# Life Cycle Management

How business uses it to decrease footprint, create opportunities and make value chains more sustainable

UNEP
United Nations Environment Programme

Life Cycle Initiative

SETAC

# About this document

## Who should read this issue brief?

This issue brief can be given to company in-house experts and non-specialist managers as well as company suppliers so that they can learn how to apply life cycle management practices throughout the value chain. This is a very practical guide that can be read by all managers and employees – from those at the "front line" working directly with suppliers, to people on the production line or in the warehouse, or staff dealing with marketing, design and development. What is vital (as the case studies underline) is that the message of sustainability and the concept of life cycle management spread out along the value chain – both inside and outside the company.

## What does this issue brief cover?

This issue brief gives a clear and practical introduction to life cycle management by:

- Explaining key concepts in plain language
- Giving "real-life" examples of how businesses put these concepts into practice
- Outlining why life cycle management business practices are so important to businesses
- Describing some of the key tools that businesses can use
- Providing a list of resources that readers can use to find more information on sustainable business practices
- Discussing a way forward for businesses towards the vision of the sustainable value chain.

## Why read this issue brief?

This issue brief outlines a business approach that goes beyond short-term success and aims at long-term value creation: life cycle management. It gives examples of how global businesses are using it to reduce, for instance, their products' carbon, material and water footprints, as well as improve the social and economic performance of their offerings in order to ensure a more sustainable value chain. These efforts improve a company's performance, strengthen corporate credibility and stakeholder relations and enhance shareholder value.

Traditionally, the focus on improving production conditions has been at a local level. Today, as more products (goods and services) are traded regionally and globally, we need international initiatives that incorporate life cycle thinking and approaches to help businesses respond to the challenges posed by today's global marketplace.

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# Contents

# Acronyms

| | |
|---|---|
| **ASSETT** | Alcan Sustainability Stewardship Evaluation Tool |
| **CMM** | capability maturity model |
| **EHS** | environmental, health and safety |
| **GHG** | greenhouse gas |
| **ISO** | International Organization for Standardization |
| **LCA** | life cycle assessment |
| **LCC** | life cycle costing |
| **LCM** | life cycle management |
| **LEED** | Leadership in Energy and Environmental Design |
| **MOC** | materials of concern |
| **NGO** | non-governmental organization |
| **PD** | product development |
| **PSI** | product sustainability index |
| **R&D** | Research and Development |
| **SCP** | sustainable consumption and production |
| **SETAC** | Society of Environmental Toxicology and Chemistry |
| **S-LCA** | social life cycle assessment |
| **UNEP DTIE** | United Nations Environment Programme, Division of Technology, Industry and Economics |
| **WBCSD** | World Business Council for Sustainable Development |
| **WRI** | World Resources Institute |

# Foreword

## UNEP

The growing attention to life cycle issues is a natural outcome of decades of UNEP work on cleaner production and ecoefficient industrial systems. It is a next step in broadening the horizons of pollution prevention – a process that has gone from a focus on production processes, to products, and then to product systems and sustainable innovation (new products, product systems and enterprises designed for win-win solutions for business, the environment and the people).

*Achim Steiner*, Executive Director, UNEP

Quoted from the foreword of the "Life Cycle Management – A Business Guide to Sustainability", UNEP/SETAC publication.

## SETAC

Under the current partnership among SETAC, UNEP, and all of the sponsors of the UNEP/SETAC Life Cycle Initiative, we have had several successful years laying the foundation to move life cycle thinking and approaches to another level. Continuing in this spirit, this valuable collaboration between UNEP and SETAC is a further demonstration of the importance of strong partnerships between key organizations in making the economic and environmental case for life cycle thinking, assessment and management to key business leaders and decision-makers. It highlights too the potential such collaboration holds for the future.

This is a small step towards building greater understanding of life cycle approaches and their value towards creating more sustainable management of our value chains. Our aim is to inspire organizations and firms to understand their value chains and then take actions collectively to reduce their footprint and improve their overall performance.

*Michael Mozur*, Executive Director, SETAC

# Executive summary

Sustainability is an emerging and evolving concept used with increasing frequency in today's globalized business world. Every day, corporate decision-makers grapple with their company's impact on the environment, natural resources and society – in addition to tackling questions of economics. At the forefront of their minds is the need to answer the critical question of *how to guarantee more sustainable business practices* into the future – to reduce their company's ecological footprint and increase their resource efficiency and productivity so that resources are not unnecessarily depleted or permanently damaged – and still ensure a sufficient profit and the creation of social value.

