the benefit of all living creatures and living systems. The methods proposed are rooted in much of classical ecology (i.e. theories of stability, and equilibrium models). This fact limits considerably the scope of reality that is embraced, but its proximity to the dominant scientific language provides a considerable power of influence within the present socio-political context. According to an ecophilosophical classification this current would fall within shallow environmentalism (Naess, 1973).

A second emerging current can be described as more integrative, holonistic, or ecogenic[1] than the first one (Naess, 1985; Fox, 1990; Kay *et al.*, 1999; Morito, 1999). The role of science is considered more explanatory starting off considering: (1) the value-laden dimension of concepts such as EI, and (2) the prevalence of synthesis over analysis to inform social discussion. This current points to the transcendence of the traditional scientific frameworks towards the spiritual awareness of the oneness of all life, its multiple manifestations, and its cycles of change and transformation. What are needed are not bigger and better technical solutions but rather a thorough rethinking of our most fundamental attitudes concerning our place in the larger scheme of things. As it can be inferred from this statement, EI is about reshaping human-environment relationships beyond law enforcement and the implementation of management plans. EI is framed as the accommodation of the "needs" of ecological systems to self-organize with the values of society, which are also self-organized. In this direction, society's values are considered themselves as to be simultaneously modified and constructed upon an understanding of how such an accommodation can take place (i.e., through a discussion about the trade-offs between economic, social and ecological goals).

Nonetheless, both currents seek for the integrative character of EI which precludes the search for a single indicator. In this sense, ecological integrity is a broader concept than, for instance, biodiversity or resilience. EI tends to emphasise the whole ecological system, rather than merely its single components, and parts. The goal of truly understanding this integrative nature carries far-reaching implications for the practice of science, and its relationship with society. Ultimately, EI should have something to do with understanding ourselves and our place in the world. The specific form this understanding will take depends on the set of assumptions about which aspects of inner human experience and outer world realities are con-

sidered or emphasised.

Notes

[1] Ecogeny can be defined as a conceptual domain emerging from the transcendence of the reductionism-holism debate.

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