Environmental Sustainability: Tools and Techniques

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Executive Summary

Many organizations fail to see the rationale for spending any more money on the environment than required, particularly in times of economic difficulty. Enlightened organizations, though, are moving from purely complying with legal requirements to realizing that a focus on environmental sustainability provides a competitive advantage. For these organizations, environmental sustainability is (a) an essential element of corporate strategy, and (b) synonymous with long-term business success.

Business leaders should be identifying and understanding the key environmental sustainability issues and drivers relevant to their organization and developing their strategy accordingly. Environmental sustainability should be integrated throughout the business, in both strategic and operational decision making, and activities should be aligned to the core business purpose.

Integrating environmental sustainability into the decisions made throughout the organization requires the combined skills of many disciplines, including management accountants. Given management accountants’ analytical and financial skills and their ability to make objective decisions, they are well placed to take a pivotal role in moving the environmental sustainability agenda forward. Environmental sustainability needs to be factored into many of the activities in which management accountants are likely to already be involved, such as planning and budgeting, information and data capture, costing, investment appraisal, performance management, and reporting.

As environmental sustainability becomes a more significant issue, new tools and techniques are emerging to help organizations make the necessary changes. However, there are also many traditional management accounting tools and techniques that can be applied or adapted to assist organizations in the effective measurement and management of environmental impacts, costs, and benefits. Often, it is a case of extending existing practices to take new issues into account, thinking beyond the boundaries of the organization, and taking a longer term view of the risks and opportunities that environmental sustainability presents.

Introduction

Leading organizations are acknowledging that long-term economic growth is not possible unless that growth is environmentally and socially sustainable. For these businesses, environmental sustainability has become an integral part of corporate strategy. However, many organizations are just beginning to understand the importance of (a) this interplay between strategy and environmental sustainability, and (b) the effects of a changing and complex regional, national, and international environmental agenda.
Organizations should be considering environmental sustainability within the context of meeting a broad range of strategic objectives, such as:

- Ensuring compliance with all legal and regulatory requirements;
- Achieving effective risk management and contingency planning;
- Improving efficiency and obtaining cost savings;
- Better meeting the needs of customers and investors;
- Attracting and retaining top talent and improving employee productivity;
- Improving standing in the local, financial, and government community;
- Positioning the organization to thrive in a low-carbon economy; and
- Achieving competitive advantage and long-term profitability.

Failing to plan for a future in which environmental sustainability will be a significant factor may put the long-term value and future of an organization at risk. Also, organizations that base their actions solely in terms of compliance will miss out on the many opportunities presented by environmental sustainability.

This guideline provides management accountants with advice on tools, techniques, and approaches to assist them in developing, implementing, monitoring, and reporting on a corporate strategy that encompasses environmental sustainability. Effective and efficient use of resources is a key part of environmental sustainability and a main goal for the management accountant. It is often the management accountant who is tasked with providing complete and reliable information to enable the organization’s resources to be managed with maximum effectiveness.

The aim of this guideline is to provide practical guidance for management accountants working within accounting and finance functions, although it also provides a strategic context for those at senior levels or who are represented on the Board. The approaches described may be used and adapted by all organizations regardless of size, location, or sector. Given the broad range of content covered by this guideline, users can select the sections most relevant to their needs and the needs of their organizations.

It is acknowledged that environmental sustainability is only one element of the wider sustainability challenge, and that economic and social issues are equally important. This guideline focuses on environmental aspects, because there are a number of methods for factoring environmental sustainability into business decisions that are becoming widely accepted by organizations, including governments. In contrast, the valuation of social impacts is less well developed and often more controversial. An existing Management Accounting Guideline Integrating Social and Political Risk into Management Decision Making provides some useful guidance regarding social issues. Although this guideline looks primarily at environmental sustainability, many of the principles, particularly the proposed strategic approach, can also be applied to sustainability in the wider context.
A Strategic Approach to Environmental Sustainability

Many organizations are starting to respond to the growing environmental sustainability agenda, and a significant number are reporting on their activities in this area. However, often this reporting does not link environmental sustainability to the organization’s overall strategy. Instead, it appears that environmental sustainability is a “bolt-on” activity that is driven primarily from a compliance or public relations perspective.

Although reporting is an important activity, it should not be the starting point for organizations looking to address environmental sustainability. It is imperative to integrate environmental sustainability within strategy and align it to the core business purpose.

As depicted in Figure 1, organizations should take a strategic approach to environmental sustainability, first identifying the key issues and drivers relevant to them, and then developing their business strategy accordingly. Tools and techniques should be applied to help implement this strategy, ensuring that environmental concerns are integrated into managerial decisions in all parts and levels of the organization. A number of traditional management accounting tools and techniques can be used to assist with this. Reporting should then be about progress towards implementing and achieving a strategy in which environmental sustainability is fully integrated.

Figure 1: A strategic approach to environmental sustainability

This guideline will look at each of the boxes in Figure 1 over the next few sections. Greatest attention will be given to (a) strategy implementation, and (b) the relevant management accounting tools and techniques that can be used to assist in integrating environmental factors into business decisions. That said, it is important that management accountants become involved from the start. By identifying and understanding the key drivers, management accountants will gain invaluable
knowledge about how to measure, control, and report on the relevant issues. Many management accountants are in senior positions within organizations and will be able to influence strategic direction. Others are in roles where they provide the business intelligence needed for strategic and operational decision making.

**The Role of the Management Accountant**

The management accountant’s role will vary with the type of job and by organization, but given the traditional skills and competencies of a management accountant, they are well positioned to take a pivotal role in integrating sustainability within strategy, and making environmental sustainability “business as usual.” Areas of environmental sustainability where the management accountant may get involved are listed below.

**Compliance:**
- Ensuring compliance with legislation and regulations, both present and projected;
- Understanding the potential impact on the business of current and forthcoming environmental legislation;
- Considering the financial costs and risks associated with an investment, product, or process that will likely cause or increase environmental damage;
- Assessing potential liabilities of past practices that have caused environmental damage; and
- Offering expertise in the financial evaluation of environmental litigation and settlement options.

**Strategy development:**
- Ascertaining the financial risks of external developments with regard to environmental sustainability;
- Identifying opportunities for more efficient use of resources;
- Helping to assess the potential costs of failing to undertake environmental initiatives; and
- Incorporating environmental issues into strategic planning and project evaluation.

**Systems and information flow:**
- Assessing the need for new or modified management information and financial systems;
- Helping to meet the need for complete and reliable information (such as useable information regarding utilities usage or business travel) to enable resources to be managed with maximum effectiveness; and
- Implementing a formal environmental management system.

**Costing:**
- Costing areas that directly relate to environmental objectives, such as carbon impacts, waste treatment, resource recovery, disposal, or site maintenance;
- Making environment-related costs more visible;
- Helping to improve methods for reallocating internal environmental costs, such as energy or water costs, to specific products and activities;
• Identifying and estimating costs resulting from the organization’s activities that
have to be met by others (externalities); and
• Highlighting potential future environmental costs that should be recognized in
current operations.

Investment appraisal:
• Employing capital investment and appraisal tools that more effectively
incorporate environmental costs and benefits.

Performance management:
• Performance measurement and monitoring of environmental costs, liabilities,
and savings; and
• Identifying and benchmarking against best environmental practice.

Reporting:
• Preparing accurate, consistent, and transparent internal reports to support
decision making; and
• Contributing to external environmental and wider sustainability reporting.

More detailed information on these areas is given in the following sections of this
guideline.

It is worth noting that both Figure 1 and this guideline are set out in a linear way.
This is for ease of representation. In practice, there is some overlap between the
different elements, because some of the tools and techniques apply to more than
one area.

**Key Issues and Drivers for Environmental Sustainability**

Environmental sustainability is not a generic issue. Every organization should
approach it within the context of its existing corporate strategy, individual
circumstances, and core business choices. Although there will be some generic
issues and drivers that will apply to most if not all businesses, many will be specific
to an organization or sector. For example, a public utility company with several
thermal power plants and a large vehicle fleet would concentrate on air emissions.
A fast-food chain that lacks plants and manufacturing operations may focus on solid
waste, particularly food product packaging.

As a first step, it is necessary for organizations to understand the environmental
sustainability agenda, and determine why they are/should be engaging in the
agenda at a strategic level. More enlightened organizations understand which
environmental concerns most apply to them and focus their activities in those
areas. They understand how environmental sustainability relates to their long-term
strategy, and look for environmental opportunities that match their strengths.
Having a clear understanding of what environmental sustainability means and how
it relates to the organization makes it easier to integrate environmental sustainability
within day-to-day operations.
Some common drivers that have led organizations to pursue environmental sustainability include:

- Managing regulatory compliance;
- Reducing costs;
- Responding to stakeholder influences; and
- Achieving competitive advantage.

**Managing Regulatory Compliance**

Ever-increasing and demanding environmental regulation is forcing companies to change their practices. In many countries, numerous pieces of legislation cover areas such as air quality, climate change, hazardous substances, packaging, waste, and water quality.

The Climate Change Act 2008 is one of the most recent and more radical pieces of UK legislation, committing the UK to an 80% reduction in carbon emissions by 2050. An independent Committee on Climate Change has been established under the Climate Change Act to advise the UK government and report to the UK Parliament on the progress made in reducing emissions. Emissions reductions will be facilitated by a number of policy frameworks in the UK, including the Carbon Reduction Commitment, which is a cap-and-trade carbon trading scheme based on energy consumption. Carbon trading schemes are also to be introduced in other countries around the world, including the US, Canada, Australia, and possibly China.
The trend is very much in the direction of increased and more stringent legislation, particularly as government leaders strive to reach some sort of post-Kyoto global deal. Given this trend, environmental sustainability is not an issue that can be avoided by any organization. Organizations need to consider how environmental regulation will impact their operations and the cost of doing business.

It makes good business sense to be aware of both national and international developments before making large capital investment decisions. For example, the most appropriate choices for plant and equipment should be made by considering the impact of expected developments in environmental legislation over its lifetime, and selecting equipment that will meet future noise or emission requirements. It may cost significantly more to alter a machine or process at a later stage to comply with environmental legislation that could easily have been anticipated. Organizations should also be aware of incentives, such as government grants and enhanced capital allowances for energy-saving investments.

Example

Dupont, the US chemical company, is a good example of an organization that strives to pre-empt legislation. As awareness of the environmental damage caused by chlorofluorocarbons (CFCs) spread, Dupont’s use of CFCs was costing it money through lost sales and production costs. Recognizing this, Dupont stopped using CFCs in its production processes and analyzed and redesigned its product range. By doing this before legislation controlling use of CFCs was introduced in the US, Dupont gained advantage over its rivals. Dupont’s actions were integral to its own strategic success, and instrumental in driving through the subsequent legislation from which Dupont later benefited.

In Europe in particular, environmental legislation is placing increasing responsibility on organizations to take back and dispose of products at the end of the product’s life. This “take-back” principle shifts the burden for disposal of products and raw material components from the consumer back to the manufacturer. The Waste Electrical and Electronic Equipment (WEEE) Directive in the UK is an example of take-back legislation. Similar legislation also applies to the remediation of land used for production facilities. A failure to recognize the costs of future disposal, recycling, and remediation in today’s production costs can result in under-estimating the total cost of the product.

Voluntary systems such as the European Union’s Eco-Management Audit Scheme (EMAS) and the ISO 14000 standards have also raised the threshold for what constitutes acceptable environmental management. These will be covered in greater detail in a later section.

Reducing Costs

Focusing on environmental sustainability will often provide opportunities for reducing costs. For example, reducing carbon impacts often also saves energy costs. Similarly, programs for reducing waste improve environmental performance
and reduce operating costs. Reducing environmental impacts can also reduce or eliminate associated taxes, levies, and other compliance costs.

Case studies of cost savings achieved through effective use of energy, raw materials, water, recycling, waste, and so on are abundant and widely available. Many of these case studies demonstrate that simple, low-cost, housekeeping measures can yield considerable cost savings. The Sustainability Framework published by the International Federation of Accountants (IFAC), and the Envirowise guide Reduce your costs with environmental management accounting are useful sources of information about cost reductions in the context of energy efficiency, waste, and water minimization, travel and transport, and supply chain management.

**Example**

Through a greater focus on environmental sustainability, IKEA, a major global furniture retailer, is saving about £1 million each year on waste disposal costs and £400,000 by removing plastic bags from the checkout. These savings are invested elsewhere to give price reductions for their customers. Over a period of about two years, IKEA has also achieved a 25% reduction of energy consumption in the UK through its “IKEA Goes Renewable” initiative. For IKEA, a 25% reduction represented a cost saving of about £3 million. For a retailer that considers that £10 worth of real sales are required for every £1 of operational profit accrued, these energy savings represent £30 million in additional sales (Browne, 2009).

**Responding to Stakeholder Influences**

Shareholders are no longer the only relevant stakeholders for an organization. Organizations are finding that an increasingly wide array of stakeholders need to be taken into account, including policymakers, special interest groups, and the community.

**Example**

Westpac, a large Australian bank, is an example of an organization that started its sustainability journey due to intense media and community pressure. Back in the 1990s, protests at the bank were being targeted by customers, unions, and environmental activists. The bank lost its social legitimacy and its “licence to operate.” Traditional public affairs initiatives failed and so, with the backing of the Executive and the Board, a small team within public affairs devoted time and resources to repositioning Westpac within the marketplace and creating a new sustainability strategy. Westpac’s sustainability strategy has developed from its initial focus on community engagement to actively embrace environmental risk management and climate change issues.

Increasingly, banks and insurance companies take an organization’s environmental performance into account before providing finance and/or insurance. As such, continued availability of finance and insurance may provide another incentive for organizations to consider environmental sustainability.
Suppliers or customers may also impose demands that require an organization to consider environmental sustainability. For example, large corporations are starting to refuse to give business to suppliers that do not meet strict environmental criteria. Similarly, environmental policies and standards are a key consideration in contracts being awarded by public sector bodies. To maintain their competitive position, organizations need to understand and be able to meet these demands.

Employees are another stakeholder group that many organizations are considering when pursuing environmental sustainability. Recruitment and retention of high-calibre employees can be positively influenced by an organization’s environmental activities, with evidence indicating that employees are keen to work for an organization that demonstrates concern for the environment.

