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Eco-efficiency as abandonment of nature

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Abstract

The paper argues that eco-efficiency is fundamentally disruptive when promoted as a universal prescription for environmental policy. Eco-efficiency runs against the cognitive and institutional bases of sustainable human–environmental interaction. At the cognitive level, eco-efficiency assumes that an individual's concern for the environment can be decoupled from his or her material dependency on ecosystem services. At the collective level, eco-efficiency builds upon decoupling environmental governance from the local socio-economic and cultural context. The assumptions are not well-supported by empirical work on systems of human–environmental interaction, which stresses the importance of material connections to maintaining environmental concerns. The criterion for adopting eco-efficiency should be the extent to which it promotes the recoupling of human perception of environmental issues with human action on the environment, and the concomitant recoupling of collective local organization with locally crafted ecosystem management.

Keywords: Eco-efficiency; Dematerialization; Human–environmental interaction; Governance; Environmental history; Ecosystem management

Ecological efficiency, or eco-efficiency, has inspired environmental policy makers worldwide as a concept that concisely articulates their ongoing concerns in environmental management. Reflecting the transition from end-of-pipe pollution control to product-oriented solutions, eco-efficiency strives toward dematerialization, that is, a dramatic reduction in the material and energy intensity of industrial production and products (OECD Policy Brief, 1998; Commission of the European Communities, 2001; United Nations, 1999; World Bank, 2000; World Business Council for Sustainable Development, 2001). As such, dematerialization breaks the long tradition of merely isolating human technologies and their wastes from nature's ecosystem services. Instead, it aims at functional decoupling of the industrial economy from the natural one. Translating dematerialization into quantitative indicators of eco-efficiency appears to be an attractive way of formulating concrete management goals for national

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environmental policies and global environmental agreements (Schmidheiny and Zorraquín, 1996; Hinterberger et al., 1997; Vitousek et al., 1997; Wackernagel et al., 1999).

Yet, in light of empirical evidence obtained from the long history of human–environmental interaction and its governance, eco-efficiency is fundamentally disruptive as an environmental policy prescription. Current formulations of eco-efficiency are an attempt at a universal shorthand to describe human–environmental interaction. Many authors consider attempts at a universal solution to environmental problems futile because of the complexities and uncertainties that follow from the fact that the proposed universal explanation is subject to constraints imposed by the larger social whole of which it is a part (Haila and Levins, 1992; Dyke, 1988). This is the trap in which we find eco-efficiency. Universal application of eco-efficiency runs against lessons learned about the cognitive and institutional bases of sustainable interaction between human beings and their biophysical environment. Eco-efficiency as environmental management will fail without individual understanding of local ecosystems, which requires local institutions with clear connections to the material world.

Eco-efficiency builds upon the notion that a main cause of modern environmental problems is the scale of material and energy flows in the industrial economy with respect to those in the natural economy (Cleveland and Ruth, 1997). Reducing the scale of the industrial economy through dematerialization, so the argument goes, will not only diminish the human drivers of global environmental problems such as climate change and biodiversity loss, but also indirectly address the more familiar pollution problems. Eco-efficiency has been operationalized in indicators such as ecological rucksack (weight of natural resources used to produce a product), ecological footprint (land area required to provide services), MIPS (material input per unit of service), and Factor 4 and 10 (expressing quantitative targets with time schedules for dematerialization) (Hinterberger et al., 1997; Wackernagel et al., 1999). Since the fundamental value consumers crave is service instead of the material product (Ayres and Kneese, 1969), the longer-term goal is seen to be a decoupling of the industrial economy from its material constraints in nature.

To be honest, many authors hold a more complex and rich conception of eco-efficiency, arguing for modes of material and energy use that respect biophysical constraints and mobilize economic forces to deal with depletion and degradation (Cleveland and Ruth, 1997; Daly, 1980). Yet significant global institutions and organizations, including those referred to earlier, have adopted a narrow interpretation of eco-efficiency that focuses on measuring dematerialization with universal indicators. This is what matters from the point of view of ecosystem policy and management worldwide.

While eco-efficiency appears to be a logical indicator of performance in global environmental policy, it is based on two erroneous assumptions about human–environmental interaction. At the cognitive level, eco-efficiency assumes that an individual's concern for the environment can be decoupled from his or her material dependency on ecosystem services. The assumption is enshrined in the dematerialization program, which supposedly leads to an economy largely based on global exchange of dematerialized goods and services. Already the Brundtland Commission envisioned that future patterns of development 'can be made far less material-intensive, and hence both more economically and environmentally efficient,' leading to 'a new era of growth in the world economy' (The World Commission on Environment and Development, 1987). At the collective level, eco-efficiency builds upon decoupling environmental governance from the local socio-economic and cultural context. By expressing environmental impact simply in terms of mass consumption of natural resources, eco-efficiency creates the illusion that environmental impacts are universally commensurable, regardless of where the impact takes place, and can, therefore, be managed through globally applicable governance systems. Such universality is assumed, for example, when calculating national natural capital accounts with the ecological footprint concept (Wackernagel et al., 1999) or corporate environmental performance with the corporate eco-efficiency procedure

(World Business Council for Sustainable Development, 2000).

The two assumptions of eco-efficiency are not well supported by earlier studies. Empirical work on systems of human–environmental interaction, relying on both historical and current case studies, and incorporating both success stories and failures, provides a framework for assessing the assumptions underlying eco-efficiency. Common focal points in this body of work are (1) the cognitive framing of environmental problems by individual actors, (2) the institutional set-up for governing environmental resource issues by collectives of individuals, and (3) the mutual reinforcement of the two (North, 1992; Ostrom, 1994; Hukkinen, 1999; Redman, 1999). I will discuss each of these points separately.

