

Ecological Integrity. LAURA WESTRA.

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Page 574

ECOLOGICAL INTEGRITY

Ecological or biological integrity originated as an ethical concept in the wake of Aldo Leopold (1949) and has been present in the law, both domestic and international, and part of public policy since its appearance in the 1972 U.S. Clean Water Act (CWA). Ecological integrity has also filtered into the language of a great number of mission and vision statements internationally, as well as being clearly present in the Great Lakes Water Quality Agreement between the United States and Canada, which was ratified in 1988.

The generic concept of integrity connotes a valuable whole, the state of being whole or undiminished, unimpaired, or in perfect condition. Integrity in common usage is thus an umbrella concept that encompasses a variety of other notions. Although integrity may be developed in other contexts, wild nature provides paradigmatic examples for applied reflection and research.

Page 575 | [Top of Article](#)

Because of the extent of human exploitation of the planet, examples are most often found in those places that, until recently, have been least hospitable to dense human occupancy and industrial development, such

as deserts, the high Arctic, high-altitude mountain ranges, the ocean depths, and the less accessible reaches of forests. Wild nature is also found in locations such as national parks that have been deemed worthy of official protection.

Among the most important aspects of integrity are the autopoietic (self-creative) capacities of life to organize, regenerate, reproduce, sustain, adapt, develop, and evolve over time at a specific location. Thus integrity defines the evolutionary and biogeographical processes of a system as well as its parts or elements at a specific location (Angermeier and Karr 1994). Another aspect, discussed by James Karr in relation to water and Reed Noss (1992) regarding terrestrial systems, is the question of what spatial requirements are needed to maintain native ecosystems. Climatic conditions and other biophysical phenomena constitute further systems of interacting and interdependent components that can be analyzed as an open hierarchy of systems. Every organism comprises a system of organic subsystems and interacts with other organisms and abiotic elements to constitute larger ecological systems of progressively wider scope up to the biosphere.

Ecological Integrity and Science

Finally ecological integrity is both "valued and valuable as it bridges the concerns of science and public policy" (Westra et al. 2000, pp. 20-22). For example, in response to the deteriorating condition of our fresh-waters, the CWA has its objective: "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (sec. 101[a]). Against this backdrop, Karr developed the multimetric Index of Biological Integrity (IBI) to give empirical meaning to the goal of the CWA (Karr and Chu 1999). Karr defines ecological integrity as "the sum of physical, chemical, and biological integrity." Biological integrity, in turn, is "the capacity to support and maintain a balanced, integrated, adaptive biological system having full range of elements (genes, species, and assemblages) and processes (mutation, demography, biotic interactions, nutrient and energy

dynamics, and metapopulation processes) expected in the natural habitat of a region" (Karr and Chu 1999, pp. 40-41). Scientists can measure the extent to which a biota deviates from integrity by employing an IBI that is calibrated from a baseline condition found "at site with a biota that is the product of evolutionary and biogeographic processes in the relative absence of the effects of modern human activity" (Karr 1996, p. 97)—in other words, wild nature. Degradation or loss of integrity is thus any human-induced positive or negative divergence from this baseline for a variety of biological attributes (Westra et al. 2000). Noss's Wildlands Project, which aims to reconnect the wild in North America, from Mexico to Alaska (Noss 1992, Noss and Cooperrider 1994) utilizes the ecosystem approach to argue the importance of conserving areas of integrity.

But the most salient aspect of ecosystem processes (including all their components) is their life-sustaining function, not only within wild nature or the corridor surrounding wild areas although these are the main concerns of conservation biologists. The significance of life-sustaining functions is that ultimately they support life everywhere. Gretchen Daily (1997), for instance, specifies in some detail the functions provided by nature's services, and her work is crucial in the effort to connect respect for natural systems integrity and human rights.

