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Changing Visions of Humans' Place in the World and the Need for an Ecological Economics

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Practical problem-solving in complex, human-dominated ecosystems requires the integration of three elements: (1) active and ongoing envisioning of both how the world works and how we would like the world to be; (2) systematic analysis appropriate to and consistent with the vision; and (3) implementation appropriate to the vision. Scientists generally focus on only the second of these steps, but integrating all three is essential to both good science and effective management. 'Subjective' values enter into the 'vision' element, both in terms of the formation of broad social goals and in the creation of a 'pre-analytic vision' which necessarily precedes any form of scientific analysis.

Research concerning the process of change in various kinds of organizations and communities suggests that a necessary ingredient of moving change in a particular direction is having a clear vision of the desired goal, a vision which is also truly shared by the members of the organization or community (Senge 1990, Wiesbord 1992, Wiesbord and Janoff 1995). Or, as Yogi Berra once said: 'If you don't know where you're going, you end up somewhere else.'

VISIONS OF THE ECONOMY AND ITS RELATIONSHIP TO THE ECOLOGICAL LIFE SUPPORT SYSTEM

Our 'pre-analytic vision' of both how the human economy and society relate to the rest of nature and of the economy itself are changing. The human economy has passed from an 'empty world' era in which human-made capital was the limiting factor in economic development to the current 'full world'

era in which remaining natural capital has become the limiting factor (Daly and Cobb 1989, Costanza *et al.* 1997). Basic economic logic tells us that we should maximize the productivity of the scarcest (limiting) factor, as well as try to increase its supply. This means that economic policy should be designed to increase the productivity of natural capital and its total amount, rather than to increase the productivity of human-made capital and its accumulation, as was appropriate in the past when this form of capital was limiting. This implies a very different vision of the economy and its place in the overall ecosystem.

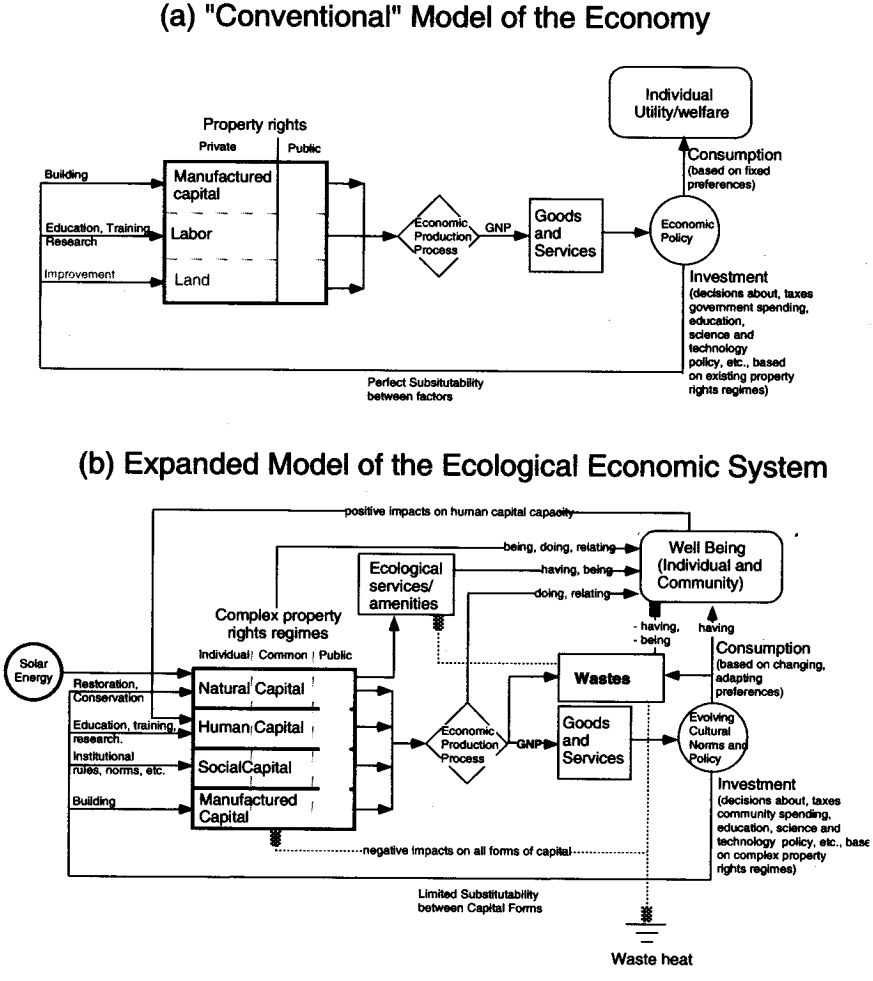

Figure 1. (a) Conventional (empty world) economics model and (b) expanded (full world) 'ecological economics' model.