Stakeholder engagement, referred to later in this section, is an important process for identifying and understanding the needs and wants of different stakeholders and the influence they have over how an organization might develop its business strategy.

**Achieving Competitive Advantage**

Leading organizations recognize that their long-term future success is increasingly linked to their ability to continuously improve their overall environmental impact. Sustainability is accepted as good business practice and a means for achieving competitive advantage, rather than a need to appease external stakeholders. These organizations are seizing the opportunities that environmental sustainability presents, and often benefit from improved financial as well as environmental performance. For example, a haulage group earned over £1 million in new business as a result of its environmental actions and perceived added value as an environmentally aware company.

Pursuing competitive advantage through an increased focus on environmental sustainability can lead to actions such as:

- Designing products/processes that take environmental impact into account;
- Introducing and marketing “eco-efficient” products and services; and
- Generating revenues through other opportunities presented by environmental sustainability.

**Designing products/processes that take environmental impact into account**

Design for the environment (DfE) is a term used to describe the integration of environmental considerations into the design process. Organizations are recognizing that, by focusing on process and product design, rather than on pollution control and cleanup, they can increase future profitability. Product quality, production yields, and profitability can be increased, and waste can be reduced or eliminated.
**Example**
Dairy Crest, a UK dairy company, is deploying DfE principles. Dairy Crest has developed a prototype handle-free plastic bottle, which is estimated to save the dairy industry up to 5,000 tonnes of packaging waste every year. The newly designed bottles require 10% less plastic to make than standard bottles (Dairy UK, 2009).

**Introducing and marketing eco-efficient products and services**
Leading organizations aim to increase their market share and long-term revenues through introducing products and services with an environmental orientation. Several approaches are possible, including repositioning existing products and services as eco-efficient, and/or developing new eco-efficient products or services.

**Example**
GE, a global infrastructure, finance, and media company, has repositioned a number of existing products with environmental credentials under a new “green” brand, Ecomagination. GE is also innovating new energy-efficient products, which are marketed under that Ecomagination brand. GE describes Ecomagination as a “business initiative to help meet customers’ demand for cleaner and more energy-efficient products and to drive reliable growth for GE.” (GE, 2009).

**Generating revenues through other environmental sustainability opportunities**
It has already been suggested that some companies may obtain new business (a) by virtue of their environmental activities, or (b) from the introduction of new products directed at meeting an environmental need. Opportunities for generating revenue through improvements in the management of energy and waste also exist.

Through recovery and reuse of polluting materials and other waste, organizations eliminate waste disposal costs, decrease material costs, and generate revenue from the saleable waste, transforming an expensive waste reduction activity into a profitable one. IKEA stores, for example, now bale their cardboard, plastic, and other waste, and get revenues back from it. Similarly, the Canadian firm Parma Plastics recovers more than 8,000 tonnes of unwanted vinyl every year and recycles it into new vinyl products, generating revenue out of material that was traditionally considered as waste.

Investments in developing clean technologies and more energy-efficient products and processes can also pay dividends. Successful innovations will not only save the organization money, but could also be patented and/or sold to other organizations, providing an additional source of income. As carbon trading schemes develop, organizations that are particularly efficient in reducing energy use and the resulting carbon emissions may find that they have carbon credits to sell on the open market, thereby actually generating revenue.
Example
Spanish wine producer Torres is pioneering carbon capture and storage for trapping carbon emissions produced from fermenting grapes. Torres is trying to convert carbon emissions into something solid, which will remain in the ground instead of being emitted into the atmosphere. If this technology is successful, then Torres will be able to patent it and earn revenues from it.

Methods for Identifying Key Drivers
Organizations can employ a number of methods for identifying and understanding the key issues and drivers for environmental sustainability with respect to their own businesses. These include:

- Stakeholder engagement;
- Strategic position;
- Risk assessment; and
- Environmental impact assessment.

There is much existing material on these methods, and only a short explanation of each will therefore be provided. New issues and drivers can become material to an organization, as can any changes within its operations. Therefore, it is important that an ongoing or regular review of key issues and drivers highlight any developments in this area. As a minimum, such a review should take place annually as part of the organization’s overall risk review process.

Stakeholder engagement
Identification of key issues and drivers for environmental sustainability should include a broad examination of the impact of the organization’s products, services, and activities on its stakeholders. Stakeholder engagement should also consider the interests of different stakeholder groups in the organization’s activities, and the ability of stakeholders to influence these activities. Figure 3 shows a model developed by Dell to represent its stakeholder engagement process with regard to sustainability.

UNEP’s Stakeholder Engagement Manual provides comprehensive guidance on undertaking a rigorous stakeholder engagement process (see Useful Websites section at the end of this guideline).
Figure 3: The Dell Stakeholder Model

Our Approach
Dell values the diversity of perspectives that our global stakeholders hold. We encourage direct dialogue and disclosure of positions and motivations. Our multistakeholder engagement model provides us with the opportunity to enrich and balance our decision-making processes.

Engagement Examples
- Newsletters
- Keynotes
- Conference sponsorship
- Personal meetings
- Annual SRI conference
- Global forums

Strategic position
A number of existing models help an organization to assess its strategic position. These include:

- PESTLE analysis (Political, Economic, Social, Technological, Legislative, and Environmental)
- SWOT analysis (Strengths, Weaknesses, Threats, and Opportunities)
- Porter’s Five Forces (Supplier power, Buyer power, Threat of substitutes, Threat of new entrants, and Industry Competitors)
- The CIMA Strategic Scorecard (Strategic position, Strategic options, Strategic implementation, and Strategic Risk)

Material is widely available on these models, and this guideline will therefore not provide further detail. One important point to note when applying such models is that factors affecting an organization’s strategic position vary over time, so analyses should consider influences over the short, medium and long term.

Risk assessment
Organizations increasingly have to demonstrate that they are managing all of their risks systematically and responsibly. This includes environmental risks – risks that are a result of impacts of the organization on the environment (which may be informed by the environmental impact assessment), and also risks arising from ecosystem changes that may affect the organization, such as increased flooding or water scarcity.
By assessing the environmental risks associated with their activities, processes, products, and services, organizations can identify their potential legal and business exposure. Environmental consequences of decisions can cause enormous financial impacts, such as remediation costs, fines, penalties, legal costs, and damages.

**Example**

In July 2009, energy drink manufacturer Red Bull was ordered to pay over £270,000 in fines and costs for breaking recycling laws. The London-based firm was penalized for not informing the appropriate agency that it was a producer of packaging waste, and for not recovering and recycling their packaging. This has been labelled the biggest fine in waste history, and is a sign that regulators are taking these issues seriously.

Again, material on risk assessment is widely available, including *Guidelines for Environmental Risk Assessment and Management*, published by the UK Department of the Environment, Food and Rural Affairs (DEFRA), and other Management Accounting Guidelines, such as *Identifying, Measuring and Managing Organizational Risks for Improved Performance, and Managing Opportunities and Risks*. A number of organizations have also produced reports that specifically highlight risks around climate change, for example the Lloyd’s 360 Risk Insight *Climate Change and Security: Risks and Opportunities for Business* and the report from World Business Council for Sustainable Development *Adaptation: An Issue Brief for Business*.

**Environmental impact assessment**

Identifying and prioritizing environmental impacts is an important first step for an organization that wants to work towards environmental sustainability. Organizations need to look at all of their activities and their effects beyond its borders. Hard evidence should be gathered in terms of (a) environmental impacts, including emissions from energy and transport, (b) the contamination of land and water courses, (c) the amount of waste going to landfill, and (d) any eventual decommissioning or disposal impacts.

Useful sources of guidance on environmental impact assessments (EIAs) include the International Association for Impact Assessment, the European Commission’s EIA website, and the United Nation’s University module on EIA.
After the key drivers have been identified and understood, the organization’s strategy should be developed accordingly, encompassing environmental sustainability in the way most relevant to the organization. Priorities should be identified, objectives set, and a means to deliver them established. Any obstacles to meeting objectives should be considered when developing the strategy. Decisions should be documented and the strategy should be reviewed regularly, so that it evolves and improves as progress is made and lessons are learned.

The Sustainable Development Commission provides extensive guidance on strategy development, as does the *Strategy Survival Guide* by the Prime Minister’s Strategy Unit in the UK. The *IFAC Sustainability Framework* is another useful source of guidance with regard to critical driving factors and activities required for developing a strategy that embeds sustainability.

To develop a successful strategy, decision makers need to be appropriately informed. As such, some of the tools and techniques discussed in subsequent sections of this guideline may also be relevant here. This section will focus on establishing priorities, policies, and action plans.

**Priorities and Policies**

It is likely that an organization will identify many issues that need to be addressed if it is to achieve environmental sustainability in the long term. Awareness of each of these issues is important, although it is useful to concentrate on only a few of the most important issues initially, to retain focus and gain momentum. Organizations should prioritize the issues on the basis of both importance and difficulty. It is
essential to understand what can realistically be achieved in the short, medium, and long term.

An assessment of the core competencies, resources, and systems within the organization should help to prioritize the issues in the short term. The organization should then consider how it will obtain the relevant competencies and/or resources for important issues that need to be addressed, but which are difficult to address given the organization’s current capabilities. Individuals with the right skills and competencies may be recruited to position the organization to meet more difficult challenges. Alternatively, certain issues may be outsourced to an organization that does have the relevant capabilities. Collaboration with organizations in the same sector, or with other external stakeholders, may provide another means for addressing more difficult issues.

Strategy should be supported by a number of policy statements. This will most likely involve (a) drafting new policy statements, such as a climate change policy or a carbon reductions policy, as well as (b) integrating environmental sustainability objectives into existing policies, such as the organization’s environmental policy, procurement policy, marketing policy, pricing policy, and business travel policy.

**Example**

Construction company Carillion has developed a Sustainability Excellence Model that lists the following priorities for the business:

- Sustainable communities;
- Natural resource protection and environmental enhancement;
- Climate change and energy; and
- Sustainable production and consumption.

For each priority area, the model sets out a definition for that priority, impact areas related to each priority, policy statements, measures, steps for achieving its goals, and its ultimate vision in each area. Appendix A provides an extract from Carillion’s Sustainability Excellence Model.

A difficult question for multinational organizations is whether or not to adopt worldwide policies and standards. IBM and Allied Signal, for example, have committed themselves to worldwide company standards. Even in countries with low environmental standards, their operations follow the standards of the most environmentally stringent country in which the company operates. Other companies do not adopt this policy, because of concern that it will hamper their international competitiveness.

**Action Plans, Goals and Targets**

To support high-level strategy and policy documents, organizations need to clearly define their goals, create action plans, and set specific targets and budgets against which to measure progress with regard to environmental sustainability.
Effective environmental action plans:

- Are soundly linked to business strategy;
- Prioritize the goals of the corporate environmental policy;
- Prioritize the goals of the organization in terms of the policy;
- Identify interactions throughout the organization and harmonize them;
- Turn goals into specific targets;
- Give the targets completion dates;
- Assign responsibilities;
- Provide for feedback and reward;
- Provide training and resources to support the required actions; and
- Require performance to be monitored.

The Sustainable Development Commission has produced guidance on sustainable development action plans (see Useful Websites). The guidance was developed with government departments in mind, but provides useful information that is relevant more widely.

It is helpful to distinguish between goals and targets. Environmental goals represent the overall aims of the organization in terms of environmental performance arising from the environmental policy. Targets are the detailed performance requirements that an organization sets out to achieve. Targets typically cascade to lower levels within the organization to measure progress towards its goals.

An environmental sustainability target might be to reduce carbon emissions by 35% within five years, or to lower waste disposal costs after two years to no more than x per cent of sales and/or unit costs. Targets should be measurable and expressed in quantitative terms, including an end date or a time frame over which they will be achieved. It is also important to establish a baseline at the time targets are set, and to collate information to support that baseline. For example, the target for a reduction in carbon emissions of 35% in five years cannot be properly assessed without establishing the organization’s current level of emissions. Typically, the baseline is a particular year.

**Example**

In December 2000, car manufacturer Toyota created an environmental action plan with the aim of achieving the best environmental performance of all car manufacturing plants in the UK. The plan outlined strategic environmental performance goals based upon ongoing benchmarks and key performance indicators. Environmental targets were set around energy reduction, water savings, waste reduction, resource conservation, and reduction of substances of environmental concern (Toyota Motor Manufacturing, 2004).
Key performance indicators

In addition to the numerous underlying targets and performance measures that are developed for achieving the organization’s environmental sustainability goals, many organizations are identifying a small set of key performance indicators (KPIs). The use of KPIs is widely supported for providing a clear and consistent way for evaluating an organization’s progress against its environmental sustainability goals, and for reporting on environmental performance to stakeholders. They are intended to help organizations to manage and communicate the links between environmental and financial performance. Performance management and reporting are covered in more detail in a later section of this guideline.

Many sources of information can help organizations to identify potential key performance metrics. For example, DEFRA has produced guidance on KPIs to support reporting on environmental issues relevant to the organization. Similarly, the United Nations Conference on Trade and Development (UNCTAD) has produced a guide on eco-efficiency indicators. A list of commonly used environmental KPIs is included at Appendix B. However, it is important that organizations do not just select KPIs from a list. Organizations need to understand how metrics are best used for internal management, and adopt KPIs that are relevant within the specific organizational context.

To prioritize its environmental sustainability metrics, an organization should consider:

- What key environmental concerns confront it;
- What environmental opportunities it perceives; and
- How it balances conflicting stakeholder demands and concerns.

The Report Leadership project undertaken by CIMA, PricewaterhouseCoopers, and Radley Yeldar recommends that KPIs be clearly linked to the organization’s strategic priorities. Successful organizations understand which environmental concerns most apply to them and focus their KPIs on those areas. Most organizations should only need to use five or fewer indicators within their business.

