Gale, Robert J.P. and Peter K. Stokoe (2001) 'Environmental Cost Accounting and Business Strategy', in Chris Madu (Ed.) *Handbook of Environmentally Conscious Manufacturing* (Kluwer Academic Publishers).

Chapter 6

Environmental Cost Accounting and Business Strategy

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1. INTRODUCTION

Firms need information for both financial and managerial accounting. On the financial side, information is required for a range of uses such as corporate financial planning and control, performance evaluation, and to verify credit worthiness and taxes owed. On the management side—the focus of this chapter—the emphasis is on controlling costs. The relationship between the environment and managerial accounting can be seen through the lens of cost control. This is because managerial accounting emphasizes the use of accounting information to serve "business managers in making capital investment decisions, costing determinations, process/product design decisions, performance evaluations, and a host of other forward-looking business decisions" (EPA, 1996: 28).

We confine our inquiry into environmental cost accounting and business strategy to corporate environmental performance in this chapter. In doing so, we focus on accounting for internal managerial decision-making rather than accounting for reporting to external shareholders and other stakeholders. It is known that environmental costs can be substantial, from five to twenty percent of the total costs of business activities according to Ditz *et al.* (1995:15). Because these costs are likely to rise as pressures for environmental protection measures increase, the purpose of this chapter is to make the case that incorporating environmental costs directly into accounting

functions and business strategies can improve a business's competitive position.

2. THE EXPANDING BASE OF COST ACCOUNTING

While research on social accounting and reporting is rooted in the early 1970s, the validity of corporate environmental accounting in professional practice has only been widely accepted over the last five years. By 1998, many of the major North American accounting organizations had produced at least one publication on environmental accounting. For example, the Canadian Institute of Chartered Accountants published *Environmental Costs and Liabilities: Accounting and Financial Reporting Issues* in 1993, and Environmental Reporting in Canada: A Survey of 1993 Reports in 1994. In gathering literature on this emerging area of inquiry, CICA now maintains a twenty-page list of environmental accounting references on its web site.[1] Elsewhere, the Society of Management Accountants of Canada has produced an excellent series of guides including Tools and Techniques of Environmental Accounting for Business Decisions (1996) and Accounting for Sustainable Development: A Business Perspective (1997). Other accounting organizations have had publications prepared for them by specific experts in the area. These include the Certified General Accountants Association of Canada,[2] the U.S. Institute of Management Accountants[3] and the International Federation of Accountants.[4]

A recent survey of environmental management strategies by the Society of Management Accountants of Canada (SMAC) suggests that the majority of major corporations in Canada and the U.S. will begin implementing environmental accounting and reporting practices by the end of 1998 (SMAC 1997). While we will have to await the evidence for this claim, the survey indicated that the three motivating factors to account for this trend in order of priority are:

1. Compliance with standards;
2. A moral commitment to environmental stewardship; and

[1] Canadian Institute of Chartered Accouniants.1999. On-line Environmental Resources. CICA, Toronto. www.cica.ca/newlpa/environ/envires.htm accessed April 2, 1999
[2] See Anderson, Elias and Zeghal (1998)
[3] See Epstein (1996)
[4] See Dzinkowski (1998)

3. The desire to promote good relations with the residents of local communities.

Within the corporation, environmental accounting concerns the definition, assessment and allocation of environmental costs and expenditures for the purposes of cost and resource management, compliance reporting, and capital budgeting, planning, and. operational decision making. Environmental accounting can be further delineated into two main areas: financial environmental accounting and managerial environmental accounting.

Financial environmental accounting emphasizes the analysis and reporting component of internal costs and liabilities related to environmental matters. This is typically the domain of an accountant who prepares financial reports for lenders and investors. The assessment and reporting of environmental risks and liabilities, capitalization for environmentally related expenditures and the treatment of environmental debt, all fall into this stream of environmental accounting. In these matters accountants are guided by professional accounting standards such as the Generally Accepted Accounting Principles (GAAP).

