ECOLOGICAL ECONOMICS. Proceedings of a Workshop. IREE/CIDA, Ottawa (1993) pp. 61-71.

APPLICATION OF ECOLOGICAL ECONOMICS TO DEVELOPMENT: THE INSTITUTIONAL DIMENSION

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THE ECOLOGICAL ECONOMICS FRAMEWORK

Ecological Economics (EE) is more than the sum of conventional economics and conventional ecology. Among the defining characteristics of Ecological Economics are: (a) the holistic view of the environment-economy system; (b) the view of the economic system as a subset of the natural system of the earth (the human household as a part of nature's household); (c) a primary concern with natural capital, resources and environmental services, which are the basis of any economic activity (in the EE view, resources are not considered free. They are considered to have a status similar to human-made capital, thus the term, natural capital); and (d) a greater concern with a wider range of human values than those normally considered by economists, including, for example, a moral obligation for future generations. Table 1 (from Costanza 1991) provides a comparison of Ecological Economics with conventional economics and ecology.

CONSIDERATION OF BIOPHYSICAL SYSTEMS IN ECOLOGICAL ECONOMICS

Figure 1 is a conceptualization of the evolution of Ecological Economics from classical (or conventional) economics (Colby 1991): EE takes into consideration market systems, biophysical systems, and socio-political systems.

Daly's three principles are an example of the way in which the EE perspective takes into consideration biophysical systems: (a) not to use renewable resources at rates that exceed their capacity to renew; (b) not to use nonrenewable resources at rates that exceed the capacity to substitute for them; and (c) not to use any resources beyond Earth's capacity to assimilate the wastes associated with their use (Daly and Cobb 1989).

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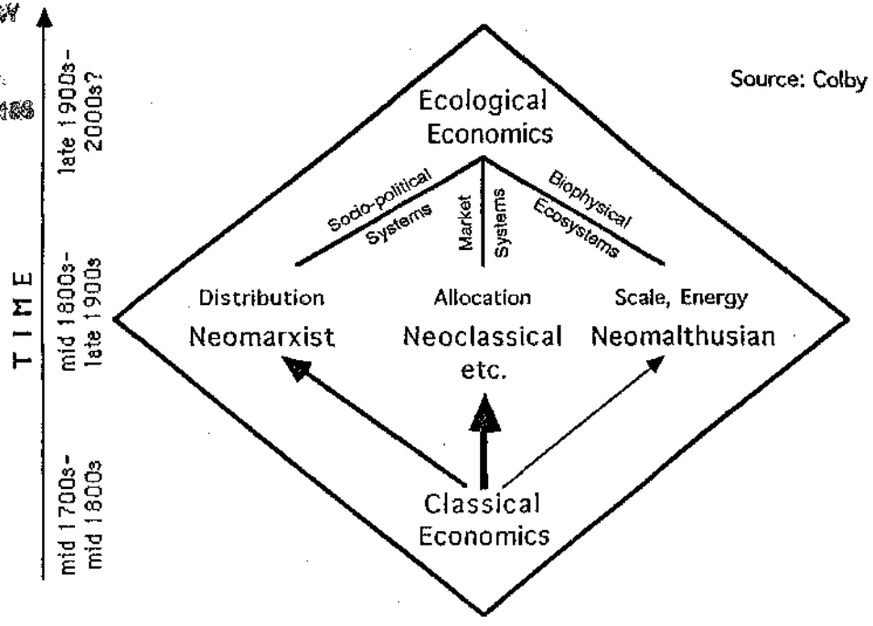
Figure 1: The Evolution of Economic Paradigms



Source: Colby 1991

The practical application of some of these EE principles has produced some startling conclusions. Figure 2 shows that the gross domestic product (GDP) of Indonesia increased at an average annual rate of 7.1 per cent from 1971 to 1984. Using the same data base, Repetto *et al.* (1989) estimated the net domestic product (NDP), taking into account the depletion of natural capital (petroleum, timber, soil) to achieve this increase in the GDP. In contrast to the GDP, they found that NDP rose by only 4.0 per cent per year (and probably less than that because only Java's natural capital depletion was considered).