Budgets

To emphasize the importance of environmental sustainability, organizations should introduce environmental factors into their budgets. The budgeting process is a means of communicating the organization’s objectives to all levels of management and to employees. By including items such as energy consumption, level of emissions, or water use in the budgeting process, management can reinforce the importance of the goals for reducing impacts in these areas. Inclusion in the budget also allows benchmarks to be established that can later be used for evaluating performance.
Example

The UK National Grid announced a major emissions reduction program in 2008, committing it to an 80% reduction in emissions by 2050. Under the initiative, the National Grid will undertake a year-long review of its operations, to measure its carbon footprint and identify the most effective areas for emissions reduction. This information will be used to set annual and five-year carbon reduction targets. These targets will in turn be used for creating carbon budgets, against which the performance of National Grid managers will be measured. According to a National Grid spokesperson, employees will “be measured against their carbon budgets in the same way performance is gauged against traditional business metrics such as financial, operational and safety targets” (Murray, 2008).

Tools and Techniques for Strategy Implementation

This section will look at a number of new and traditional management accounting tools and techniques that can be applied or adapted to help implement a strategy that encompasses environmental sustainability. These tools and techniques can be used (a) to make the link between environmental and financial performance more visible, (b) to embed the idea of environmental sustainability within the organization’s culture, and (c) to give decision makers information that can help them to reduce costs and risks and create value from potential opportunities.
Management accounting tools and techniques are not the only measures that are relevant in strategy implementation. A change in strategy such as that required to achieve environmental sustainability should follow the approach of any significant change management process, and there are many soft skills and behavioural elements that also play an important role. There is much existing material on change management and the softer skills required for embedding environmental sustainability into strategy, and this guideline will not look at these aspects. Useful material to refer to include the Accounting for Sustainability Project (A4S), which discusses ten points necessary for embedding sustainability into an organization’s “DNA,” and Bob Willard’s book The Sustainability Champion’s Guidebook, which sets out a seven-step change process. An existing Management Accounting Guideline Using Strategy Maps To Drive Performance should also be referred to for further guidance on strategy implementation.

Environmental Management Systems

Leading organizations that are pursuing environmental sustainability tend to create a support framework through an environmental management system (EMS). An EMS is essentially a management tool for helping a business to increase its awareness of and control over environmental impacts. It provides an overarching framework for implementing many of the tools and techniques being discussed in this guideline.

An effective EMS contains numerous elements that span all aspects of an organization’s operations. Elements critical to implementing strategy throughout the organization include:

- Policies and procedures;
- Employee buy-in to the vision;
- Alignment and integration;
- Accountability and responsibility;
- Management information;
- Training and management development;
- Performance measurement;
- Monitoring of trends;
- Reporting;
- Formal risk management systems; and
- Emergency preparedness.

There is no fixed approach for implementing an EMS, and creating an EMS that best provides guidance and incentives for improving environmental sustainability throughout the organization is not easy. Additional complexities arise as organizations (a) increase their business and geographical diversity, and (b) must address particular business needs, local laws, different cultures, and the different requirements of a
variety of stakeholders. An EMS is designed to be flexible, however, and can be developed for a single site, for a division, or for the business as a whole.

A number of standards and accreditation systems can help organizations to develop appropriate systems. For example, the ISO 14000 series provide a set of international standards for EMS certification. Developed by the International Organization for Standardization, the ISO 14000 family is a set of more than 20 voluntary standards, guides, and other publications that deal with various aspects of environmental sustainability (for more information see Appendix C). Many organizations of all types and size have an EMS certified to ISO 14001, and increasing numbers are working towards accreditation.

Example
According to international financial services company Barclay’s, operating an EMS has resulted in numerous benefits “including better risk management, better collaboration with key suppliers on environmental performance, enhanced employee engagement through internal communications programmes, and environmental cost savings” (IEMA, 2005).

Organizations need to ensure that the EMS remains fit for purpose in light of ever-developing environmental sustainability risks and opportunities. It is also important for the EMS to align itself with other business systems, including financial or cost management systems. Some organizations develop an integrated management system that merges the different management systems.

Example
Electronics company Sharp has merged its strategic management system, environmental management system, and quality management system to create a more accurate and efficient approach. According to Sharp’s 2007 Social and Environmental report, by integrating the different systems to focus on “activities aimed at achieving the same company-wide management objectives, Sharp is able to put its management resources where it needs them the most”.

Information and Data Capture
Complete, accurate, and reliable information is required to support both strategy development and implementation. For example, managers require information to make informed trade-offs between cost and environmental impact, and to measure progress against baselines. Information systems should be developed to track and disseminate environmental information on a cross-functional basis and provide relevant environmental performance data.
A number of new tools and techniques are being developed for capturing information and data on the environmental impacts of an organization’s activities, products and services. These include:

- Life-cycle assessment;
- Carbon footprinting; and
- Water footprinting;

Life-cycle assessment

Life-cycle assessment (LCA) helps organizations to evaluate the cradle-to-grave environmental burdens and opportunities associated with their products, processes, or activities. Just as value is added to the product at each stage along the supply chain, environmental impacts also occur at different stages throughout the life of a product. By looking beyond the organization’s facility and analyzing its entire life cycle, the LCA process helps organizations to identify and assess environmental impacts that they may not presently capture. This includes identifying and quantifying energy and materials used and wastes released to the environment.

LCA consists of four inter-related activities, as shown in Figure 6:

**Figure 6: The four stages of LCA**

1. Goal setting (scoping). The first stage of LCA identifies which issues are pertinent to the particular product in each of its life-cycle stages, and identifies specific environmental vulnerabilities.

2. Inventory analysis (data collection). The second stage of LCA quantifies inputs (e.g., energy and raw material) and outputs (e.g., air, water, and waste) associated with each phase in the product life cycle – from raw materials acquisition to disposal. Inventory analysis is a fairly complex, in-depth process. It is usually completed by consultants or by several internal teams with knowledge and experience in each stage of the life cycle. Some or all of the necessary information may already be available in various formats. For example, an organization might
already have gathered information about air emissions, water pollutants, and even habitat destruction, to apply for government permits and comply with environmental regulations.

3. Impact assessment (environment evaluation). This stage of LCA characterizes the effects (e.g., ecological, health, economic, aesthetic) and significance of the pollutants identified in the inventory analysis. It is usually accomplished by completing an assessment matrix that qualifies relevant impacts. Typically, an organization can improve its impact assessment by including a cost comparison of either competing products or competing materials and manufacturing processes (including such costs as raw materials, manufacturing, research and development (R&D), and process redesign). Both internal and external environmental costs should be included.

4. Improvement assessment (company response). The final stage of LCA strategically evaluates the options for reducing the environmental impact of the product or process, while considering the product’s environmental vulnerabilities and strengths. Opportunities for impact reduction include (a) minimizing energy and raw material consumption, (b) introducing closed-loop systems, (c) minimizing activities that destroy habitat, and (d) minimizing emissions and releases.

LCA should not be a static exercise, but an iterative, dynamic one that develops along with understanding the impacts of activities. It is also important to integrate the findings of the LCA within the organization.

Example
Procter & Gamble has used LCA for evaluating new product innovations, for instance the development of a cool cleaning detergent. The LCA of laundry detergent highlighted that heating water for washing during its use in the home consumed far more energy than any other part of the life cycle. As a consequence, developing a cool cleaning detergent offered opportunities for energy reduction along the value chain. From a financial perspective, the cool cleaning detergent looks to be a profitable investment, with a financial analysis showing high returns (Riccaboni and Leone, 2009).

The lack of standardized data sets can make widespread, consistent, and cost-effective use of LCA difficult. However, LCA is continually evolving to overcome these barriers, and various databases are being developed. For example, Canadian businesses can obtain environmental information on raw materials for their products and packaging systems through a Canadian Raw Material Database developed by Environment Canada, in partnership with the CSA and a number of Canadian raw material producers.

Case Study 1 provides a more detailed look at how a company applies and uses LCA.
Case Study 1: LCA in practice

Interface, the world’s largest modular carpet manufacturer, uses LCA to evaluate the environmental burdens associated with its products and processes. For Interface, a complete assessment involves capturing the materials, energy, and wastes involved in each stage of the product’s life cycle, as shown in Figure 7. Environmental impacts are quantified, and opportunities are identified and evaluated for continuous improvement.

Figure 7: The Interface LCA process

The results of Interface’s LCA are measured in terms of environmental impacts, including the following:

- Global warming – gases released that contribute to global warming
- Toxicity – a measure of the toxic emissions to air, water, and land
- Acid rain – the potential to damage water and soil systems by increasing their acidity
- Resource depletion – the extraction of non-renewable resources
- Others – additional measures, including smog creation, ozone depletion, and fossil energy

Interface has long used LCA as an internal decision-making tool, and is now also using LCA for public disclosure. Based on the LCAs’ detailing of the environmental impact of their products, Interface now produces Environmental Product Declarations (EPDs). The main purpose of an EPD is to provide accessible, comparable, and quality-assured information regarding the environmental impacts that happen during the manufacture and life of a product. This information allows customers to make comparisons between different products, giving them the ability to choose products with low environmental impacts.

According to Interface, an EPD “is similar to the ingredient and nutrition labels on food. Instead of calories and percent recommended daily allowances, an EPD
shows all of the ingredients and the associated environmental impacts.” EPDs are certified to a public standard and verified by a credible third party. For a verifiable EPD, companies must perform an LCA pursuant to ISO 14040 standards and develop the EPD in line with ISO 14025 (Type III environmental declarations).

**Carbon footprinting**

Many organizations are now calculating and reporting on their organizational carbon footprint. Some organizations are also establishing the carbon footprint (or the “embodied carbon”) of individual products. A carbon footprint is the total emissions of carbon dioxide and other harmful greenhouse gases (GHGs), often referred to as carbon dioxide equivalents, for a defined product or activity. The standard reporting unit is tonnes of carbon dioxide equivalent (tCO₂e). It is called equivalent because it covers a number of different GHGs, although carbon dioxide is the most prevalent.

Organizations are using carbon footprinting as a tool for (a) understanding the carbon impact of their operations or products, (b) benchmarking against other businesses or products, and (c) identifying areas for improvement. Carbon footprinting often is a key element of a carbon reduction strategy.

Legislation such as carbon trading schemes will also require organizations to understand their carbon footprints. As such, organizations that are taking steps now to get an accurate picture of their carbon emissions will be better placed to ensure future compliance. Carbon footprinting can also enhance an organization’s reputation for effective environmental management and transparency.

The Greenhouse Gas Protocol is the main source of international guidance for preparing an organizational carbon footprint. In 2009, it was announced that a new GHG Protocol specifically to cover public sector organizations was being developed in recognition of that sector’s influence in this area.

To calculate its carbon footprint, an organization first needs to gather activity data (e.g., energy use, miles driven or flown, or refrigerant leakages). The scope of this activity data may vary and should be agreed on up front. Some organizations only collate data directly attributable to their own activities; others include indirect emissions in their scope. Getting real and verifiable data can be complex, and the further down the supply chain an organization chooses to go, the more difficult it becomes.

After activity data has been collated, appropriate emissions factors and global warming potentials need to be applied. There are several reputable sources for emission factors, including international bodies such as the United Nations’ Intergovernmental Panel on Climate Change (IPCC), and national government departments such as DEFRA and the Carbon Trust in the UK.

In 2008, the UK launched the world’s first carbon footprinting standard, Publicly Available Specification 2050:2008 (PAS 2050). Based on existing LCA standards, it is designed to help organizations to measure and understand the carbon impacts embodied in the life-cycle of their products and services, and to identify
opportunities for reducing the impact along the value chain. It may also form the basis for a carbon labeling scheme in the future, allowing customers to compare the carbon impact of different products (similar to an EPD).

The Carbon Trust has piloted the standard across 22 businesses on a number of different products and services, including bank accounts, clothing, washing powder, food, and drink. Carbon labels now appear on these products. The standard is also being adopted in different countries around the globe, including Japan and China.

**Water footprinting**

In addition to their carbon footprint, some organizations are also starting to measure their water footprint. An organization’s water footprint represents the total volume of water use associated with the activities and outputs of the business. The footprint should include direct and indirect water use, i.e., water for production or manufacturing and for supporting activities internally (direct), and water consumption along the organization’s supply chain (indirect). The Water Footprint Network provides a water footprinting calculator on its website.

Coca Cola discloses its water footprint in its financial report, as do numerous other companies. Currently, it is mainly water-intensive companies, such as those in the food and beverage sector, although other organizations such as Unilever and IKEA are also concerned with their water footprint. Some organizations are looking at the water footprint of individual products and, as with carbon labelling, are considering water labels for products.

**Example**

PepsiCo has looked at the water footprint of an individual product, its Tropicana orange juice. PepsiCo estimates that the vast majority (99.74%) of the water footprint of Tropicana occurs up its supply chain when growing the oranges in Brazil. Most of that water comes from rainfall though, with only 1.5% being from irrigation diverted from rivers. The remainder of the water footprint arises from water use in the production of packaging and in the bottling process. Orange juice suppliers now use waste water to irrigate a sustainable palm tree plantation next to the orange-juicing factory.

**Costing**

To successfully implement a strategy that takes environmental sustainability into account, decision makers often require more precise information about the environmental costs of the organization’s products, processes, and activities.

Some environmental costs may be represented in current accounting practice, for example:

- Off-site waste disposal;
- Purchase and maintenance of air emissions control systems;
• Utilities costs;
• Costs associated with permitted air or wastewater discharges; and
• Costs of environmental, health and safety (EHS), and legal staff to ensure compliance.

However, a wide range of less tangible or indirect company costs (and savings and revenue streams) are not usually factored in, including:

• Liability costs;
• Future regulatory compliance costs;
• Enhanced position in “green” product markets; and
• Economic consequences of changes in corporate image linked to environmental performance.

These are all costs that can affect the organization’s bottom line under current and foreseeable regulatory and market conditions.

There is growing consensus that organizations also need to take account of external costs in management decisions. External costs, or externalities, are costs to society and the environment arising from the activities of the organisation for which the organisation is not currently accountable. For example, externalities may include:

• Catastrophic climate change due to harmful greenhouse gas emissions;
• Exploitation of natural resources;
• Environmental damage due to acid rain deposits from combustion of fossil fuels; and
• Adverse health effects due to noise pollution from airports or highways.

These costs are borne in the longer term by the rest of society rather than by the organization. However, as regulation and penalties proliferate, these external costs can eventually become internal costs, and should be kept in mind when evaluating the long-term profitability of activities and products.