Managerial environmental accounting has a different focus. It supports the internal management and decision-making process through various techniques of cost allocation, performance measurement and business analysis. This type of environmental accounting is interdisciplinary in scope. On the one hand, scientists, economists, and policy advisors can identify internal and external environmental costs. On the other hand, the management accounting profession can use its expertise to allocate these costs within existing and emerging environmental and sustainability accounting frameworks.

Given the two main areas of environmental accounting and the fact that both accountants and environmental experts are required to delineate and allocate internal and external costs, it is not surprising to find different methods related to environmental accounting in the literature. These include:

- activity-based costing/activity-based management
- total quality management/total quality environmental management
- business process re-engineering/cost reduction
- design for environment/life-cycle design and assessment
- life-cycle assessment/life-cycle costing
- total cost assessment

- full cost assessment

In this paper, the focus on corporate environmental accounting is confined to activities where one could reasonably expect the accounting profession to be involved. While this includes all of the activities noted above we will confine our discussion to total cost assessment, full cost environmental assessment and life-cycle assessment.

2.1 Understanding Internal and External Environmental Costs

There are many ways in which environmental costs, losses or benefits may go unrecorded in traditional accounting systems. One broad approach to calculating full environmental costs is to distinguish between internal costs (those borne by the organization) and external costs (those passed on to society, e.g., environmental and health costs). In this approach, internal environmental costs to the firm are composed of direct costs, indirect costs, and contingent costs. These typically include such things as remediation or restoration costs, waste management costs or other compliance and environmental management costs. Internal costs can usually be estimated and allocated using the standard costing models that are available to the firm. Direct costs can be traced to a particular product, site, type of pollution or pollution prevention program (e.g., waste management or remediation costs at a particular site). Indirect costs such as environmental training, R&D, record keeping and reporting are allocated to cost centers such as products and departments or activities.

External costs are the costs of environmental damage external to the firm. These costs can be "monetized" (i.e., their monetary equivalent values can be assessed) by economic methods that determine the maximum amount that people would be willing to pay to avoid the damage, or the minimum amount of compensation, that they would accept to incur it.

Full environmental costs = (internal + external costs)

Where:

Internal costs = (direct + indirect + contingent)

External costs = the costs of external environmental and health damage (e.g., the costs of uncompensated health effects and environmental impacts – Stratospheric ozone depletion; biodiversity loss; climate change)

From the perspective of society as a whole (i.e., the firm and the rest of society), economic efficiency is achieved (i.e., full environmental costs are minimized) when the firm takes internal measures to protect the environment up to the point where the sum of internal and external costs is minimized.

Contingent or intangible environmental costs are costs that may arise in the future to impact the operations of the firm. Contingent costs can fall into both internal and external cost categories, and include:

- changes in product quality as a result of regulatory changes that affect material inputs, methods of production, or allowable emissions;
- an unforeseen liability or remediation cost;
- employee health and satisfaction;
- customer perception and relationship costs; and
- investment financing costs or the ability to raise capital.

External costs are typically of less interest to the firm than internal costs, unless the external costs lead to liabilities for the firm. The distinction between internal and external environmental costs is illustrated in Table 1. The total area of the box in the table represents the entire spectrum of environmental costs that can be incurred as a result of the production or existence of a firm.

Within the existing financial reporting framework, the Canadian Institute of Chartered Accountants (CICA 1993) applies the term "environmental losses" to the category of environmental cost expenditures for which there are no returns or benefits. According to CICA environmental losses are damages that have to be paid to others as a result of damage to the environment that resulted in bodily injury to humans, damage to the property of others, economic damage to others, or damage to natural resources (CICA 1993). CICA also describes another category of environmental cost expenditures as "environmental measures". These are the costs incurred to "prevent, abate, or remediate damage to the environment or to deal with the conservation of renewable and non-renewable resources" (CICA 1993; see also, Judd 1996).

