

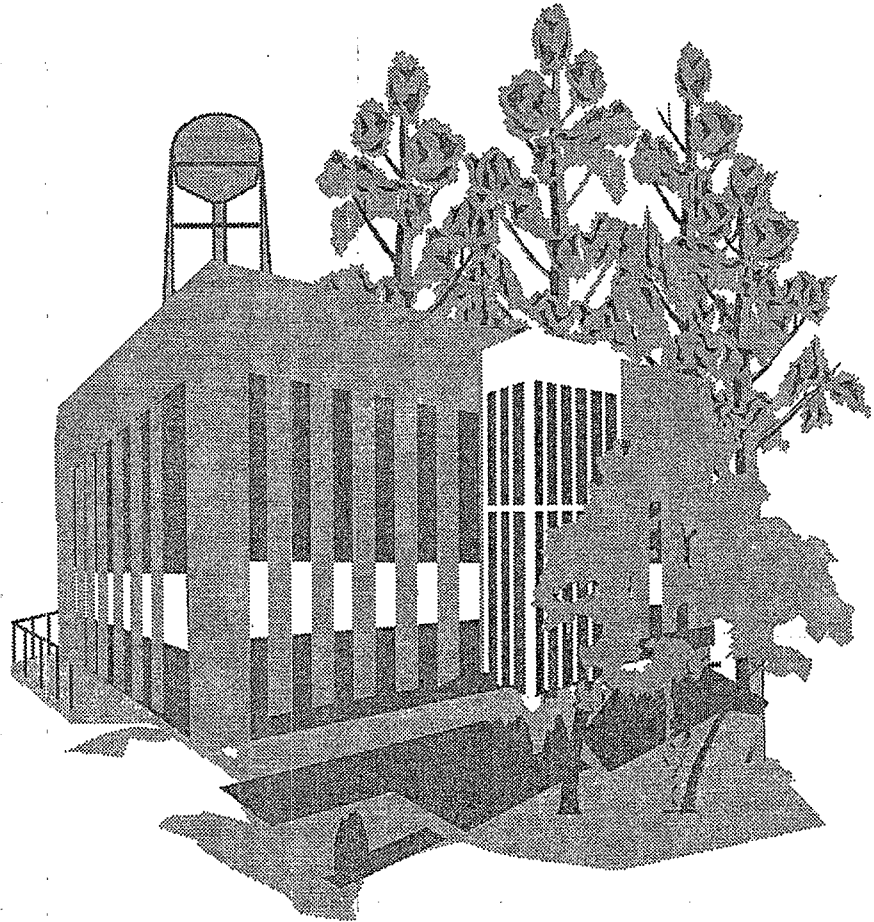
United States
Environmental Protection
Agency

Office of Pollution
Prevention And Toxics
(MC 7409)
Washington, D.C. 20460

EPA 742-R-95-001
June 1995



An Introduction to Environmental Accounting As A Business Management Tool: Key Concepts And Terms



**U.S. Environmental Protection Agency
Design for the Environment Program
Environmental Accounting Project**

This paper was prepared by ICF Incorporated under EPA Contract No. 68-W2-0008, Work Assignment 82. The EPA Work Assignment Managers were Marty Spitzer and Holly Elwood. Carlos Lago served as the EPA Project Officer. The ICF Work Assignment Manager was Paul Bailey.

Disclaimer

This primer refers to environmental accounting activities at several companies in North America. These examples are by no means exhaustive of the many laudable efforts underway to implement environmental accounting at firms in many different industries. Moreover, by mentioning these examples, EPA is not necessarily endorsing their approaches or terminology.

Acknowledgments

The Environmental Protection Agency (EPA) would like to thank all of the individuals who took the time to review earlier drafts of this paper and offered their helpful comments and suggestions. Their contributions are very much appreciated. The reviewers included the following individuals:

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Control
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Acknowledgments (continued)

Dr. Marty Spitzer, EPA Office of the Administrator, deserves special recognition for preparing earlier versions of this paper and offering his thoughts throughout the preparation and review of subsequent drafts.

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PURPOSE OF THIS DOCUMENT

The central purpose of this primer is twofold: (1) to orient readers to key concepts often referred to as environmental accounting, and (2) to explain how the terms that refer to environmental accounting are currently being used, so that confusion about the terms does not impede progress in understanding and applying the core concepts.

EPA prepared this document to be a starting point for readers who have questions about environmental accounting. The intended audience includes business managers and other professionals who wish to understand environmental accounting. In addition, people involved with activity-based costing, total quality management, business re-engineering, or design for the environment should find environmental accounting to be compatible with and potentially helpful to their programs.

EPA's Environmental Accounting Project has produced this primer at the behest of stakeholders who have suggested that an important step in promoting environmental accounting is to clarify key concepts and terms to facilitate more widespread adoption of environmental accounting practices.¹

¹ In December 1993, a national workshop of experts drawn from business, professional groups, government, nonprofits, and academia produced an *Action Agenda* "to encourage and motivate businesses to understand the full spectrum of environmental costs and integrate these costs in decisionmaking." *Stakeholder's Action Agenda: A Report of the Workshop on Accounting and Capital Budgeting for Environmental Costs, December 5-7, 1993*; EPA 742-R-94-003 (May 1994). The *Agenda* identifies four overarching issue areas that require attention to advance environmental accounting: (1) better understanding of terms and concepts, (2) creation of internal and external management incentives, (3) education, guidance, and outreach, and (4) development and dissemination of analytical tools, methods, and systems. The purpose of this document is to help address the first recommendation. The U.S. Chamber of Commerce, the Business Roundtable, the American Institute of Certified Public Accountants, the Institute of Management Accountants, AACE International (the Society of Total Cost Management), and the U.S. EPA co-sponsored the Workshop.

This primer focuses on environmental accounting as a management tool for a variety of purposes, such as improving environmental performance, controlling costs, investing in "cleaner" technologies, developing "greener" processes and products, and informing decisions related to product mix, product retention, and product pricing. The primer does not cover all of these potential applications but does summarize how environmental accounting can be applied to cost allocation, capital budgeting, and process/product design. Specific applications of environmental accounting are illustrated in case studies that EPA has prepared documenting companies' programs to implement environmental accounting. For more information on EPA's activities in this area or for copies of the case studies, please contact the EPA's Pollution Prevention Information Clearinghouse at (202) 260-1023.

AN INTRODUCTION TO ENVIRONMENTAL ACCOUNTING

A. Introduction

The term *environmental accounting* has many meanings and uses. Environmental accounting can support national income accounting, financial accounting, or internal business managerial accounting. This primer focuses on the application of environmental accounting as a managerial accounting tool for internal business decisions. Moreover, the term *environmental cost* has at least two major dimensions: (1) it can refer solely to costs that directly impact a company's bottom line (here termed "private costs"), or (2) it also can encompass the costs to individuals, society, and the environment for which a company is not accountable (here termed "societal costs"). The discussion in this primer concentrates on private costs because that is where companies starting to implement environmental accounting typically begin. However, much of the material is applicable to societal costs as well.

B. Why Do Environmental Accounting ?

Environmental costs are one of the many different types of costs businesses incur as they provide goods and services to their customers. Environmental performance is one of the many important measures of business success. Environmental costs and performance deserve management attention for the following reasons:

- (1) Many environmental costs can be **significantly reduced or eliminated** as a result of business decisions, ranging from operational and housekeeping changes, to investment in "greener" process technology, to redesign of processes/products. Many environmental costs (e.g., wasted raw materials) may provide no added value to a process, system, or product.
- (2) Environmental costs (and, thus, potential cost savings) **may be obscured in overhead accounts or otherwise overlooked.**
- (3) Many companies have discovered that **environmental costs can be offset by generating revenues** through sale of waste

by-products or transferable pollution allowances, or licensing of clean technologies, for example.

- (4) Better management of environmental costs can result in **improved environmental performance and significant benefits to human health** as well as business success.
- (5) Understanding the environmental costs and performance of processes and products can promote **more accurate costing and pricing** of products and can aid companies in the **design of more environmentally preferable** processes, products, and services for the future.
- (6) **Competitive advantage** with customers can result from processes, products, and services that can be demonstrated to be environmentally preferable.
- (7) Accounting for environmental costs and performance can support a company's development and operation of an overall **environmental management system**. Such a system will soon be a necessity for companies engaged in international trade due to pending international consensus standard ISO 14001, developed by the International Organization for Standardization.²

EPA's work with key stakeholders leads it to believe that as businesses more fully account for environmental costs and benefits, they will clearly see the financial advantages of pollution prevention (P2) practices. Environmental costs often can be reduced or avoided through P2 practices such as product design changes, input materials substitution, process re-design, and improved operation and maintenance (O&M) practices. For example, increased environmental costs may result from use of chemical A (e.g., a chlorinated solvent), but not from chemical B (e.g., an aqueous-based solvent). This is true even though chemical A and chemical B can be substitutable. Another example: some environmental compliance costs are required only when use of a substance or generation of a waste exceeds a defined threshold. A company that can reduce chemical use below such thresholds or employ substitutes for regulated chemicals can realize substantial cost savings from design, engineering, and operational decisions.