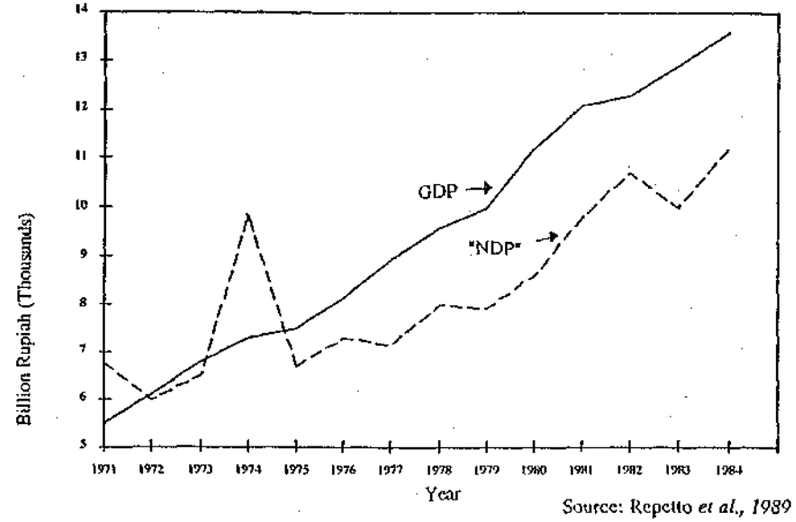
Similarly, Daly and Cobb (1989) estimated what they referred to as the Index of Sustainable Economic Welfare (ISEW) for the US economy for the period 1950 to 1986. The gross national product (GNP) appeared to be rising throughout that period, but this did not take into account the depletion of natural capital and the societal costs of pollution. When these costs were taken into account, the ISEW appeared relatively unchanged since about 1970 (Figure 3).

Table 1 Comparison of "Conventional" Economics with Ecological Economics

	"Conventional" Economics	"Conventional" Ecology	Ecological Economics
Basic World View	Mechanistic, Static, Atomistic Individual tastes and preferences taken as given and the dominant force. The resource base viewed as essentially limitless due to technical progress and infinite substitutability	Evolutionary, Atomistic Evolution acting at the genetic level viewed as the dominant force. The resource base is limited. Humans are just another species but are rarely studied.	Dynamic, Systems, Evolutionary Human preferences, understanding, technology and organization co-evolve to reflect broad ecological opportunities and constraints. Humans are responsible for understanding their role in the larger system and managing it sustainably.
Time Frame	Short 50 yrs. max, 1-4 yrs. usual	Multiscale Days to eons, but time scales often define non-communicating sub-disciplines	Multiscale Days to eons, multiscale synthesis
Space Frame	Local to International Framework invariant at increasing spatial scale, basic units change from individuals to firms to countries.	Local to Regional Most research has focused on smaller research sites in one ecosystem, but larger scales have become more important	Local to Global Hierarchy of scales
Species Frame	Humans Only Plants and animals only rarely included for contributory value	Non-Humans Only Attempts to find "pristine" ecosystems untouched by humans	Whole Ecosystem Including Humans Acknowledges interconnections between humans and rest of nature
Primary Macro Goal	Growth of National Economy	Survival of Species	Ecological Economic System Sustainability
Primary Micro Goal	Max Profits (firms) Max Utility (indivs) All agents following micro goals leads to macro goal being fulfilled. External costs and benefits given lip service but usually ignored	Max Reproductive Success All agents following micro goals leads to macro goal being fulfilled	Must Be Adjusted to Reflect System Goals Social organizations and cultural institutions at higher levels of the space/time hierarchy ameliorate conflicts produced by myopic pursuit of micro goals at lower levels
Assumptions About Technical Progress	Very Optimistic	Pessimistic or No Opinion	Prudently Skeptical
Academic Stance	Disciplinary Monistic, focus on mathematical tools	Disciplinary More pluralistic than economics, but still focused on tools and techniques. Few rewards for integrative work	Transdisciplinary Pluralistic, focus on problems.

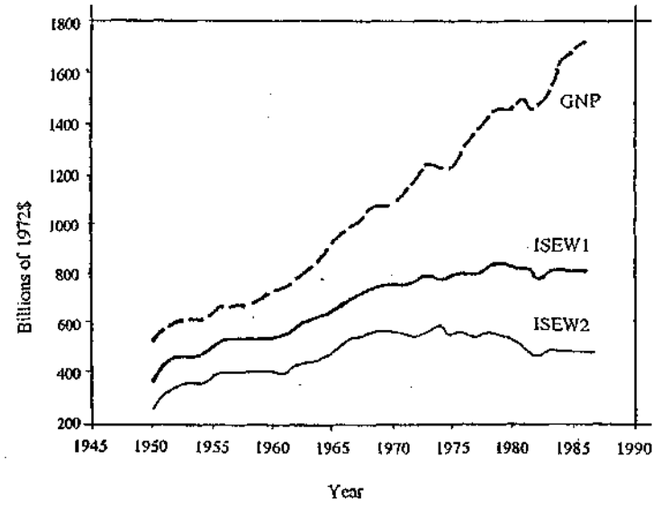
Source: Costanza 1991, Chapter 1

Figure 2: GDP and "NDP", in Constant 1973 Rupiah



Source: Repetto *et al., 1989*

Figure 3: US GNP compared to the Index of Sustainable Economic Welfare (ISEW, from Daly and Cobb 1989) for the interval 1950 to 1986. ISEW2 includes corrections for depletion of non-renewable resources and long term environmental damage; ISEW1 does not.



