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**Social Science Library: Frontier Thinking in Sustainable Development and Human Well-being**

### **"Accounting and Evaluation" by Jonathan M. Harris**

One of the known weaknesses in standard economic theory is its reliance on Gross National Product or Gross Domestic Product accounts as a measure of income. Some of the limitations and inconsistencies in GNP/GDP have long been known to economists, including the failure to account for unpaid work, leisure time, and pollution damage. Ecological economists have expanded the critique of GNP, and have started to propose alternative measures. The issue is potentially of enormous significance for policy. Growth in GNP is almost always a major economic policy goal, and GNP accounts provide the measure of success or failure in meeting this goal. If we change the yardstick of measurement, our policy priorities will undoubtedly change also.

GNP/GDP has not proved easy to displace, however. One reason for this is the strong attachment of statistical authorities to existing measurement categories. Another is the difficulty of achieving agreement among the critics on a clearly definable alternative standard - or even on whether such a standard should be sought. Efforts to grapple with this issue have given rise to an expanding literature on the subject, including a number of practical applications of revised national income analysis.

The case for new accounting techniques was first presented comprehensively in the UNEP/World Bank report Environmental Accounting for Sustainable Development, (1989) edited by Yusuf J. Ahmad, Salah El Serafy, and Ernst Lutz. The contributors to this volume argue that a measure of *sustainable* income is needed, which standard GDP measures fail to provide. This argument is consistent with the widely accepted "Hicksian" definition of income, according to which current consumption can only be considered income if it does not reduce future welfare through depletion of assets. GDP fails to distinguish between income derived from production and income derived from depleting *natural capital* assets such as forests, soils, and mineral reserves. It also fails to identify *defensive expenditures* such as costs of cleaning up pollution or restoring eroded soils. While these activities in themselves are productive, it is a form of *double counting* to add both the pollution-creating activities and the resulting cleanup activities into GDP.

The clear implication of these criticisms is that if natural resource depletion and pollution are significant factors, standard GDP may grossly overstate the well-being of an economy. The contributors to the UNEP/World Bank report suggest a systematic response to these problems - essentially offering methods to subtract the value of natural resource depreciation and defensive

expenditures from standard GDP. This raises many questions of appropriate techniques for identifying and assigning a value to these factors. One set of issues in accounting and valuation concerns these questions of techniques for adjusting GDP figures. Another, broader discussion concerns whether it is appropriate to "adjust" an inherently flawed measure at all, with some authors suggesting that completely different, more ecologically based measures should be used, and others proposing "pluralism," with no single measure dominating.

Prominent among those arguing for pluralism in national accounts is Richard Norgaard. In "Three Dilemmas of Environmental Accounting" he traces the environmental and resource depletion issues to more fundamental inconsistencies in the logic of GDP accounting, and in economic theory itself. This is a central point for ecological economics. The criticisms of the neoclassical paradigm raised by ecological economists have already been extensively discussed. In view of these sweeping criticisms, does it make any sense to accept a modified version of the neoclassical GDP construct as an adequate index of economic activity? Practical considerations may imply the need for a straightforward, single-value estimate of "modified" GDP to compete with standard GDP for the attention of policy-makers. But in Norgaard's view there cannot be a theoretical justification for the use of such a measure. Rather, we must seek to measure different dimensions of economic and ecological reality, and oppose any single standardized system of accounts.

From the opposite, systematizing point of view there have been numerous efforts to offer, in Roefie Huetting's words, "a practical solution for a theoretical dilemma." Huetting's own proposal is to define a standard of sustainability, then adjust present GDP figures based on the estimated cost of achieving this standard. Jan Tinbergen and Roefie Huetting point out the paradox that environmental improvement may imply *lower* GNP but *higher* welfare (as when bicycles substitute for cars, or agricultural land is fallowed to rebuild soils). The use of an environmental standard system corrects for this inherent bias in GDP accounts. Henry Peskin advocates a similar system, using neoclassical techniques to measure the "services" provided by the environment as well as natural capital depreciation.<sup>1</sup> This system has been applied in a US Environmental Protection Agency pilot study of the Chesapeake Bay region.

The article by Peskin and Lutz summarized here provides an overview of accounting techniques appropriate for environmentally-adjusted national income accounts, but offers no single recommended system. Peskin and Lutz also draw attention to the differences between industrialized and developing nations in this area; developing nations tend to be more resource-based and have more glaring environmental problems, but statistical data to account for this is often lacking. For the United States, Herman Daly and John Cobb have presented a systematic "Index of Sustainable Economic Welfare" which deconstructs national income analysis by sector to impose standards of sustainability (and equity) on all elements of the national income accounts.<sup>2</sup> No such measure has yet been derived for developing nations. The United Nations Development Programme's Human Development Report offers a GDP alternative based primarily on social factors, though they have recently introduced some environmental categories into their calculations of a "Human Development Index."<sup>3</sup>

During the period since the 1989 World Bank volume, considerable empirical work has been done to apply natural resource accounting techniques to specific countries. Robert Repetto and

his associates at the World Resources Institute have published a number of natural resource accounting studies for developing nations, including Indonesia, the Philippines, and Costa Rica.<sup>4</sup> The studies can be summarized graphically as modified GDP time series, showing quite dramatically the difference made by an accounting for such factors as petroleum depletion, forest loss, and soil erosion in the growth trend of GDP. When investment trends are similarly presented graphically, the results are even more striking, with adjusted net investment becoming negative during years when gross investment appears high and rising.

