

# Industrial Ecology as a Cultural Phenomenon

## On Objectivity as a Normative Position

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### Summary

Taking a recent column by Braden Allenby in this journal as a starting point, we argue the need for researchers in the field of industrial ecology to reflect upon its normative aspects. We argue that the field will advance through an explicit discourse on such issues as epistemological positions, the inherent normative nature of using metaphors, and the way in which the field of study relates to the field of practice.

In "Culture and Industrial Ecology," Allenby raises, and begins to address, some critical questions that define the field of industrial ecology. We suggest that his arguments dismiss too lightly issues that are central to this developing field. The purpose of this reply is to open up for further discussion what industrial ecology is, and what it is not.

We begin by summarizing Allenby's line of reasoning. We explore his arguments around the notion of objectivity and the questions he raises about the relationship among objective science, normative positions, opinions, and fads. While Allenby makes a strong plea for industrial ecology to maintain objectivity and avoid normative positions, we contend that any positions on what should or should not be included in a field of study carry normative intent. Although science might seek to be objective in its method, scientists are rarely free of such normative positions. These positions need to be explicit and open to debate. Also, Allenby's position implies that industrial ecology as a field of study should be separated from industrial ecology as a field of practice. We argue that the interrelation of these fields provides important advantages.

Our main concern is that Allenby's position forestalls discussion on important issues at the heart of the field of study. We examine some key issues around the concept of objectivity and propose an agenda for research on the cultural and ideological aspects of industrial ecology.

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## The Reign of Objectivity— Allenby's Position

The starting point for Allenby's paper is the need to define the boundary of the field of study. Discussing the boundary is important to any emerging field. In fact, this question has been considered before within the pages of the *Journal of Industrial Ecology* by Allenby (1998) and by Lifset (1998). In his most recent paper, which stimulated this reaction, Allenby asks whether "ideology" and "culture" are among the objects of study for industrial ecology. One consequence of including ideology and culture in the field of industrial ecology is that it invites disciplines such as sociology, political science, psychology, and anthropology to contribute their research perspectives. Once these disciplines are within the house of industrial ecology, it becomes possible to develop the interdisciplinary perspectives that blend science and social science in ways that match the social and environmental character of industrial ecological systems.

Allenby clearly argues that technical issues, such as the analysis of energy and materials streams, and the calculation of environmental impacts of changes in these streams are an "appropriate subject for industrial ecology." Using the example of the pulp and paper industry, he points out that "complex economic, ideological, and cultural dynamics" have a practical impact on these technical issues. Moreover, decisions based on these technical assessments have economic, social, and cultural outcomes. In other words, technical concerns are impacted by, and have an impact on social, nontechnical variables and processes.

It seems obvious, then, to include the interrelationship between technical and social in the field of study of industrial ecology. Allenby qualifies his position, however, by referring to the concept of objectivity. This is such a key point that it is important to quote him in detail. He argues that these social factors should be included in the field of industrial ecology because "science and technology questions raised by this case [the pulp and paper industry] cannot be adequately understood without some *relatively objective* notion of the cultural, economic, and social context within which they are embedded" [our italics]. Yet he also claims that "industrial ecology should not

become a cultural phenomenon, a fad, a *normative exercise* in political correctness, as some believe has happened with the concept of 'sustainable development'" [our italics]. Allenby's juxtaposition of objective and normative ways of dealing with ideology and culture is further exemplified in the following quote: "Industrial ecology should not become a normative tool rather than an objective field. Selective use of data, imposition of ideological absolutes on complex real world systems, and simply bad science should not be part of industrial ecology."

We summarize these arguments by suggesting that Allenby wants to include ideology and culture within the boundaries of the field of industrial ecology to the extent that they determine the context within which industrial ecology takes place, and as far as they can be dealt with in an objective way. Such issues are not a valid subject of study when they refer to something normative. Under these circumstances, he suggests they should be excluded from research inquiry.

In order to develop our position, we need to consider what is positive and what is normative. In economic science, positive refers to statements that can be tested through hypotheses and refuted by reference to empirical evidence. For example, a positive statement is: "More people take their shoes off when visiting homes in North America than in Europe." Normative statements imply what ought to be, what is desirable or good (Lipsey 1963, 5), that is, normative statements are referenced against norms. Norms derive from ethical or moral systems that define what is good or bad, right and wrong, as, for example, in the statement "We ought to respect the property and freedom of others." Alternatively, norms can be based on what is considered normal in a society, as, for example, in the statement "We ought to take our shoes off when we visit a North American home." Normative positions cannot be reconciled simply by an appeal to empirical evidence. They require discourse.