TABLE 1: Internal and External Environmental Costs

External Environmental Costs	
Examples: Depletion of natural resources Noise and aesthetic impacts Residual air and water emissions Long-term waste disposal Uncompensated health effects Change in local quality of life	
Internal Environmental Costs	
Direct or Indirect Environmental Costs *Examples:* • Waste management • Remediation costs or obligations • Compliance costs • Permit fees • Environmental training • Environmentally driven R&D • Environmentally related maintenance • Legal costs and fines • Environmental assurance bonds • Environmental certification/labeling • Natural resource inputs • Record keeping and reporting	**Contingent or Intangible Environmental Costs** *Examples:* • Uncertain future remediation or compensation costs • Risk posed by future regulatory changes • Product quality • Employee health and satisfaction • Environmental knowledge assets • Sustainability of raw material inputs • Risk of impaired assets • Public/customer perception

Source: Adapted from: Whistler Center for Business and the Arts. Environmental Accounting. Prepared by T. Berry and L. Failing. 1996.

2.2 Internalizing Externalities

The objective of externality costing is to internalize externalities. In other words:

- to allow the external costs a firm imposes on society to be brought to bear in an augmented profitability calculation;
- to bring external costs considerations into the corporate decision-making process;
- to ensure future viability of the organization through understanding potential liability and risk scenarios; and
- to be able to inform stakeholders on the environmental and health impacts of the organization's economic activities.

Externality costing generates monetized estimates of environmental damage created by an organization, either at a specific site or through its activities. There are two widely used approaches for monetizing externalities. The only valid approach from the standpoint of economic theory is the damage cost approach, i.e., assessing the value of environmental (and health) damage to those who incur the damage, as described above. The damage cost approach uses the value of loss of use to estimate externality costs. Within the damage cost approach are the following evaluation methods:

1. market price method
2. hedonic-pricing method
3. travel cost method
4. contingent valuation methods (survey questionnaire methods)

However, if firms undertake (or are required to undertake) measures to reduce environmental damage to the "optimal" extent (i.e., the extent which minimizes the sum of internal and external costs), then the marginal external cost (incremental cost of the last unit of harm) will be equal to the marginal internal cost (incremental cost of preventing the last unit of harm). On this basis, marginal external costs are sometimes assumed to be equal to marginal internal costs, and are estimated accordingly; this is generally called the "cost of control approach".

The concern about accounting for external costs is also reflected in the increasingly widespread practice of using "shadow prices" (e.g., dollars per ton of greenhouse gas emissions) in firms' capital budgeting decisions. This

reflects the view that, although such costs are not currently imposed on the firm, it is likely that they will be before long.

Alternatively, it might be more pragmatic and realistic for a firm to take account of external costs as impending internal costs. In other words, it might be assumed that each category of external cost would eventually be reflected in internal costs. As external costs become internalized, the internal costs rise from zero (when the costs are purely external) to magnitudes that might meet or even exceed the magnitudes of the initial external costs. Therefore, rather than accounting for external costs directly and immediately, a firm might take account of them in terms of various possible time profiles of (future) internal costs (as external costs become internalized). These time profiles of future costs would still have implications for current capital budgeting (and other) decisions.

3. IMPLICATIONS FOR BUSINESS STRATEGY: TOTAL, FULL COST AND LIFE-CYCLE ASSESSMENT

Broadly speaking, environmental accounting describes, measures and reports on the allocation of environmental resources, costs, expenditures and risks to various industry groups, to specific firms, or within firms to specific departments, projects, activities or processes. With regard to the expanding base of environmental accounting, three techniques are particularly salient: total cost assessment, full cost assessment, and life-cycle analysis. Each has its basis in activity-based costing (ABC), a technique accountants are familiar with, at least at the theoretical level.

According to the Society of Management Accountants of Canada (SMAC, 1997), the origins of activity-based costing (ABC) can be traced back to 1985. The Society distinguishes between traditional cost accounting and ABC (SMAC (1997: 1):

Traditional cost accounting allocates costs to products based on the attributes of a single unit. A typical attribute is the number of direct labor hours required to manufacture one unit. Allocations therefore vary directly with the number of units produced. In contrast, ABC systems focus on the activities required for producing each product or providing each service, based on that product or service's consumption of the activities.

