

## Greening the National Accounts

*U. S. Congressional Budget Office*

Reviewed By Giles Atkinson

In recent years, few aspects of the environmental debate have received as much attention as green accounting. But why has so much excitement surrounded what basically amounts to a national accounting issue? One reason is the ongoing debate on how to measure human well-being and economic progress, including the search for environmental indicators.

Many are probably familiar with the shortcomings of existing measures of income such as gross domestic product (GDP). Without becoming too technical, GDP mainly consists of the value of final sales of goods and services during a certain period of time.<sup>1</sup> Hence, GDP is a measure of current economic activity. The chief criticism of this measure is that it tells very little about what is happening to human welfare and whether current human welfare is sustainable. Environmental concerns are relevant in both respects. Not only does the environment provide us with a significant source of well-being today—from the health benefits of clean air to the enjoyment of a spectacular view—but the similar well-being of future generations depends on how well we care for and protect the environment.

Calls to “green” measures of national income such as GDP have come from a diverse lobby. The impression often conveyed is that overhauling the way economic progress is recorded will also alter environmental policy. Academic research shows what these green measures might look like;<sup>2</sup> meanwhile, government statisticians, urged on by politicians, have begun examining how existing national accounting systems can be adapted to include environmental concerns.

*Greening the National Accounts*<sup>3</sup> by Raymond Prince and

Patrice Gordon (both of the U.S. Congressional Budget Office) is a report to the U.S. Joint Economic Committee and reflects increasing political interest in this area. The report will also be of significant interest to a wider audience, although, apart from the summary, a little knowledge of accounting identities and the green accounting literature will help. An important aspect of this survey is the authors’ welcome combination of major theoretical concerns with practical accounting issues. Prince and Gordon also ac-

knowledge the important role of valuation techniques, which is developed in the environmental economics literature.

The report outlines the two widely recognized problems for national accountants to tackle. The first is resource depletion (e.g., the extraction of nonrenewable resources), which is now considered relatively easy to measure. However, depletion is of little empirical significance in most developed countries.<sup>4</sup> Rather, it is the second issue, the quantification of pol-

lution issues, that presents the major challenge for statisticians. National accountants face two main problems: how to measure the physical change in (or level of) environmental quality and how to value this change when there is no market price as a guide.

The problem of physical measurement is integral to the environmental indicators debate. So far, most success has been achieved on developing so-called pressure indicators such as emissions of pollutants from human sources.<sup>5</sup> Prince and Gordon argue, correctly, that emissions data reveal little about whether an emitted ton of sulfur dioxide is more damaging than an emitted ton of carbon monoxide. However, pressure indicators, as well as state indicators—e.g., ambi-

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ent sulfur dioxide concentrations in urban areas—remain relevant to national accountants. In fact, as the authors argue, both are required to estimate environmental damage.

In general, physical environmental indicators are incapable of providing this type of information on pollution damage independently of some specified system of weight-

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ing. Rather, this information requires combining pressure and state indicators in a model relating pollution to its effects on receiving agents such as human health, forestry, and ecosystems. Often these links are highly complex, but a simplified application expresses effects as a function of emissions—for example, an  $x$  percent increase in sulfur dioxide emissions causes  $y$  additional deaths. This assesses the respective impacts of pollutants on particular receiving agents, giving a ranking of pollutant per impact. However, additional assessment techniques are necessary to understand the impacts across receiving agents, i.e., the overall ranking of impacts. This is where economic valuation comes in.

Prince and Gordon review some of the available valuation techniques that have long formed part of the environmental economics research agenda.<sup>6</sup> These techniques can estimate the marginal social costs associated with changes in environmental quality.<sup>7</sup> Recent green accounting literature suggests that the value of environmental degradation should consist of a price representing the marginal social costs of a unit of emitted pollution multiplied by the total number of units emitted in a year.<sup>8</sup> Emissions data are especially important for green accounting because they are directly influenced by policies such as carbon taxes. Transboundary pollution effects should also be included here. The resulting measurement is similar to the notion of an international polluters-pays principle and the import and export of sustainability.<sup>9</sup>