² See ISO 14001: *Environmental Management System Specification* (Committee Draft, February 1995). ISO 14000 guidance document *General Guidelines on Principles and Supporting Techniques* (Committee Draft, February 1995) adds that tracking environmental benefits and costs can support the appropriate allocation of resources for achieving environmental objectives.

In two of the most thorough reports on the subject of pollution prevention in the industrial community, the not-for-profit group INFORM³ studied 29 companies in the organic chemical industry in 1985 and again in 1992. This research found that chemical "plants with some type of environmental cost accounting program" had "an average of three times as many" P2 projects "as plants with no cost accounting system."⁴ The study also showed that the average annual savings per P2 project in production facilities, where data were available, were just over \$351,000, which equalled an average savings of \$3.49 for every dollar spent. Not only were substantial savings and returns on investment documented for P2 projects, but an average of 1.6 million pounds of waste were reduced for each project.

Results like these have highlighted the potential benefits of environmental accounting to the business community. For example, responses to a questionnaire administered by George Nagle of the Bristol-Myers Squibb Company at the Spring 1994 Global Environmental Management Initiative (GEMI) Conference showed that corporate professionals are placing a high priority on environmental accounting.⁵ Of the 25 respondents to the informal survey, half stated that their company had some form of a tracking system for environmental costs. All but two reported that they believed environmental accounting issues would be more important to their companies in the near future. In addition, the Business Roundtable expects to turn its attention to environmental accounting issues in 1995, and companies of all sizes in the U.S. are beginning to consider implementing environmental accounting in their facilities.⁶

³ *Cutting Chemical Wastes* (1985), INFORM, New York, NY; *Environmental Dividends: Cutting More Chemical Wastes* (1992), INFORM, New York, NY.

⁴ *Environmental Dividends*, at page 31.

⁵ "Business Environmental Cost Accounting Survey," *Global Environmental Management Initiative '94 Conference Proceedings*, p. 243, March 16-17, 1994, Arlington, VA.

⁶ See *Green Ledgers: Case Studies in Corporate Environmental Accounting*, edited by Daryl Ditz, Janet Ranganathan, and Darryl Banks (World Resources Institute, 1995) and *Environmental Accounting Case Studies*, EPA 742-R-95-00X (forthcoming).

C. What Is Environmental Accounting?

Different uses of the umbrella term *environmental accounting* arise from three distinct contexts:

Type of Environmental Accounting	Focus	Audience
(1) national income accounting	nation	external
(2) financial accounting	firm	external
(3) managerial or management accounting	firm, division, facility, product line, or system	internal

National income accounting is a macro-economic measure. Gross Domestic Product (GDP) is an example. The GDP is a measure of the flow of goods and services through the economy. It is often cited as a key measure of our society's economic well-being. The term environmental accounting may refer to this national economic context. For example, environmental accounting can use physical or monetary units to refer to the consumption of the nation's natural resources, both renewable and nonrenewable. In this context, environmental accounting has been termed "natural resources accounting."

Financial accounting enables companies to prepare financial reports for use by investors, lenders, and others. Publicly held corporations report information on their financial condition and performance through quarterly and annual reports, governed by rules set by the U.S. Securities and Exchange Commission (SEC) with input from industry's self-regulatory body, the Financial Accounting Standards Board (FASB). Generally Accepted Accounting Principles (GAAP) are the basis for this reporting. Environmental accounting in this context refers to the estimation and public reporting of environmental liabilities and financially material environmental costs.

Management accounting is the process of identifying, collecting, and analyzing information principally for internal purposes.⁷ Because a key purpose of management accounting is to support a business's forward-looking management decisions, it is the focus of the remainder of this primer. Management accounting can involve data on costs, production levels, inventory and backlog, and other vital aspects of a business. The information collected under a business's management accounting system is used to plan, evaluate, and control in a variety of ways:

- (1) planning and directing management attention,
- (2) informing decisions such as purchasing (e.g., make vs. buy), capital investments, product costing and pricing, risk management, process/product design, and compliance strategies, and
- (3) controlling and motivating behavior to improve business results.

Unlike financial accounting, which is governed by Generally Accepted Accounting Principles (GAAP), management accounting practices and systems differ according to the needs of the businesses they serve. Some businesses have simple systems, others have elaborate ones. Just as management accounting refers to the use of a broad set of cost and performance data by a company's managers in making a myriad of business decisions, environmental accounting refers to the use of data about environmental costs and performance in business decisions and operations. Exhibit 1 lists many types of internal management decisions that can benefit from the consideration of environmental costs and benefits. This primer later summarizes how environmental accounting can be integrated into cost allocation, capital budgeting, and process/product design.

⁷ "Management accounting is the process of identification, measurement, accumulation, analysis, preparation, interpretation, and communication of financial information used by management to plan, evaluate, and control within an organization and to assure appropriate use of and accountability for its resources...." Institute of Management Accountants Statement on Management Accounting, No. 1A.

EXHIBIT 1

Types of Management Decisions Benefitting from Environmental Cost Information



A clipboard with a black clip at the top, holding a white sheet of paper with a checklist. The checklist is organized into two columns, each with a checked box (✓) next to the item name. The items are listed in a table format.

✓ Product Design	✓ Capital Investments
✓ Process Design	✓ Cost Control
✓ Facility Siting	✓ Waste Management
✓ Purchasing	✓ Cost Allocation
✓ Operational	✓ Product Retention and Mix
✓ Risk Management	✓ Product Pricing
✓ Environmental Compliance Strategies	✓ Performance Evaluations

D. What Is An Environmental Cost?

Uncovering and recognizing **environmental costs** associated with a product, process, system, or facility is important for good management decisions. Attaining such goals as reducing environmental expenses, increasing revenues, and improving environmental performance requires paying attention to current, future, and potential **environmental costs**. How a company defines an environmental cost depends on how it intends to use the information (e.g., cost allocation, capital budgeting, process/product design, other management decisions) and the scale and scope of the exercise. Moreover, it may not always be clear whether a cost is "environmental" or not; some costs fall into a gray zone or may be classified as partly environmental and partly not. Whether or not a cost is "environmental" is not critical; the goal is to ensure that relevant costs receive appropriate attention.

Identifying Environmental Costs

Environmental accounting terminology uses such words as *full*, *total*, *true*, and *life cycle* to emphasize that traditional approaches were incomplete in scope because they overlooked important environmental costs (and potential cost savings and revenues).⁸ In looking for and uncovering relevant environmental costs, managers may want to use one or more organizing frameworks as tools. This section presents examples of environmental costs as well as a framework that has been used to identify and classify environmental costs.

There are many different ways to categorize costs. Accounting systems typically classify costs as:

- (1) direct materials and labor,
- (2) manufacturing or factory overhead (i.e., operating costs other than direct materials and labor),⁹

⁸ See, for example, Paul E. Bailey, "Full Cost Accounting for Life Cycle Costs --- A Guide for Engineers and Financial Analysts," *Environmental Finance* (Spring 1991), pp. 13-29.

⁹ Manufacturing or factory overhead typically includes indirect materials and labor, capital depreciation, rent, property taxes, insurance, supplies, utilities, repairs and maintenance, and other costs of operating a factory.

- (3) sales,
- (4) general and administrative (G&A) overhead,¹⁰ and
- (5) research & development (R&D).

Environmental expenses may be classified in any or all of these categories in different companies. To better focus attention on environmental costs for management decisions, the *EPA Pollution Prevention Benefits Manual* and the Global Environmental Management Initiative (GEMI) environmental cost primer use similar organizing frameworks to distinguish costs that generally receive management attention, termed the "usual" costs or "direct" costs, from costs that may be obscured through treatment as overhead or R&D, distorted through improper allocation to cost centers, or simply overlooked, termed "hidden," "contingent," "liability" or "less tangible" costs.¹¹ Exhibit 2 lists examples of these costs under the labels "conventional," "potentially hidden," "contingent," and "image/relationship" costs.

Conventional Costs. The costs of using raw materials, utilities, capital goods, and supplies are usually addressed in cost accounting and capital budgeting, but are not usually considered environmental costs. However, decreased use and less waste of raw materials, utilities, capital goods, and supplies are environmentally preferable, reducing both environmental degradation and consumption of nonrenewable resources. It is important to factor these costs into business decisions, whether or not they are viewed as "environmental" costs. The dashed line around these *conventional costs* in Exhibit 2 indicates that even these costs (and potential cost savings) may sometimes be overlooked in business decision-making.

¹⁰ General and administrative costs may be pooled with sales costs (i.e., SG&A) or as part of "technical, sales, and general administrative" costs (i.e., TSGA).

¹¹ The EPA's *Pollution Prevention Benefits Manual* (October 1989) introduced the terminology distinguishing among usual, hidden, liability, and less tangible costs. This framework was largely adopted in *Finding Cost-Effective Pollution Prevention Initiatives: Incorporating Environmental Costs into Business Decision Making* (1994, Global Environmental Management Initiative (GEMI)), which uses the terms direct, hidden, contingent liability, and less tangible costs.