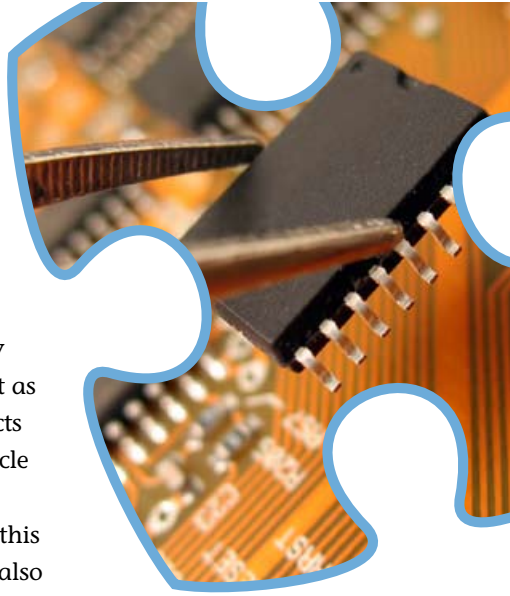
So, how can companies spread the message of sustainability to employees, suppliers and customers throughout the product and value chain to promote more sustainable products and business practices into the future? Life cycle management is one answer.

The business case for achieving sustainable development rests on how it affects the bottom line. Life cycle management is a business approach that can be used to achieve sustainable development as it goes beyond short-term success and aims at long-term value creation. Global businesses are using it to reduce, for instance, their products' carbon, material and water footprints, as well as improve the social and economic performance of their offerings in order to ensure a more sustainable value chain. These efforts improve a company's performance, strengthen corporate credibility and stakeholder relations and enhance shareholder value, both on a local and global level.

Companies that meet the sustainability challenge will have the edge over their competitors that do not heed this challenge – those that offer consumers what they want now and in the future are guaranteeing their own futures.

## So what is life cycle management?

Life cycle management is a business management approach that can be used by all types of businesses (and other organizations) to improve their products and thus the sustainability performance of the companies and associated value chains. A method that can be used equally by both large and small firms, its purpose is to ensure more sustainable value chain management. It can be used to target, organize, analyze and manage product-related information and activities towards continuous improvement along the life cycle.



Life cycle management is about making life cycle thinking and product sustainability operational for businesses that are aiming for *continuous improvement*. These are businesses that are striving towards reducing their footprints and minimizing their environmental and socio-economic burdens while maximizing economic and social values.

When a product passes from one part of a product chain or life cycle stage to the next, it *gains value*. At *all stages* of this process, value is added as it passes through each part of the value chain.

Leading companies have understood how life cycle management can be used to make value chains more sustainable and are applying it to create value.

- 3M, Dow and UTC began using life cycle management and related tools with the objective of preventing pollution and decreasing materials of concern. This was frequently also part of risk analyses with the aim of maintaining the right to operate following pressure from non-governmental organizations, civil society and increasing demands from new legislative initiatives.
- 3M, Eskom and Veolia Environnement also have other reasons to use life cycle management, including to save money and to increase efficiency, i.e., by reducing energy, reducing the use of materials and saving water.
- Veolia Environnement uses life cycle management to support key choices in technology.
- Eskom uses it to support important investment decisions.
- Alcan Packaging uses it for product development.
- Alcan Packaging, Dow and Veolia Environnement, companies dealing with final customers and/or consumers, see sustainability as offering a competitive advantage.

Partnering with customers and suppliers to achieve the minimum impact within the complete value chain creates value and benefits society at large. If managed effectively and by taking direct as well as indirect effects into account, life cycle management helps not only to provide this overall benefit, but also delivers positive bottom-line consequences for each company involved.

Cooperation means that important systemic approaches are being generated. These can reinforce gains achieved through process and technical solutions within production and distribution cycles. Adopting a sustainable value chain approach will allow businesses to meet challenges ranging from poverty, climate change, resource depletion, water scarcity, globalization and demographic shifts, to name a few, and to reshape the world and the way business is done. And business leaders have a central part to play in ensuring sustainable development.

UNEP, SETAC and business partners believe that key principles and criteria for sustainable products and life styles from a life cycle perspective are needed to help consumers choose more sustainable products and services. These should encompass information on those product aspects for which the sustainability relevance relies, in particular, on the “use” or the “end of life” phases.