Many are skeptical of economic valuation of the environment for a number of reasons, including ethical grounds, lack of scientific certainty, and doubts about the methods themselves. National accountants tend to be concerned about the role of these valuation techniques in the national accounts. Unfortunately, if alternatives to GDP are sought,

valuation techniques will probably play an important role.<sup>10</sup> This search for green income measures is an intriguing aspect of the green accounting debate and is well covered in Prince and Gordon's report. But would the deduction of certain items (such as environmental degradation) from GDP yield the so-called measure of green national income (GNI) that many appear to hanker after?<sup>11</sup> Prince and Gordon do not think so, because the accounting framework would be altered to a greater degree than is generally recognized. Some idea of the "output" provided by the environment—maintenance of human health, aesthetic amenity, and so forth—is required.<sup>12</sup> The estimation of environmental degradation only captures the change in this output, not the level of the output itself.

Even if this measurement issue can be overcome, the resulting GNI may still be inappropriate as a measure of economic welfare—that is, unless it can be assumed that other items in the accounts are measured properly. Some researchers have attempted to include additional welfare-oriented adjustments to national income that are unrelated to the environment. A widely publicized example is Herman Daly and John Cobb's index of sustainable economic welfare (ISEW).<sup>13</sup> Although the ISEW is questionable both in theory and in measurement,<sup>14</sup> the pursuit of broader measures of economic welfare is not unfounded. Green accounting opens up a Pandora's box of issues regarding the measurement of human well-being.

Rather than providing a blueprint for a U.S. green accounting strategy, Prince and Gordon's report is intended to keep decision makers abreast of possible options. Ultimately, the responsibility for implementing actual revisions to accounting practice lies with the body charged with compiling the national accounts. In the United States, this is the Bureau of Economic Analysis (BEA). Yet, publicly at least, BEA has not had too much to say on this issue.<sup>15</sup> Their apparent reticence may be due to obstruction from the U.S. Congress. Although BEA has undoubtedly been monitoring developments, an assessment of green accounting in action requires one to look to other countries.

**A**t the international level, Agenda 21 (approved at the Earth Summit in June 1992) calls for countries to add an environmental dimension to their national accounting activities. Although this is not a legal commitment, it illustrates how the green accounting agenda is embedded in what has become known as international soft law.<sup>16</sup> Countries such as the United Kingdom are just embarking on green accounting programs. Others such as Norway, the Netherlands, France, and Canada have been exploring this field for some years, with different degrees of financial commitment. Already useful inferences can be drawn from this work.

Certain countries—notably Norway—have explicitly rejected options that require the type of monetary valuation of the environment described earlier.<sup>17</sup> Even so, most

national statisticians agree that green accounting, if only in physical terms, is a useful way to make sense of the emerging mass of environmental data. The Norwegian Central Bureau of Statistics has shown how these physical indicators of environmental change can be utilized within the existing system of accounts. In contrast, other countries that are more comfortable with the idea of valuation may eventually move toward a GNI.

Not surprisingly, a variety of different routes have been suggested to obtain this goal, and many difficulties still need to be resolved. Resource-rich countries such as Canada and Australia are experimenting with ways to account for subsoil commercial resources.<sup>18</sup> The volatility of world resource prices can lead to wild fluctuations in the national income. Hence, it is difficult to infer much from green accounting given these large year-to-year oscillations. For many other countries, resource extraction is a tiny proportion of total output, and these particular issues are of little concern. When countries have to import resources, however, new questions are raised, which green accounting could answer to good effect. (One such question might concern the effect of resource imports on sustainability in export countries.) One unique aspect of the work in the Netherlands is the analysis of connections between Dutch economic activity and its impact on other countries via the import of natural resources (and the "export" of pollution).<sup>19</sup>

Individual countries have used diverse methods and have had diverse experiences with green accounting. To facilitate international comparison, the United Nations Statistical Office (UNSTAT) has established a framework to standardize national efforts similar to the conventional accounting framework for estimating GDP.<sup>20</sup> There is one important difference, however: UNSTAT's suggested green accounting is a *satellite account* that is additional to the core (conventional) accounts. Therefore, UNSTAT is not yet looking for a replacement accounting system. (Indeed, *all* individual country efforts so far have taken this approach.) National accountants feel that this is an even-handed response, given the need to raise the profile of environmental information while recognizing the deficiencies in the data. Hopes that GDP will be replaced by a GNI measure are extremely premature at best. Some countries will choose not to publish an actual GNI figure even though they will publish the various components needed to estimate it. In other words, the concept of GNI will not be officially endorsed.