EXHIBIT 2
Examples of Environmental Costs Incurred by Firms

<i>Potentially Hidden Costs</i>		
<u>Regulatory</u>	<u>Upfront</u>	<u>Voluntary</u> <u>(Beyond Compliance)</u>
<ul style="list-style-type: none"> • Notification • Reporting • Monitoring/testing • Studies/modeling • Remediation • Recordkeeping • Plans • Training • Inspections • Manifesting • Labeling • Preparedness • Protective equipment • Medical surveillance • Environmental insurance • Financial assurance • Pollution control • Spill response • Stormwater management • Waste management • Taxes/fees 	<ul style="list-style-type: none"> • Site studies • Site preparation • Permitting • R&D • Engineering and procurement • Installation <div style="border: 1px dashed black; padding: 5px; margin: 5px 0;"> <p align="center"><u>Conventional Costs</u></p> <ul style="list-style-type: none"> • Capital equipment • Materials • Labor • Supplies • Utilities • Structures • Salvage value </div> <p align="center"><u>Back-End</u></p> <ul style="list-style-type: none"> • Closure/decommissioning • Disposal of inventory • Post-closure care • Site survey 	<ul style="list-style-type: none"> • Community relations/outreach • Monitoring/testing • Training • Audits • Qualifying suppliers • Reports (e.g., annual environmental reports) • Insurance • Planning • Feasibility studies • Remediation • Recycling • Environmental studies • R & D • Habitat and wetland protection • Landscaping • Other environmental projects • Financial support to environmental groups and/or researchers
<i>Contingent Costs</i>		
<ul style="list-style-type: none"> • Future compliance costs • Penalties/fines • Response to future releases 	<ul style="list-style-type: none"> • Remediation • Property damage • Personal injury damage 	<ul style="list-style-type: none"> • Legal expenses • Natural resource damages • Economic loss damages
<i>Image and Relationship Costs</i>		
<ul style="list-style-type: none"> • Corporate image • Relationship with customers • Relationships with investors • Relationship with insurers 	<ul style="list-style-type: none"> • Relationship with professional staff • Relationship with workers • Relationship with suppliers 	<ul style="list-style-type: none"> • Relationship with lenders • Relationship with host communities • Relationship with regulators

Potentially Hidden Costs. Exhibit 2 collects several types of environmental costs that may be potentially hidden from managers: first are **upfront environmental costs**, which are incurred prior to the operation of a process, system, or facility. These can include costs related to siting, design of environmentally preferable products or processes, qualifications of suppliers, evaluation of alternative pollution control equipment, and so on. Whether classified as overhead or R&D, these costs can easily be forgotten when managers and analysts focus on operating costs of processes, systems, and facilities. Second are **regulatory** and **voluntary environmental costs** incurred in operating a process, system, or facility; because many companies traditionally have treated these costs as overhead, they may not receive appropriate attention from managers and analysts responsible for day-to-day operations and business decisions. The magnitude of these costs also may be more difficult to determine as a result of their being pooled in overhead accounts. Third, while upfront and current operating costs may be obscured by management accounting practices, **back-end environmental costs** may not be entered into management accounting systems at all. These environmental costs of current operations are *prospective*, meaning they will occur at more or less well defined points in the future. Examples include the *future* cost of decommissioning a laboratory that uses licensed nuclear materials, closing a landfill cell, replacing a storage tank used to hold petroleum or hazardous substances, and complying with regulations that are not yet in effect but have been promulgated. Such back-end environmental costs may be overlooked if they are not well documented or accrued in accounting systems.

Exhibit 2 contains a lengthy list of "**potentially hidden environmental costs**", including examples of the costs of upfront, operational, and back-end activities undertaken to (1) comply with environmental laws (i.e., regulatory costs) or (2) go beyond compliance (i.e., voluntary costs). In bringing these costs to light, it also may be useful to distinguish among costs incurred to respond to *past pollution* not related to *ongoing operations*; to control, clean up, or prevent pollution from *ongoing operations*; or to prevent or reduce pollution from *future operations*.

Contingent Costs. Costs that may or may not be incurred at some point in the future -- here termed "**contingent costs**" -- can best be described in probabilistic terms: their expected value, their range, or the probability of their exceeding some dollar amount. Examples include the costs of remedying and compensating for future accidental releases of contaminants into the environment (e.g., oil spills), fines and penalties for future regulatory infractions, and future costs due to unexpected consequences of permitted or intentional releases. These costs may also be termed "contingent liabilities" or "contingent liability costs." Because these costs may not currently need to be recognized for other purposes, they may not receive adequate attention in internal management accounting systems and forward-looking decisions.

Image and Relationship Costs. Some environmental costs are called "less tangible" or "intangible" because they are incurred to affect subjective (though measurable) perceptions of management, customers, employees, communities, and regulators. These costs have also been termed "**corporate image**" and "**relationship**" costs. This category can include the costs of annual environmental reports and community relations activities, costs incurred voluntarily for environmental activities (e.g., tree planting), and costs incurred for P2 award/recognition programs. The costs themselves are not "intangible," but the direct benefits that result from relationship/corporate image expenses often are.

Is It An "Environmental" Cost?

Costs incurred to comply with environmental laws are clearly environmental costs. Costs of environmental remediation, pollution control equipment, and noncompliance penalties are all unquestionably environmental costs. Other costs incurred for environmental protection are likewise clearly environmental costs, even if they are not explicitly required by regulations or go beyond regulatory compliance levels.

There are other costs, however, that may fall into a gray zone in terms of being considered environmental costs. For example, should the costs of production equipment be considered "environmental" if it is a "clean technology?" Is an energy-efficient turbine an "environmental"

cost? Should efforts to monitor the shelf life of raw materials and supplies in inventory be considered "environmental" costs (if discarded, they become waste and result in environmental costs)? It may also be difficult to distinguish some environmental costs from health and safety costs or from risk management costs.

The goal of environmental accounting is to increase the amount of relevant information that is made available to those who need or can use it. The success of environmental accounting does not depend on "correctly" classifying all the costs a firm incurs.

The success of environmental accounting does not depend on "correctly" classifying all the costs a firm incurs. Rather, its goal is to ensure that relevant information is made available to those who need or can use it. To handle costs in the gray zone, some firms use the following approaches:

- allowing a cost item to be treated as "environmental" for one purpose but not for another,
- treating part of the cost of an item or activity as "environmental," or
- treating costs as "environmental" for accounting purposes when a firm decides that a cost is more than 50% environmental.

There are many options. Companies can define what should constitute an "environmental cost" and how to classify it, based on their goals and intended uses for environmental accounting. For example, if a firm wants to encourage pollution prevention in capital budgeting, it might consider distinguishing (1) environmental costs that can be avoided by pollution prevention investments, from (2) environmental costs related to remedying contamination that has already occurred. But for product costing purposes, such a distinction might not be necessary because both are costs of producing the good or service.

E. Is There a Proper Scale and Scope for Environmental Accounting?

Environmental accounting is a flexible tool that can be applied at different scales of use and different scopes of coverage. This section describes some of the options for applying environmental accounting.

Scale. Depending on corporate needs, interests, goals, and resources, environmental accounting can be applied at different scales, which include the following:

★	individual process or group of processes (e.g., production line)
★	system (e.g., lighting, wastewater treatment, packaging)
★	product or product line
★	facility , department, or all facilities at a single location
★	regional/geographical groups of departments or facilities
★	corporate division, affiliate, or the entire company

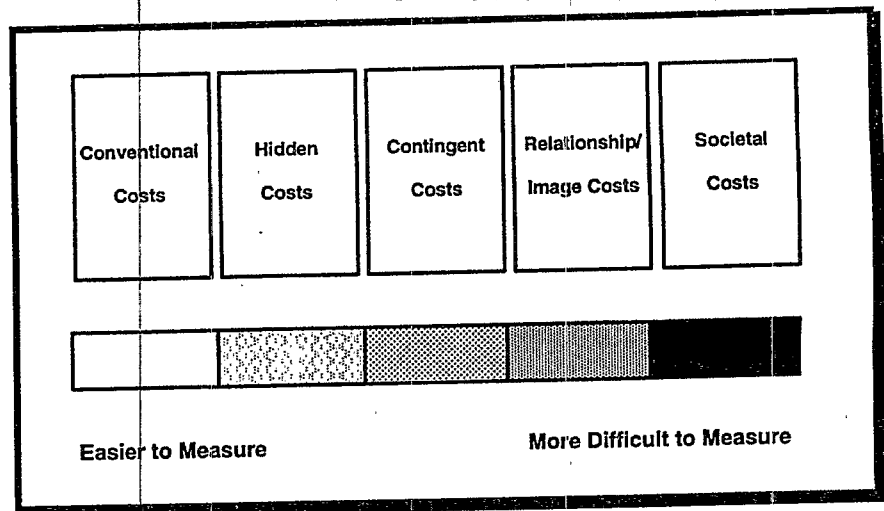
Specific environmental accounting issues or challenges may vary depending on the scale of its application.