## Industrial Ecology as a Cultural and Scientific Phenomenon

Our point of departure is that industrial ecology as a field of research and practice is inherently normative. We contend that industrial ecology is

a cultural phenomenon, that is, it is an *evolving* concept and set of practices that can be found in a number of societies. Moreover, those who propose that industrial systems should (ought to) conform to the properties of natural ecosystems are pursuing normative positions. Moreover, these normative aspects of industrial ecology are phenomena that deserve to be subjected to scientific inquiry. In putting forward these ideas, we do not accept that we give way to “simply bad science”; rather we want to make it possible to discuss and research the normative components of industrial ecology in the traditions of good social science, which studies, among other things, human actions, values, and conventions.

This starting point may seem philosophical, but it is crucially important. After all, Allenby’s plea for objectivity is normative. He states what researchers in the field of industrial ecology *should* do. This position is based on a Popperian perspective of science (Popper 1959). Although Allenby acknowledges that “no science or field of human study is objective,” he goes on to refer to Kuhn (1970) as arguing that this does not exclude the possibility of integrity and objectivity of analysis being characteristic of the scientific process. What we find problematic about this argument is that Allenby advances his own (normative) position as the only defensible position. This implies that he can judge what is to be termed “bad science.” Yet in the development of any field of science, it is important to entertain and discuss the outcomes of a range of scientific traditions and perspectives and to judge them on their outcomes rather than limit them from the outset. Only in this way is it possible to establish which of the many competing perspectives gains scientific credibility through its plausible and useful explanations and predictions of the world. By establishing as opposites “objective analysis” and “bad science,” or “exercises in political correctness” and the “imposition of ideological absolutes” Allenby closes down discussion and limits interdisciplinary scientific inquiry.

Allenby even develops his argument about the primacy of objectivity in such a way that it excludes all normative issues from the field of industrial ecological research. We argue the exact opposite. Our position is that studying these issues is essential for the development of the field

and to any substantive understanding of the contribution of the field to society. We propose the following core issues as central to any scientific and practical discussion about industrial ecology.

First, we contend that the field of industrial ecology is itself defined through the use of a metaphor. Before exploring the metaphor in specific detail it is important to make the general point that all metaphors are normative. Metaphors provide models and perspectives on observed factors and events (in the case of industrial ecology, these factors and events are industrial activities and their resulting energy and materials streams). The metaphor, as perspective, provides a certain way of viewing or perceiving the world around us. By necessity, the perspective highlights some factors and events, while diminishing the attention devoted to other aspects of such activities (Morgan 1986). Indeed, the true value of a metaphor is not simply to be found in what it is able to explain about the operation of the world around us: Value is also found in exploring the ways in which the metaphor (or model) fails to explain the phenomena to which we apply it. Using the metaphor of a machine to understand how an organization works, for example, highlights such features as the way in which its different parts are interrelated into a design to produce a certain outcome. At the same time, this metaphor fails to address the fact that the organizational “nuts and bolts” are actually human beings with their own intentions, and can, to a certain extent, act on those individual intentions. The metaphor is thus as insightful in what it does not explain as in what it does explain.

Secondly, as far as the specific metaphor of industrial ecology is concerned, at least one of its dominant definitions is based on the normative notion that industrial ecosystems should be made to function in the same way that natural ecosystems operate (Frosch and Gallopoulos 1989), and in *Industrial Ecology*, Graedel and Allenby (1995, 5) define the topic of study in the following way:

Industrial ecology is the means by which humanity can deliberately and rationally approach and maintain a desirable carrying capacity, given continued economic,

cultural and technological evolution. The concept requires that an industrial system be viewed not in isolation from its surrounding systems, but in concert with them. It is a systems view in which one seeks to optimize the total materials cycle from virgin material, to finished material, to component, to product, to obsolete product and ultimate disposal. Factors to be optimized include resources, energy and capital.

This definition clearly has a normative aspect in referring to a “desirable carrying capacity” and the optimization of resources, energy and capital. Other definitions of industrial ecology, such as White (1994), avoid this explicit normative formulation. Yet the concern to close the apparent gap between the ways in which present industrial and natural ecosystems function is an implicit part of industrial ecology. To exclude the scientific examination of the value and validity of this metaphor is a strong normative position. Instead we would argue that the way the ecology metaphor is used and applied is quite critical to our research, because it can only increase our understanding of how such industrial ecosystems operate and evolve, as well as the extent to which we are able to direct the evolution of those systems. For example, we would argue that industrial systems are not simply ecologies. They are driven and guided by human thought and action. Industrial ecologies are, therefore, more precisely viewed as human ecologies, which we may choose to guide according to the principles that derive from our currently held human conceptions of ecological principles.