The costing tools and techniques covered in this section are designed to assist organizations to (a) define the activities, processes, and products that cause environmental costs, (b) better understand and track environmental costs, and (c) help managers make decisions that will reduce or eliminate these costs.

These tools and techniques include:

• Environmental cost allocation;
• Activity-based costing;
• Quantification and monetization of externalities and full cost accounting; and
• Material flow cost accounting.
Environmental cost allocation

Not all activities, processes, and products are equally responsible for generating environmental costs. Even in modestly sized manufacturing firms with two or three production lines, environmental costs are not driven equally by each production line. Various lines may (a) contain more hazardous materials, (b) generate more emissions per unit of output, (c) require more frequent intensive inspection and monitoring, (d) use more water for production or cooling, or (e) generate greater quantities of waste requiring off-site disposal. Similarly, particular processes or products may cause a disproportionate share of costs associated with training and reporting to government agencies, or lead to risks that may increase insurance costs. However, organizations often allocate environmental costs to general overhead costs, and combine environmental costs with non-environmental costs into cost pools, rather than trace them to particular products or manufacturing processes.

By not adequately separating or tracking environmental costs, organizations are unable to accurately determine their product costs, thus under-costing some products and over-costing others. Analysis and cost reduction are also difficult because organizations do not know which products cause the environmental costs. Ultimately, inappropriate allocation of environmental costs distorts costing and pricing across the business, and results in poor investments and strategic decisions.

Organizations should be identifying the principal factors that determine the environmental costs incurred, and properly allocating those costs to the activities and products that generate them. This results in more accurate costing, and should also motivate affected managers and employees to find creative alternatives that lower those costs, improve profitability, and contribute toward environmental sustainability (IFAC, 2009). Case Study 2 provides an example of a Nigerian beauty care company that has benefited from using environmental cost allocation.

Case Study 2: Environmental cost allocation in action

A study of overhead costs at a Nigerian beauty care company found that production costs were heavily distorted due to allocation of a product specific environmental cost across all product lines using traditional cost allocation methods. An environmental cost allocation model was developed, based on the principle that the polluter pays, i.e., the division causing the damage should bear the cost. The study looked at overhead allocations relating to four divisions (or product lines) over the year from January to December 2007. Under traditional cost allocation methods, total overheads were allocated to divisions based on the number of units produced.

However, it was found that only one of the divisions (the Weavon division) was responsible for waste water costs. Using “polluter pays” overhead cost allocations, the waste water disposal costs were separated from the general overhead pool, and revised cost allocations were prepared. The Weavon division now takes full responsibility for the waste water costs as well as its proportion of other overheads. The tables below show the difference between the production costs under the traditional overhead cost allocation method, and the environmental cost allocation method for each of the four divisions.
### Table 1: Production costs under traditional overhead cost (N’000)

<table>
<thead>
<tr>
<th></th>
<th>Soap</th>
<th>Cream</th>
<th>Weavon</th>
<th>Perfectfinish</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct material</td>
<td>2800</td>
<td>2500</td>
<td>2000</td>
<td>3000</td>
<td>10300</td>
</tr>
<tr>
<td>Direct labour</td>
<td>1000</td>
<td>1100</td>
<td>800</td>
<td>1150</td>
<td>4050</td>
</tr>
<tr>
<td>Overhead</td>
<td>1566</td>
<td>1737</td>
<td>1093</td>
<td>3094</td>
<td>7490</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5366</td>
<td>5337</td>
<td>3893</td>
<td>7244</td>
<td>21840</td>
</tr>
</tbody>
</table>

### Table 2: Production costs under environmental cost allocation (N’000)

<table>
<thead>
<tr>
<th></th>
<th>Soap</th>
<th>Cream</th>
<th>Weavon</th>
<th>Perfectfinish</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct material</td>
<td>2800</td>
<td>2500</td>
<td>2000</td>
<td>3000</td>
<td>10300</td>
</tr>
<tr>
<td>Direct labour</td>
<td>1000</td>
<td>1100</td>
<td>800</td>
<td>1150</td>
<td>4050</td>
</tr>
<tr>
<td>Overhead</td>
<td>1093</td>
<td>1214</td>
<td>760</td>
<td>2153</td>
<td>5220</td>
</tr>
<tr>
<td>Waste water cost</td>
<td>0</td>
<td>0</td>
<td>2270</td>
<td>0</td>
<td>2270</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4893</td>
<td>4814</td>
<td>5830</td>
<td>6303</td>
<td>21840</td>
</tr>
</tbody>
</table>

| Difference from traditional overhead cost | -473 (8.8%) | -523 (9.8%) | 1937 (49.8%) | -941 (13.0%) |

Applying environmental cost allocation highlighted the huge costs of waste water being incurred by the Weavon division. Following the study, the management of the Weavon division purchased a state-of-the-art waste water treatment plant and entered into an agreement to sell the waste water to a nearby manufacturer, earning an estimated monthly revenue of N50,000 (Nigerian Naira). The manufacturer pipes the treated water straight to its own plant, so that transportation costs are saved for both companies. In addition to the revenue from the agreement with the manufacturer, the Weavon division saves an average of nearly N200,000 per month in waste water discharge costs that were previously paid to the local council. The waste water treatment plant cost N15 million, and has an estimated useful life of 15 years. With the resulting savings, the investment has about a five-year payback period. Not only does this case show that proper environmental cost allocation results in relevant cost information for management decisions, but it also demonstrates the revenue implication of environmental investment. The company’s image with the community and the local government is also enhanced, creating intangible value.

Source: C. Ngwakwe, 2008, *Justifying environmental cost allocation in a multiple product firm: a case study*

### Activity-based costing

To get more accurate and useful information about their environmental costs, some organizations are implementing activity-based costing (ABC). Through ABC, environmental costs are taken out of general overheads and allocated to activities, processes, products, and services by identifying the relevant resources and activities used to produce the output. Environmental costs are related to the activities that cause them, making them more transparent and easier to manage.
Assigning environmental costs to products and services using ABC can also help to highlight opportunities for improving processes for future products during their design and development stages.

Although traditional cost accounting assumes that costs arise out of making products and providing services, ABC attributes costs to the associated activities involved in making products and providing services. There is no agreed methodology for defining environmental costs for ABC, and many organizations categorize them in the way that best suits their own business needs. IFAC’s publication on Environmental Management Accounting provides some common environmentally related cost categories, which are shown in Exhibit 1 (IFAC, 2005).

**Exhibit 1: Environmentally related cost categories**

1. **Materials Costs of Product Outputs**
   Includes the *purchase costs* of natural resources, such as water and other materials that are converted into products, by-products, and packaging.

2. **Materials Costs of Non-Product Outputs**
   Includes the *purchase* (and sometimes processing) costs of energy, water, and other materials that become Non-Product Output (Waste and Emissions).

3. **Waste and Emission Control Costs**
   Includes costs for handling, *treatment and disposal* of Waste and Emissions, remediation and compensation costs related to environmental damage, and any control-related *regulatory compliance* costs.

4. **Prevention and Other Environmental Management Costs**
   Includes the costs of *preventive environmental management activities* such as cleaner production projects. Also includes costs for *other environmental management activities* such as environmental planning and systems, environmental measurement, environmental communication, and any other relevant activities.

5. **Research and Development Costs**
   Includes the costs for *Research and Development projects* related to environmental issues.

6. **Less Tangible Costs**
   Includes both *internal and external* costs related to less tangible issues. Examples include *liability, future regulations, productivity, company image, stakeholder relations, and externalities*.

Source: IFAC, 2005, Environmental Management Accounting

ABC should allocate usual production costs, such as pollution control, water, and waste treatment costs, and the use of raw materials and energy. It should also include liability costs and other hidden and less tangible costs and benefits, such as capital costs for emissions monitoring equipment, and expenses such as for monitoring and testing procedures.
ABC provides two approaches for tracking the costs of activities. One approach is to establish sub-accounts in the general ledger, into which the costs of various activities are allocated in the appropriate proportions. This approach resembles traditional accounting systems, but permits the organization to emphasize environmental costs. The other approach is to mirror more closely the actual flow of costs through the organization. This method emphasizes the relationships among activities and different cost drivers. Following this approach, costs move from incurrence to cost objects in a series of steps, all based on a cause-and-effect relationship. Energy consumption can be used as a cost driver for ABC, as can waste, where costs are assigned to specific waste generation and waste disposal activities.

Example
Double Envelope, a company based in Florida in the US, used ABC to allocate energy costs across different cost centres (Capehart, 2007). Using the ABC method, the cost of energy was moved from overhead to a line item in the cost of production, in the same way as line item costs for labour and materials. This cost allocation data gives Double Envelope a clearer picture of which cost centres consume the most energy resources. Based on this information, Double Envelope can decide where reductions can best be made. For example, it is easier to justify new equipment and new processes that reduce energy costs for areas that are consuming the most energy.

Implementing ABC to rationalize environmental managerial decisions carries its own cost. Organizations must always weigh the value of disaggregating cost information against the attendant costs of setting up and maintaining the accounting infrastructure to collect, analyze and digest its outputs. The time required to implement ABC can also vary considerably, depending on (a) the number and complexity of the products and processes, (b) the availability of data, and (c) the experience of those implementing the tool. However, many available software packages can help organizations to implement ABC.

Quantification and monetization of externalities and full cost accounting

Internalizing externalities
Countries around the world are increasingly using taxes, regulations, and levies to incentivize organizations to take action to reduce negative environmental impacts. Green taxes and other fiscal incentives are designed to resolve market distortions (i.e., costs to society that previously did not appear in an entity’s financial accounts). They do this by internalizing the cost of environmental impacts created by organizations, so that they are recognized by the conventional financial accounting system. Examples of fiscal incentives include carbon trading schemes, and carbon or waste disposal taxes, such as the Climate Change Levy and the Landfill Tax in the UK.

Quantification and monetization of externalities allow organizations to be better informed as to which decisions are more environmentally sustainable. Without proper systems to account for such costs, it is unlikely that organizations will be able to meet the future expectations of customers, investors, and an increasingly stringent regulatory regime.
Large energy producers in the European Union (EU) are already subject to a carbon trading scheme, the EU Emissions Trading Scheme (EU ETS). For those organizations, measuring and accounting for carbon emissions is now a financially material issue.

Example

In 2008, the German electricity and gas company RWE faced obligations to deliver carbon emissions allowances of around €1.2 billion (RWE, 2008). Despite an overall reduction in carbon dioxide emissions, this obligation increased from €390 million in 2007 as the second phase of the EU ETS was introduced, and 2008 certificates sold for an average of €22 per metric ton of carbon dioxide.

The carbon obligation is likely to keep increasing as carbon prices go up over time and emissions trading schemes become more stringent. RWE has developed a carbon mitigation strategy for reducing its physical and financial exposure between 2008 and 2015. Based on the current size of its power plant fleet, RWE has identified a carbon reduction potential of 30% compared to its 2008 emissions.

There are plans in the UK to roll out a carbon trading scheme for large energy emitters in non-energy-intensive industries. The Carbon Reduction Commitment (CRC) is due to come into force in 2010, and will capture more than 5,000 private and public sector organizations. During its initial phase from 2010 to 2013, the carbon price is due to be set at £12 per metric ton of carbon dioxide equivalent. Other countries around the world are also looking to introduce similar schemes, raising the issue of carbon budgeting and accounting higher on the business agenda. Organizations will be faced with internalizing costs for carbon, and so should be factoring it in to the costs of activities and products, ensuring that they reflect the true cost to the organization and to society.

Carbon is not the only issue. Organizations also need to consider internalizing costs for other externalities, such as water and waste. In many areas of the world, businesses do not pay for the water they consume, and often excessive water use by local companies results in environmental degradation, as well as water shortages for surrounding communities. The role of water pricing for managing resources is becoming more widely recognized. For water to be treated as an economic good, its price should not only reflect the supply cost, but also the opportunity cost and environmental externalities.

Imposing fiscal regimes and regulations to encourage internalization is often criticized, with arguments that it (a) results in increased prices for consumers, (b) affects competitiveness, and (c) reduces investments in new technologies. However, the full extent of external costs is rarely reflected in either financial reporting or in decision making, and effective resource allocation depends on understanding and recognizing these externalities (IFAC, 2009).
Full cost accounting

One approach for considering a broader inventory of environmental costs is full cost accounting (FCA). FCA is used to capture both current and likely future costs, including externalities, and to allocate them to the product or activity.

The IFAC Sustainability Framework provides useful guidance with regards to FCA. According to IFAC, FCA focuses on internalizing a full range of environmental and social costs, including:

- Conventional costs including direct and indirect costs associated with a capital or revenue project;
- Hidden costs – found in overheads and general accounts;
- Liability costs – contingent liabilities not currently recognized in conventional accounts, such as future clean-up costs;
- Less tangible costs – costs and benefits that may be assessable in financial terms and are likely to arise from improved sustainability management, such as loss/gain of goodwill, changing attitudes of stakeholders; and
- Sustainability-focused costs – costs that would be incurred if a sustainability-focused approach was taken to a project or organizational performance. Costs to ensure zero environmental and social impact could be estimated.

An example of an organization that has implemented FCA to inform the decision process and improve their environmental sustainability performance is British Petroleum (BP), which applied a Sustainability Assessment Model (SAM) following the principles of FCA. More information is provided in Case Study 3.

Case Study 3: Application of FCA at BP

The SAM developed by BP follows the generic four-step approach of FCA:

1. Define the cost objective of the FCA exercise
2. Specify the scope of the analysis
3. Identify and measure the impacts of the cost objective in physical terms
4. Monetize the impacts

The cost objective may be a product, process, a division, or a whole organization. At BP, the SAM was initially developed for an oil and gas field development, although it has now been applied to a number of other projects. For oil and gas development, the scope (or boundaries) of the evaluation were widely defined – the SAM tracking sustainable development impacts of the project over its full life cycle, from exploration drilling, through design and commissioning of a drilling platform, to the production of oil and gas, to the final decommissioning of the platform. The SAM extended the analysis beyond the extraction of oil and gas to include the impacts from refining, the manufacture of products from oil and gas, and eventual product use.
When it comes to identifying and measuring the impacts of sustainable development, the SAM considers four headings: economic, resource use, environmental, and social. The data for identifying and measuring impact under these headings is gathered from two sources:

i. Existing project data – e.g., expected number of barrels of oil produced, amount of water used, waste produced, and estimates of the financial performance included in the project evaluation

ii. Imputed impacts – e.g., air pollution impacts from the combustion of barrels of crude oil extracted

For the SAM to remain manageable, an upper limit of 25 impacts was set, rather than including all possible impacts of an oil and gas field development. The included impacts were those determined to be most significant.