Scope. Whatever the scale, there also is an issue of scope. An initial scope question is whether environmental accounting extends beyond conventional costs to include potentially hidden, future, contingent, and image/relationship costs. Another scope issue is whether companies intend to consider only those costs that directly affect their bottom line financial profit or loss (e.g., see examples of costs listed in Exhibit 2 above), or whether companies also want to recognize the environmental costs that result from their activities but for which they are not accountable, referred to as societal or external costs. These latter costs are described in Section F.

Thus, the *scope* of environmental accounting refers to the types of costs included. As the scope becomes more expansive, firms may find it more difficult to assess and measure certain environmental costs. This is illustrated by Exhibit 3.

EXHIBIT 3

The Spectrum of Environmental Costs

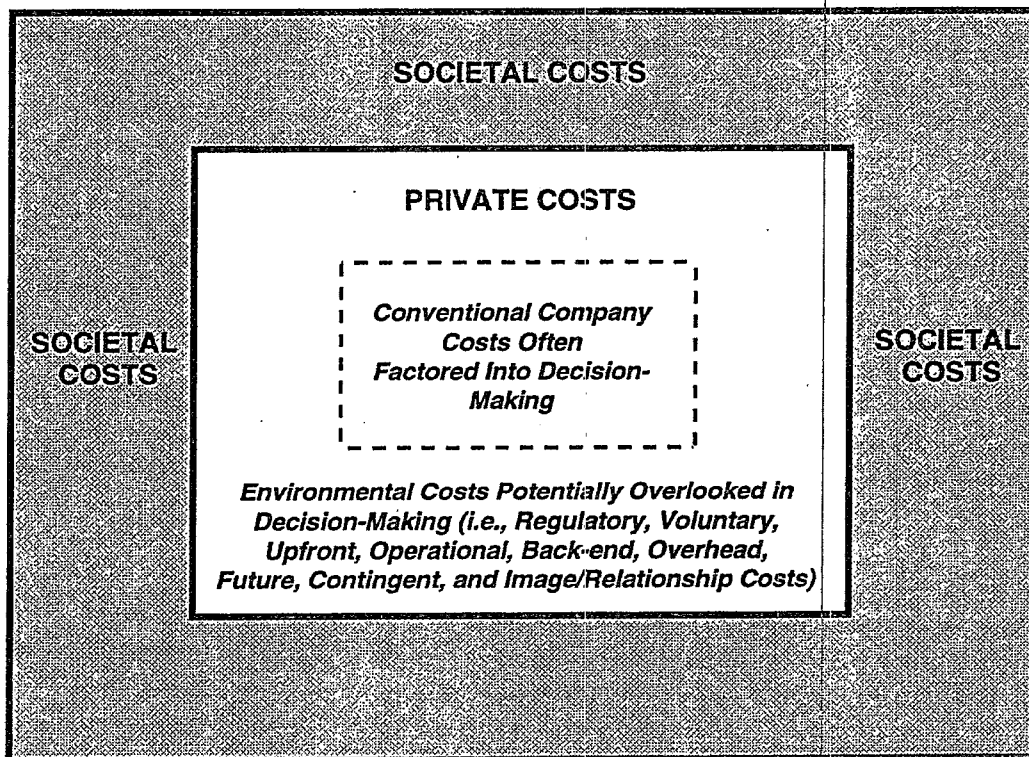


F. What Is The Difference Between Private Costs and Societal Costs?

Understanding the distinction between private and societal costs is necessary when discussing environmental accounting, because common terms are often used inconsistently to refer to one or both of those cost categories. Exhibit 4 provides a graphical representation of the important difference between private and societal costs. It also shows that many private costs are not currently considered in decision-making. This perspective can apply to a process, product, system, facility, or an entire company.

EXHIBIT 4¹²

Private and Societal Environmental Costs



¹² Adapted from Allen T. White, Monica Becker, and Deborah E. Savage, "Environmentally Smart Accounting: Using Total Cost Assessment to Advance Pollution Prevention," *Pollution Prevention Review* (Summer 1993), pp. 247-259.

The innermost box labeled "*conventional company costs*" includes the many costs businesses typically track well (e.g., capital costs, labor, material). Many of these costs may already be directly allocated to the responsible processes or products in cost accounting systems and be included in financial evaluations of capital expenditures. The larger unshaded box includes all of the potentially overlooked costs a business incurs. Examples of these costs are shown on page 9 at Exhibit 2. Together, the unshaded area represents "*private costs*," which are the costs a business incurs or for which a business can be held accountable (i.e., legally responsible). These are the costs that can directly affect a firm's bottom line.

The outside shaded box labeled "*societal costs*" represents the costs of business' impacts on the environment and society for which business is not legally accountable. (These costs are also called "externalities" or "external costs.") Societal costs include both (1) environmental degradation for which firms are not legally liable and also (2) adverse impacts on human beings, their property, and their welfare (e.g., employment impacts of spills) that cannot be compensated through the legal system. For example, damage caused to a river because of polluted wastewater discharges, or to ecosystems from solid waste disposal, or to asthmatics because of air pollutant emissions are all examples of societal costs for which a business often does not pay. Because laws can vary from state to state, the boundary between societal and private costs may differ as well. At present, valuing societal costs is both difficult and controversial; nevertheless, some businesses are attempting to address these costs and EPA supports their efforts. A major North American power utility, Ontario Hydro, has made a corporate commitment to determine external impacts and, to the extent possible, value societal costs in order to integrate them into its planning and decision-making.¹³ EPA urges businesses to address all private

Life Cycle Perspective Can Help to Identify Private and Societal Costs

The life cycle of a product, process, system, or facility can refer to the suite of activities starting with acquisition (and upfront pre-acquisition activities) and concluding with back-end disposal/decommissioning that a specific firm performs or is responsible for. This life-cycle perspective can foster a thorough accounting of private costs (and potential cost savings) in addition to facilitating a more systematic and complete assessment of societal impacts and costs due to a firm's activities.

¹³ See "*Full Cost Accounting*" at Ontario Hydro: A Case Study, EPA 742-R-95-00X (forthcoming).

environmental costs shown on Exhibit 2, including hidden, future, contingent, and image/relationship costs, to the extent practical. Companies are also encouraged to move beyond consideration of private costs to incorporate societal costs, at least qualitatively, into their business decisions.

G. Who Can Do Environmental Accounting?

Environmental accounting can be employed by firms large and small, in almost every industry in both the manufacturing and services sectors. It can be applied on a large scale or a small scale, systematically or on an as needed basis. The form it takes can reflect the goals and needs of the company using it. However, in any business, top management support and cross-functional teams are likely to be essential for the successful implementation of environmental accounting because:

- Environmental accounting may entail a new way of looking at a company's environmental costs, performance, and decisions. Top management commitment can set a positive tone and articulate incentives for the organization to adopt environmental accounting.
- Companies will likely want to assemble cross-functional teams to implement environmental accounting, bringing together designers, chemists, engineers, production managers, operators, financial staff, environmental managers, purchasing personnel, and accountants who may not have worked together before. Because environmental accounting is not solely an accounting issue, and the information needed is split up among all of these groups, these people need to talk with each other to develop a common vision and language and make that vision a reality.

AT&T is one example of a company that has combined senior management support and use of a cross-functional team for its environmental accounting initiative.¹⁴

¹⁴ See *Introducing "Green Accounting" at AT&T: A Case Study*, EPA 742-R-95-00X (forthcoming).

Companies with formal environmental management systems may want to institutionalize environmental accounting because it is a logical decision support tool for these systems. Similarly, many companies have begun or are exploring new business approaches in which environmental accounting can play a part:

- Activity-Based Costing/Activity-Based Management
- Total Quality Management/Total Quality Environmental Management
- Business Process Re-Engineering/Cost Reduction
- Cost of Quality Model/Cost of Environmental Quality Model
- Design for Environment/Life-Cycle Design
- Life-Cycle Assessment/Life-Cycle Costing

All of these approaches are compatible with environmental accounting and can provide platforms for integrating environmental information into business decisions.

Companies using or evaluating these approaches may want to consider explicitly adopting environmental accounting as part of these efforts.

Environmental accounting can be an important component of overall corporate environmental management, quality management, and cost management.

Small businesses that may not have formal environmental management systems, or are not using any of the above approaches, have also successfully applied environmental accounting. As with larger firms, management commitment and cross-functional involvement are necessary.

H. Applying Environmental Accounting to Cost Allocation

An important function of environmental accounting is to bring environmental costs to the attention of corporate stakeholders who may be able and motivated to identify ways of reducing or avoiding those costs while at the same time improving environmental quality.

This can require, for example, pulling some environmental costs out of overhead and allocating those environmental costs to the appropriate accounts. By *allocating* environmental costs to the products or processes that generate them, a company can motivate affected managers and employees to find creative pollution prevention alternatives that lower those costs and enhance profitability. For example, Caterpillar's East Peoria, Illinois, plant no longer dumps waste disposal costs into an overhead account; rather, the costs of waste disposal are allocated to responsible commodity groups, triggering efforts to improve the bottom line through pollution prevention.¹⁵

COST ALLOCATION

Overhead is any cost that, in a given cost accounting system, is not wholly attributed to a single process, system, product, or facility. Examples can include supervisors' salaries, janitorial services, utilities, and waste disposal. Many environmental costs are often treated as overhead in corporate cost accounting systems. Traditionally, an overhead cost item has been handled in either one of two ways:

- (1) it may be allocated on some basis to specific products, or
- (2) it may be left in the pool of costs that are not attributed to any specific product.

