
Commentary

Adding Ecological Considerations to “Environmental” Accounting

Environmental accounting is a rapidly evolving area of management, accounting, and finance. It enables an organization and its stakeholders to evaluate the organization’s performance with both economic and environmental measures (Thayer 1995, Atkinson 2000, IFA 2005). If the market were complete, this would not be necessary, and Milton Friedman’s dictum, “A company’s only responsibility is to increase profits for stockholders” would suffice. However, the flawed and incomplete market we have today, with enormous uncounted costs and incorrectly attributed costs, performs poorly. This should not be a surprise; as British economist A.C. Pigou noted early in the last century, the market will fail unless it includes all costs. Most markets today consider only a small fraction of the total transaction cost, leaving many “externalities” out of the picture (Antheaume 2004, Bainbridge 2004). If full costs were known, many market transactions would not occur, and the environment would be cleaner and safer.

A wide range of environmental accounting approaches and methods are being used to more accurately determine financial performance, to improve operations, and to compare alternative strategies for strategic planning and driving innovation. The governments, nongovernmental organizations, companies, and professional organizations that deal with these issues have adopted very different approaches and perspectives, which remain in their formative stages (Gray et al. 1995, Rikhardsson et al. 2005, Chua 2006). Cultural differences play a clear role in what is considered reasonable or desirable (Mathews and Reynolds 2001). While a growing number of tools are available to facilitate environmental accounting, much remains to be done to make them more useful, inclusive, effective, accurate, and user

friendly (Beets and Souther 1999, O’Dwyer et al. 2005). The weaknesses are particularly apparent in discussions of ecological issues such as: the value of nature’s services, ecotoxicity, nutrient cycle disruption, biodiversity, invasive species, habitat fragmentation, and restoration costs (Günther 1997, Karlen et al. 2001, Howarth and Farber 2002). It is an area where the Ecological Society of America can make a contribution, and where active involvement could create funding for new career paths for undergraduate and graduate students and post-docs.

University training still lags far behind the need and slightly behind the demand, with very few opportunities in most ecology, business, or engineering curricula for the integrated approach to accounting demanded by this new field. To succeed with this new approach, we will have to surmount a number of obstacles common to interdisciplinary studies (Baumann 2003, Moore 2005). Revisions to university curricula, continuing education, and more detailed and user-friendly web resources can help improve the value of environmental accounting.

Environmental accounting is increasing in traditional financial and management accounting, policy accounting, and environmental management accounting (Schaltegger and Burritt 2001, Sigma Project 2002, International Federation of Accountants 2005). The growth has been quite rapid, with more than 10,000 sustainability reports now prepared annually worldwide (Rikhardsson et al. 2002). Certified or Chartered Accountants do much of the financial accounting, which includes preparing financial and tax statements and auditing, often focused on investors, lenders, and regulators. Management accounting supports business operations and strategy, and activity-based and enterprise accounting can be used to improve allocation of overhead and more directly link environmental costs to operations. Improved process flow mapping, integrated substance chain management, and material flow analysis better account for inputs/outputs and help identify costly nonproduct outputs. Governments and advocacy groups use environmental accounting to help develop and review the effects of policy, in-

centives, and regulation on the performance of companies, industries, and nations (Bainbridge 2004). The focus has generally been on management applications, although all fields of environmental accounting are rapidly developing.

Environmental management accounting focuses on collecting and evaluating data on an organization's environmental performance, often using accounting over the full life cycle of products or policies, from inception to disposal, recycling, or closure. Environmental management tools include: eco-footprinting, material flow analysis, substance flow accounts, environmental accounting information systems, environmental audits, and required reports for regulators, such as the Eco-Management and Audit Scheme (EMAS) in Europe (GRI 2002, Robert et al. 2002, Bringezu et al. 2003, Palm and Jonsson 2003, EMAS 2006). The basic premise of environmental management accounting is that conventional accounting practices and existing operational and financial management within organizations obscure environmental information. By clarifying inputs, outputs, and impacts, environmental management accounting can help companies and organizations develop innovative solutions to changing resource constraints, regulations, and public pressure.