While the UNSTAT process has provided a useful platform for discussing green accounting issues, its recently published green accounting manual does not offer much guidance in choosing between different approaches.<sup>21</sup> This is especially true with respect to measurements of environmental degradation. However, in a number of countries a consensus appears to be forming around the notion of restoration cost. One reason for this favored status is that accountants are familiar with the measurement of depreciation at replacement cost. This concept can be transferred to

the environment by estimating costs that would be incurred in restoring environmental quality. However, because it has no conceptual underpinning as a measure of environmental damage, will the measures actually mean anything?<sup>22</sup> Prince and Gordon have done an admirable job discussing the economic foundations of the national accounts. It appears that only Sweden has as yet undertaken official work estimating the social costs of pollution emissions.<sup>23</sup>

Somewhat alarmingly, however, much of the green accounting literature pays very little attention to how the revised accounts will actually be used.<sup>24</sup> This is true even of the more practical work, giving the perception that statisticians are running ahead of policy. Better communication between statistical offices and other government departments may remedy this situation. The close connections between the Norwegian Central Bureau of Statistics, Ministry of Finance, and Ministry of Environment is a good example: Policy modeling has now become an integral part of the Norwegian indicator work.

An obvious use is in the measurement of sustainable development. Indeed, this is one of the main motivations behind Canada's green accounting efforts, where a unique focus has been placed on accounting for national wealth.<sup>25</sup> Prince and Gordon also recognize the possibility of measuring sustainability by greening national accounts. However, the authors' point of departure is the widespread belief that it is the growth rate of GNI that can tell us about sustainable development.

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Yet, while a declining level of GNI indicates that a country has behaved unsustainably, it is not so clear that an increasing GNI implies sustainability.<sup>26</sup> It would be better to ask how much a country is putting aside in the form of genuine savings (GS). GS is defined as gross savings minus the depreciation of manufactured capital, resource depletion, and environmental degradation.<sup>27</sup> This measure is clearer on

the implications of environmental losses for future well-being. Hence, past rates of GS offer a preliminary guide to the sustainability of current development. This may not be true of actual estimates of GNI. If a country is systematically undersaving over time—with a GS less than zero—then its well-being will decline in the future.<sup>28</sup> In the inevitable (and much needed) assessment of the uses of green national accounts, the further development of GS must be a priority.

Overall, Prince and Gordon have provided an accessible and informative guide to current green accounting issues. The bottom line is that national statistical offices are beginning to implement forms of green accounting. Such documents will ensure that what emerges is actually meaningful and useful to policymakers and analysts.