If overhead is allocated incorrectly, one product may bear an overhead allocation greater than warranted, while another may bear an allocation smaller than its actual contribution. The result is poor product costing, which can affect pricing and profitability. Alternatively, some overhead costs may not be reflected at all in product cost and price. In both instances, managers cannot perceive the true cost of producing products and thus internal accounting reports provide inadequate incentives to find creative ways of reducing those costs.

¹⁵ Jean V. Owen (senior editor,) "Environmental Compliance: Managing the Mandates," *Manufacturing Engineering* (March 1995).

Separating environmental costs from overhead accounts where they are often hidden and allocating them to the appropriate product, process, system, or facility directly responsible reveals these costs to managers, cost analysts, engineers, designers, and others. This is critical not only for a business to have accurate estimates of production costs for different product lines and processes, but also to help managers target cost reduction activities that can also improve environmental quality. The axiom "one cannot manage what one cannot see" pertains here.

Steps in Environmental Cost Allocation

1. Determine scale and scope
2. Identify environmental costs
3. Quantify those costs
4. Allocate environmental costs to responsible process, product, system, or facility

There are two general approaches to allocating environmental costs:

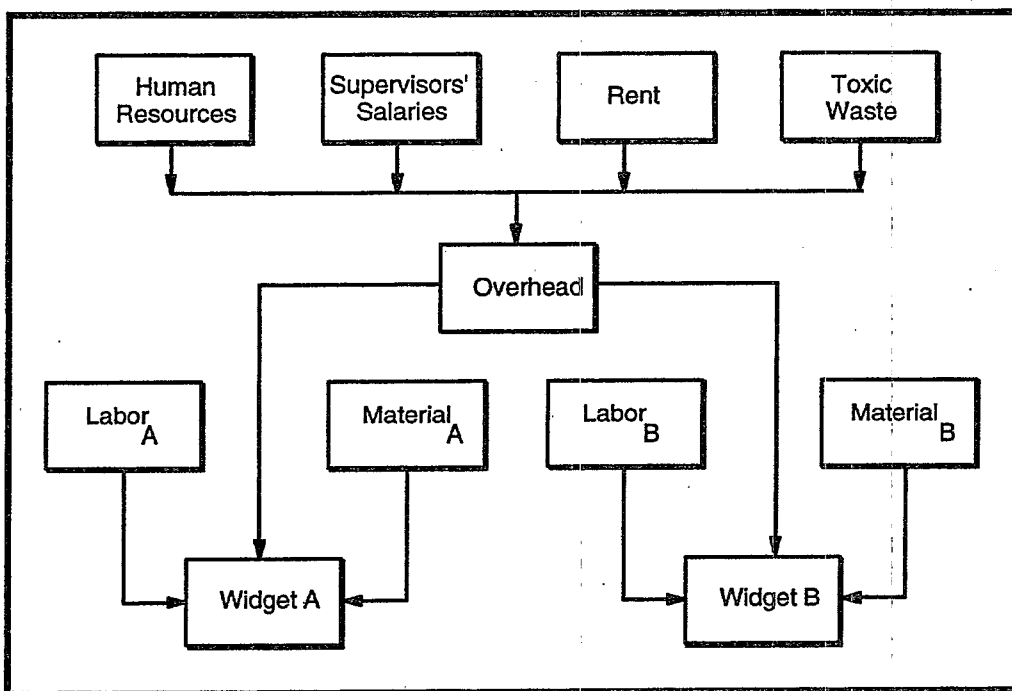
- (1) Build proper cost allocation directly into cost accounting systems, or
- (2) Handle cost allocation outside of automated accounting systems.

Companies may find that the latter approach can serve as an interim measure while the former option is being implemented.

A simple example illustrates the problem.¹⁶ Exhibit 5 depicts a traditional accounting system that assigns environmental and certain other costs to overhead. Such overhead costs generally are allocated to Widgets A and B in proportion to their consumption of labor and materials.

EXHIBIT 5

TRADITIONAL COST ACCOUNTING SYSTEM



¹⁶ This example and the diagrams are derived from Rebecca Todd, "Accounting for the Environment: Zero-Loss Environmental Accounting Systems," Presented at the National Academy of Engineering, Industrial Ecology/Design for Engineering Workshop, July 13-17, 1992.

Exhibit 6 highlights the misallocation of environmental costs. Suppose Widget B is solely responsible for toxic waste management costs, and Widget A creates no toxic waste costs. The misallocation occurs because the toxic waste management cost is lumped together in an overhead cost pool that is misallocated to both Widgets A and B, even though none of the toxic waste management cost results from the production of Widget A. The effect is to distort the actual costs of producing Widget A and Widget B.

EXHIBIT 6

Misallocation of Environmental Costs Under Traditional Cost System

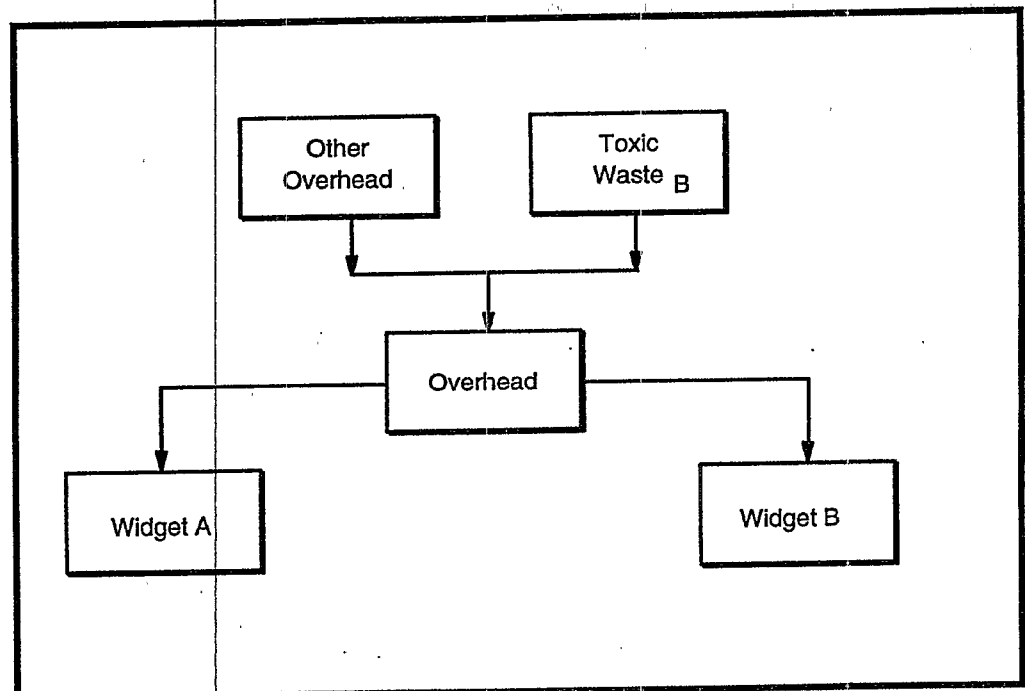
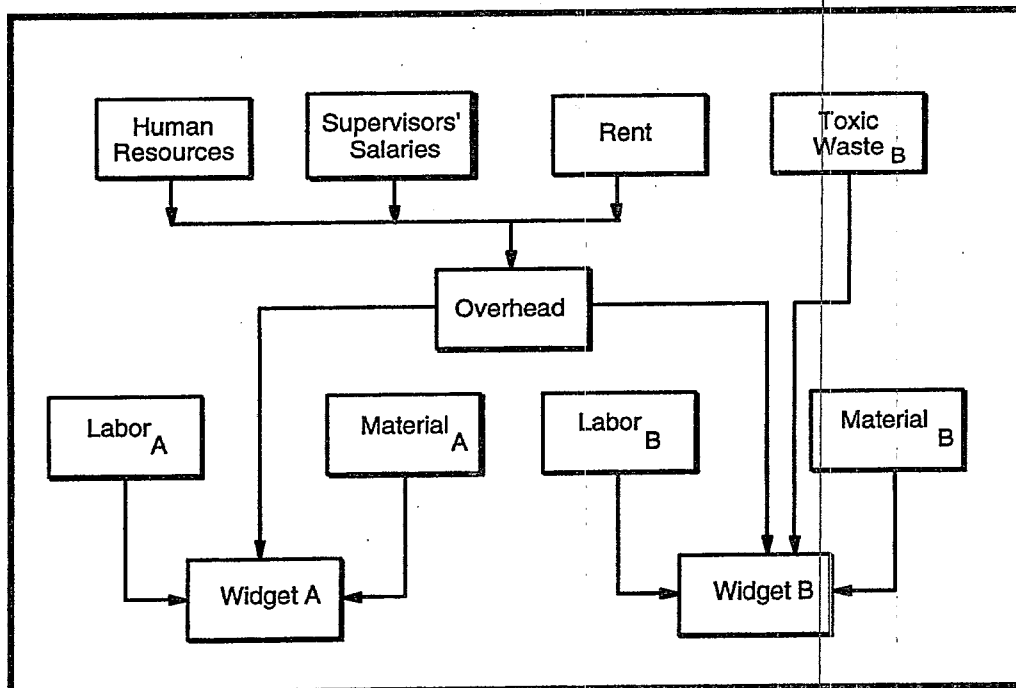


Exhibit 7 illustrates a cost accounting system that correctly attributes the environmental costs of Widget B only to Widget B. By breaking environmental costs out of overhead and directly attributing them to products, managers will have a much clearer view of the true costs of producing Widget A and B. Alternatively, environmental costs can be allocated to responsible processes, systems, or departments. Environmental costs resulting from several processes or products may need to be allocated based on a more complex analysis. And future costs (e.g., toxic waste disposal) may need to be amortized and allocated to proper cost centers.