The EPA (1995: 37) states that ABC is:

> *a means of creating a system that ultimately directs an organization's costs to the products and services that required these costs to be incurred. Using ABC, overhead costs are traced to products and services by identifying the resources, activities, and their costs and quantities to produce output.*

ABC can be considered as a technique for the economic analysis of a firm's overhead or indirect costs. Unlike total cost assessment or full cost assessment, it is part of conventional cost accounting (Figure 1). Although ABC does not ensure that a broader range of direct, indirect, contingent or less quantifiable costs are included in the analysis, it is a more accurate form of environmental accounting than traditional cost accounting. ABC is also a critical technique for gathering information that is required in TCA and FCA. Ideally, although this is not generally emphasized in the literature on TCA and FCA, costs need to be itemized by using the ABC technique before meaningful results can be generated in a TC or FC assessment. As Foster (1995:296) states:

> *The basic premise of ABC is to "cost" activities, which then becomes the ways and means for assigning/allocating costs to products. Subsequently, relevant environmental costs are allocated on the basis of the individual products' demand for those services.*

3.1 Total Cost Assessment

Total cost assessment refers to the long-term, comprehensive financial analysis of the full range of internal (i.e., private) costs and savings of an investment. The framework for the total cost assessment (TCA) technique represents an expanded approach to traditional financial analysis. It is a tool for preparing business cases that facilitates identifying and analyzing internal project costs and savings. Total cost assessment builds upon conventional cost accounting models by including:

- direct and indirect financial costs, and
- recognized contingent costs

Recognized contingent costs include future compliance costs, penalties and fines, relationship costs, release response costs, remediation costs and the

time value of money (also a critical concern in "conventional" accounting models).

However, TCA is less comprehensive than full cost environmental accounting in that it necessarily excludes costing for externalities (Figure 1). According to Reid, Fraser and Schoeffel (1997), the primary benefit of TCA is that "it helps 'level the playing field' by allowing projects that generate longer-term savings to compete more successfully for limited capital funds. This, in turn, provides companies with an opportunity to improve their bottom line through captured efficiencies and more accurate costing and pricing."

Investment appraisal techniques such as TCA that incorporate allocations of environmental costs and extended time horizons are appropriate when assessing which investments, including pollution prevention investments, are economically favorable (Schaltegger and Muller 1997). P2/FINANCE, developed by the Tellus Institute, is a spreadsheet software application for conducting financial evaluations of current and potential investments. P2/FINANCE has been designed to capture a broad range of potential environmental costs and savings including internal indirect and less tangible environmental costs and uses profitability indicators and time horizons that capture the long-term characteristics of environmental investments.

There are only a handful of good TCA case studies. For example, White, Savage and Shapiro (1996: 7-9) from the Tellus Institute report on an unnamed paper mill that commissioned a study on the operation of the mill and how to reduce "peak effluent flows, reduce BOD in the effluent and reduce total fresh water intake on a mill wide scale". Since TCA is concerned with a range of costing errors in project financial analysis, a TCA cost analysis is different to a conventional cost analysis. As White, Savage and Shapiro note (1996: 7-10):

> *The extent to which TCA improves a pollution prevention investment's profitability depends on the firm's current cost structure, project evaluation practices, the specific project, and the degree to which less tangibles are significant and quantifiable.*

In the case study these authors report on, results are discussed in terms of three financial indicators: net present value, internal rate of return and simple payback. Their analysis indicates that a proposed investment in new

equipment "meets the mill's 2-year-payback rule of thumb" when the costs are properly allocated.

