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The idea of "green", or environmental, accounting has become popular, and a number of proposals have been made for modifying national accounts to include a consideration of resource depletion and environmental deterioration.   In this article, the author suggests that certain weaknesses still pervade the new proposals.   National accounts are primarily an economic framework and are not suitable for an adequate representation of all environmental changes. There are also serious problems involved with the valuation of resource and environmental stocks.   Especially for developed nations where the main environmental concern is with pollution impacts, greening the accounts is of limited value.   However, integrated resource accounting is vital for developing nations which have a heavy dependence on natural resources, and for which conventional accounting can lead to distorted and destructive macroeconomic and trade policies.   This paper suggests that green acounting can help to ensure income (or "weak") sustainability as a step towards a stronger ecological sustainability.

Principles of green accounting

Advocates of green accounting have different concerns, including preserving the stock of environmental assets and measuring the effect of environmental changes on welfare.   This paper has a more precisely defined goal: the proper measurement of national output and expenditure.   "Selling natural assets and including the proceeds in the gross domestic product, GDP, is wrong on both economic and accounting grounds." (218)   To get a proper estimate of *net value added*, we must subtract depreciation of assets. This is done for produced assets in the calculation of net national product (NDP).   Even though NDP is rarely estimated, depreciation of produced assets is fairly small and predictable. Declines in natural assets, on the other hand, may be large and volatile, and are not reflected at all in the estimates of GDP commonly used for macroeconomic analysis.

The concept of green accounting presented here thus involves no value judgement about preserving the environment.   It simply embodies a correct accounting principle for estimating sustainable *income.*   In accordance with this principle, economic policies will need to be reassessed once national accounts have been adjusted for natural asset losses.
However, greening the national accounts cannot fully capture many aspects of environmental deterioration such as biodiversity loss, nor can they provide a solution for a broad range of environmental problems.   For these purposes, physical rather than economic indicators of environmental change are more appropriate.

Definitions of Sustainability

There are different possible definitions of sustainability. *Weak sustainability* has been used to refer to sustainable income, which should include only value added, and exclude the proceeds of asset sales. This approach reflects the accounting principle of keeping capital intact for income-estimation purposes. If capital is consumed, then allowance must be made for capital consumption or depreciation. Weak sustainability is a *positive* rather than *normative* concept, requiring only a correct approach to income estimation. Also, since income accounting is done on a year-by-year basis, this approach does not guarantee long-term sustainability.

Strong sustainability, on the other hand, requires maintaining the *stock* of natural capital intact, including the waste-assimilation services of the environment. Advocates of strong sustainability argue for the existence of a complementary relationship between natural resources and produced capital. This means that damaged or depleted natural capital cannot easily be replaced with manufactured capital. For non-renewable resources, this principle implies that the equivalent of the user cost[1] of depletable natural resources should be invested in developing renewable substitutes. Strong sustainability is appropriate to a long-run normative approach. While (for income sustainability) it may be appropriate in the short term, or for an individual firm, to deplete natural assets in order to build up produced capital, it would be environmentally irresponsible to assume that this can be done without limit over an extended period of time.

Satellite accounting systems

The United Nations Statistical Division has proposed a system of integrated economic and environmental accounting, SEEA.[2] This proposal, the outcome of a process of discussion among different international agencies including the United Nations Environment Programme (UNEP) and the World Bank, is intended as a compendium of information on points of contact between the environment and the economic system. However, it does not offer any definitive recommendation on reform of macroeconomic accounting systems, and is referred to by its authors as an "interim version"*,* indicating that the discussion is still in progress.

The SEEA appears to focus on accounting for environmental *stocks*. The *flow* accounts are derived from changes in stocks during the accounting period. There are two weaknesses in this approach. First, it is impossible to compile a comprehensive list of all environmental stocks. Second, the valuation of environmental stocks using current prices means that the flow estimates are affected by price volatility during the estimation period. This compromises both the environmental and the economic information provided by such estimates. For economic purposes, a better approach would be to calculate the user cost component of resource declines, and either subtract this from GDP as capital consumption or (much better) exclude it from the gross product altogether.

In dealing with pollution, the costs of regulating or cleaning up pollution should be considered as intermediate inputs to be charged against output. Where effective regulations are lacking, pollution costs can be estimated by calculating the theoretical cost of meeting acceptable standards, based on current technology. Like the calculation of user cost, this should not be

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viewed as a radical new departure, but simply as an overdue correction of national accounts which currently value environmental damages incorrectly at zero.

We must distinguish between two different goals for environmental accounting. If the objective is to describe the state of the environment, then physical measures of resource and environmental stocks should be used. This could be done within a system of *satellite accounts*, which must be deliberately separated from the economic accounts. If the objective is to reform the system of national accounts, a procedure focused on estimating user costs and intermediate environmental costs is needed to achieve realistic macroeconomic measurements. In the latter case, environmental stocks should be kept firmly in the background.

Policy implications of greening the national accounts

If economists accept conventional GDP estimates, then their policy recommendations are likely to be wrong in the case of natural resource dependent economies. Output estimates may be exaggerated by 20% or more and true estimates of capital formation may turn out to be nil or negative. Factor productivity estimates are thrown into question when neither the products nor the inputs are measured correctly. Capital/output ratios will be incorrect if they ignore rapid liquidation of natural capital. Sophisticated macroeconomic models based on such data will give highly questionable results for guiding long-term development.

International trade will tend to align domestic with international prices. But international prices are often distorted by agricultural subsidies, political and military interventions, and the failure to internalize externalities. This will encourage the selling of natural resources below full environmental cost, and the situation gets worse in view of the often upward-sloping supply curves of many poorer countries' exports.

The impact of natural capital depletion will be especially large in estimates of national savings and investment. Estimates of "genuine savings" by the World Bank indicate that many countries' net savings and capital formation may in fact be negative, a clear indicator of unsustainability.

The export of natural capital also distorts exchange rates, and creates a bias against non-resource-exporting sectors, including manufacturing. This phenomenon is recognized by economists as the "Dutch Disease", but methods used to estimate exchange rate overvaluation will not be reliable when proceeds from the unsustainable export of natural assets finance an import surplus. In this case, an apparent stability of the domestic price level will be illusory, masking significant damage to non-resource exporting sectors which must compete with artificially cheap imports. In the balance of payments accounts, a trade deficit may be concealed, or appear to be a surplus, since the proceeds of natural capital exports are recorded incorrectly in the current account.

"Greening the national accounts is more important for economic than for environmental policy . . .especially for those countries whose natural resources are rapidly eroding, and the erosion is counted misleadingly in GDP as value added. Once the accounts are greened, macroeconomic policies need to be re-examined along the lines elaborated in this paper." (228)

Notes

1. The user cost can be thought of as the cost imposed on future extraction by using up a resource today. Its calculation depends on the expected lifetime of the resource and on the inter-generational discount rate, the interest rate realistically to be expected on the new investments. Note: life expectancy of the resource may be very short and need not straddle generations.
2. United Nations Department for Economic and Social Information and Policy Analysis, (1993).