The preceding discussion applies equally to the appropriate crediting of revenues derived from sale or use of by-products or recyclables (e.g., raw materials and supplies). Although the focus of cost allocation is on environmental costs, environmental revenues should be treated in a parallel fashion.

EXHIBIT 7

Revised Cost Accounting System



I. Applying Environmental Accounting to Capital Budgeting

Capital budgeting includes the process of developing a firm's planned capital investments. It typically entails comparing predicted cost and revenue streams of current operations and alternative investment projects against financial benchmarks in light of the costs of capital to a firm.¹⁷

It has been quite common for financial analysis of investment alternatives to exclude many environmental costs, cost savings, and revenues. As a result, corporations may not have recognized financially attractive investments in pollution prevention and "clean technology." This is beginning to change.

CAPITAL BUDGETING

When evaluating a potential capital investment it is important to fully consider environmental costs, cost savings, and revenues to place pollution prevention investments on a level playing field with other investment choices. To do this, identify and include the *types* of costs (and revenues) (i.e., the "cost inventory") that will help to demonstrate the financial viability

of a cleaner technology investment. Analyze qualitatively those data and issues that cannot be easily quantified, such as the potential less tangible benefits of pollution prevention investments. Exhibit 2 may help in identifying potentially relevant costs (and savings).

Integrating Environmental Accounting into Capital Budgeting

1. Inventory and quantify environmental costs
2. Allocate and project environmental costs and benefits
3. Use appropriate financial indicators
4. Set reasonable time horizon that captures environmental benefits

¹⁷ Allen White and Monica Becker, "Total Cost Assessment: Catalyzing Corporate Self Interest in Pollution Prevention," *New Solutions*, (Winter, 1992), p. 34. See also, "Total Cost Assessment: Accelerating Industrial Pollution Prevention through Innovative Project Financial Analysis, With Applications to the Pulp and Paper Industry," U.S. Environmental Protection Agency (May, 1992) EPA-741-R-92-002.

After collecting or developing environmental data (either from the accounting system or by manual means), allocate and project costs, cost savings, and potential revenues to the products, processes, systems, or facilities that are the focus of the capital budgeting decision. Begin with the easiest to estimate costs and revenues and work toward the more difficult to estimate environmental costs and benefits such as contingencies and corporate image. The benefit of improved corporate image and relationships due to pollution prevention investments can impact costs and revenues in ways that may be challenging to project in dollars and cents. (See sidebar) For example, a company selected as "Clean Air Partner of the Year" under a Colorado partnership program attracted several new clients from the positive publicity.¹⁸ Information about past expenditures on corporate image also may be helpful in estimating future benefits (e.g., potential savings or reductions in those outlays resulting from the investment) for companies that want to go beyond the qualitative consideration of these benefits.

It may be easier to include environmental costs in capital budgeting, if existing processes, systems, and products are already being assigned environmental costs in cost accounting systems.

Potential Less Tangible Benefits of Pollution Prevention Investments

- Increased sales due to enhanced company or product image
- Better borrowing access and terms
- Equity more attractive to investors
- Health and safety cost savings
- Increased productivity and morale of employees, greater retention, reduced recruiting costs
- Faster, easier approvals of facility expansion plans or changes due to increased trust from host communities and regulators
- Enhanced image with stakeholders such as customers, employees, suppliers, lenders, stockholders, insurers, and host communities
- Improved relationships with regulators

¹⁸ Reported by representative of Majestic Metals, March 22, 1995, at EPA Regional Office training program on pollution prevention.

Be sure to use appropriate financial indicators that include the time value of money (i.e., a dollar today is worth more than a dollar next year). Sound financial indicators include net present value,¹⁹ internal rate of return,²⁰ and other profitability indices. Payback,²¹ although commonly used, does not recognize the time value of money. Further, payback may not recognize the long-term benefits of pollution prevention investments.

Consider cash flows and the profitability of a project over a sufficiently long time horizon (e.g., economic life of the capital investment) to capture the long-term benefits of pollution prevention investments. Finally, prepare the data and information in a format that managers and lenders can understand and find useful.

For more information on integrating environmental costs into capital budgeting, see EPA's *Total Cost Assessment: Accelerating Industrial Pollution Prevention through Innovative Project Financial Analysis* (EPA 741-R-92-002, May 1992).

J. Applying Environmental Accounting to Process/Product Design

The design of a process or product significantly affects environmental costs and performance. The design process involves balancing cost, performance, cultural, legal, and environmental criteria.²²

PROCESS/PRODUCT DESIGN

¹⁹ The present value of the future cash flows of an investment less the investment's current cost. It incorporates the time value of money.

²⁰ The discount rate at which the net present value of a project is equal to zero.

²¹ The time period required for revenues or cost savings to equal costs; payback typically does not involve discounting.

²² EPA *Life Cycle Design Guidance Manual: Environmental Requirements and the Product System*, EPA-600-R-92-226 (1993).

Many companies are adopting "design for the environment" or "life cycle design" programs to take environmental considerations into account at an early stage. To do so, designers need information on the environmental costs and performance of alternative product/process designs, much like the information needed in making capital budgeting decisions. Thus, making environmental cost and performance information available to designers can facilitate the design of environmentally preferable processes and products.

For example, the Rohm and Haas Company has developed a model to estimate in R&D the environmental cost of new processes. The model includes conventional, hidden, contingent, and relationship costs. In early phases of process development, the cost model prompts process researchers to select and justify process chemistries, operating conditions, and equipment that embody the principles of pollution prevention. As the project progresses, the model identifies environmental cost reduction opportunities. The model can provide financial analysts with an economic picture of the potential environmental risk of a new process prior to its commercialization.²³

Integrating Environmental Issues Into Design

1. Include environmental issues in needs analysis
 - consider environmental costs and performance in defining scope of design project
 - establish baseline environmental cost and performance
2. Add environmental requirements to design criteria
3. Evaluate alternate design solutions taking into account environmental cost, performance, cultural, and legal requirements

²³ Suzanne T. Thomas, Victoria Weber, Scott A. Berger, and I. Leo Klawiter, *Estimate the Environmental Cost of New Processes in R&D*, prepared for American Institute of Chemical Engineers (AIChE) Spring National Meeting (April, 1994).

K. Key Terms and Underlying Concepts

A company that wants to use environmental accounting for management purposes may find the terminology confusing and used rather loosely. This section identifies and explains some commonly encountered terms, and, most importantly, their underlying concepts. Unlike a glossary, the following discussion does not prescribe how these terms *should* be used. The section has six parts: the first part recapitulates the three different uses of the term *environmental accounting*; the second part reviews such terms as *environmental cost accounting*, *full cost accounting*, *total cost assessment*, and related terms, highlighting critical distinctions that can clarify what people intend to mean in using these terms; the third part summarizes some *life-cycle* terms and concepts that relate to environmental accounting; the fourth part comprises terms describing key applications of environmental accounting: *cost allocation*, *capital budgeting*, and *process/product* design; the fifth part lists a series of terms used to categorize or describe *environmental costs*; and the last part presents two other terms related to environmental accounting.

Environmental Accounting. As noted earlier, the term *environmental accounting* has three distinct meanings:

- **Environmental accounting in the context of national income accounting**, refers to natural resource accounting, which can entail statistics about a nation's or region's consumption, extent, quality, and value of natural resources, both renewable and non-renewable.
- **Environmental accounting in the context of financial accounting** usually refers to the preparation of financial reports for external audiences using Generally Accepted Accounting Principles.
- **Environmental accounting as an aspect of management accounting** serves business managers in making capital investment decisions, costing determinations, process/product design decisions, performance evaluations, and a host of other forward-looking business decisions.

Commonly Used Terms. Exhibit 8 lists nine terms that frequently are used in various ways with the same or different meanings. To understand what someone means when using these terms it is essential to determine whether they are referring to a specific management application of environmental accounting (e.g., cost accounting, capital budgeting, process/product design) and the scope of environmental costs meant to be included (e.g., private costs only, both private and societal costs).