Environmental and social accounting may be included in preparation of company documents for the Global Reporting Initiative (GRI), Dow Jones Sustainability Index, Corporate Social Responsibility rankings, Social Accountability 8000, the International Organization for Standards Environmental Management Systems 14001, and other environmental and social standards. Environmental accounting also plays a role in a range of new approaches to improved product and service development including: Factor X (Factor 10), the Natural Step, Industrial Ecology, Design for Environment, Cleaner Production, Dematerialization, Cradle-to-Cradle, Leadership in Energy and Environmental Design (LEED), Material Flow Accounting, and the Triple Bottom Line (Baumann and Cowell 1999, Rezaee 2000, Robert et al. 2000, McDonough and Braungart 2002, Robert et al 2002).

The potential benefits of environmental accounting include:

- Improved profitability
- Better decision making
- Discovered opportunities for cost saving
- Discovered opportunities for new processes
- Discovered opportunities for new products and services
- Competitive advantage
- Improved internal reports
- Improved external reports
- Improved employee morale and health
- More accurate and complete costing and pricing
- Reputation building
- Societal benefits
- Environmental benefits
- Improved stakeholder relations
- Reduced risk and liability

The first challenge is deciding what approach to use, at what level, and how best to integrate environmental accounting into current accounting and management systems. There are many alternatives, and a growing number of corporate financial reports and case studies provide some insight into what works, and what needs work (Wallage 2000, O'Dwyer et al. 2005). These studies, and others, generally suggest that proactive environmental reporting improves profitability and reduces risk, and creates a competitive advantage. Software development is underway, but no standard has yet emerged for this complex task. Ideally the software could be easily integrated with existing business management software to provide data and reports useful for financial, management, and policy purposes. These programs would translate the gallons/liters of gasoline consumed into global warming gas cost contributions, the cost of local nitrogen pollution remediation, and the water and air pollution generated

in the supply and disposal chain. This will take a concerted effort from ecologists, accountants, software developers, managers, engineers, and environmental scientists. I would suggest an environmental accounting software contest, like the recent, highly successful Defense Advanced Research Projects A robotic vehicle test, where a well-administered \$2 million prize brought incredibly fast progress through intense competition and real-world testing.

The second challenge is more fundamental, reflecting our incomplete understanding of the complex environmental systems that we live in and attempt to manage. This is where the Ecological Society of America can make its biggest contribution. Our often profound ignorance of function and structure in ecosystems makes current attempts at full-cost accounting very crude and incomplete. Much more detailed and interdisciplinary long-term ecological research is needed to better understand the external costs of business operations. The Long Term Ecological Research Program should immediately be doubled, with the

new program directed at research involving environmental accounting issues. The creation of the National Ecological Observatory Network, NEON, provides another excellent opportunity for needed interdisciplinary, integrated, long-term research and monitoring (NEON 2006). Progress in including more and better ecological science in environmental accounting will not happen without funding, and much of this should be sought from corporate sources. I look forward to the day when there will be as many corporate ecologists as there are corporate accountants (9000 ESA members today vs. 335,000 American Institute of CPA members).

The members of ESA have not been as active in the fields of environmental accounting or ecological economics as we might have hoped, but we have not ignored these issues, either. A recent survey using Google as a crude indicator suggests we are doing better than most organizations, but we have much to do (Table 1). It is also instructive to compare the European accounting organization with the American ac-

Table 1. Hits per search term linked to association title, Google, March 2006.

| Association | Assoc. and environmental accounting | Assoc. and environmental externalities | Assoc. and sustainability |
|--------------------------------------|-------------------------------------|--|---------------------------|
| U.S. Society Ecological Economics | 1.585 | 0.0225 | 0.498 |
| European Accounting Association | 0.262 | 0.0045 | 0.316 |
| Academy of Management | 0.045 | 0.0093 | 7.084 |
| American Solar Energy Society | 0.018 | 0.0365 | 16.314 |
| Ecological Society of America | 0.016 | 0.0114 | 9.433 |
| American Economic Association | 0.009 | 0.0128 | 2.074 |
| Am. Soc. Agric. and Biol. Engineers | 0.009 | 0.0084 | 4.608 |
| American Planning Association | 0.006 | 0.0069 | 7.133 |
| Am. Institute Chemical Engineering | 0.004 | 0.0010 | 1.169 |
| Am. Institute CPA | 0.001 | 0.0001 | 0.059 |
| American Bar Association | 0.000 | 0.0004 | 0.142 |
| Ecological Society of America, Rank | 5 | 3 | 2 |

counting organization. The European accountants are 300 times more likely to be involved in environmental accounting. This reflects cultural differences, policy failure in Washington, reflecting the power of corporate lobbies, and our failure to push an agenda for full cost accounting.