The final step is to monetize the identified sustainable development impacts. For the development of the oil and gas field, a variety of monetization approaches were adopted for different impacts. Current prices or open literature were used as far as possible for identifying a monetization mechanism. For example, there is much open literature, such as government-sponsored publications, that gives a range of figures for the damage costs of pollution.

More in-depth information on the application and evaluation of the SAM can be found in *Accounting for Sustainable Development* (Bebbington, 2007).

FCA is not a precise science and, beyond the four steps, there is little consensus on methodology. The steps are not easy to work through, and FCA can be constrained by data limitations. Such limitations primarily affect the quantification of hidden regulatory costs, contingent liability costs, and less tangible costs. Monetary estimates of externalities are also generally uncertain. Organizations must determine whether the benefits of collecting environmental data outweigh the costs of doing so. Judgment also needs to be exercised at each of the stages, and the decisions made at each stage may have a significant impact on the outcome of the FCA. In particular, different approaches to monetization of impacts may result in different conclusions.

Although there are difficulties with the FCA approach, the strategic planning benefits that result from an FCA “are deemed to be significant and this is the area in which the business case for FCA gains ground” (Bebbington et al, 2001). Through the FCA process, externalities that may be eliminated by redesigning products, activities, or operations are highlighted.

**Material flow cost accounting**

Material flow cost accounting (MFCA) is a relatively new management accounting technique for improving decision making and performance with regard to environmental sustainability. The MFCA method calculates, in both physical and monetary terms, the amount of unnecessary waste and emission from a
manufacturing process by tracking the flow of materials from raw materials (including energy) to the finished product. Improvements can be made as a result of identifying the processes that cause losses.

The principle behind MFCA is that materials generating the output of waste and emissions should not be input in the first place. Recognizing the increasing importance of environmental issues, energy prices, and resource availability, manufacturing organizations all over the world are now implementing the MFCA technique. Useful sources of information include the Guide for Material Flow Cost Accounting published by the Japanese Ministry of Economy, Trade and Industry (METI), and Environmental Management Accounting Procedures and Principles published by the United Nations Division for Sustainable Development. The ISO is currently developing a standard for MFCA, which will provide further guidance.

Example
Japanese pharmaceutical company, Tanabe Seiyaku, benefited from substantial reductions in waste disposal cost and environmental impact following the introduction of MFCA into its pharmaceutical production process. As a result of MFCA analysis, the company switched from incineration of waste liquids to active treatment and recycling of solvents. The capital investment was recovered in about one year, and costs for raw materials, waste disposal, and incinerator maintenance were reduced by around ¥55 million each year. Tanabe Seiyaku also achieved annual energy saving costs of around ¥33 million, and over 2,000 tonnes of carbon dioxide emissions (METI, 2007).

Investment Appraisal

In many organizations, traditional investment appraisal approaches overlook environmental factors, assessing potential investments against economic criteria only. Integrating environmental costs and information with other relevant information in investment appraisal for all capital spending decisions allows an organization to make more informed decisions, and to better manage its environmental considerations and impacts.

Environmental factors, such as site recovery costs or the cost of meeting take-back legislation, can be paramount in determining the returns from an investment. Government grants and incentive schemes, such as enhanced capital allowances (which some governments use to encourage business to invest in energy-efficient technology), may also significantly affect investment decisions.

Improving environmental performance may require investment in new processes, equipment, or technologies. As with other capital spending, such investment will require financial justification. However, environmental projects usually fare poorly because traditional investment analysis places them at a competitive disadvantage. Appraisals should attempt to take into account the costs and savings arising from a range of factors, including enhanced reputation, employee motivation, and stakeholder satisfaction as a result of improved environmental performance.
It may be difficult to quantify some of the potential costs and benefits. In these circumstances, a narrative piece should be included in the investment appraisal.

There are several frameworks and measurement techniques (a) for incorporating environmental factors into capital decision processes, and (b) for more fairly appraising environmental projects. Although not without their limitations, these approaches offer significant improvements for environmental sustainability and can result in win-win investments. Tools and techniques include:

- Life-cycle costing;
- Total cost assessment;
- Environmental risk assessment and uncertainty analysis;
- Carbon values and shadow prices; and
- Multi-criteria assessment.

**Life-cycle costing**

For most organizations, investments must usually pass a so-called “hurdle rate” or an acceptable profitability threshold. For investments that are more environmentally sustainable in the long term to reach corporate hurdle rates, organizations need to use a longer time frame, and account for costs and benefits of alternative decisions over the lifetime of the product, project, or purchase. Life-cycle costing (LCC) is a tool that can be used to achieve this. LCC may also be referred to as whole-life costing (WLC) or total cost of ownership.

As its name implies, the aim of LCC is to maximize the return over the asset’s total life rather than using a cut-off time. LCC is closely related to LCA, discussed earlier in this guideline, in that both approaches recognize that all products or assets have a defined life cycle. Whereas LCA is concerned with providing a complete picture of a product’s impact on the environment, LCC is about determining the total costs over the anticipated life of an asset (or investment). LCC traditionally only looked at economic impacts, but LCC techniques are being expanded to include environmental and social factors, so that the full impact of different alternatives can be assessed more accurately.

Unlike LCA, where it is often difficult to determine where the life cycle starts, the cycle for LCC is more straightforward, starting with the purchase of the item of equipment or asset, and ending with its eventual disposal. Figure 8 shows the spend profile of an asset, demonstrating how the costs vary with time.
Acquisition costs are defined as those incurred between when the decision to proceed with the procurement is made and the entry of the asset into operational use; operational costs are those associated with the operational life of the asset; and end of life costs are those incurred through disposal, termination, or replacement of the asset.

The acquisition costs of any investment typically represent only a small part of the overall cost of the decision in the long term. For example, the procurement of IT equipment should not only be based on the up-front cost of the hardware, but also include consideration of factors such as:

- Licensing and service fees;
- Training costs and facilities;
- Reliability and resulting maintenance, repair, or failure costs;
- Efficiency, and therefore energy costs, over the long term;
- Carbon emissions resulting from use of the equipment;
- Retirement and disposal costs; and
- Recyclability.

In some cases, an item may have a resale value, thus reducing or eliminating any disposal cost. For other purchases, the disposal cost may be extremely high and should be accounted for at the planning or procurement stage.

LCC methodology varies by organization, and there is no single approach. Typically, one-off costs and recurring costs should be identified for each decision alternative. Some costs will be easily identified; others will need to be estimated. Cost estimates can be derived from historical or empirical data or, when real data is not available, through expert opinion.
The Chartered Institute of Purchasing and Supply (CIPS) provide useful guidance on LCC (although it uses the term WLC). CIPS acknowledges that financial criteria and tools such as depreciation rates, resale values, and discount rates are all relevant in LCC and suggest that purchasing and supply professionals seek assistance and advice from Finance when applying LCC (CIPS, 2008).

**Example**
Fife Council in Scotland has recently developed an LCC tool for procurement decisions. The project was led by Finance and Resources through its Procurement and Supply Chain Management Team. The LCC tool has been developed to calculate the financial cost profile and the carbon emissions over the life of a contract/product.

**Total cost assessment**
Total cost assessment (TCA) is one methodology for evaluating total life cycle costs of decision alternatives. TCA improves the internal decision-making process, by ensuring that the gathered data includes all environmental costs, risks, and liabilities, both direct and indirect, associated with the decision. It considers a broader range of costs than traditional investment analysis, including certain probabilistic costs and savings.

Traditional investment appraisals usually omit indirect, intangible, and external costs. Without these considerations, it is difficult to level the playing field to enable projects that are more environmentally sustainable to compete. This does not mean that, with TCA, all or most environmentally oriented projects will compete on purely economic terms. However, it does mean that organizations will discover a wider variety of costs and benefits over a longer time frame than they normally would utilizing traditional investment analysis.

The TCA methodology was developed by the American Institute of Chemical Engineers (AIChE) and a group of chemical and pharmaceutical manufacturers, including Dow, Merck, and Monsanto, to help these companies take uncertain environmental and health costs into account in their decision-making process1. The methodology was refined to make it “useful for both EHS professionals and financial professionals within their organizations” (Laurin, Norris and Trupia, 2007).

TCA involves four stages, as shown in Figure 9.
Figure 9: The four stages of TCA

Stage 1: Define the scope of the decision or option

The first stage of the process is to agree on the options or alternatives to be assessed. Understanding the alternatives helps in identifying the type of cost information needed. The choice may be (a) across two or more existing products or processes, (b) between an old and a new way of doing things, or (c) between a number of possible new products, projects, or processes. The goals and scope of the assessment should also be determined at this stage. The organization should consider both financial and environmental goals.

Stage 2: Identify relevant costs and savings

The AIChE methodology for TCA sets out five different types of costs that may be considered for each decision choice. These are listed in Exhibit 2. The five types cover recurring and non-recurring direct and indirect capital costs and expenses, future and contingent liabilities, and more difficult to measure costs such as company-paid intangible costs and externalities. A value or range of values should be assigned to each cost in all five categories. Everything that is impacted by the decision should be included.

Stage 3: Analyze financial performance

The cost data is then analyzed. The AIChE has published a freely available manual to help organizations use the TCA approach, a manual that includes spreadsheets for analyzing each of the cost types. Automated tools and software are also available for applying TCA. TCA uses DCF to recognize the time value of money.

Stage 4: Make the decision

At this stage, the results are interpreted and fed into the decision-making process. A decision is made by integrating all of the factors that are relevant to the profitability of an investment opportunity. Through using TCA, the organization gains a wider perspective on the possible impact of the decision.
A lot of the items that are included under TCA would not be addressed in traditional financial models. Although they are considered cost types, many of the newly included items can actually save an organization money rather than increase costs. For example, if a new piece of equipment produces less waste than the machine it replaces, then the cost of waste disposal will go down. Similarly, if a new process has the capacity to recycle material and use it over again, substantial cost benefits are likely. Both decisions would also result in a more positive environmental impact.

**Example**

GE has used TCA methods and programs to better select and justify waste management investment decisions that are environmentally sound and reduce long-term liabilities, and Dow reports that use of TCA has lead to decisions “estimated to save/earn hundreds of millions of dollars” (Norris, 2005).

A detailed case study of an organization that has successfully used TCA for investment decision making is set out in Case Study 4.
Case Study 4: TCA at Fletcher Challenge

Fletcher Challenge used TCA for deciding whether to retrofit the main power boilers at its Elk Falls pulp mill, a world-scale pulp and newsprint complex located on the east coast of Vancouver Island in Canada. As a result of incomplete combustion, the boiler was producing large amounts of unburned carbon or fly ash, which creates costs in terms of landfill, boiler maintenance, and acquisition of permits. The annual operating cost of the boiler was in excess of $6 million, leading managers at the mill to investigate the feasibility of retrofitting the boiler with a more efficient “bubbling fluidized bed boiler” (BFBB) that would reduce fly ash production and lower operating costs.

An initial analysis of the profitability of the BFBB concluded that the financial returns from a retrofit were insufficient to satisfy the company’s existing policy on capital expenditures. However, the environmental manager felt that the appraisal had overlooked many of the potential benefits associated with the retrofit. To allow a more comprehensive financial analysis, a TCA was carried out. The financial components considered in the TCA included landfill costs, boiler operation and maintenance, costs of obtaining environmental permits, and intangible costs.

The assessment recognized that savings would be realized in landfill costs due to the large reduction in fly ash. Less fly ash in the boiler’s flue gases would also lower maintenance costs, increase boiler availability, and reduce the plant’s reliance on other energy sources. The lower combustion temperatures of a BFBB also results in fewer emissions of other harmful gases, such as nitrogen oxide and sulphur dioxide.

For investments in pollution abatement equipment, such as the BFBB, the Canadian government allows firms to write off their capital costs over the first three years of operation, another relevant factor that should be included in the investment decision.

The results of the TCA indicated a payback period of just over two years, which was close to the company’s payback requirement for capital investments. The net present value of the BFBB was estimated to be $25 million, using a discount rate of 8%. Based on the TCA, the total future saving as a result of the BFBB was calculated to be more than twice the initial outlay of $10 million. Therefore, the installation of BFBB was judged to be not only environmentally beneficial but also a financially sound investment.

Source: Adapted from a case study published by the International Institute for Sustainable Development, 2007
One element of TCA is the consideration of different environmental risks that may result from the decision. To assess the risk associated with different alternatives, some organizations construct various possible futures or scenarios, using environmental risk assessment and techniques to analyze uncertainty. Cost drivers are then identified for each scenario.

Environmental risk assessment and uncertainty analysis

An overview of risk assessment was given earlier in the Key Issues and Drivers section. This section focuses on the frameworks and measurement techniques that are available to effectively incorporate environmental risks and uncertainties into the investment appraisal process. Many organizations actively use such techniques as:

- Scenario forecasting; and
- Monte Carlo simulation and decision trees.

**Scenario forecasting**

A growing number of businesses are using scenario forecasting or scenario planning techniques to help them examine the likely impacts of changing regulations, changing technologies, and changing environmental costs. Scenario forecasting encourages decision makers to (a) go beyond simple straight-line extrapolation for projecting future events, and (b) try to anticipate a variety of large-scale changes that could affect the organization.

The result of scenario forecasting is a description of a number of plausible futures. Decision makers are then faced with the challenge of how to deal with each possible future scenario. Scenario forecasting is intended to aid in assessing and managing risk, broaden corporate thinking, and make managers focus on the long-term impact of their decisions.

Shell has been using scenario forecasting techniques for many years, and has led the way in the corporate sector. Case Study 5 provides further information on Shell’s scenario forecasting.

**Case Study 5: Scenario forecasting at Shell**

Shell first introduced scenario forecasting after energy companies lost billions of dollars of revenue in the 1970s by not foreseeing or planning for the growing environmental movement, the Middle East Wars, and changes within OPEC. Shell’s current energy scenarios to 2050, called “Scramble” and “Blueprint,” consider how the world will respond to the political, economic, and environmental factors that create the energy challenge of the future.