3.2 Full Cost Environmental Assessment

For the purposes of our discussion, full cost environmental assessment is distinguished from total cost assessment and other cost accounting techniques (Figure 1). In addition, while the term 'full cost accounting' is frequently used in discussions of environmental accounting, most FCA studies do not attempt to quantify the social impacts of an organization's activities. For greater clarity, we prefer the terms full cost environmental assessment or full cost environmental accounting when considering the identification, evaluation and allocation of conventional and environmental costs in an organization. The broader term 'full cost accounting' would include these costs plus the external social costs borne by society (e.g., adjustment costs from lay-offs and involuntary terminations, especially in firms or industries where turnover rates are higher than average and this is not reflected in higher social insurance tax rates).

Perhaps the best-known case study with full cost assessment is at a major North American power utility. In 1993, with the aid of former Chair and CEO Maurice Strong, Ontario Hydro became one of the few organizations to incorporate full cost accounting (FCA) information into their decision-making process. In particular, Ontario Hydro was a pioneer in taking on external cost accounting as part of its FCA framework.

Prior to developing its FCA framework, Ontario Hydro had conducted assessments of external costs of its activities (and proposed activities) on an *ad hoc* basis, in connection with regulatory reviews and various project assessments. The support of Maurice Strong provided an opportunity to give external cost assessment a greater role. Mr. Strong had been the Secretary General of the first major United Nations environment conference in 1972; he was subsequently the first Director of the United Nations Environment Program (UNEP), and later the Secretary General of the Rio "Earth Summit" in 1992. Upon becoming Chair and CEO of Ontario Hydro in 1992, Mr. Strong appointed a Task Force on Sustainable Energy Development, which received analytical support from several working groups or "teams" within the Company, including a Full Cost Accounting Team. The work of the Task Force and the Full Cost Accounting Team provided the basis for establishing FCA as a principal analytical tool to support decision-making for sustainable development within the company.

Toward this objective, Ontario Hydro conducted and supported extensive work in the mid-1990s on generic assessments of the external (i.e., environmental and human health) impacts of its activities. In 1995, the Environment and Sustainable Development Division (ESDD) developed Corporate Guidelines for FCA. The Guidelines outline the rational for FCA, describe the implementation process, and delineate roles and responsibilities. The guidelines also specified that Ontario Hydro incorporate FCA into evaluations of:

- major integrated resource plans;
- operation and dispatch of Ontario Hydro's system;
- investment decisions;
- environmental externalities associated with imports and exports of electricity;
- retiring or rehabilitating existing stations;
- benefits and costs of additional pollution control equipment; and
- monitoring environmental performance improvements.

Ontario Hydro applied methods of environmental economics (based on the "damage function approach") to develop monetary values for external impacts, which hence became "monetized external impacts". By monetizing external impacts, they could then be taken into account, like any other monetary value, in economic decision-making. Although the ideal might be to monetize all external impacts, practical difficulties often meant that some external impacts remained as non-monetized external impacts. Where non-monetized external impacts or other considerations (e.g., risk, reliability, and social impact) were considered important, Ontario Hydro resorted to Multi-Criteria Analysis (MCA) to balance incommensurables in decision-making.

In a report (ICF Incorporated 1996) on Ontario Hydro's experience with FCA, it is noted that:

> *Ontario Hydro recognizes that some definitions of full cost accounting include only "internal costs" (also termed "private costs"), which are the costs that affect a firm's bottom line, and exclude "external costs" (also termed "social costs") which is a term used to describe monetized impacts on human health and the environment that currently are not reflected in a firm's bottom line. Ontario Hydro's approach explicitly encompasses both internal costs and external impacts (both positive and adverse), even if the latter cannot be monetized or expressed as external costs (i.e., fully monetized in dollars)... Ontario Hydro has explicitly acknowledged that the dividing line between internal and external costs is not static. For example, a cost that Ontario Hydro considers external today may be internalized tomorrow because of new environmental regulations or corporate standards.*

After Ontario Hydro began its FCA work, Ontario regulators also encouraged Ontario's natural gas utilities to adopt FCA principles. At present these initiatives are in abeyance, as Ontario's utilities are currently undergoing substantial restructuring.