Environmental accounting is developing rapidly and improving decision-making around the world. Modest investments in improved environmental accounting can lead to significant gains in profitability, corporate image, and reduced liability. Environmental accounting demands new skills, tools, and more integrated accounting across department and division lines within companies and all the company or organization stakeholders. Environmental accounting is also increasingly in demand for policy development by NGOs and a range of levels of government.

If we look outside the United States we can find many excellent examples, ranging down to the city level. Ecology programs, business schools, environmental science programs, health programs, engineering and design programs, and all of our professional organizations need to embrace this new challenge and opportunity (Bainbridge 1985, Gray and Collison 2002, Thomas 2004, Haigh 2005).

The ESA can make its impact by developing a more aggressive campaign to require more detailed environmental accounting in the United States. We should also quickly reshape our educational programs to provide ecologists and environmental scientists with a solid grounding in ecological economics and environmental accounting, and to encourage our brethren in accounting and business to include courses in ecology and environmental science. We can also make a difference by joining and participating in related organizations, such as the U.S. Society for Ecological Economics and the International Society for Industrial Ecology, and the major business organizations, particularly the Academy of Management. The Society could also help by assisting in building pressure to create new Sustainability Citation Indexes to credit researchers and

faculty who tackle these important, but time-consuming and challenging interdisciplinary issues (Baumann 2002) and to make research more accessible. One of the weakest points of ecological economics and environmental accounting has been the ecological science, and that is something we can help correct.

Acknowledgments

With special thanks to Greg Lorton for review and discussion of the challenges in environmental accounting.

Literature cited

- Antheaume, N. 2004. Valuing external cost—from theory to practice: implications for full cost accounting. *European Accounting Review* **13**(3):443–464.
- Atkinson, G. 2000. Measuring corporate sustainability. *Journal of Environmental Planning and Management* **43**(2):235–252.
- Bainbridge, D. A. 1985. Ecological education: time for a new approach. *ESA Bulletin* **66**:461–462.
- Bainbridge, D. A. 2004. The price falls short. *Solar Today* **18**(5):62,59.
- Baumann, H. 2003. Publish and perish? The impact of citation indexing on the development of new fields of environmental research. *Journal of Industrial Ecology* **6**(3–4):13–26.
- Baumann, H., and S. J. Cowell. 1999. An evaluative framework for conceptual and analytical approaches used in environmental management. *Greener Management International* **26**:109–123.
- Beets, S. D. and C. C. Souther. 1999. Corporate environmental reports: the need for standards and an environmental assurance service. *Accounting Horizons* **13**(2):129–145.
- Bringezu, S., H. Schütz, and S. Moll. 2003. Rationale for and interpretation of economy-wide material flow analysis and derived indicators. *Journal of Industrial Ecology* **7**(2):43–64.
- Chua, W. F. 2006. Extended performance reporting. Institute of Chartered Public Accountants in Aus-