Scramble is based around a world of intense competition between individual countries rushing to secure more energy for themselves. It recognizes that political responses to the two crises of the energy squeeze and climate change are often
knee-jerk and severe, leading to price spikes, periods of economic slowdown, and increasing turbulence.

The Blueprint scenario describes a more measured approach to global energy production. It is disorderly at first, as local initiatives result in a patchwork of different policies and approaches to deal with the challenges of economic development, energy security, and climate change. However, under the Blueprint scenario, these efforts become harmonized relatively quickly, as individual initiatives succeed and others adopt them more widely. A global policy framework emerges that spurs innovation, increases energy efficiency, limits the impact of rising energy demand and global warming, and helps maintain steady economic growth.

Much information can be found on Shell’s website about its past and current scenarios.

The Intergovernmental Panel on Climate Change (IPCC) has collated various datasets that can be combined to construct climate change scenarios. The IPCC describe climate scenarios as “plausible representations of the future that are consistent with assumptions about future emissions of greenhouse gases and other pollutants and with our understanding of the effect of increased atmospheric concentrations of these gases on global climate” (IPCC, 2008). Organizations can use these climate scenarios in their scenario forecasting.

The IPCC emphasizes that climate scenarios are not predictions. Similarly, scenario forecasting does not mean that organizations are able to predict the future. However, those that have considered different scenarios are usually more prepared to respond to change, reacting better and more quickly than their competitors.

**Monte Carlo simulation and decision trees**

A decision tree visually portrays the structure of a decision problem, thus displaying the alternative courses of action, all possible outcomes, and the probability values of each decision. Monte Carlo is a simulation technique that permits the calculation of probability distributions of outcomes for complex decision trees. The technique employs a computer to repeatedly and rapidly simulate the outcome of a series of probable events.

One example of its use in bringing environmental factors into investment decisions is the application of Monte Carlo simulation for comparing the possible costs of alternative environmental remediation options. Using Monte Carlo random sampling, the probability that one option will cost more than another can be estimated, and the most likely costs of each operation can be compared. Probabilities (or confidence levels) can be assigned to a range of possible costs, leading to more credible and defensible comparisons.
Carbon values and shadow prices

Linked to TCA and the incorporation of externalities into investment decisions is the decision of some organizations to bring carbon values into the appraisal process, to help make the financial case for more environmentally sustainable decisions. For example, the UK Government now requires that a carbon value be included in the mandatory impact assessment for all proposed government policies. Adding a value to the carbon emissions that result from a policy affects the overall cost of that policy choice, making it a relatively less attractive option than a policy with lower additional emissions. Including a monetized value for emissions may even tip the balance so that the costs outweigh the benefits of a particular policy.

A shadow price for carbon (SPC) is one mechanism that has been used to put a value on carbon. The SPC is intended to give a value to “the expected increase or decrease in emissions of greenhouse gases resulting from a proposed policy” (DEFRA, 2007). An SPC reflects the cost of damage caused by climate change as a result of each additional tonne of greenhouse gas emitted into the atmosphere. As carbon trading schemes develop, the price of carbon used in policy appraisals will move from an SPC to an amount more closely linked with the market value of carbon.

UK government guidance suggests that organizations should continue to appraise policy options using traditional cost-benefit analysis techniques, set out in the “Green Book”. This includes showing the NPV of the carbon impacts and performing sensitivity analysis on the carbon impacts, in the same way as would be done for other costs and benefits. The Green Book is HM Treasury’s guidance for policy appraisal. It contains a section on valuing environmental impacts, including GHG emissions, climate change, air quality, landscape, water, biodiversity, noise, and forests.

The adoption of carbon values and shadow prices is not limited to the public sector. It is expected that a growing number of businesses will adopt an SPC when making investment decisions.

Example

The National Grid emulates the government’s approach and incorporates an SPC into cost-benefit analyses as part of its major emissions reduction program. An SPC is used by the National Grid “to determine emissions costs for future design, construction and maintenance of its electricity and gas networks, management of its fleet and facilities, and any potential new investments” (Murray, 2008). Including an SPC helps the National Grid account for the environmental impact of investment decisions, and also better prepares it to deal with future legislation around carbon trading or carbon taxes.

Multi-criteria assessment

Another technique that offers improvements to traditional investment appraisal is multi-criteria assessment (MCA). MCA may also be referred to as Multiple-Criteria Decision Making (MCDM) or Multi-Criteria Decision Analysis (MCDA).
MCA is designed to help organizations systematically evaluate options according to multiple criteria that are sometimes measured on different and/or non-commensurable scales. It enables organizations to consider and trade off all relevant criteria in decision making, providing a transparent process for reaching a decision when faced with conflicting priorities and objectives of different stakeholder groups. Trade-offs among different objectives may include cost, social, environmental, reliability, or risk trade-offs.

MCA techniques have long been applied in planning and decision analysis, and have become increasingly popular in environmental decision making. For instance, MCA is now widely used in energy planning projects. One of the drivers for this is that MCA can be used to compare and evaluate “unlike” environmental and social impact information when the organization lacks a full range of monetized impact data.

MCA typically provides a qualitative rather than a quantitative evaluation of investment options, although they may be combined. Decision makers (which may include a number of stakeholders) are asked to value the criteria using qualitative techniques, such as scoring and ranking exercises, qualitative scales, and percentage weighting. This makes MCA more subjective in nature than certain other investment appraisal techniques, but helps to overcome the difficulties of trying to compare more tangible financial estimates with less tangible environmental factors.

The methodology of MCA can be divided into three steps:
1. Structuring the decision problem;
2. Formulating a preference model; and
3. Evaluating and comparing alternatives.

Structuring the decision problem includes (a) specifying objectives and attributes, (b) generating alternatives, and (c) determining the multiple criteria to be used for assessing the consequences of each alternative. It can be helpful to establish the decision problem and criteria through workshops with relevant decision makers and stakeholders. A formal preference model is then developed to represent the perceptions, priorities, and preferences of the decision makers. Often a matrix format, such as the one shown in Exhibit 4, is used for collating scores or rankings for each alternative against the different criteria. Finally, the alternatives are evaluated and compared and the different decision alternatives are ordered in terms of priority or preference.

Exhibit 4: An MCA decision matrix

<table>
<thead>
<tr>
<th></th>
<th>Criteria 1</th>
<th>Criteria 2</th>
<th>Criteria 3</th>
<th>Criteria 4</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weights</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example
The UK Government uses MCA to support decision making. It has developed an MCA-based framework called the New Approach to Appraisal (NATA) for appraising transport projects and proposals in the UK. One such project proposed changes to a road network, and MCA was used to assess the likely effects as a result of this change, both monetary and otherwise (Emmerson, Francisics and Abbott, 2003). The assessment was based on a survey of current users of the route, and considered the following criteria for the different options being proposed:

- Changes in operating costs;
- Changes in working time;
- Changes in air quality (including carbon dioxide and nitrogen oxide); and
- Changes in noise nuisance.

The International Society on MCDM provides further guidance on MCA.

Monitoring and reporting on environmental sustainability performance

Figure 10: Monitor and report on environmental sustainability performance

For an organization intent on achieving environmental sustainability, measuring, monitoring, and reporting on environmental performance is critical. Performance management and reporting follow naturally from the earlier stages of strategy development and planning, during which goals, targets, and KPIs are set for key environmental sustainability impacts. Outputs from the performance management and reporting process should then feed back into planning and decision making.
Robust and reliable information needs to be gathered for measuring, monitoring, and reporting progress. Many organizations may already be collecting some of the required data, either in the form of standard business data, such as energy bills, as part of an established EMS. They may also do this because the organization already provides such information to regulators or other stakeholders. Ideally, information should only be gathered once, with the same data being used for measurement against targets and KPIs, for internal reporting, and for external reporting.

**Performance Management**

Monitoring and review mechanisms need to be put in place for periodically measuring and assessing progress against baselines and the organization’s environmental sustainability goals and objectives. This acts as the basis for timely decisions, increasing the organization’s chances of achieving its goals efficiently and effectively. Performance management is not just about knowing how the organization is performing, but also about enabling it to perform better.

Performance management tools and techniques for measuring and monitoring progress and driving behavior with regard to environmental performance include:

- Balanced scorecard;
- Individual incentives; and
- Internal taxes and transfer pricing.

**Balanced scorecard**

The balanced scorecard is based on a recognition that managers need both financial and non-financial measures to effectively manage an organization. As increased environmental sustainability becomes a core corporate value, this should be reflected in the balanced scorecard, along with other key measures. Including environmental sustainability measures in the balanced scorecard aligns them more closely with strategy, signaling the value that the organization places on such issues.

Environmental sustainability measures could be included within each of the four perspectives of the traditional balanced scorecard. For example, environmental sustainability could be seen as relating to:

(a) Increased financial profitability;
(b) Increased customer satisfaction;
(c) Increased operating effectiveness; and
(d) Increased innovation and learning.

Alternatively, environmental sustainability could be viewed as a new fifth perspective on the balanced scorecard. Organizations could also combine these two approaches, including a separate sustainability-focused perspective in the scorecard, and also integrating key environmental factors into the four traditional scorecard perspectives where appropriate. This offers the most integrated approach.
The measures to be included in the balanced scorecard will most likely relate to the KPIs agreed at the planning stage. Epstein and Wisner (2001) provide examples of balanced scorecard measures for environmental sustainability under each of the original four balanced scorecard headings, as shown in Exhibit 5. Many of these measures could be included as well under a fifth environmental sustainability perspective.

**Exhibit 5: Examples of balanced scorecard measures for environmental sustainability**

<table>
<thead>
<tr>
<th>Financial perspective</th>
<th>Customer perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy costs</td>
<td>Number of “green” products</td>
</tr>
<tr>
<td>Disposal costs</td>
<td>Percent of products reclaimed after use</td>
</tr>
<tr>
<td>Recycling revenues</td>
<td>Number of recalls</td>
</tr>
<tr>
<td>Cost avoidance from environmental actions</td>
<td>Product safety</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal business process perspective</th>
<th>Learning and growth perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption</td>
<td>Percentage of employees trained</td>
</tr>
<tr>
<td>Fresh water consumption</td>
<td>Number of functions with environmental responsibilities</td>
</tr>
<tr>
<td>Air emissions</td>
<td>Management attention to environmental issues</td>
</tr>
<tr>
<td>Vehicle fuel use</td>
<td>Inclusion of stock in green funds</td>
</tr>
<tr>
<td>Greenhouse gas emissions</td>
<td></td>
</tr>
</tbody>
</table>

Source: Epstein and Wisner, 2001, *Using a balanced scorecard to implement sustainability*

Tesco, a global retailer, is one company that has introduced a fifth element to its balanced scorecard, or “Steering Wheel” as Tesco refers to it. Figure 11 shows Tesco’s top-level Steering Wheel, including the “Community” segment introduced in 2006. The Community segment breaks down into various subheadings, including measures aimed at “Caring for the environment.” According to Tesco, the aims set out in the Steering Wheel are integrated into the management of the business from decision making to individual performance appraisals.

**Individual incentives**

Many organizations strive for environmental excellence, but continue to evaluate and reward performance based strictly on short-term financial indicators. If environmental sustainability is truly important to an organization, evaluations and rewards of individuals need to reflect this. Some companies, such as Tesco, establish environmental goals for individuals and track progress toward those goals. This ensures that both the employee and the manager consider environmental impacts in the performance management process.
Objectives and rewards may also be given to teams or business units, as well as individuals. Siemens hold in-house Environmental Award competitions every three years, and the next competition will include two new prizes honoring a Regional Company and a Division that have made outstanding contributions to Siemens’ environmental program. Employees who show exceptional dedication to promoting environmental sustainability are also honored (Siemens, 2008).

Some organizations have intentionally chosen an implicit system that gives managers discretion to make trade-offs between environmental performance and financial performance. If a company views environmental performance as a core value and wants to change its corporate culture, an explicit performance evaluation system will probably produce more powerful results.

**Internal taxes and transfer pricing**

Organizations can also motivate behaviour by introducing mechanisms such as a waste tax or transfer pricing.

**Example**

At its Michigan division, Dow created a waste landfill that was originally built to last until 2007. However, a few years ago, the company started to charge each plant a fee based on the amount of waste that it brings to the landfill, making it more economical for plants to introduce process improvements to reduce their waste quantities. The internal waste tax reduced the amount of solid waste by half, and the Michigan landfill is now expected to last until 2034.
Transfer pricing is about establishing internal “selling prices” to create an internal market. As goods or services are traded between divisions, a charge is raised by the selling division and becomes a cost for the buying department. The transfer pricing of energy, for example, would make the cost of energy the responsibility of the users of energy. It is these end users who are in a better position to take simple actions to reduce energy consumption.

Example
CIMA-funded research Emissions Trading and the Management Accountant gives an example of a company that uses transfer pricing for its energy costs. The energy division of this company previously operated as a cost center for managing costs through budgets, but has now been established as a profit centre to manage energy. Internal invoices are raised, and buyers of energy effectively deal on an arms’ length basis with issues concerning energy usage. The energy division is expected to at least break even over the financial year, and divisions treat amounts in payment of internal invoices as costs of their operations. The buying divisions in turn work within the discipline of annual budgets, which include targets for energy costs. An interviewee from the company considered the transfer pricing scheme to be effective in driving behaviors to reduce energy.

Reporting
After environmental impacts have been identified and measured, organizations should develop reporting systems to inform internal and external decision makers. The amount and type of information needed for management decisions will differ from what is required for external financial disclosures and for annual environmental reports. That said, data and information collected internally should be managed in a way that satisfies both internal and external reporting requirements.

Internal reporting
Internal reporting often takes the form of management accounts, a primary source of financial and non-financial information used by organizations to run their operations and plan for the future. Management accounts inform strategy and aid decision making. These can be tailored to include information on environmental sustainability. This information should be based on the measuring and monitoring of environmental sustainability goals, targets, and KPIs. According to Vodafone, KPIs not only act as a management system for monitoring performance but also “provide a tool for reporting CR data” (Vodafone, 2009). Further information on Vodafone’s internal reporting is given in Case Study 6.
Case Study 6: Vodafone’s internal reporting

Vodafone, the international telecommunications company, has an internal reporting system for collecting data from local operating companies and measuring implementation of environmental sustainability objectives (part of Vodafone’s wider corporate responsibility (CR) program).