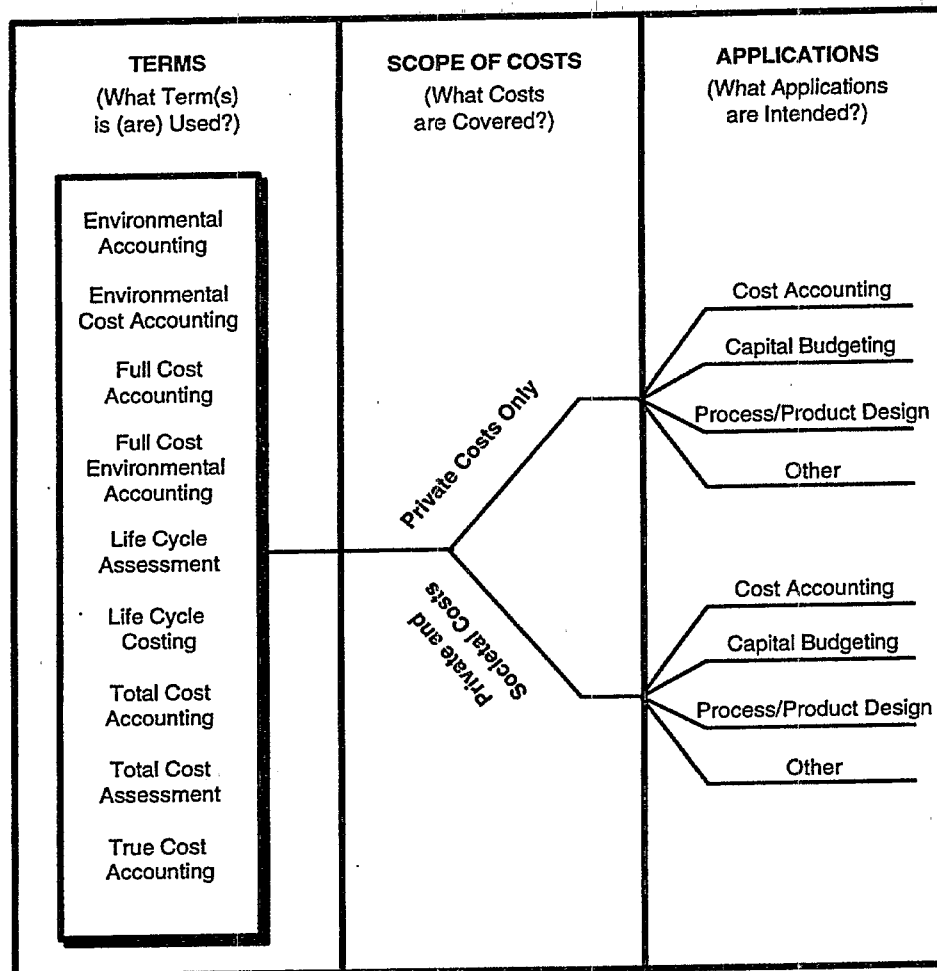
Sometimes, the terms are used to refer to a specific application of environmental accounting. As noted below, **total cost assessment** is often used to refer to the act of adding environmental costs into capital budgeting, whereas **life-cycle costing** may be most frequently used to refer to incorporating environmental accounting into process and product design. Whether or not one uses these terms to refer to environmental cost allocation, capital budgeting, process/product design, or other applications, there is another key difference in the way the terms are commonly used. Some professionals use the terms to refer to

- a firm's private costs only (i.e., those that directly affect the firm's bottom line), or
- both private and societal costs, some of which do not show up directly or even indirectly in the firm's bottom line.

For some people, **full cost accounting**, **full cost environmental accounting**, **total cost accounting** and the other terms refer only to *private costs*. Other people may use the terms to refer to both *private and societal costs*. Some people use one of the terms for private costs alone and another of the terms for both private and societal costs together. Understanding the basic distinction between private and societal costs makes it possible to clarify the intended meanings of the vocabulary and thereby hold a conversation with anyone interested in environmental accounting.. (See Section F.)

EXHIBIT 8

Common Terms and Potential Meanings



This difference is at the heart of much of the confusion in environmental accounting terminology. It confuses those items that can be handled more easily — incorporation of private costs — with those that are more difficult to address — societal costs. Clarifying what someone means when using environmental accounting terms is the first step to advance communication and cooperation.

- **Environmental cost accounting** is a term used to refer to the addition of environmental cost information into existing cost accounting procedures and/or recognizing embedded environmental costs and allocating them to appropriate products or processes.

- **Full cost accounting** is a term often used to describe desirable environmental accounting practices. In the accounting profession, "full cost accounting" is a concept and term used in various contexts.²⁴ In management accounting, "full costing" means the allocation of all direct and indirect costs to a product or product line for the purposes of inventory valuation, profitability analysis, and pricing decisions.²⁵
- **Full cost environmental accounting** embodies the same concept as full cost accounting but highlights the environmental elements.
- **Total cost accounting**, an often used synonym for full cost environmental accounting, is a term that seems to have origins with environmental professionals. It has no particular meaning to accountants.
- **Total cost assessment** has come to represent the process of integrating environmental costs into a capital budgeting analysis. It has been defined as the long-term, comprehensive financial analysis of the full range of private costs and savings of an investment. Adding to the confusion, the acronym for total cost assessment (TCA) is the same as the acronym for total cost accounting (TCA).

²⁴ For example, as required by GAAP for external financial and income tax reporting, accountants calculate the costs of goods sold and value inventory using **full absorption costing** (also called "absorption costing") which assigns all types of manufacturing costs (direct material and labor as well as manufacturing overhead) to products. In this context, full costs per unit equals full absorption cost per unit plus selling, general and administrative, and interest expenses, per unit. See, for example, Stickney, Weil, and Davidson, *Financial Accounting* (6th Ed., 1991). An alternative procedure, known as "variable costing," is often considered superior for certain internal management purposes. A "full cost method of accounting" is available for oil and gas producing activities that includes the capitalization and amortization of upfront activities (e.g., acquisition, exploration, development), estimated future expenditures of developing proven reserves, and estimated back-end costs of dismantlement and abandonment. See Regulation S-X governing financial statements to be filed with the SEC, Section 50410 Rule 4-10.

²⁵ See Statement on Management Accounting No. 2A (Nov. 30, 1990) issued by the Institute of Management Accountants.

- **True cost accounting** is a less used synonym for full cost accounting. The EPA Office of Solid Waste in its program to encourage local governments to apply full cost accounting to municipal solid waste management uses the term "true cost accounting" to encompass both private and societal costs while employing the term "full cost accounting" to refer exclusively to costs that affect the bottom line of solid waste management activities.

Life-Cycle Terminology. Life-cycle terms also are used in connection with environmental accounting. These terms include: life-cycle design, life-cycle assessment, life-cycle analysis, life-cycle cost assessment, life cycle accounting, and life-cycle cost.

- **Life-cycle design** has been defined as an approach for designing more ecologically and economically sustainable product systems, integrating environmental requirements into the earliest stages of design. In life cycle design, environmental, performance, cost, cultural, and legal requirements are balanced.²⁶
- **Life-cycle assessment** has been described as a holistic approach to identifying the environmental consequences of a product, process, or activity through its entire life cycle and to identifying opportunities for achieving environmental improvements. EPA has specified the four major stages in the life cycle of a product, process, or activity as raw materials acquisition, manufacturing, consumer use/reuse/maintenance, and recycle/waste management.²⁷ By itself, life-cycle assessment focuses on environmental impacts, not costs.
- **Life-cycle analysis** is sometimes used as a synonym for life-cycle assessment. The U.S. EPA uses the life-cycle assessment term. Neither term addresses the costs and revenues of environmental consequences and improvements, however.
- **Life-cycle cost assessment** is a term that highlights the costing aspect of life-cycle assessment. It has been termed a systematic process for evaluating the life-cycle costs of a product, product line, process, system, or facility by identifying environmental

²⁶ EPA *Life Cycle Design Guidance Manual: Environmental Requirements and the Product System*, EPA-600-R-92-226 (1993)

²⁷ *Life Cycle Assessment: Inventory Guidelines and Principles*, EPA-600-R-92-245 (1993).

consequences and assigning measures of monetary value to those consequences. Ideally, life-cycle cost assessment can be used to evaluate options for reducing total life-cycle costs and optimizing the use of resources. Some people view life-cycle cost assessment as basically adding cost information to life-cycle assessments.

- **Life-cycle accounting** is a term used to describe the assignment and analysis of product-specific costs within a life-cycle framework including *usual, hidden, liability, and less tangible* costs.²⁸
- **Life-cycle cost**, according to the U.S. Office of Management and Budget, means the sum total of the direct, indirect, recurring, nonrecurring, and other related costs incurred, or estimated to be incurred, in the design, development, production, operation, maintenance, and support of a major system over its anticipated useful life span.²⁹ More recently, **life-cycle cost** has been defined in an Executive Order as the amortized annual cost of a product, including capital costs, installation costs, operating costs, maintenance costs, and disposal costs discounted over the lifetime of a product.³⁰ The term may also be used more expansively to include societal costs.