Arguments against the value of ecological integrity for public policy have identified the concept as stipulative rather than fully scientific (Shrader-Frechette 1995). In a similar vein even the concept of ecology as such has been criticized as not robust enough to guide public policy (Shrader-Frechette and McCoy 1993). But ecological integrity is already a part of public policy, thus requiring consideration of its meaning and the role its inclusion should play in policy, rather than arguing for its rejection. Further to maintain that "we need a middle path—dictated in part by human not merely biocentric theory" (Shrader-Frechette 1995, p. 141) ignores how humans do not exist apart from other organisms: Biocentrism is life-

oriented, and this principle is increasingly accepted not only by science, but in the law.

The routine use of Karr's IBI to reach general conclusions illustrates the ethical effectiveness of the scientific concept of ecological integrity in public policy. The law analyzes a crime or victim under a particular set of circumstances. But public policy must abstract from specifics. Disintegrity (or lack of integrity) and environmental crime (Birnie and Boyle 2002) are global in scope and need international fora and broad concepts to ensure that they will be proscribed and possibly eliminated.

In addition, there is mounting evidence to connect disintegrity or biotic impoverishment (Karr 1993) in all its forms, from pollutions, climate change, toxic wastes, and encroachment into the wild (Westra 2000) toPage 576 | Top of Article human morbidity, mortality, and abnormal functioning. International law has enacted a number of instruments to protect human rights (Fidler 2001) and the World Health Organization (WHO) invited the Global Ecological Integrity Project (1992-1999) to consult with it. This collaboration eventually produced a document titled "Ecological Integrity and Sustainable Development: Cornerstones of Public Health" (1999) (Soskolne and Bertollini).
The Ethics of Integrity

Because of this global connection between health and integrity, and the right to life and to living (Cançado Trindade 1992), a true understanding of ecological integrity reconnects human life with the wild, and the rights of the latter with those of the former. The ethics of integrity primarily involves respect for ecological rights (Taylor 1998) without limiting these to the human rights that are the primary focus of the law. The main point of an ethic of integrity is that it is a new ethic (Karr 1993), one founded on recent science demonstrating the interdependence between humankind and its habitats. Environmental ethicists may prefer to focus on one or the other aspect of this interconnected whole—biocentrism or anthropocentrism. While biocentrists accept the presence of humankind as

such within the rest of nature, anthropocentrists attempt to separate the two, in direct conflict with ecological science.

If, as argued, human health and function are both directly and indirectly affected by disintegrity (Soskolne and Bertollini Internet article), then no theory can properly separate one from the other. The strength of the proverbial canary-in-the-mine example is based on the fact that the demise of the canary anticipates that of the miner. Hence it is necessary to accept a general imperative of respect for ecological integrity. Onora O'Neill makes this point well:

The injustice of destroying natural and man-made environments can also be thought of in two ways. In the first place, their destruction is unjust because it is a further way by which others can be injured: systematic or gratuitous destruction of the means of life creates vulnerabilities, which facilitate direct injuries to individuals. ... Secondly, the principle of destroying natural and man-made environments, in the sense of destroying their reproductive and regenerative powers, is not universalizable. (O'Neill 1996, p. 176)

In addition, the vulnerability that follows the destruction of integrity links this concept to environmental justice. The principle of integrity together with appropriate second order principles would ensure (a) the defense of the basic rights of humankind (Shue 1996) as well as (b) the support of environmental justice globally, because it would ensure the presence of the preconditions of agency and thus the ability of all humans to exercise their rights as agents (Gewirth 1982, Beyerveld and Brownsword 2001).