Figure 1a shows the conventional (empty world) economic pre-analytic vision. The primary factors of production (land, labor, and capital) combine in the economic process to produce goods and services (usually measured as Gross National Product or GNP). GNP is divided into consumption (which is the sole perceived contributor to individual utility and welfare) and investment (which goes into maintaining and increasing the capital stocks). Preferences are fixed. In this model the primary factors are perfect substitutes for each other so 'land' (including ecosystem services) can be almost ignored since one could always substitute more labor or capital for it. Property rights are usually simplified to either private or public and their distribution is usually taken as given. There is nothing in this model that would in any way prevent the economy from growing indefinitely. The main policy question thus becomes: how much should we consume vs. invest in each time period in order to keep the economy growing at the 'optimal' (i.e. fastest possible) rate. If 'welfare' equates to the absolute level of consumption of marketed goods and services then (under this vision) we are maximizing welfare by maximizing the discounted stream of consumption into the future.

Almost all economic policy today is still made based on this vision of the world. If GNP decreases for even a quarter, the 'health' of the economy is thought to be in severe trouble and we have to do everything in our power to get the economy 'growing' again.

What's wrong with this model/vision? The list is long, but here is a brief and partial summary:

- It ignores physical reality, the laws of thermodynamics, and the fact that the economy is a subsystem of the larger global ecosystem. Note that there is no 'waste' in the empty world model. It is a perpetual motion machine that can run forever on its own output.
- It assumes near-perfect substitutability between the main factors of production (land, labor and capital) such that the economy could continue to grow indefinitely, even with no natural resources.
- The view of human psychology embedded in the model is hopelessly simplistic and inaccurate. Psychological research has clearly shown that (beyond a fairly low level) consumption of goods and services is only one of many factors that contribute to human well-being, and that within the consumption factor it is relative rather than absolute consumption that is the more important criteria (Kahneman *et al.* 1999, Kasser 2002).
- It assumes that tastes and preferences are fixed and given, when in fact it is well known that they are evolving and changing in response to a host of influences, including advertising (Norton *et al.* 1998).

- It assumes that humans are rational actors with fixed preferences and perfect information. They value things according to their relative ability to satisfy their individual preferences and there is no interpersonal interaction of one person's preferences with any others'.
- It ignores direct, non-marketed contributions to human welfare by factors such as ecosystem services, a fulfilling job, and family and community social interactions.
- Its view of property rights is simplistic and ignores the many forms of community ownership that have proven effective in many contexts. It also ignores the distribution of these property rights as a problem that is outside the boundaries of economics.

AN ALTERNATIVE MODEL

Figure 1b shows an alternative 'ecological economics' or 'full world' vision of the process (Ekins 1992, Costanza *et al.* 1997) that attempts to address the problems and limitations of the 'empty world' model noted above. Notice that some of the key elements of the conventional model are still present, but much more has been added and many basic assumptions and priorities have changed, including:

1. There is limited substitutability between the basic forms of capital in this model and their number has expanded to four. Their names have also changed to better reflect their roles: (1) natural capital (formerly land) includes ecological systems, mineral deposits and other aspects of the natural world; (2) human capital (formerly labor) includes both the physical labor of humans and the know-how stored in their brains; (3) manufactured or built capital includes all the machines and other infrastructure of the human economy; and (4) social (or cultural) capital includes the web of interpersonal connections, institutional arrangements, rules and norms that allow individual human interactions to occur (Berkes and Folke 1994).
2. Property rights regimes in this model are complex and flexible, spanning the range from individual to common to public property.
3. Natural capital contributes to the production of marketed economic goods and services, which affect human welfare. It also produces ecological services and amenities that directly contribute to human welfare without ever passing through markets.
4. Natural capital captures solar energy and behaves as an autonomous complex system. The model conforms to the basic laws of thermodynamics (conservation of mass and energy, the need for low entropy inputs to keep the system running).