Source: Daly and Cobb, 1989

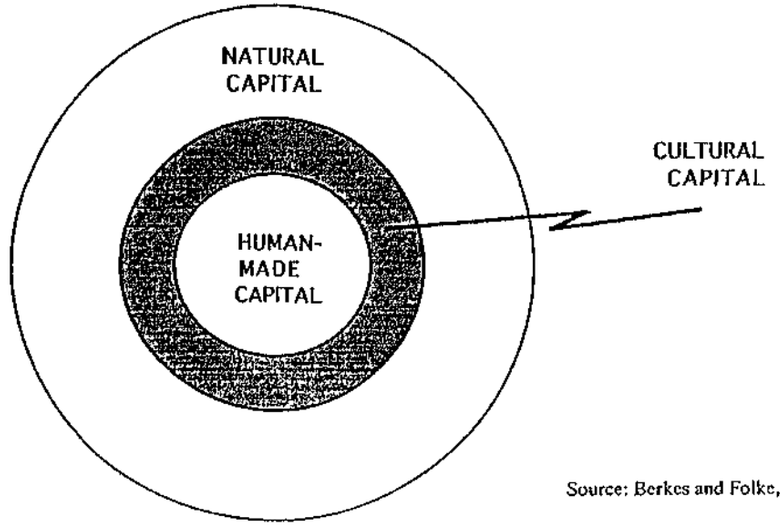
CONSIDERATION OF SOCIO-POLITICAL SYSTEMS IN ECOLOGICAL ECONOMICS

The emphasis in the rest of this paper is the third leg of the EE tripod in Figure 1. The following is largely adapted from Berkes and Folke (1992) and Berkes and Feeny (1990).

Just as resources and environmental services are considered a kind of capital (natural capital), the factors that provide human societies with the means and adaptations to deal with the natural environment may also be considered a kind of capital. This we have called "cultural capital" (Berkes and Folke, 1992); others have used the terms social capital or institutional capital (e.g. Ostrom, 1990) to capture similar dimensions. In simplest terms, cultural capital is the interface between natural capital and human-made capital (Figure 4). Our world view, values, knowledge, and institutions shape, the way in which we treat the environment.

A more complex view of the interrelationships among the three kinds of capital is provided in Figure 5. Natural capital is the basis, the precondition, for cultural capital. Human-made capital is generated by an interaction between natural and cultural capital. Human-made capital, in turn, may cause an alteration of cultural capital. Technologies that mask the society's dependence on natural capital encourage people to think that they are above nature. The more extensive this change in thinking, the more technologies of a similar type will be developed, leading to more impacts on natural capital. Positive feedback established between cultural capital and human-made capital enhances this trend. There will be resource depletion and environmental degradation to feed an industrial society that requires ever-increasing amounts of raw materials, and that generates ever-increasing amounts of waste. Cultural capital will, to a large extent, determine how a society uses natural capital to "create" human-made capital. Approaching sustainability will require "investing" in cultural capital as well as in natural capital. Figure 6 summarizes some of the ways in which cultural capital may be conserved and enhanced.

Figure 4: Cultural capital is the interface between natural capital and human-made capital.



Source: Berkes and Folke, 1992

Figure 5: First-order interrelationships among natural capital (NC), human-made capital (H-MC) and cultural capital (CC)