This brings us to our third point. Allenby is quite explicit in his paper about the fact that “industrial ecology should not become a cultural phenomenon, a fad.” Companies, policy-makers, consultants, and scientists, however, use the concept in their activities. This means that industrial ecology is a cultural phenomenon, and in certain countries industrial ecology has taken on the form of a fad, or a hyped idea. Indeed, different social actors link their own activities and interests with industrial ecology because it serves their purposes. Scientists do this as part of the institutionalization of the field, to gain scientific contracts and to

establish scientific credentials and legitimacy. Certainly, this type of institutional/scientific construction blurs the boundary and definition of what industrial ecology represents as a metaphor and a scientific phenomenon. Rather than trying to deny this, we see the process by which a concept emerges, is defined and redefined, and is followed by its scientific and practical application in a variety of different settings as a legitimate area for research, and we view this as inquiry that falls firmly in the field of industrial ecology. In fact, there is a line of sociological thinking that sees the process of concept diffusion as a continuous process of translation. Each time a concept is picked up by members of an organization, it is modified, or “translated,” into a shape that fits the unique features of the adopting organization (Czarniawska and Sévon 1996). This suggests that different conceptions of industrial ecology may represent competing fads in a broader process of institutionalization. The field of industrial ecology provides interesting possibilities for analyzing processes of this kind (Boons et al. 2000). A further reason for being enthusiastic, rather than dismayed, about industrial ecology as a fad is that it describes an important characteristic of the process by which the concept is developed and diffused in science and practice. Even though this implies that the concept is used in a superficial or devalued way, the main principle of industrial ecology as metaphor (the interconnections of industrial activities and energy and materials streams) is still transmitted to an increasingly diverse and ever larger audience.

Allenby ends his article by expressing his concern for society and the environment if “ideology will reign.” He cites the possibility of decisions being made to shift the pulp and paper industry toward the use of nonwood fibers. His proposal, based on the distinction between objective and normative issues, is that there should be some field of study that provides the information or, in his terms, the “objective” analysis on which such decisions can be based. We are critical of this perspective and the strict separation it implies. We maintain that industrial ecology is not only a field of study, but also a field of practice. These two aspects of the field are often separated, and in this respect the definition of White (1994) serves well:

Industrial ecology is the study of the flows of material[s] and energy in industrial and consumer activities, of the effects of these flows on the environment, of the influences of economic, political, regulatory, and social factors on the flow, use and transformation of resources. The objective of industrial ecology is to understand better how we can integrate environmental concerns into our economic activities.

But the practice of industrial ecology is intimately connected with industrial ecology as a field of research. We see this connection as something that cannot be so readily separated for analytical purposes. On the contrary, this connection is a starting point for analysis. Consider, for example, the parallel Allenby makes between industrial ecology and the concept of “sustainable development,” although again our conclusion is far less critical than Allenby’s. The concept of sustainable development is abstract and leaves open numerous different ways to operationalize the concept. Nevertheless, it appeals to many people precisely because the “openness” of the definition enables people to construct and contribute to the process of defining what sustainable development entails. This is its most important feature, because it enables actors who wish to work on the goal and process of sustainable development to be involved in discussion of what the concept means to the parties involved. This provides a basis for learning and adaption that is key to the process of sustainable development as a continuous assessment and response to ecological, social, and economic aspects of decisions (Roome 1998; Boons and Berends 2000). This way of seeing sustainable development has been developed into research efforts that combine the development of knowledge (field of study) with the actual learning process of societal actors (field of practice) (Carley and Christie 1993).

Also, the interrelatedness of the field of practice and the field of study connects to our starting point, concerning Allenby’s epistemological position. The interrelatedness of these fields is to a great extent characterized through action research. This research strategy builds on the assumption that social phenomena can only be

studied by being actively involved in them. A research project is then a real-life experiment in which the researcher is part of the laboratory. For this research strategy to be productive, it is crucial that the researchers involved be highly reflective regarding their dual position as participant and observer. If this reflectivity is absent, such research might lead to what Allenby seems to fear, that is, that scientists become activists. But his proposed solution of separating the researcher from the participant through an appeal to objectivity seems to us to rob us of a valuable research strategy. When used in a sensible way, that is, by explicitly addressing the involvement of researchers in the phenomena they study, it gives us one way to develop a better knowledge of the functioning of industrial ecosystems.

Together, these points illustrate some of the fundamental differences between industrial ecosystems and their natural counterparts. Natural ecosystems fall into the class of systems that Checkland (1981, 112–113) calls “natural systems,” systems that stem from the origin of the universe and processes of evolution. Given their origins, these systems “can only be as they are.” By contrast, an industrial ecosystem is a social system, which combines human conceptions of “natural systems” (the ecosystem) with a “human activity system” (the industrial system). Industrial ecosystems as human activity systems possess features that are uniquely different from those of natural systems. These features originate in the fact that human beings have a consciousness, and are able to employ symbols, attribute meaning, and distinguish between right and wrong, good and bad. For example, the use of a metaphor such as industrial ecology is a symbol. In other words, the values and perceptions of the human beings, which form part of those systems, influence those systems. That these values and perceptions exist and are used to guide systems provides an opportunity to see the world in different ways, and to develop positions about the possible directions in which the world might change. This provokes change in the relationship between a human activity system and its environmental context. Defining the properties of this relationship as beyond the field of industrial ecology seems to us to be a serious human mistake.

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