-
- tralia, Sydney, Australia.
- EMAS. 2006. Eco-Management and Audit Scheme. <<http://www.emas.org.uk>>
- Global Reporting Initiative. 2002. Sustainability reporting guidelines. GRI Secretariat, Boston, Massachusetts, USA.
- Gray, R., and D. Collison. 2002. Can't see the wood for the trees, can't see the trees for the numbers? Accounting education, sustainability and the Public Interest. *Critical Perspectives on Accounting* **13**(5/6):797–837.
- Gray, R., R. Kouhy, and S. Lavers. 1995. Corporate social and environmental accounting; a review of the literature and a longitudinal study of UK disclosure. *Accounting, Auditing and Accountability Journal* **8**(2):47–77.
- Günther, F. 1997. Hampered effluent accumulation process: phosphorus management and societal structure. *Ecological Economics* **21**:159–174.
- Haigh, M. 2005. Greening the university curriculum: appraising an international movement. *Journal of Geography in Higher Education* **29**(1–3):31–48.
- Howarth, R. B., and S. Farber. 2002. Accounting for the value of ecosystem services. *Ecological Economics* **41**(3):421–429.
- International Federation of Accountants. 2005. Environmental management accounting. IFA, New York, New York, USA.
- Karlen, C., I. O. Wallinde, D. Heijerick, C. Leygraf, and C.R. Janssen. 2001. Runoff rates and ecotoxicity of zinc induced by atmospheric corrosion. *Science of the Total Environment* **277**(1–3):169–180.
- Mathews, M. R., and M. A. Reynolds. 2001. Cultural relativity and accounting for sustainability: a research note. *Accounting Forum*. **25**(1):79–88.
- McDonough, W., and M. Braungart. 2002. Cradle to cradle: remaking the way we make things. North Point Press, New York, New York, USA.
- Moore, J. 2005. Barriers and pathways to creating sustainability education programs: policy, rhetoric and reality. *Environmental Education Research* **11**(5):537–555.
- NEON. 2006. National Ecological Observatory Network Office. <www.neoninc.org>
- O'Dwyer, B., J. Unerman, and E. Hession. 2005. User needs in sustainability reporting: perspectives of stakeholders in Ireland. *European Accounting Review* **14**(4):759–787.
- Palm, V., and K. Jonsson. 2003. Materials flow accounting in Sweden: material use for national consumption and for export. *Journal of Industrial Ecology* **7**(1):81–92.
- Rezaee, Z. 2000. Help keep the world green. *Journal of Accountancy*. **190**(5):57–67.
- Rikhardsson, P., A. J. R. Andresen, and H. Bang. 2002. Sustainability reporting on the Internet: a study of the Global 500. *Greener Management International* **40**:57–75.
- Rikhardsson, P. M., M. Bennett, J. J. Bouma, and S. Schaltegger, editors. 2005. Implementing environmental management accounting: status and challenges. Springer, New York, New York, USA.
- Robèrt, K.-H., J. Holmberg, and E. U. von Weizsäcker. 2000. Factor X for subtle policy-making. *Greener Management International* **31**:25–37.
- Robèrt, K.-H., B. Schmidt-Bleek, J. Aloisi de Lardarel, G. Basile, J. L. Jansen, R. Kuehr, P. Price Thomas, M. Suzuki, P. Hawken, and M. Wackernagel. 2002. Strategic sustainable development—selection, design and synergies of applied tools. *Journal of Cleaner Production* **10**:197–214.
- Schaltegger, S., and R. Burritt. 2001. Contemporary Environmental Accounting Solutions Manual. Greenleaf Publishing, Sheffield, UK.
- Sigma Project. 2002. The Sigma guidelines toolkit. The Sustainability Integrated Guidelines for Management Project. UK Department Trade and Industry, British Standards Institute, Forum for the Future, SustainAbility, London, UK.
- Thayer, A. 1995. Full accounting for environmental cost offers benefits to companies. *Chemical and Engineering News* **73**(28):10–11.
- Thomas, I. 2004. Sustainability in tertiary curricula: what is stopping it happening? *International Journal of Sustainability in Higher Education* **5**(1):33–47.
-

Wallage, P. 2000. Assurance on sustainability reporting: an auditor's view. *Auditing: A Journal of Practice and Theory* **19**:53–65.

U.S. Society for Ecological Economics
<www.ussee.org>

Web resources

Environmental Management Accounting Research and Information Center <www.emaweb.org>

International Society for Industrial Ecology
<www.is4ie.org>

Environmental Management Accounting Network-EU
<www.emanu-eu.net>

International Federation of Accountants
<www.ifac.org>

David A. Bainbridge
Associate Professor
Marshall Goldsmith School of Management
Alliant International University
San Diego, CA 92131
E-mail: dbainbridge@alliant.edu

Global Reporting Initiative
<www.globalreporting.org>