Another key area for cooperation is the integration of sustainability aspects into research and development and subsequent engineering and maintenance processes. This encompasses the managing of descriptions and properties of a product through its development and useful life, mainly from a business/engineering point of view as a means of improving the product development processes across the value chain to deliver enhanced business value.

Principles and criteria for products and strategies addressing life cycle issues are emerging as a viable contribution to be offered to business and consumers through the continued joint cooperation between UNEP, SETAC and business partners.

These organizations propose a way forward for companies:

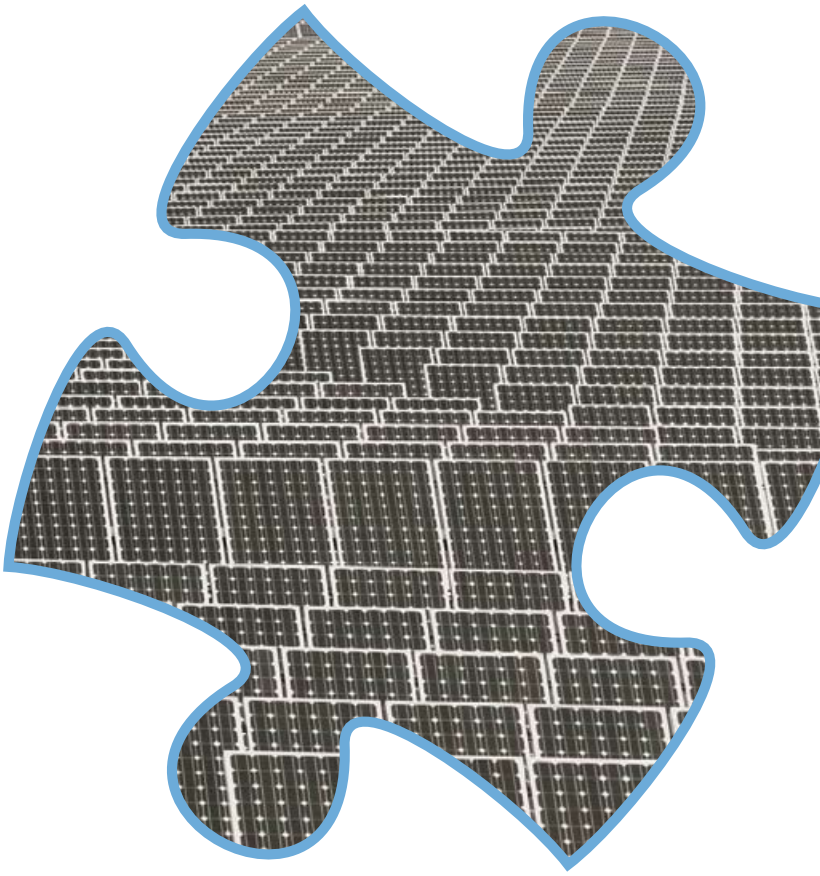
- **Look for your success story** – Look at what other companies are doing to identify those examples that are most meaningful for your organization, culture, markets and value chain. Explore internally for additional examples of efforts to make value chains more sustainable. Brainstorm with your colleagues on ideas that could be replicated in your company and identify potential benefits you may see and challenges you may face from selected examples. Discuss with top management and move ahead with the selected one(s).
- **Build awareness** – Begin to build awareness internally. Integrating sustainability oriented life cycle management within a company facilitates constructive stakeholder dialogue to align company strategic planning with customer and public expectations. It also provides assurance that internal company programs promote value chain sustainability.
- **Spread the word** – Communicate broadly, with customers, consumers, suppliers and everyone else within your value chain. Consider the key people along the value chain who can help make a difference.

Any improvement is already a success. Be part of it.

Achieving sustainable development is more important than ever in our rapidly changing world. The global financial crisis that started in 2008 shows just how vital concerted forward thinking on a worldwide scale actually is.

However, sustainable business practices are not just good for the environment: they are good for business. And businesses can play a vital role in securing solutions to enhance sustainable development.

More than ever, business practices are driven by changes in global economic development, demographics and their own impact on humans and the environment. In the future, the leading global companies will not only use cutting-edge technological and production methods, but they will also address the world's major challenges – poverty, climate change, resource depletion, water scarcity, globalization and demographic shifts, to name just a few.



# 1 The business case for life cycle management

Life cycle management (LCM) is a framework to analyse and manage the sustainability performance of goods and services. It is a business approach that goes beyond short-term success and aims at long-term value creation. Global businesses are using it to reduce, for instance, their products' carbon, material and water footprints, as well as to improve the social and economic performance of their offerings in order to ensure a more sustainable value chain. These efforts improve a company's performance, strengthen corporate credibility and stakeholder relations and enhance shareholder value.