5. There is waste production by the economic process, which contributes negatively to human welfare and has a negative impact on capital and ecological services.
6. Preferences are adapting and changing but basic human needs are constant. Human welfare is a function of much more than the absolute level of consumption of economic goods and services. Welfare involves consumption relative to perceived peers, participation in decisions, a sense of fairness about the distribution of resources, non-marketed benefits from ecosystem services, social interactions at many scales, and other factors.
7. People have limited knowledge and 'rationality' and limited ability to process the information they do have. The value of things has to do with their contribution to the broader conception of human welfare sketched above, rather than the narrow conception embodied in the 'empty world' model.

These visions of the world are significantly different. As Ekins (1992) points out: 'It must be stressed that ~~that~~ the complexities and feedbacks of model 2 are not simply glosses on model 1's simpler portrayal of reality. They fundamentally alter the perceived nature of that reality and in ignoring them conventional analysis produces serious errors...' (151).

One could expand on any of the issues above, and other chapters in this book do just that. In what follows, I'll expand a bit on the valuation issue, as it has been a core concept in economics since its inception.

VALUATION AND SOCIAL GOALS

Valuation ultimately refers to the contribution of an item to meeting a specific goal or objective. A player on a sports team is valuable to the extent that he or she contributes to the goal of the team's winning. In ecology, a gene is valuable to the extent it contributes to the survival of the individuals possessing it, and thus their ability to produce progeny. In conventional economics, a commodity is valuable to the extent it contributes to the goal of individual welfare as assessed by willingness to pay. The point is that one cannot state a value without stating the goal being served. Conventional economic value is based on the goal of individual welfare or utility maximization. But other goals, and thus other values, are possible and may be more important to human welfare, more broadly conceived. For example, if the goal is sustainability, one should assess value based on the contribution to achieving that goal – in addition to value based on the goals of individual utility maximization, social equity, or other goals that may be deemed important. This broadening is particularly important if the goals are potentially in conflict.

There are at least three broad goals which have been identified as important to managing economic systems within the context of the planet's ecological life support system (Daly 1992):

1. assessing and insuring that the scale or magnitude of human activities within the biosphere are ecologically sustainable;
2. distributing resources and property rights fairly, both within the current generation of humans and between this and future generations, and also between humans and other species; and
3. efficiently allocating resources as constrained and defined by 1 and 2 above, and including both marketed and non-marketed resources, especially ecosystem services.

Several authors have discussed valuation of ecosystem services with respect to goal 3 above – allocative efficiency based on individual utility maximization (e.g. Farber and Costanza 1987, Mitchell and Carson 1989, Costanza *et al.* 1989, Dixon and Hufschmidt 1990, Pearce 1993, Goulder and Kennedy 1997). We need to explore more fully the implications of extending these concepts to include valuation with respect to the other two goals of (1) ecological sustainability, and (2) distributional fairness (Costanza and Folke 1997). Basing valuation on current individual preferences and utility maximization alone, as is done in conventional analysis, does not necessarily lead to ecological sustainability or social fairness (Bishop 1993).

A Kantian or intrinsic rights approach to valuation (see Goulder and Kennedy 1997) is one approach to goal 2, but it is important to recognize that the three goals are not 'either-or' alternatives. While they are in some senses independent multiple criteria (Arrow and Raynaud 1986) they must all be satisfied in an integrated fashion to allow human life to continue in a desirable way. Similarly, the valuations that flow from these goals are not 'either-or' alternatives. Rather than an 'utilitarian or intrinsic rights' dichotomy, we must integrate the three goals listed above and their consequent valuations.

A two-tiered approach that combines public discussion and consensus building on sustainability and equity goals at the community level with methods for modifying both prices and preferences at the individual level to better reflect these community goals may be necessary (Rawls 1971, Norton 1995, Norton *et al.* 1998). Estimation of ecosystem values based on sustainability and fairness goals requires treating preferences as endogenous and co-evolving with other ecological, economic, and social variables.