Salah El Serafy has revised the results of Repetto's study of Indonesia to make the figures more compatible with standard accounting techniques. In his rendition, the series are less volatile but show equally dramatic differences in the interpretation of net investment. Kirk Hamilton has applied similar techniques to calculation of net savings, arriving at the startling conclusion that for most of the developing world, net savings have been negative since the mid-seventies when resource and environmental factors are included.<sup>5</sup>

The United Nations has performed similar resource accounting studies for Mexico, Papua New Guinea, and Thailand.<sup>6</sup> While this expanding list of country studies does not offer a systematic substitute for standard GDP, it does offer a detailed array of more environmentally-sensitive measures for the consideration of development policy-makers.

Another, more radical, approach to a systematic revision of national accounts would be to use a completely different basis for measuring economic activity. Malcolm Slessor, following the logic of the energetic school discussed in Section IV, proposes the use of an energy/embodied energy *numéraire*. Together with Jane King, he has developed a simulation model based on embodied energy which is offered as an alternative to standard GNP analysis. The model is used to study development options, with a special focus on the potential for transition to a solar-based economy.<sup>7</sup> Slessor uses the term "natural capital accounting" to distinguish this methodology from the more conservative approaches which have been developed by economists for resource accounting.

Georgescu-Roegen, as we have already seen, criticizes energetic models on the ground that "matter matters too," and cannot be subsumed in a single energy measure. A measure such as Slessor and King's undoubtedly focuses attention on the essential role of energy supplies in expanding carrying capacity, but perhaps we should bear in mind the criticisms of energetics, as well as Norgaard's call for pluralism, and regard such work as providing one measure, rather than the best or only measure, of economic activity.

Glenn-Marie Lange and Faye Duchin are skeptical about the value of environmentally-adjusted national income measures for different reasons. In their view, there are too many methodological barriers to the construction of a single "alternative" measure, and the one-dimensionality of any such measure fails to capture the complex requirements of true sustainability. They propose instead the use of *satellite accounts* covering environment and resource data for different economic sectors. There is already practical experience with the compilation of such accounts in a number of countries. Lange and Duchin feel that they are better suited to policy analysis and development planning than any single measure. This is likely

to prove true; but one criticism of the satellite approach might be that it leaves GDP measures, with all their distortions and internal contradictions, unaffected.

The longest and most successful experience with satellite national resource accounts has been that of Norway. Lange and Duchin cite the use of the Norwegian accounts in formulating energy, environmental, and land use policies. However, when we move to developing nations, data limitations are a major constraint on the construction and use of such accounts. For Botswana, preliminary accounts for important natural resource sectors have been compiled, but they are not yet available for other African countries. In general, the urgency of the need to address a particular policy problem, such as rangeland degradation, must be balanced against the costs of data collection. This is no small issue for a poor nation like Botswana. Unless significant resources are made available internationally for this specific purpose, policy formulation in developing nations will likely be severely hampered by lack of the necessary resource accounts.

Several of the articles summarized here address more specific problems of valuation and discounting in areas involving resource and environmental policy. Markandya and Pearce deal with the issue of discounting, pointing out the (probably insuperable) theoretical problems in selecting a single discount rate. They acknowledge that present social discount rates undervalue the interests of future generations and undercut environmental sustainability. Similarly, the standard economic approaches to risk and uncertainty (adding a risk premium to discount rates) may be inappropriate in evaluating the possibility of irreversible and catastrophic environmental damage. But rather than attempting to adjust discount rates, Markandya and Pearce favor imposing a sustainability constraint while continuing to use standard discounting for analysis of resource allocation.

Norgaard's article on "Economic Indicators of Resource Scarcity: A Critical Essay" makes the point that market prices reflect not real resource scarcity but the subjective judgments of resource allocators as to the existence of scarcity. This can be related to the discounting controversy. Current market participants typically give insufficient weight to damages inflicted on future generations; present known profits from resource exploitation are more attractive than uncertain future profits from resource conservation. Most economists, however, assume that current market prices accurately reflect resource values, and regard any modification of market prices as the imposition of a value judgment. In fact, the value judgment that consumption today takes precedence over sustainability has already been imposed by resource allocators, and is embodied in market price structures, as well as discount rates.