These life-cycle terms are also subject to terminological confusion. For example, some people view life-cycle costing as referring only to private costs, while others view it as including both private and societal costs. Some apply a life-cycle perspective to capital budgeting, while others apply life-cycle concepts to process and product design. As previously mentioned, the key to facilitating communication is to recognize the different uses of common terms and to be able to identify underlying concepts. A threshold question is to determine whether someone is using an environmental accounting term to include solely private or both private and societal costs. A related question is to determine what application(s) a person has in mind when using these terms.

²⁸ EPA *Life Cycle Design Guidance Manual: Environmental Requirements and Product System*, EPA-600-R-92-226 (1993), pp. 122-9.

²⁹ OMB Circular No. A-109 (April 5, 1976).

³⁰ "Federal Acquisition, Recycling, and Waste Prevention," Executive Order 12873, Section 210 (October 20, 1993).

Scope of Costs. Because people may use environmental accounting terminology to refer to specific sets of environmental costs, or may be imprecise about what they mean, careful delineation of which types of costs are intended to be within the scope of one term or another can reduce confusion and enhance communication. This issue is discussed further in Section K. There is an important distinction between costs for which a firm is accountable and costs resulting from a firm's activities that do not directly affect the firm's bottom line:

- **Private costs** are the costs a business incurs or for which a business can be held responsible. These are the costs that directly affect a firm's bottom line. Private costs are sometimes termed **internal costs**.
- **Societal costs** are the costs of a company's impacts on the environment and society for which the business is not financially responsible. These costs do not directly affect a firm's bottom line. Societal costs may also be referred to as **external costs** or **externalities**. These costs may be expressed, qualitatively, in physical terms (e.g., tons of releases, exposed receptors), or in dollars and cents. **Societal costs** (or externalities) are sometimes subdivided according to whether the impacts are environmental, referred to as **environmental costs** or **environmental externalities**, or social, referred to as **social costs** or **social externalities**.
- **Internal costs** -- a synonym for private costs.
- **External costs** -- a synonym for societal costs. Also termed **externalities**.
- **Social costs** can be a synonym for **societal costs** or can refer to a subset of external costs
- **Environmental costs** can refer to a subset of external costs or can be used as a synonym for **environmental externalities**, **societal costs**, **private costs**, or both **private and societal costs**.

Applications. Of the many types of forward-looking business decisions (see Exhibit 1, page 6) that can benefit from environmental accounting, this primer focuses on cost accounting, capital budgeting, and process/product design:

- **Cost allocation** refers to the procedures and systems for identifying, measuring, and allocating or assigning costs for internal management purposes.
- **Capital budgeting**, also known as **investment analysis** and **financial evaluation**, refers to the process of determining a company's planned capital investments.
- **Process/product design** refers to the process of developing specifications for products and processes, taking environmental costs and performance, among other factors, into account.

Environmental Costs. Terms used to classify or categorize environmental costs are listed below:

- **Regulatory costs** are costs incurred to comply with federal, state, or local environmental laws (also termed **compliance costs**).
- **Voluntary costs** represent costs incurred by a company which are not required or necessary for compliance with environmental laws but go beyond compliance.
- **"Gray zone costs"** refers to costs that are not solely or clearly "environmental" in nature but may also be viewed, in whole or part, as health and safety costs, risk management costs, production costs, operational costs, etc.
- **Upfront costs** include preacquisition or preproduction costs incurred for processes, products, systems, or facilities (e.g., R&D costs).
- **Operational costs** refer to costs incurred during the operating lives of processes, products, systems, and facilities, as opposed to **upfront** costs and **back-end** costs.
- **Back-end costs** include environmental costs that arise following the useful life of processes, products, systems, or facilities. See also **exit costs**.
- **Conventional costs** include costs typically recognized in capital budgeting exercises such as capital equipment, raw materials, supplies, and equipment. Referred to as *usual costs* in EPA *Pollution Prevention Benefits Manual*.

- **Direct costs** is an accounting term for costs that are clearly and exclusively associated with a product or service and treated as such in cost accounting systems.
- **Usual costs** -- see conventional costs.
- **Hidden costs** refer to the results of assigning environmental costs to overhead pools or overlooking future and contingent costs.
- **Overhead** is often used synonymously with **indirect** or **hidden** costs as comprising all costs that are not accounted for as the **direct** costs of a particular process, system, product, or facility. The underlying distinction is between (1) costs that are either pooled and allocated on the basis of some formula, or not allocated at all, and (2) costs that an accounting system treats as belonging (directly) to a process, system, product, or facility (i.e., a cost center, in accounting terminology).
- **Manufacturing or factory overhead** refers to costs that are allocated using more or less sophisticated formulae as contrasted with "**general and administrative (G&A)**" overhead costs that remain in pools and are not allocated.
- **General & administrative (G&A) costs** are overhead or indirect costs that are not allocated to the costs of goods and services sold.
- **Research and development (R&D) costs** can include the costs of process and product design. See also **upfront costs**.
- **Exit costs** are the costs of proper closure, decommissioning, and clean-up at the end of the useful life of a process, system, or facility. See also **back-end costs**.
- **Contingent costs** refer to environmental costs that are not certain to occur in the future but depend on uncertain future events (e.g., costs of remediating future spills). Sometimes referred to as "**environmental liabilities**," "**liability costs**," or "**contingent liabilities**."
- **Future (or prospective) costs** refer to environmental costs that are certain to be incurred at a later date, which may or may not be known. Sometimes referred to as "**environmental liabilities**."

- **Environmental liabilities** is an umbrella term used to refer to different types of environmental costs including costs for remediating existing contamination, costs of complying with new regulations, future environmental costs of current operations (also known as **back-end** or **exit costs**), and/or contingent costs.
- **"Less tangible costs"** refers to expenses incurred for corporate image purposes or for maintaining or enhancing relationships with regulators, customers, suppliers, host communities, investors/lenders, and the general public. Also termed **"relationship costs"** or **"image costs."**

Other Related Terms. Two other terms that are relevant to environmental accounting include the following:

- **Activity-Based Costing (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.³¹
- **Materials accounting** or **materials balance** refers to an organized system of accounting for the flow, generation, consumption, and accumulation of materials in a facility or process in order to identify and characterize waste streams.³² Some view a materials balance as a more rigorous form of materials accounting.³³

³¹ See *Practices and Techniques: Implementing Activity-Based Costing*, Statement on Management Accounting No. 4T (September 30, 1993) Institute of Management Accounting, reproducing the Society of Management Accountants of Canada Management Accounting Guideline 17, *Implementing Activity-Based Costing*.

³² See, e.g., Harry M. Freeman (ed.), *Industrial Pollution Prevention Handbook* (McGraw-Hill, Inc., 1995).

³³ *Environmental Dividends*, at page 8.

L. Conclusion: Moving Ahead

A successful environmental management system should have a method for accounting for full environmental costs and should integrate private environmental costs into capital budgeting, cost allocation process/product design and other forward-looking decisions. Companies can make progress in environmental accounting incrementally, beginning with

A successful environmental management system should have an environmental cost accounting system and a capital budgeting process that considers a full array of private environmental cost and revenue information.

limited scale, scope, and applications. Companies can start with those costs that they know the most about and work toward the more difficult to estimate costs and revenues. Where private costs or revenues are difficult to estimate, and there is little management support for integrating them, then it may be best to handle them qualitatively. In many instances, it may be unnecessary to quantify the more difficult to estimate costs and benefits of capital investment choices because the more easily measured costs (and benefits) are sufficient to justify an investment in cleaner technologies. The same is true for process/product design, if one design direction is clearly superior to the alternatives. Ultimately, businesses will benefit from including probabilistic and difficult to estimate costs in cost allocation, capital investment, process/product design, and other decisions. The best approach is to go as far as you can in integrating environmental costs, including hidden, future, and contingent costs, into management decisions.

Efforts to integrate societal costs into business decisions will continue and expand. Most corporate information and decision systems do not currently support such proactive and prospective decision making.³⁴ The capital markets do not yet have adequate ways to evaluate the financial performance of progressive companies who do so. Although some companies are at the leading edge of efforts to address societal costs, it will likely be some time before societal impacts and costs can be integrated into cost allocation, capital budgeting,

³⁴ See *Incorporating Environmental Costs and Considerations into Decisionmaking: Review of Available Tools and Software*, EPA 742-R-95-OXX (1995).

process/product design, and general business decisions. However, there is a growing body of information documenting a variety of businesses engaged in advancing the state of the art to bring societal costs into their decision-making.

Sources of Further Information

EPA is committed to helping businesses understand their environmental costs and integrate those costs into decision-making. The EPA's Environmental Accounting Project performs education, research, guidance, and outreach on this issue. Join EPA's Environmental Accounting Network to keep informed of latest developments by contacting EPA's Pollution Prevention Information Clearinghouse (PPIC) and asking for a Network Membership Form. PPIC also can provide a variety of materials including case studies and lists of EPA and non-EPA publications on these topics. Please call PPIC at 202/260-1023 for details and/or more information on the EPA Accounting Project.