3.3 Life-Cycle Assessment

Life-cycle assessment is a third approach to business strategy development because the costs of a product or process throughout its life cycle can ultimately bear on costs for the firm. This is especially so given the increasing expectations on firms to take responsibility for the full life-cycle impacts of products, including through product (and packaging) take-back requirements and "extended producer responsibility". There are also increasing demands for product labeling to take account of "process and production methods" (PPMs), and not only the characteristics of the product *per se*.

There are a number of approaches to Life Cycle Assessment that reflect its origins in different disciplines (Welford 1995; Epstein 1996; Allen 1999; White, Savage and Shapiro 1996). From an environmental accounting perspective, the focus is on adding a monetary component, that is, to assign a cost to each environmental impact. The sum of all the costs at each stage in a LCA would yield the net environmental costs of a product or process. This means that there is a life-cycle costing (LCC) component to LCA. Epstein (1996: 154) states that life cycle costing is:

> *. . . an attempt to identify all the environmental costs (internal and external) associated with a product, process, or activity throughout all stages of its life. The product stages in the life cycle process are raw materials acquisition; manufacturing; use, reuse, and maintenance; and recycling and waste management.*

AT&T, in their Green Accounting Glossary, define LCC as:

A costing concept that argues for including all the costs incurred for a product, from its inception to abandonment, as part of its product cost. In Green Accounting, this includes cost of extraction, intermediate manufacturing, manufacturing, transportation. product recycling in take-back, disassembling, reverse distribution, restocking used material, disposing of waste, etc.

Allen (1999) provides case examples of LCA. These studies detail opportunities for energy efficiency, water efficiency, and solid waste reduction. An environmental accounting approach would add costs to this analysis so that the financial impacts are clear.

4. LINKING ENVIRONMENTAL ACCOUNTING TO BUSINESS STRATEGY

Given the techniques described above, business strategy can be linked to environmental cost accounting in at least three separate ways. Business strategy could focus exclusively on total cost assessment in which case the external environmental costs borne by society are ignored. Or the external environmental costs could be included in the broader full cost environmental assessment framework. Finally, business strategy could be linked to the broad range of external environmental and social costs in a full cost assessment. The later approach ultimately leads to the category of sustainability accounting and reporting which is beyond the scope of this account. Details on this approach can be found in Elkington (1998).

From a management accounting perspective, the next step beyond Activity Based Costing is "strategic cost management". According to Shank and Govindarajan (1993), strategic cost management "is cost analysis in a broader context, where the strategic elements become more conscious, explicit, and formal. Here, cost data is used to develop superior strategies en route to gaining sustainable competitive advantage": Strategic cost management thus represents an important link between business strategy and the choice of an environmental accounting tool such as TCA, FCEA, or LCA.

Success in linking strategic cost management to environmental accounting will depend on at least five factors:

1. The motivation for environmental protection and/or pollution prevention initiatives;
2. A systematic procedure for identifying costs (or to use CICA's terms environmental measures and losses);
3. Achievable but demanding objectives and targets;
4. The integration of various corporate strategies in the organization as a whole; and
5. A reporting system that provides a monitoring and corrective feedback system for the strategy.

First, the motivation to link environmental accounting to business strategy needs to be considered. A concern with compliance, for example, will drive a different choice of management strategies than a concern for the costs of environmental impacts. Compliance-oriented strategies would lead to techniques such as environmental auditing and the development of corporate environmental management systems. In this approach, concern for the costs of environmental impacts would be very general. Whole books are written on environmental topics for business managers without any mention of costs. In contrast, a cost-oriented strategy would go beyond EMS and EA techniques to examine "the costs of production plus the cost of any environmental damage associated with it" (Schmidheiny, 1992: 17).

Second, the system for gathering information is critical to the success of an environmental accounting initiative. To this end, the purpose of environmental accounting "is to provide relevant in-house information that will support the making of environmentally compatible decisions by management" (Fuller, 1999:287).