The standard economic techniques of cost-benefit analysis and contingent valuation are reviewed in Per-Olov Johansson's article, and subjected to a sweeping critique in the articles by Sagoff and by Funtowicz and Ravetz. No doubt the money-value measurement of environmental damage has its place, and the methods devised by economists for valuation (survey research, travel costs, hedonic prices, etc.) are better than assigning an implicit value of zero to "intangible" environmental factors. But as Sagoff points out, there are serious pitfalls in assuming that market valuation can be applied to the environment. Market valuation is based, in economic theory, on individual utility. But utility is a notoriously slippery concept, not susceptible to direct observation or measurement. If individuals can be induced to state a valuation for an

environmental "amenity," it is questionable whether they would really be happier if paid that dollar sum in return for destruction of the amenity. Sagoff cites the results of a Wyoming study in which participants simply refused to place a dollar valuation on the environment.

In a similar vein, Funtowicz and Ravetz argue that there are epistemological assumptions embodied in economic valuation which are simply inappropriate for dealing with the complex ecosystems and ethical values at the center of many environmental policy issues. Their prescription of a "post-normal" scientific methodology is quite similar to Norgaard's methodological pluralism. The problem with standard economic methods, in this view, is not any technical deficiency but the underlying assumption that environmental considerations can be "scientifically" measured as money equivalents. If we adopt this view, then any numerically precise measure of GNP/GDP looks suspect.

A different perspective on income accounting has been proposed by Bruce Hannon. Rather than revising or substituting for GNP measures, he suggests a contrasting measure of ecosystem health - the "Gross Ecosystem Product" or GEP.<sup>8</sup> The GEP is distinguished from GNP in that it can grow only up to an inherent limit. Further, GEP competes with GNP in the sense that increased economic output (at least using present fossil-fuel based techniques) tends to *lower* GEP. The suggested goal, therefore, is to reform production techniques to make GNP and GEP more compatible - a process which clearly implies an upper limit to GNP growth as well. Hannon's approach, based as it is in ecological rather than economic analysis, will doubtless be uncongenial to economists, but it clearly harks back to the fundamental proposition of ecological economics presented by Robert Goodland in Section I - that ecological limits must govern the future course of economic development.

Here we return to the essential theme of ecological economics: we cannot separate economic activity from its relation to the biosphere. A "purely economic" measure turns out to be inconsistent even on its own terms (specifically in the treatment of depreciation and defensive expenditures). Yet once we try to correct for these deficiencies, we are drawn into an expanding set of measurement and valuation problems and normative judgments. All the authors summarized here are grappling with aspects of this problem. Perhaps the most significant implication of this discussion, as Salah El Serafy has pointed out,<sup>9</sup> is for macroeconomic policy-making. Fiscal and monetary policy, public finance, and trade policy will all be affected by our measurement and perception of GNP/GDP and national investment. For this reason, it seems imperative to press on with the development of alternative measures of "green" GDP despite the methodological problems.

One general conclusion can certainly be drawn: the widely accepted focus on GNP growth as a goal of economic policy must be questioned. Instead, perhaps we should be asking the question of how full employment and fulfilling lives for a nation's people can be achieved *without* GNP growth, or with a modified and "lower" growth rate. This formulation of the issue has very different implications for developed and developing nations; we deal with aspects of this dichotomy in Section VI.

## Notes

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1. Henry M. Peskin, "Alternative Environmental and Resource Accounting Approaches," in *Ecological Economics: The Science and Management of Sustainability*, ed. Robert Costanza (New York: Columbia University Press, 1991), 176-193.
  2. Herman E. Daly and John B. Cobb Jr., "Appendix: The Index of Sustainable Economic Welfare," in *For the Common Good: Redirecting the Economy Toward Community, the Environment, and a Sustainable Future* (Boston: Beacon Press, 1989), 443-507.
  3. United Nations Development Programme, *Human Development Report 1993* (New York and Oxford: Oxford University Press, 1993).
  4. Robert Repetto, William Magrath, Michael Wells, Christine Beer and Fabrizio Rossini, *Wasting Assets: Natural Resources in the National Income Accounts*, World Resources Institute, 1989; Wilfrido Cruz and Robert Repetto, *The Environmental Effects of Stabilization and Structural Adjustment Programs: The Philippines Case*, World Resources Institute, September 1992; Maria Conception Cruz, Carrie A. Meyer, Robert Repetto and Richard Woodward, *Population Growth, Poverty and Environmental Stress: Frontier Migration in the Philippines and Costa Rica*, World Resources Institute, October 1992.
  5. Kirk Hamilton, "Monitoring Environmental Progress" and "Green Adjustments to GDP," World Bank Environment Department discussion papers, 1994.
  6. United Nations, *Integrated Environmental and Economic Accounting: A UN Handbook of National Accounting*, 1993.
  7. Jane King and Malcolm Slessor, "The Natural Philosophy of Natural Capital: Can Solar Energy Substitute?" in J. van den Bergh and J. van der Straaten eds., *Toward Sustainable Development: Concepts, Methods, and Policy*, ed. Jeroen C.J.M. van den Bergh and Jan van der Straaten (Washington, D.C. and Covelo, CA: Island Press, 1994), 139-164.
  8. Hannon, Bruce, "Measures of Economic and Ecological Health," in *Science and Policy*.
  9. Salah El Serafy, *Country Macroeconomic Work and Natural Resources*, World Bank Environment Department Working Paper No. 58, March 1993.