One key characteristic of LCM is that this approach requires companies to move away from just looking at their own operations and to look at what is happening in their value chain (upstream and downstream operations that are outside the company's direct control). Traditionally, the focus on improving production conditions has been at a local level. Today, as more products (goods and services) are traded regionally and globally, we need international initiatives that incorporate LCM thinking and approaches to help businesses respond to the challenges posed by today's global marketplace.

## Sustainability and the bottom line

Meeting the sustainability challenge can present businesses with tremendous opportunities. As we look at ways to address issues of sustainability, new business models will emerge that will help businesses achieve more success in a resource-constrained world with more stringent stakeholder expectations. In this issue brief, leading companies describe how their efforts to find new ways to answer sustainability questions allowed them to also find new – and more profitable – business models.

Companies that meet the challenge of sustainability will have the edge over their

competitors who do not face up to this challenge – those that offer consumers what they want now and in the future are guaranteeing their own futures.

In short, LCM is a logical approach for any company, no matter what its size. Sustainability is a growing concept and any company that is serious about its affairs needs to be in the business of incorporating the concepts of the future today.

## Who is on board?

The value chain goes beyond *individual* organizations – it is intrinsically connected to whole supply chains, distribution networks, customers and end-consumers. Delivering a mix of goods and services to the end customer mobilizes different economic factors. The synchronized interactions of those local or individual value chains very often create an industry-wide global value chain. Corporations can really only achieve sustainable value chain management if they are also able to enhance sustainability with their supply chains.

## What sustainability approaches can companies use?

Approaches to sustainable consumption can be grouped into three broad categories:

1. Innovation – business processes for the development of new and improved goods and services; businesses are shifting to incorporate provisions for maximizing societal value and minimizing environmental impacts.
2. Choice influencing – the use of marketing and awareness-raising campaigns to enable and encourage customers and consumers to choose and use goods and services more efficiently and sustainable.
3. Choice editing – the removal of "unsustainable" goods and services from the marketplace in partnership with other actors (e.g., retailers) in society or plainly via market mechanisms.

To this end, a variety of sustainability tools can be used – ranging from life cycle assessment (LCA) to life cycle costing (LCC), and (eco-) design methods or green procurement, to factoring in the consumption patterns of consumers and how to make them sustainable (to list just a few).

## Working with suppliers and outsourcing

It is impossible to achieve profitable solutions and to avoid inefficient and possibly counterproductive aspects without looking at the bigger picture. Production can place significant environmental and socioeconomic burdens on the world. How goods are manufactured and distributed is complex – designers, producers, their suppliers and consumers, retailers, etc. all use interlinked processes that both affect each other and the global environment. LCM is an approach that can be used to address and manage these interlinkages and networks.

# 2 Defining the terms

Recognizing the differences between sectors and products, for a couple of years now the UNEP/Wuppertal Institute Collaborative Centre on Sustainable Consumption and Production (Schaller et al., 2009) has been highlighting the mismatch between opportunities and risks along the value chain and the current management effort. Overall, a disproportionate amount of management effort is being spent addressing *in situ* environmental and social (compliance) issues. Many of the environmental and social impacts of products do not occur on the site where they are produced, but rather at upstream and downstream product chains. That is precisely what is meant with the 80/20 mismatch: 80% of the issues are being addressed through management effort, causing most of the time "only" 20% of the problems.

The areas at each end of the supply chain offer a far bigger opportunity for improving the environmental, social and business performance. While not losing sight of the "business as usual" management, in the near future the focus should shift towards relevant aspects of extraction of raw materials and (pre-) production issues at the one end and the use-phase at the other end of the value chain.

Several different strategies have been used by companies to implement LCM in their operations. Among these concepts and tools are (eco-) design methods, green procurement, LCA, LCC, eco- and energy labeling, environmental product declarations, ecological and carbon footprint analyses, environmental performance indicators, and social sustainability assessments and approaches, in addition to organizational strategies that are essential for actual implementation.

Here, we give definitions and explanations of key terms (such as "value chain" or "footprint") that will be used to discuss the strategies presented in Section 3. We also introduce a summary of three important tools – LCA, LCC and the capability maturity model (CMM) – that companies can use to help evaluate how to proceed in ways that are appropriate to their circumstances. Just as each situation is unique, so too must be the path that will be followed – underlining the need for assembling a flexible toolset and the means to select the right tools.