Third, the managerial uses of environmental cost accounting information must be related to achievable but demanding objectives to enhance not only environmental performance objectives but also productivity and profitability objectives for the company. Fuller (1999: 294-295) suggests the following six areas in which environmental cost accounting information can support marketing and managerial decisions: product mix decisions, choosing manufacturing inputs, assessing pollution prevention projects, evaluating waste management options, comparing environmental costs across facilities and pricing products. We believe that environmental cost accounting could be used in all areas of business decision-making and that these six areas provide a good starting point for analysis. To these six, we would add product (and/or service) *design.*

The fourth factor to consider is the integration of corporate strategies. Schaltegger, Muller and Hindrichsen (1996:225) argue in favor of evaluating strategic options on at least three levels: corporate, business and product.

Strategic options include, for example, the choice of new businesses to enter. Business strategy may be concerned with product-mix decisions. Finally, at the product strategy level, options include environmental upgrades or the discontinuation of products on environmental or other grounds. For strategic cost management to be successful, strategy at the corporate, business and product levels needs to be coherent from an environmental accounting perspective.

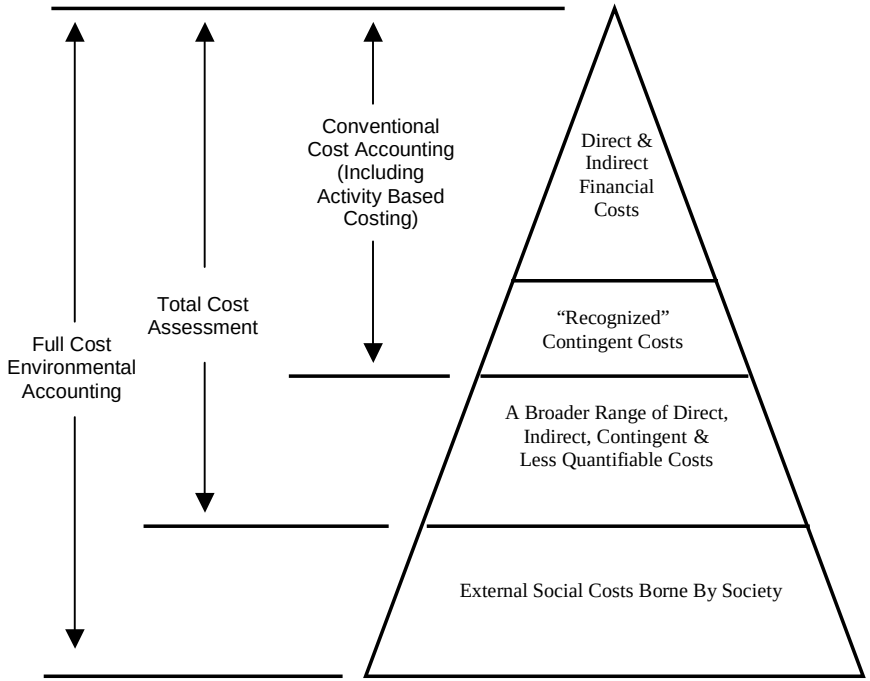
Rob Gray (1996: 173) best sums up the fifth factor, reporting. He sees accounting and reporting as two sides of the same coin.

> *The two sides are mutually dependent, it is impossible to report until one has something to report, to give account until something is accounted for.*

5. CONCLUSIONS

Managerial environmental accounting provides a comprehensive means for incorporating environmental considerations into business decision-making. The inclusion of internal environmental costs in its accounting will assist a company in working to maximize its current profitability. A firm can further be guided in maximizing its long-run profitability by taking into account external environmental costs, especially to the extent that it may be required to internalize these costs in the future. The adoption of these methods can help put a firm in a stronger competitive position in relation to firms that apply only conventional accounting. The extent of this advantage will depend on how extensively and creatively the firm makes use of these methods in its decision-making.

Figure 1: The Relationship between Environmental Accounting and Other Forms of Accounting



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