VALUATION WITH SUSTAINABILITY, FAIRNESS, AND EFFICIENCY AS GOALS

Thus, we can distinguish at least three types of value which are relevant to the broader goal of maintaining human welfare. These are laid out in Table 1,

according to their corresponding goal or value basis. Efficiency-based value (E-value) is based on a model of human behavior sometimes referred to as '*Homo economius*' – that humans act independently, rationally and in their own self-interest. Value in this context (E-value) is based on current individual preferences, which are assumed to be fixed or given (Norton *et al.* 1998). No additional discussion or scientific input is required to form these preferences (since they are assumed to already exist) and value is simply people's revealed willingness to pay for the good or service in question. The best estimate of what people are willing to pay is thought to be what they would actually pay in a well-functioning market. For resources or services for which there is no market (like many ecosystem services) a pseudo-market can sometimes be simulated with questionnaires that elicit individual's 'contingent' valuation.

Fairness based value (F-value) would require that individuals vote their preferences as a member of the community, not as individuals. This different 'species' (*Homo communicus*) would engage in much discussion with other members of the community and come to consensus on the values that would be fair to all members of the current and future community (including non-human species), incorporating scientific information about possible future consequences as necessary. One method to implement this might be Rawls' (1971) idea of the 'veil of ignorance', where everyone votes as if they were operating with no knowledge of their own individual status in current or future society.

Table 1. Valuation of ecosystem services based on the three primary goals of efficiency, fairness, and sustainability (Costanza and Folke 1997)

Goal or Value Basis	Who votes	Preference Basis	Level of Discussion Required	Level of Scientific Input Required	Specific Methods
Efficiency	*Homo economius*	Current individual preferences	low	low	willingness to pay
Fairness	*Homo communicus*	Community preferences	high	medium	veil of ignorance
Sustainability	*Homo naturalis*	Whole system preferences	medium	high	modeling with precaution

Sustainability-based value (S-value) would require an assessment of the contribution to ecological sustainability of the item in question. For example,

the S-value of ecosystem services is connected to their physical, chemical, and biological role in the long-term functioning of the global system. Scientific information about the functioning of the global system is thus critical in assessing S-value, and some discussion and consensus-building is also necessary. If it is accepted that all species, no matter how seemingly uninteresting or lacking in immediate utility, have a role to play in natural ecosystems (Naeem *et al.* 1994, Tilman and Downing 1994, Holling *et al.* 1995), estimates of ecosystem services may be derived from scientific studies of the role of ecosystems and their biota in the overall system, without direct reference to current human preferences. Humans operate as *Homo naturalis* in this context, expressing preferences as if they were representatives of the whole system. Instead of being merely an expression of current individual preferences, S-value becomes a system characteristic related to the item's evolutionary contribution to the survival of the linked ecological economic system. Using this perspective we may be able to better estimate the values contributed by, say, maintenance of water and atmospheric quality to long-term human well-being, including protecting the opportunities of choice for future generations (Golley 1994, Perrings 1994). One way to get at these values, would be to employ systems-simulation models that incorporated the major linkages in the system at the appropriate time and space scales (Costanza *et al.* 1993, 2002, Boumans *et al.* 2002). To account for the large uncertainties involved, these models would have to be used in a precautionary way, looking for the range of possible values and erring on the side of caution (Costanza and Perrings 1990).

In order to fully integrate the three goals of ecological sustainability, social fairness, and economic efficiency we also need a further step, which Sen (1995) has described as 'value formation through public discussion'. This can be seen as the essence of real democracy. As Buchanan (1954: 120) put it: 'The definition of democracy as 'government by discussion' implies that individual values can and do change in the process of decision-making.' Limiting our valuations and social decision-making to the goal of economic efficiency based on fixed preferences prevents the needed democratic discussion of values and options and leaves us with only the 'illusion of choice' (Schmookler 1993). So, rather than trying to avoid the difficult questions of valuation, we need to acknowledge the broad range of goals being served as well as the technical difficulties involved. We must get on with the process of value formation and analysis in as participatory and democratic a way as possible, but one which also takes advantage of the full range and depth of scientific information we have accumulated on system functioning. This is not simply the application of the conventional pre-analytic vision and analyses to a new problem, but will require the new, more comprehensive, more integrated, pre-analytic vision

discussed above, and new, yet to be developed, analyses and valuation techniques that flow from it. This will be an enormously important challenge for the next generation of ecologists and economists working together in the transdisciplinary field of ecological economics.

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