In addition to LCM and LCA approaches, businesses also use other tools in their work to make value chains more sustainable. Tools developed by WBCSD include the GHG protocol, corporate ecosystem services review, global water tool, measuring impact framework, and the sustainable procurement of wood and paper-based products guide and resource kit.


**Figure 1: Mobile phone life cycle**

## What is a value chain?

A product value chain covers one product while a corporate value chain covers the product portfolio of a whole company. A value chain can be made more sustainable if, at *each* step of the chain, the environmental and social drivers, impacts and benefits are considered and optimized at the same level as the economic dimension.

When a product passes from one part of a product chain or life cycle stage to the next, it *gains value*. So, when for instance a mobile phone is being produced:

- The product is first designed and then developed
- Raw materials are selected, procured and supplied
- The mobile phone is then manufactured, marketed, packaged and distributed
- It is then retailed, purchased, used and serviced
- Finally, it is recycled or disposed of.

## What is life cycle management?

As noted above LCM is a framework to analyse and manage the sustainability performance of goods and services.

LCM is a business management approach that can be used by all types of business (and other organizations) in order to improve their sustainability performance. A method that can be used equally by both large and small firms, its purpose is to ensure more sustainable value chain management. LCM can be used to target, organize, analyze and manage product-related information and activities (Remmen et al,. 2007) towards continuous improvement along the product life cycle.

LCM is about making life cycle thinking and product sustainability operational for businesses that are aiming for *continuous improvement*. These are businesses that are striving towards reducing their footprints and minimizing their environmental and socio-economic burdens while maximizing economic and social values.

## What is life cycle assessment?

Increasing awareness of the importance of environmental protection, and the possible impacts associated with products (both manufactured and consumed) has strengthened the interest in the development of methods to better understand and address these impacts along their life cycle/value chain. One basic tool that can be used to do this is LCA, standardized by the International Organization for Standardization (ISO 14040/14044 [2006]).

LCA is a compilation and evaluation of the inputs, outputs and other interventions and the current or potential environmental aspects and impacts (e.g., use of resources and the environmental consequences of releases) throughout a product's life cycle – from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e., "cradle to grave").

LCA can assist in:

- Identifying opportunities to improve the environmental performance of products at various points in their life cycle
- Informing decision-makers in industry, government or non-governmental organizations (e.g., for the purposes of strategic planning, priority setting, and product or process design or redesign)
- Selecting relevant indicators of environmental performance, including measurement techniques
- Marketing (e.g., implementing an ecolabeling scheme, making an environmental claim, or producing an environmental product declaration).

LCA then is a key tool for improving resource efficiency – it allows companies and other stakeholders to identify "hotspots" along the supply chain, as well as potential risks and opportunities for improvements. LCA's broad scope ensures that tangible improvements are made as it measures effects *across* the life cycle so that it prevents the shifting of burdens to other types of environmental impacts/or other stages of the life cycle.

Product design tools supported by LCA based information exist in various forms such as eco-design and design for sustainability (Crul and Diehl, 2007).

LCA is one of several environmental management tools and might not be the most appropriate one to use in all situations. For instance, LCA typically does not address the economic or social aspects of a product, but life cycle thinking and corresponding methodologies can be applied to these other aspects (see environmental life cycle costing or social life cycle assessment below).

## What is social life cycle assessment?

A social life cycle assessment (S-LCA) is a method that can be used to assess the *social* aspects of products and their potential positive and negative impacts along the life cycle. This looks at the extraction and processing of raw materials, manufacturing, distribution, use, reuse, maintenance, recycling and final disposal. S-LCA makes use of generic and site-specific data, can be quantitative or qualitative, and complements LCA with social aspects. It can either be applied on its own or in combination with LCA.

S-LCA does not provide information on the question of whether a product should be produced or not – although information obtained from an S-LCA may offer "food for thought" and can be helpful for taking a decision.

Although S-LCA follows the ISO 14040 framework, some aspects differ, are more common or are amplified at each phase of the study. The UNEP *Guidelines for Social Life Cycle Assessment of Products* proposes one methodology to develop life cycle inventories. A life cycle inventory is elaborated for indicators (e.g. number of jobs created) linked to impact categories (e.g. local employment) which are

related to five main stakeholder groups (e.g., [i] worker, [ii] consumer, [iii] local community, [iv] society and [v] value chain actors). Examples of impact categories for "local community" are: access to material resources, access to immaterial resources, delocalization and migration, cultural heritage, safe & healthy living conditions, respect of indigenous rights, community engagement, local employment and secure living conditions.