Ecological integrity is thus not an empty metaphor or a grand theory of little utility. It is a concept robust enough to support a solid ethical stance, one that reinstates humans in nature while respecting the latter, thus permitting clear answers in cases of conflicts between (present) economic human interests and (long-term) ecological concerns.
Ecological Integrity and the Law

It is reasonable to conceive of humanity as being morally responsible to protect the integrity of the whole ecosystem, and for that responsibility to be translated into such mechanisms as standard setting in a manner that is cognizant of ecological thresholds (Taylor 1998). Insofar as such responsibility is justified as a protection of human life and health, breaches of environmental regulations deserve not just economic penalties but criminal ones. Nevertheless there is a growing parallel movement to recognize the intrinsic value of both the components and the processes of natural systems, not only in philosophy (Westra 1998, Callicott 1987, Stone 1974, Leopold 1949), but also in the law (Brooks et al. 2002).

A number of international legal instruments also reflect the emerging global ecological concerns, and thus include language about respect for the intrinsic value of both natural entities and processes. This point is illustrated by a project involving the justices of the world's highest courts, which is funded by the United Nations Environment Programme (UNEP). The project's biocentric goal, as outlined by Judge Arthur Chaksalson of South Africa, is one of the most important results of the Johannesburg meeting (also known as "Rio+10"). The 2000 Draft International Covenant on Environment and Development incorporates the mandates of the Earth Charter, which was adopted by a United Nations Economic, Scientific, and Cultural Organization (UNESCO) resolution on October 16, 2003, in its language, and includes articles on ecological integrity and the intrinsic value of nature.

Although the positions advanced in these international initiatives are present in law, economic interests often obscure the opposition between the basic rights of persons and peoples and the property rights of legal entitiesPage 577 | Top of Article and institutions. In the process courts tend to weigh these incommensurable values as though they were equal. But the right to life and the survival of peoples is not comparable to economic benefits or even the survival of corporate and industrial enterprises.

An additional connection arises from a consideration of ecological integrity a complex concept that, after several years of funded work, the Global Ecological Integrity Project eventually defined in 2000 (Westra et al. 2000). The protection of basic human rights through recognition of the need for ecological integrity, as Holmes Rolston (1993) acknowledges, is a step in the emerging awareness of humanity as an integral part of the biosphere (Westra 1998, Taylor 1998).

On the basis of the biocentric foundation for ecological integrity, it is necessary to move toward the twin goals of deterrence and restraint, as is done in the case of assaults, rapes, and other violent crimes. Laws that restrain unbridled property rights represent a first target; but efforts should not be limited to action within the realm of tort law. The reason is obvious: Economic harms are transferable, thus acceptable to the perpetrators of such harms, although the real harms produced are often incompensable. As Brooks and his colleagues indicate in reference to U.S. law, science is now available to support appeals to interdependence. "Not only has conservation biology as a discipline and biodiversity as a concept become an important part of national forest and endangered species management, but major court cases reviewing biodiversity determinations have been decided" (Brooks et al. 2002, p. 373). In addition, Earth System Science increasingly provides "multidisciplinary and interdisciplinary science framework for understanding global scale problems," including the relations and the functioning of "global systems that include the land, oceans and the atmosphere" (Brooks et al. 2002, p. 345). In essence, the ecosystem approach and systematic science of ecological integrity have contributed support to what Antonio A. Cançado Trindade terms "the globalization of human rights protection and of environmental protection" (Cançado Trindade 1992, p. 247).

As noted these ideals are contained in the language and the principles of the Earth Charter. The global reach of these ethics and charters, to be effective, must be

supported by a supranational juridical entity such as the European Court of Human Rights. As the case for environmental or, better yet, ecological rights, becomes stronger and more accepted in the international law, the best solution as suggested by Patricia Birnie and Adam Boyle could be to empower the United Nations (UN). It might be desirable "to invest the UN Security Council, or some other UN organ with the power to act in the interests of 'ecological security,' taking universally binding decisions in the interests of all mankind and the environment (Birnie and Boyle 2002, p. 754). Empowering the United Nations in this way would foster support for programs based on the abundant evidence linking ecology and human rights and could become the basis for a new global environmental/human order (Westra 2004).

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SEE ALSO Ecology; Research Integrity.
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