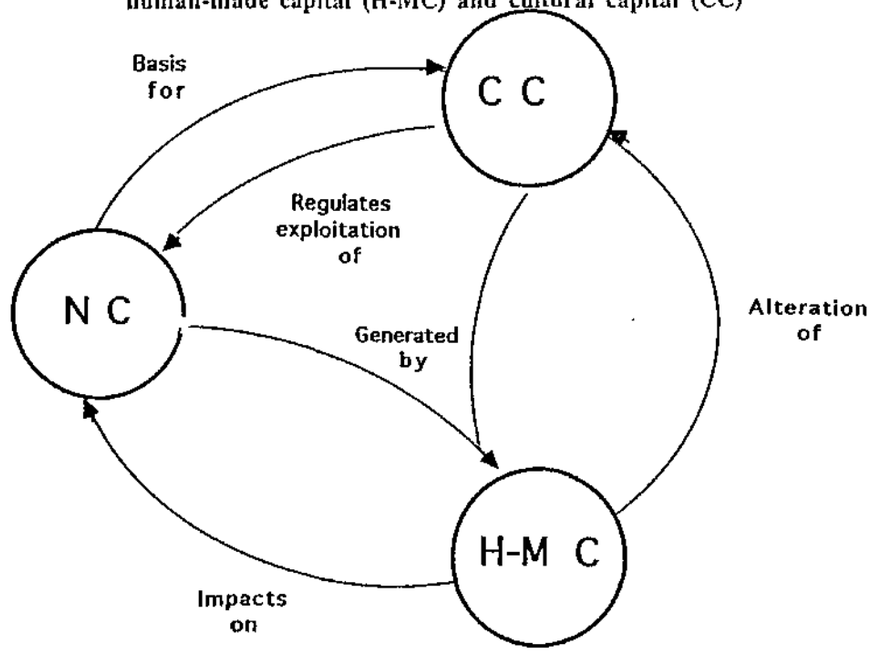
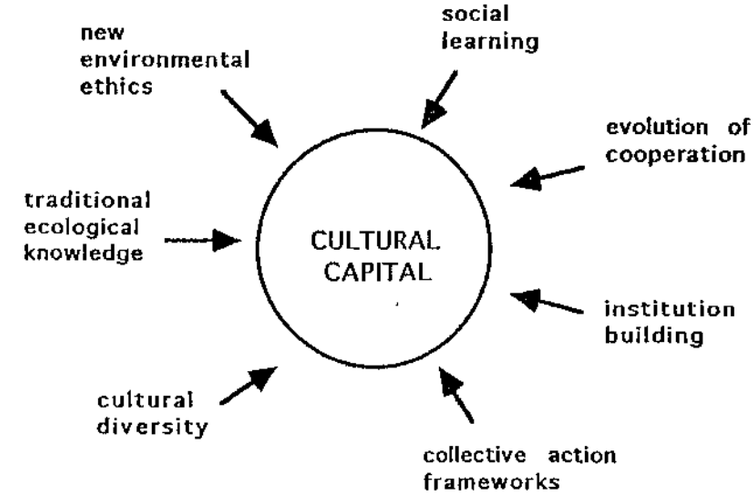


Figure 6: Conserving and enhancing cultural capital towards self-organization for sustainability



Source: Berkes and Folke, 1992

LOCAL INSTITUTIONS FOR DEVELOPMENT

A major component of cultural capital has to do with institutions, cooperation and collective action. This is so because most local resources (or natural capital) on which development is based in the rural areas of south east Asia (and indeed in most parts of the world) are common-property resources. The sustainable use of these resources depends on appropriate communal management institutions.

Formally, common-property (or common-pool) resources share two key characteristics: control of access of potential users is problematic; and each user is capable of subtracting from the welfare of other users. Hence, common-property (common-pool) resources are defined as "a class of resources for which exclusion is difficult and joint use involves subtractability" (Berkes, 1989).

Many traditional societies have a rich heritage of communal management systems. Many of these have continued to be viable, including irrigation water management systems in south and south east Asia. (See Box 1). Such self-regulatory systems are

Box 1: Irrigation Water Management in Andhra Pradesh

In semi-arid Andhra Pradesh in south India, agricultural production is highly variable, and irrigation plays an important role. Robert Wade provides a lucid analysis of water management in the village of Kottapalle, which is located at the tail end of a 32 kilometre irrigation canal. Because irrigated water becomes progressively more scarce and less reliable as one moves down the canal, there is a strong incentive for Kottapalle villagers to organize and improve the management of available water. The solidarity of the intra-village coalition of water users is strengthened by the scattering of plots which means that households frequently find themselves both at the head and tail ends of distribution channels within the village.

To manage the village-irrigation system, 12 to 13 common irrigators are hired each year at the end of September when the heavy rains have stopped and the crop comes to depend on canal water. Their tasks include the diversion of more water into the village from the government-operated main channel, the repair and maintenance of facilities within the village, the resolution of conflicts among users, and the distribution of water along each outlet. The rule for allocation is that all fields along an outlet must be adequately wetted before any user may have another turn. Common irrigators are paid at the harvest time by the landowners they serve, according to the area irrigated, at rates set by the village council. Those who fail to pay are cut off from irrigation water in the following year. Fines are levied for other infractions.