Local operating companies report quarterly to the Group on environmental KPIs, alongside financial and operational performance. The KPIs include measures on issues such as (a) energy efficiency, (b) waste management, and (c) handset collection, reuse, and recycling. Information on KPIs is reported through a dashboard of indicators, which are checked and consolidated at the Group level. Senior executives review the data to assess level of commitment, integration, management of issues, and implementation of Vodafone’s CR strategy. This enables the Group to benchmark performance and share best practices. The Vodafone Group provides guidelines on data collection and internal reporting, which are made available on their website. Vodafone also reports publicly on its environmental performance in external CR reports.

External reporting

Discerning investors, particularly institutional investors, are keenly aware that environmental deeds speak much louder than environmental words. Environmental concerns are no longer a peripheral consideration. They are becoming a measurable mainstream factor in directing the flow of future investment into the marketplace. The emergence of various sustainability-focused indices, such as the FTSE4Good Index and the Dow Jones Sustainability Index, has also encouraged greater environmental reporting. This is so because organizations that report on their environmental performance are better placed for inclusion and ranking in the indices.

To try to address the varying needs of different stakeholders, separate environmental or wider sustainability reports are becoming more prevalent. There are various other names given to such reports, including CR reports, corporate social responsibility (CSR) reports, or triple bottom line reports. According to a recent international survey by KPMG, over 80% of the world’s largest 250 companies produce sustainability reports (KPMG, 2008). These stand-alone reports are published voluntarily, and the format and content of the reports varies widely. There are several useful sources of information on CSR or sustainability reports, including websites from which sustainability reports of companies all over the world can be downloaded (see Useful Websites section).

More progressive organizations are expanding their coverage of environmental issues in their annual reports, instead of or as well as producing a separate sustainability report, although this is still the exception rather than the rule. These integrated reports satisfy financial disclosure requirements and meet information demands of financial analysts, environmental activists, and other stakeholders. It is the organization’s way of signaling the importance of environmental sustainability to its overall business strategy.
The pressure to include information on environmental sustainability in annual reports is coming not just from investors and NGOs. In many jurisdictions, regulators are requiring greater disclosure of environmental sustainability performance within annual reports, particularly where disclosure may be material to investors. For example, US Securities regulations require registered companies to disclose information on environmental matters such as:

- The material costs of complying with environmental regulations in future years;
- The costs of remediating contaminated sites;
- Other contingent liabilities arising from environmental exposures; and
- Any known trend or uncertainty involving environmental issues.

In the UK, the Companies Act 2006 requires the directors of quoted companies to include a Business Review, which, to the extent necessary for an understanding of the business, reports on (a) environmental matters, (b) the company’s employees, and (c) social/community issues. This is based on the EU Accounts Modernisation Directive (AMD), which requires that companies report to investors on how environmental issues affect the company’s profitability. The AMD only applies to large companies, although small and medium-sized companies are still encouraged to report on environmental matters voluntarily, in recognition of the benefits that such disclosure brings to the organization.

As referred to earlier in this guideline, DEFRA has published environmental reporting guidelines to support the requirements of the Companies Act. The UK Government has also produced guidance on interpreting the term “environmental matters,” and suggests that reporting should include the following:

- Environmental impacts, both of the company on the environment (e.g., greenhouse gas emissions, waste to landfill), and of the environment on the company (e.g., a depleting natural resource base, how a company is operating in a carbon-constrained world);
- Company policies – how a company is managing, or intending to manage, these impacts; and
- Company performance – how a company manages its impacts against its policies.

Narrative reporting within a structured management commentary (MC), such as the Business Review, supports financial information by providing additional insight into the organization’s performance. It is a useful place to include information that cannot easily be represented in the financial statements. Narrative disclosures often provide the best way for explaining how environmental sustainability performance has contributed toward overall organizational performance and value. The IFAC Sustainability Framework provides useful guidance and sources of information about narrative reporting and making disclosures in the MC. The International Accounting Standards Board (IASB) has also issued proposed guidance for preparing and presenting the MC.
Although various reporting requirements are being introduced through legislation, standardized external environmental reporting has yet to be established. To overcome this, numerous organizations have been working to develop a format that would be acceptable to the producers of the reports and useful to the various users. These include the IASB, the Global Reporting Initiative (GRI), the Carbon Disclosure Project (CDP), and Accounting for Sustainability (A4S).

The IASB has covered some environmental aspects in its mainstream financial reporting standards. For example, IAS 36 Impairment of assets and IAS 37 Provisions and contingent liabilities refer to environmental issues. IFAC's Sustainability Framework provides useful guidance on external reporting and how to reflect environmental (and other sustainability-related liabilities and costs) in financial statements prepared under IFRS and US GAAP. Financial reporting requirements are likely to develop over time, as schemes such as carbon emissions trading and renewable energy certificates are more widely introduced.

The GRI has developed a framework and guidelines for organizations to follow when reporting on sustainability-related performance (the GRI Sustainability Reporting Guidelines). This framework provides generally accepted standards for reporting on economic, environmental, and social factors. The current reporting standards are the G3 guidelines. The GRI framework includes sector-specific supplements and country-level information.

Under the CDP framework, information, including risks and opportunities arising from climate change, is provided by way of responses to an annual Information Request, sent on behalf of institutional investors and purchasing organizations. Disclosing and reporting on carbon emissions is likely to become a requirement for organizations in many countries, as mandatory carbon reporting regulations are introduced.

The A4S project has developed a Connected Reporting Framework (CRF) to provide clearer, more consistent, and comparable information for both internal and external use. A key principle of the CRF is that sustainability issues should be clearly linked to an organization’s overall strategy. It is about presenting sustainability and more conventional financial information together to give a more complete and balanced picture.

A growing number of organizations are seeking independent third party assurance for the environmental information they are including in external reports. Assurance standards have been developed to meet this need, including ISAE 3000 (Revised), issued by the International Auditing and Assurance Standards Board, and AccountAbility’s AA1000AS. Independent third party verification is used to add credibility to the reporting and to provide the organization with feedback.
Conclusion

Only recently have organizations begun to really consider the interplay between business strategy and environmental sustainability. Organizations will inevitably be affected by the increasingly complex environmental agenda emerging internationally and within national and regional markets. Those that set out to develop a sustainable business will gain in stature and enhance their reputation and business results in a daunting and challenging world.

Organizations must recognize that environmental sustainability issues will pervade all functions, including R&D, procurement, production, marketing, legal, and finance. Finance will need to improve the quality and quantity of information it provides, so that better decisions can be made with regard to product and process design, resource use, product and service costing, and capital investments. The quality and quantity of external disclosures related to environmental sustainability will also need to improve, so that users of the information can better evaluate the organization’s current and future prospects.

Achieving environmental sustainability is not an easy task for organizations, and challenges will need to be overcome along the journey. The tools and techniques suggested in this guideline are meant to assist with the development and implementation of a strategy that embraces environmental sustainability and help address some of those challenges. Many of the tools and techniques covered in this guideline will not be new to management accountants. Management accountants are therefore well placed to help their organization to take a strategic approach to minimizing environmental impact and improving financial performance.

The key challenge for management accountants is to expand their focus. Management accountants must focus on the likely impact of existing and future products and practices on both the environment and the organization. As environmental sustainability moves from being “an optional extra” to a “must have,” management accountants must learn to fully integrate environmental considerations alongside information on financial and operational impacts and performance. Environmental sustainability needs to become “business as usual,” and it must become routine for management accountants to incorporate environmental sustainability into their decisions and actions. Understanding this key opportunity for the management accountant is vital if finance professionals are to secure themselves a place for the future.
## Appendix A: Carillion’s Sustainability Excellence Model

<table>
<thead>
<tr>
<th>Carillion plc</th>
<th>Sustainability Excellence Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared priority</td>
<td>Shared priority definitions</td>
</tr>
<tr>
<td>Natural Resource Protection and Environmental Enhancement</td>
<td>“We will responsibly manage our impact on the environment through the prudent use of natural resources, minimising waste and by protecting and enhancing the environment in which we work and live.”</td>
</tr>
<tr>
<td>Climate Change and Energy</td>
<td>“We will work to reduce our impact on climate change by minimising all our uses of energy.”</td>
</tr>
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</tr>
</tbody>
</table>

Source: Adapted from Carillion’s Sustainability Excellence Model (Carillion, 2007)
### Appendix B: Commonly used Environmental KPIs

<table>
<thead>
<tr>
<th>Energy Aspect</th>
<th>Unit</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>kWh energy</td>
<td>kWh energy/m² floor area</td>
</tr>
<tr>
<td>Electricity (from fossil fuel)</td>
<td>m² floor area</td>
<td>kWh energy/unit of production</td>
</tr>
<tr>
<td>Electricity (from ‘green’ sources)</td>
<td>Units of production</td>
<td>Energy cost/unit of production</td>
</tr>
<tr>
<td>Fuel oil</td>
<td>Number of employees</td>
<td>For total usage: % of ‘green’ fuel vs fossil fuel usage</td>
</tr>
<tr>
<td>Coal</td>
<td>Cost (£)</td>
<td>CCL cost/unit of production</td>
</tr>
<tr>
<td>Other (woodchip/biomass boiler fuel)</td>
<td>Total fuel usage</td>
<td>CCL cost/person</td>
</tr>
<tr>
<td>Climate Change Levy (CCL) cost</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport Aspect</th>
<th>Unit</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel</td>
<td>Distance travelled</td>
<td>Litres of fuel type used per shipment per person</td>
</tr>
<tr>
<td>Petrol</td>
<td>Litres of fuel used</td>
<td>Efficiency: fuel usage per unit of distance travelled</td>
</tr>
<tr>
<td>Biofuel</td>
<td>Tonnes of product shipped</td>
<td>Litres of fuel (and cost) saved – by avoiding journeys through the use of remote communication solutions</td>
</tr>
<tr>
<td>Hybrid engine fuel usage</td>
<td>Unit of production</td>
<td>For total usage: % of total transport fuel from fossil fuel (vs ‘greener’ fuels)</td>
</tr>
<tr>
<td>Transport mode (private car, fleet car, truck, public transport)</td>
<td>Number of employees</td>
<td>% of employees walking/cycling to work (vs private car use)</td>
</tr>
<tr>
<td>Bicycle use</td>
<td>Number of deliveries</td>
<td></td>
</tr>
<tr>
<td>Walking to work</td>
<td>Number of staff journeys</td>
<td></td>
</tr>
<tr>
<td>Teleconferencing and videoconferencing</td>
<td>Cost (£)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Miles and time of staff journeys avoided (e.g. by using IT-based conferencing)</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix B: Commonly used Environmental KPIs (continued)

<table>
<thead>
<tr>
<th>Water</th>
<th>Unit</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Water</td>
<td>• Quantity of water (litres/m³)</td>
<td>• m³ water/employees</td>
</tr>
<tr>
<td>• Effluent (wastewater)</td>
<td>• Quantity of effluent (litres/m³)</td>
<td>• m³ water/unit of production</td>
</tr>
<tr>
<td>• Effluent quality</td>
<td>• Quality which meets effluent consent/permit levels</td>
<td>• Number of water pollution incidents per year</td>
</tr>
<tr>
<td>• Water pollution incidents</td>
<td>• Number of exceedances beyond effluent consent/permit levels</td>
<td>• Number of wastewater permit exceedances per year</td>
</tr>
<tr>
<td></td>
<td>• Number of employees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Units of product processed (number/tonnes etc.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Number of water pollution incidents</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Raw materials and waste</th>
<th>Unit</th>
<th>KPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Paper/cardboard</td>
<td>• Quantities of raw material used (kg/tonnes/litres, etc.)</td>
<td>• Tonnes of materials</td>
</tr>
<tr>
<td>• Plastics</td>
<td>• Quantity of product manufactured (kg/tonnes/litres/m³, etc.)</td>
<td>• % of waste recycled</td>
</tr>
<tr>
<td>• Chemicals</td>
<td>• Number of employees</td>
<td>• % of paper recycled vs paper purchased</td>
</tr>
<tr>
<td>• Metals</td>
<td>• Cost (£)</td>
<td></td>
</tr>
<tr>
<td>• Oils</td>
<td>• Time spent in manufacture</td>
<td>• Quantity of solid waste per unit production or per person</td>
</tr>
<tr>
<td>• Packaging waste</td>
<td>• Time and materials</td>
<td>• Tonnes of waste generated per tonne of raw materials used</td>
</tr>
<tr>
<td>• Packaging materials – virgin</td>
<td>• Tonnes of waste</td>
<td>• Cost of waste per unit product</td>
</tr>
<tr>
<td>• Packaging materials – re-used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waste to landfill (eg. general waste)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waste recycled (eg. aluminium cans, paper)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waste re-used</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Waste sent for treatment as hazardous waste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Landfill Tax</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Envirowise, 2009. Reduce your costs with environmental management accounting
### Appendix C: The ISO 14000 Family