First, individual recognition of environmental problems and concern for their management have been found to demand intimate material dependency on and activity in natural resource systems. Positive evidence comes from ancient urban and agricultural systems that have lasted for centuries under a management structure that has allowed resource users themselves to formulate their own cognitive models of resource management problems and solutions. Furthermore, the same urban and agricultural systems have often lost their sustainability and deteriorated under a centralized and large-scale political decision making hierarchy. In the latter case, the cognitive prerequisites for environmental concern have been lost in a system that funnels production surpluses to political elites who decide over local resource use without adequate knowledge of local ecological constraints (Redman, 1999).

But the recognition of environmental issues needs appropriate collective governance systems as well to materialize in sustainable management. In short, such governance systems tend to ensure that the local community is responsible for the management of the natural resource on which it depends. More specifically, common pool resource management systems that have successfully lasted over centuries have been found to operate under institutional rules that first of all clearly articulate the boundaries of the local resource and its legitimate users. Furthermore, the rules ensure that the design, monitoring, and sanctioning of resource governance is largely in the hands of the local users. Case examples of historical successes and failures of human–environmental interaction in irrigated agriculture, groundwater use, grazing, and fisheries management support these principles of common pool resource governance (Ostrom, 1994).

Third, collective institutions are linked with individual cognition: appropriate institutional rules have been found to strengthen an individual's perception of interdependence with ecosystem services (Hukkinen, 1999; Redman, 1999). Success in irrigated agriculture, for example, requires that local knowledge on how to link water management with agricultural benefits and ecological costs has been made a constitutive element of the institutional rules of irrigation. When individuals live with jointly crafted rules for a substantial time and develop shared patterns of reciprocity, they come to possess the social capital with which to continuously strengthen the institutional arrangement for resolving common resource problems (Ostrom, 1994; Hukkinen, 1999).

Embracing eco-efficiency as a universal environmental policy is ill-advised because it builds upon assumptions and strives for visions that erode what have proven to be the cognitive and institutional foundations of sustainable human–environmental interaction. If the historical lessons are to be taken seriously, the role of eco-efficiency in environmental policy should be dramatically reconsidered. The criterion for adopting eco-efficiency should be the extent to which it promotes the recoupling of human perception of environmental issues with human action on the biophysical environment, and the concomitant recoupling of human capacity for collective local organization with locally crafted ecosystem management.

In practice, eco-efficiency indicators must be applied in the right context and at the appropriate scale (Arrow et al., 1995; Sala et al., 2000). First, eco-efficiency indicators ought to ensure that individual actors perceive their everyday activities to be materially grounded in bundles of ecosystem services. Second, the indicators ought to serve the more general goal of building local level governance systems for ecosystem management, charac-

terized by locally designed and maintained institutions and conflict resolution mechanisms. While the limitations of eco-efficiency in terms of material and energy flow management have been aptly summarized in concepts such as eco-effectiveness (McDonough and Braungart, 1998) and industrial ecology (Allenby, 1999), the cognitive and institutional details are less clear. Articulation of the cognitive and institutional details of human–environmental systems that are grounded in local material conditions and buffered against complex disruptions of globalization remains a challenge for future research (Ostrom et al., 1999; Young, 1996). For the time being, the only things we know from experience are that locally grounded systems can sometimes sustain themselves over generations whereas systems in which the local context has been obliterated (or, put it another way, universal remedies have been applied) are likely to deteriorate.

The recommendations offered here are not a call for a complete overhaul of the concept of eco-efficiency. In most cases found in the industrialized and industrializing world, the achievement of local ecosystem management regimes will indeed require a dramatic reduction in the material and energy intensity of human activities (Vitousek et al., 1997). But this is not always the case. Just as there are ecosystems with materially and energetically intensive processes, there are systems of human–environmental interaction that demand intensive flows of material and energy (McDonough and Braungart, 1998). We should also accept the possibility of a genuine policy dilemma in which the necessity to delimit the scale of our industrial activities within ecological boundary conditions simply overwhelms our cultural capacity to cope with the challenge (Ostrom et al., 1999; Redman, 1999).

Furthermore, the recommendations are not a universal plea to return to some historical ideal of self-sustaining communities. The important issue here is local control of some ecosystem services, not the complete set of services required for the survival of a particular community. After all, trade has historically been one of the key insurances against local disruptions in the production of ecosystem services (Redman, 1999). At the same time, trade is a double-edged sword. From the perspective of delimiting global material flows, trade ought to be no more than an insurance against breakdowns in local ecosystem services. From the perspective of restricting the movement of hazardous waste, world trade in toxics, like those built into televisions and computer monitors, necessitates major changes in trading patterns and human behavior. Eco-efficiency facilitates changes in neither trade nor behavior because it continues to institutionalize distant transfers and fails to differentiate between kinds of material.

Eco-efficiency as currently promoted by influential environmental policy makers rests on the interrelated beliefs that human beings can somehow turn their backs toward nature and rid themselves of their material shackles; and that their understanding of natural resource systems has reached a level enabling environmental management measures at the local level to be woven together into a coherent whole at the global level. With no historical evidence to support the beliefs, eco-efficiency remains hyperbole wrapped in contradiction.

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