This village-level system operated effectively without the knowledge or support of the government irrigation department. Although the villagers may not be using water optimally, they have successfully devised and maintained a water management system, improving their welfare in the process.
Wades's analysis covers 41 villages in South India, 31 of which have irrigation. Despite the conventional view to the contrary, he finds collective action in a significant number of these villages. There is self-management in the provision of public goods and services through local arrangements, as if these villages were little republics unto themselves. These arrangements have little to do with outside bodies, whether government or voluntary agencies. Wade, however, does see a role for the state to provide legal recognition of village organizations' identities and rights, and to be an enforcer of last resort.

For details see Robert Wade, *Village Republics: Economic Conditions for Collective Action in South India* (Cambridge University Press, 1988).

not absent in the western world either, and may be found, for example, in some coastal fisheries of such industrialized countries as the United States and Canada (Berkes, 1989, for examples).

Sustainable management of common property resources requires an understanding of the associated common property institutions governing use, their historical and cultural context, and the ecological and physical nature of the resource. It also requires an understanding of the interactions between institutional arrangements, technology, market forces, and the resource system itself. In general, institutional arrangements to manage common property resources include formal or informal rules concerning who may use the resource, who is excluded from using the resource, and how the users shall conduct themselves in the use and sharing of the resource in question (Bromley, 1989). The rules may be quite complicated, as in the case of some traditional societies, or very simple, as with the rule, "you must be a member of this community to use this resource" (Ostrom, 1990).

Strategies for sustainable development of natural resources would benefit from a systematic analysis and search of any existing management institutions for the resource in question. Resources that may initially appear to be unowned *(res nullius)* may, in fact, turn out to be commonly owned and managed *(res communes)*. The practical significance of such a finding is that a presumed case of "free-for-all" leading to the dilemma of the commons and overuse of the resource may not, in fact, materialize. If the existing common property arrangements are working well, it may be wise to restrain prescriptions for additional government controls or privatization.

Once existing common property institutions have been identified, development planners may rely on, or simply assist the community of users to set development goals and to implement them. To make this possible, the relevant institutions may need to be recognized and strengthened, as many of them may be under pressure. In cases in which traditional management is weakening, government legislation may be necessary to legitimize and protect existing common property institutions (Malayang, 1991).

POLICY CONSIDERATIONS FOR DEVELOPMENT PLANNERS

Private, state and communal property regimes are all potentially viable approaches for common-property management. In practice, resources are often held in overlapping combinations of these three property-rights regimes. Even though a given regime may provide a better match for a particular resource, none of the three regimes is intrinsically

superior to any other. However, the emphasis here is on communal property solutions because the viability of the other two regimes has long been recognized.

The elements of a long-term strategy for sustainable development planners for common property resource conservation include:

(a) identification of common property institutions, if any, applicable to the resource in question;
(b) consideration of a relevant and effective mix of institutional arrangements and property-rights regimes;
(c) recognition, legitimization and strengthening of common property institutions, if these are indeed to be an important part of the management or development plan; and
(d) promotion of their use as mechanisms of local-level participation in the planning and implementation of sustainable development.

Special attention may be given to co-management approaches and to the use of appropriate technology in common property management. Often, locally-developed appropriate technology goes hand-in-hand with sustainable use, while large-scale, exploitive technology is accompanied by short-term economic objectives and the "mining out" of the resource base. This is an issue that has been receiving attention from ecological economists (see Daly's three principles summarized earlier).

Universal prescriptions that would be applicable to all types of common property resources would be difficult or impossible to formulate. The management of common property resources has to be tailor-made for the particular resource and setting in question. This often requires an interdisciplinary approach and the use of local information and indigenous knowledge. Bringing together traditional knowledge and scientific knowledge is one of the major challenges. So is bringing together local-level managers and government managers. It is not always easy to determine if a resource is used as communal property or not-there are "grey" areas.

Short- and medium-term action elements to implement strategic objectives include pilot projects to identify common property institutions, in order to recognize, legitimize and strengthen them as mechanisms of local-level participation in planning and implementing sustainable development. Continuing research and documentation are needed to identify the diversity and effectiveness of these institutions. Of special importance is the identification of players or actors in common property institutions.

Development assistance should incorporate concern for, and sensitivity to, common property institutions. Special attention should be given to any existing institutions that may assist in formulating planning objectives and meeting goals of sustainable development. The explicit consideration both of the resource and institutions, and subsequent local-level participation, is likely to contribute to the effectiveness of any plan.

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