<table>
<thead>
<tr>
<th>Standard and/or project</th>
<th>Title/description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 14001:2004</td>
<td>Environmental management systems – Requirements with guidance for use</td>
</tr>
<tr>
<td>ISO 14004:2004</td>
<td>Environmental management systems – General guidelines on principles, systems, and support techniques</td>
</tr>
<tr>
<td>ISO/DIS 14005</td>
<td>Environmental management systems – Guidelines for the phased implementation of an environmental management system, including the use of environmental performance evaluation</td>
</tr>
<tr>
<td>ISO/CD 14006</td>
<td>Environmental management systems – Guidelines on eco-design</td>
</tr>
<tr>
<td>ISO 14015:2001</td>
<td>Environmental management – Environmental assessment of sites and organizations (EASO)</td>
</tr>
<tr>
<td>ISO 14020:2000</td>
<td>Environmental labels and declarations – General principles</td>
</tr>
<tr>
<td>ISO 14021:1999</td>
<td>Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)</td>
</tr>
<tr>
<td>ISO 14024:1999</td>
<td>Environmental labels and declarations – Type I environmental labelling – principles and procedures</td>
</tr>
<tr>
<td>ISO 14025:2006</td>
<td>Environmental labels and declarations – Type III environmental declarations – principles and procedures</td>
</tr>
<tr>
<td>ISO/AWI TS 14033</td>
<td>Environmental management – Quantitative environmental information – guidelines and examples</td>
</tr>
<tr>
<td>ISO 14040:2006</td>
<td>Environmental management – Life-cycle assessment – principles and framework</td>
</tr>
<tr>
<td>ISO 14044:2006</td>
<td>Environmental management – Life-cycle assessment – requirements and guidelines</td>
</tr>
<tr>
<td>ISO/TR 14045</td>
<td>Environmental management – Eco-efficiency assessment of product systems – principles, requirements, and guidelines</td>
</tr>
<tr>
<td>ISO/TR 14047:2003</td>
<td>Environmental management – Life-cycle impact assessment – examples of application of ISO 14042 (ISO 14042 now withdrawn)</td>
</tr>
<tr>
<td>ISO/TR 14049:2000</td>
<td>Environmental management – Life-cycle assessment – examples of application of ISO 14041 to goal and scope definition and inventory analysis (ISO 14041 now withdrawn)</td>
</tr>
<tr>
<td>ISO 14050:2009</td>
<td>Environmental management – Vocabulary</td>
</tr>
<tr>
<td>ISO/CD 14051</td>
<td>Environmental management – Material flow cost accounting – general principles and framework</td>
</tr>
<tr>
<td>ISO/TR 14062:2002</td>
<td>Environmental management – Integrating environmental aspects into product design and development</td>
</tr>
<tr>
<td>ISO 14063:2006</td>
<td>Environmental management – Environmental communication – guidelines and examples</td>
</tr>
<tr>
<td>ISO 14064-1:2006</td>
<td>Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals</td>
</tr>
<tr>
<td>ISO 14064-2:2006</td>
<td>Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring, and reporting of greenhouse gas emission reductions or removal enhancements</td>
</tr>
<tr>
<td>ISO 14065:2007</td>
<td>Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition</td>
</tr>
</tbody>
</table>

**Note:** AWI = Approved Work Item  
CD = Committee Draft  
DIS = Draft International Standard  
TR = Technical Report  
TS = Technical Specification  
WD = Working Document

Source: International Organization for Standardization website
AA1000AS – One of a series of principles-based standards developed by AccountAbility for helping organizations to become more accountable, responsible, and sustainable. The assurance standard is used internationally to provide assurance on publicly available sustainability information, particularly CSR or Sustainability reports.

Acid Rain – Acid or any other form of precipitation that is unusually acidic, typically as a result of emissions of sulphur and nitrogen compounds into the atmosphere. Acid rain has harmful effects on plants, aquatic animals, and infrastructure, and many governments have introduced laws to reduce these emissions.

Carbon Trading – A market mechanism designed to put a price on carbon to reduce carbon dioxide emissions and help tackle climate change. Under a system of carbon trading, the right to exceed an agreed level of pollution has a price. “Good” organizations can benefit from reducing their emissions, while “bad” ones pay a financial penalty.

Climate Change Levy (CCL) – An energy tax introduced in the UK in April 2001 that adds approximately 15% to typical energy bills of UK businesses. The CCL is a key part of the UK government’s strategy to promote energy efficiency and reduce greenhouse gas emissions. The CCL is applied to electricity, gas, coal, and Liquid Petroleum Gas, but is not applied to any domestic supplies. Energy-intensive industries are able to join Climate Change Agreements to help mitigate the effects of this tax.

Closed Loop – A system that recycles materials and resources back into the production process, without any waste or emissions of toxic materials.

Design for the Environment (DFE) – A term used to describe the integration of environmental considerations into the design process.

Eco-efficient – A term used by the World Business Council for Sustainable Development to highlight the positive connections between economic and ecological efficiency. It is based on the concept of using fewer resources and creating less waste, while producing more goods and services.

Eco-Management Audit Scheme (EMAS) – A management tool for public and private sector organizations to evaluate, report, and improve their environmental performance.

Enhanced Capital Allowances (ECAs) – A government incentive that enables a business to write off the capital cost of its investment in certain qualifying technologies against their taxable profits of the period during which it makes the investment.

Environmental Impact – The total effect of a product, process, or organization on the environment, including all benefits and costs.
Environmental Product Declaration (EPD) – A standardized tool for communicating the environmental performance of a product or service. The declaration includes quantified information on environmental impacts, such as raw material acquisition, energy use and efficiency, emissions to air, water usage, and waste generation.

EU’s Accounts Modernisation Directive (AMD) – A directive intended to increase the comparability between companies in the EU through a common reporting framework.

EU Emissions Trading Scheme (EU ETS) – The largest multi-country, multi-sector Greenhouse Gas Emission Trading System world-wide. It has been in place since 2005, and is a Europe-wide scheme that aims to reduce emissions of carbon dioxide by putting a price on carbon that businesses use and creating a market for carbon.

Failure Costs – Refers to costs incurred to remediate damage caused by the failure to avoid negative environmental impact.

Green Taxes – Taxes designed to protect the environment.

Greenhouse Gases (GHG) – Gases whose emissions are deemed to contribute to global warming or climate change. Some GHGs occur naturally, but others are generated as a result of human activity (referred as anthropogenic). The Kyoto Protocol focuses on six harmful anthropogenic GHGs: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons; perfluorocarbons; and sulphur hexafluoride.

Greenhouse Gas Protocol (GHG Protocol) – A widely used international accounting tool for understanding, quantifying, managing, and reporting GHG emissions. The protocol, developed by the World Resources Institute and the World Business Council for Sustainable Development, provides a framework for nearly every GHG standard and program in the world.

Hidden Costs – Refers to the results of assigning environmental costs to overhead pools or overlooking future and contingent costs. In addition, hidden costs include costs that are identified and recorded in the accounting system, but are not typically used in capital budgeting.

Hurdle Rate – The minimum acceptable rate of return that a capital investment proposal must achieve if it is to be accepted. Often, this is set by reference to the organization’s cost of capital or weighted average cost of capital (WACC), but may be increased or decreased to allow for different levels of risk in the specific investment. It may also be referred to as the required rate of return.

ISAE 3000 (Revised) – An assurance standard that establishes basic principles for all assurance engagements, other than audits or reviews of historical financial information, for example assurance engagements regarding environmental, social, and sustainability reports.
Kyoto Protocol – The first scheme to introduce trading of GHGs on a global basis. Around 170 countries and other governmental entities ratified the Kyoto Protocol, which is part of the United Nations Framework Convention on Climate Change (UNFCCC).

Landfill Tax – A UK tax payable on the disposal of waste at landfills. This tax is regulated by HM Revenue and Customs. It aims to encourage waste producers to (a) produce less waste, (b) recover more value from waste, for example through recycling or composting, and (c) use more environmentally friendly methods of waste disposal. Rates for 2008/09 were: active waste – £32/tonne (+VAT); inactive waste – £2.50/tonne (+VAT).

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 public (also termed “relationship costs” or “image costs”). Previously, less tangible costs were difficult if not impossible to quantify. Recent experience – and growing awareness of the benefits of environmental sustainability – may provide essential insight into estimating these costs and savings.

Liability Costs – Refer to contingent liabilities not currently recognized in conventional accounts, such as future clean-up or remediation costs, liabilities for personal injury or property damage, and penalties and fines for violation of environmental regulations.

NGOs – A term that has become widely accepted as referring to legally constituted, non-governmental organizations created by natural or legal persons with no participation or representation of any government. Many NGOs exist with the aim of improving the environment and promoting the sustainable development agenda.

Publicly Available Specification 2050:2008 (PAS 2050) – A specification for the assessment of the life-cycle greenhouse gas emissions of goods and services. The standard was published by BSI British Standards, with the support of DEFRA and the Carbon Trust.

Regulatory Costs – Refers to costs incurred to comply with environmental legislation, regulation, and standards (also termed “compliance costs”).

Shadow Price – The increase in value that would be created by having available one additional unit of a limiting resource. This represents the opportunity cost of not having the use of one extra unit.

Up-front Cost – Includes pre-acquisition or pre-production costs incurred for processes, products, systems, or facilities (e.g., R&D costs).

Waste Electrical and Electronic Equipment Directive (WEEE Directive) – Aims to minimize the impact of electrical and electronic goods on the environment, by (a) increasing reuse and recycling, and (b) reducing the amount of WEEE going to landfill. It seeks to achieve this by making producers responsible for financing the collection, treatment, and recovery of waste electrical equipment, and by obliging distributors to allow consumers to return their waste equipment free of charge.
Useful Websites

**AccountAbility**
A global not-for-profit partnership that works to promote accountability innovations for sustainable development. [www.accountability21.net](http://www.accountability21.net)

**Accounting for Sustainability Project (A4S)**
A project established by the Prince of Wales to bring organizations together to develop practical guidance and tools for embedding sustainability into day-to-day operations, decision making, and reporting processes. [www.accountingforsustainability.org](http://www.accountingforsustainability.org)

**BSI British Standards**
The UK’s National Standards Body was the world’s first. It represents UK economic and social interests across all of the European and international standards organizations. [www.bsi-global.com](http://www.bsi-global.com)

**Canadian Standards Association (CSA)**
A not-for-profit membership-based association serving business, industry, government, and consumers in Canada and the global marketplace. [www.csa.ca](http://www.csa.ca)

**Carbon Disclosure Project (CDP)**
An independent not-for-profit organization that collects climate change data submitted by companies voluntarily. [www.cdproject.net](http://www.cdproject.net)

**Carbon Trust**
An independent company that was set up by the UK government in 2001 to work with organizations to reduce emissions and develop commercial low-carbon technologies that will assist the move to a low-carbon economy. [www.carbontrust.co.uk](http://www.carbontrust.co.uk)

**CorporateRegister.com**
A global directory of CSR resources, including a CSR report directory, a reporting partners directory, CSR news and information, and research and publications. [www.corporateregister.com](http://www.corporateregister.com)

**Environment Agency**
A UK public body that aims to protect and improve the environment, and to promote sustainable development. [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

**Envirowise**
Envirowise delivers free, independent advice to enable businesses to increase profitability and reduce environmental impact. [www.envirowise.gov.uk](http://www.envirowise.gov.uk)

**European Commission**
The European Commission has a useful Environment section on its website, including resources on Environmental Impact Assessments. [ec.europa.eu/environment/eia/home.htm](http://ec.europa.eu/environment/eia/home.htm)
Environmental Data Services (ENDS)
A leading European provider of environmental information, including the latest EU and UK legislation and policy, and guidance for developing strategies to meet future requirements. www.ends.co.uk

Global Reporting Initiative (GRI)
A network-based organization that aims to create conditions for the transparent and reliable exchange of sustainability information through the development and continuous improvement of the GRI Sustainability Reporting Framework. www.globalreporting.org

Greenhouse Gas Protocol (GHG Protocol)
A widely used international accounting tool for understanding, quantifying, managing, and reporting GHG emissions. www.ghgprotocol.org

Institute of Environmental Management and Assessment (IEMA)
A not-for-profit membership organization established to promote best practice standards in environmental management, auditing, and assessment. The website includes a number of useful case studies within its Reading Room. www.iema.net

Intergovernmental Panel of Climate Change (IPCC)
The leading body for the assessment of climate change, established to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences. www.ipcc.ch

International Association for Impact Assessment (IAIA)
A forum for improving and promoting best practice in environmental impact assessment around the world. www.iaia.org

International Corporate Sustainability Reporting Site
A site dedicated to corporate sustainability and environmental reporting that provides access to a resource library, news items, and an award gallery. www.enviroreporting.com

International Institute for Sustainable Development (IISD)
IISD champions sustainable development around the world through innovation, partnerships, research, and communications. www.iisd.org

International Organization for Standardization (ISO)
A network of the national standards institutes of 162 countries that together forms the world’s largest developer and publisher of international standards. www.iso.org

International Society on Multi-criteria Decision Making
A society established (a) to develop, test, evaluate, and apply methodologies for solving multiple criteria decision-making problems, (b) to foster interaction and research in the scientific field of multiple criteria decision making, and (c) to cooperate with other organizations in the study of management from a quantitative perspective. www.mcdmsociety.org
Office of Government Commerce (OGC)
An independent office of the UK’s HM Treasury, established to help Government deliver best value from its spending. It is dedicated towards achieving six key goals, including delivering sustainable procurement and sustainable operations.
www.ogc.gov.uk

Report Leadership
A multi-stakeholder group that aims to challenge established thinking on corporate reporting, to make it more accessible and informative. www.reportleadership.com

Sustainable Development Commission
The Sustainable Development Commission is the UK Government’s independent advisory body on sustainable development. www.sd-commission.org.uk

Sustainability at Work
A product of A4S, developed in partnership with the National Audit Office, the Sustainable Development Commission, and DEFRA. It brings together key guidance, tools, and other information in the sustainability arena, and is supported by case studies. www.sustainabilityatwork.org.uk

Sustainability-Reports.com
A portal for sustainability reports of multinational companies from all over the world. www.sustainability-reports.com

United Nations Environment Programme (UNEP)
UNEP provides leadership and encourages partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations. www.unep.org

The UK’s Department for the Environment, Food & Rural Affairs (Defra)
has recently published detailed advice on how to measure and report greenhouse gas emissions www.defra.gov.uk/environment/business/reporting/index.htm

The Water Footprint Network
A network of international institutions established to coordinate efforts to further develop and disseminate knowledge on water footprint concepts, methods, and tools. www.waterfootprint.org

Endnote

1 TCA was originally developed in 1991 by the Tellus Institute for the EPA and New Jersey Department of Environmental Protection. Later, the AIChE developed a full methodology around the TCA concept and the AIChE methodology is more widely adopted.


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Helenne joined CIMA in 2007 as an Innovation and Development Specialist. Her areas of specialty include responsible business and sustainability. She has written a paper Climate Change Call For Strategic Change and has contributed to a number of articles and publications on sustainability and climate change. Helenne also presents at conferences, events, and training academies on these topics. She represents CIMA on a variety of sustainability-related projects, including the Prince of Wales’ Accounting for Sustainability project.
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