## NOTES

1. This is not quite the whole story. GDP also includes government expenditures and changes in business inventories.
2. For an overview see K. Hamilton, "Green Alternatives to GDP," *Resources Policy* 20, no. 3 (1994): 155–68. See also E. Lutz, ed., *Towards Improved Accounting for the Environment* (Washington, D.C.: The World Bank, 1994), particularly the papers by J. M. Hartwick and J. M. Hartwick and P. Hageman.
3. R. Prince and P. Gordon, *Greening the National Accounts* (Washington, D.C.: U.S. Congressional Budget Office, March 1994).
4. Of course, depletion is a major issue in resource-dependent developing countries.
5. This is the conclusion of a recent investigation by the World Resources Institute; see A. Hammond, A. Adriaanse, E. Rodenburg, D. Bryant, and R. Woodward, "Environmental Indicators" (World Resources Institute, Washington, D.C., 1994, mimeograph). Pressure indicators form one part of the Organisation for Economic Cooperation and Development's (OECD) pressure-state-response framework; see OECD, *Environmental Indicators* (Paris, 1994). Most environmental indicator work appears to follow this approach.
6. See M. Cropper and W. Oates, "Environmental Economics: A Survey," *Journal of Economic Literature* 30, no. 2 (1992): 675–740.
7. Strictly speaking, this is the marginal social benefit of the provision of an additional unit of environmental quality.
8. Alternatively, price should be the marginal costs of abatement. The issues surrounding the appropriate choice are analyzed in the green accounting context in K. Hamilton and G. Atkinson, "Valuing Air Pollution in the National Accounts," (Centre for Social and Economic Research on the Global Environment, University College London and University of East Anglia, 1995, mimeograph). See also Hamilton, note 2 above.
9. See Hamilton and Atkinson, note 8 above.
10. This is not to say that valuable insights cannot be gained by analyzing physical environmental data alongside the conventional monetary accounts. This is the approach adopted by the Norwegian Central Bureau of Statistics (CBS). See CBS Norway, *Natural Resources and the Environment* (Oslo, 1994).
11. Note that one should also deduct for the value of manufactured capital depreciation (e.g., buildings and machinery).
12. See Hamilton, note 2 above.
13. H. Daly and J. Cobb, *For the Common Good* (New York: Beacon Press, 1989). The application of the ISEW in the United Kingdom can be found in T. Jackson and N. Marks, *Measuring Sustainable Economic Welfare—A Pilot Index: 1950–1990* (Stockholm: Stockholm Environment Institute, 1994).
14. See G. Atkinson, "Measuring Sustainable Economic Welfare: A Critique of the U.K. ISEW," (Centre for Social and Economic Research on the Global Environment, University College London and University of East Anglia, 1995, mimeograph); and W. D. Nordhaus, "Is Growth Sustainable?" Proceedings of the 1992 Meeting of the International Economics Association, 1994.
15. However, recent work completed within BEA has resulted in accounts of the costs of pollution abatement and control expenditures. See G. L. Rutledge and C. R. Vogan, "Pollution Abatement and Control Expenditures," *Survey of Current Business* 74, no. 5 (May 1994): 36–49. BEA also hosted the second meeting of the "London Group" in March 1995. This group is made up of national accountants from statistical offices around the world and provides a forum for the discussion of accounting for resources and the environment.

16. K. Hamilton, D. W. Pearce, G. Atkinson, A. Gomez-Lobo, and C. Young, "The Policy Implications of Natural Resource and Environmental Accounting," CSERGE Working Paper GEC 94-18 (Centre for Social and Economic Research on the Global Environment, University College London and University of East Anglia, 1994).
17. See, for example, CBS Norway, *Natural Resources and the Environment*, (Oslo, 1992).
18. A. Born, "Valuation of Canada's Mineral Resources: A Discussion of Conceptual Issues," (paper presented at the second "London Group" meeting, Washington, D.C., March 1995); and J. Jolsce, "Natural Resources in the Balance Sheet: What Are They and What Do They Mean?" (paper presented at the second "London Group" meeting, Washington, D.C., March 1995).
19. R. Hueting and P. Bosch, "Methodology for the Calculation of a Sustainable National Income," *Statistical Essays M44* (Voorburg, Netherlands: Central Bureau of Statistics, 1992).
20. See United Nations, *Integrated Environmental and Economic Accounting*, Series F, No. 61 (New York, 1993). Case studies using this framework in Mexico and Papua New Guinea can be found in Lutz, note 2 above.
21. United Nations, note 20 above.
22. Efforts to do this have been rewarding in accounting for natural resources in Canada (see note 18 above).
23. See Statistics Sweden and National Institute of Economic Research, "SWEEA: Swedish Economic and Environmental Accounts," Interim Report (Stockholm, 1994).
24. Hamilton et al., note 16 above.
25. See K. Hamilton, *Proposed Treatment of the Environment and Natural Resources in the National Accounts*, Environmental Discussion Paper No. 7 (Ottawa: Statistics Canada, 1991).
26. In fact, using the data presented in Prince and Gordon's final section, it can be shown that a hypothetical per capita green income measure would have grown at an average annual rate of 2.5 percent from 1982 to 1990. This is higher than the 2.2 percent growth rate of per capita GDP over the same period. Growth rates of GNI tell us very little about sustainability.
27. This term comes from Hamilton, note 2 above. Gross savings are simply defined as output minus consumption, i.e., that portion of output not consumed in a given year. The first practical use of this concept can be found in D. W. Pearce and G. Atkinson, "Capital Theory and the Measurement of Sustainable Development: An Indicator of Weak Sustainability," *Ecological Economics* 8, no. 2 (1993): 103–08.
28. Hamilton and Atkinson, note 8 above. It is also worth noting that this focus on saving avoids having to measure the level of output from the environment.

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