## What is life cycle costing?

Traditional life cycle costing (LCC) is a method of calculating the total cost of a product (goods and services) generated throughout its life cycle from its acquisition to its disposal, including design, installation, operation, maintenance, and recycling/disposal, etc.

LCC can be used for a wide range of different purposes. In general, the most common uses of LCC are selection studies for different products and design trade-offs, relating to both comparisons and optimization. The construction industry is the main user of affordability studies, and cases from the energy sector often focus on the source selection for different services. Quite understandably, the public sector uses LCC mostly in sourcing decisions, while the private sector also uses LCC as a design support tool.

## What is environmental life cycle costing?

Environmental LCC extends traditional LCC – it assesses all costs associated with a product's life cycle that are covered by one or more of the actors in the product's life cycle. These actors include suppliers, manufacturers, customers, end-users or end-of-life actors. While environmental LCC does not include external costs not related to real monetary flows and the decision or analysis at hand, it does look at the external costs of social externalities or environmental impacts that are anticipated in the decision-relevant future (Rebitzer and Hunkeler, 2003).

Traditional LCC is confined to the economic costs within the dotted line in Figure 2, or the costs borne directly by the actors involved in the financial transactions and not complemented by other sustainability analyses (environmental and social). In addition, often only parts of the life cycle are addressed (e.g., excluding end-of-life).

Environmental LCC is the equivalent to LCA, just in economic terms. The goal is to cover important aspects of the economic pillar of product-related sustainability. Environmental LCC also extends a traditional LCC by requiring a complementary LCA with an equivalent

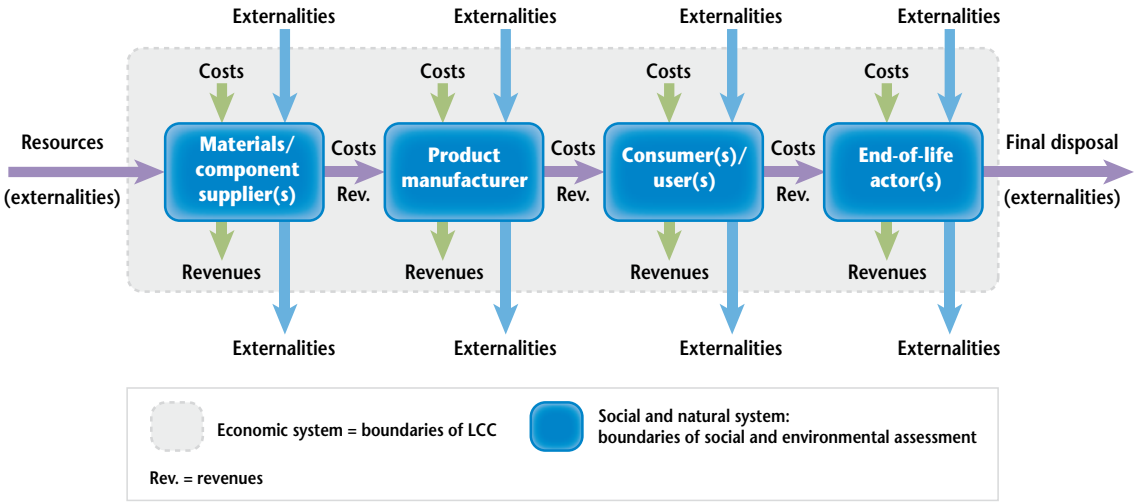



**Figure 2: Conceptual framework for Environmental LCC**

Source: Rebitzer and Hunkeler, 2003.

system boundary and functional unit (therefore the term "environmental" LCC). It should not be used alone, but together with an environmental and possibly also social assessment (such as an S-LCA) to represent all facets of sustainability.

The goal is to provide a more comprehensive assessment of the product system to detect hidden cost drivers, compare total costs and trade-offs for alternative technologies, plan technology developments for new product offerings, develop a carbon-trading strategy, inform a decision to upgrade or replace capital equipment and more (Hunkeler et al., 2008). Therefore, it is a tool for management accounting (also coined "cost management"), but is not related to financial accounting.

## What is the capability maturity model?

The CMM is another tool that can support companies in moving towards a next level of evolution in business management. Acting as a framework, this tool provides five levels of maturity (see Table 1). As the organization moves from a compliant strategy toward sustainability, higher levels of maturity or capability are required for successful execution.

## What is the "footprint"?

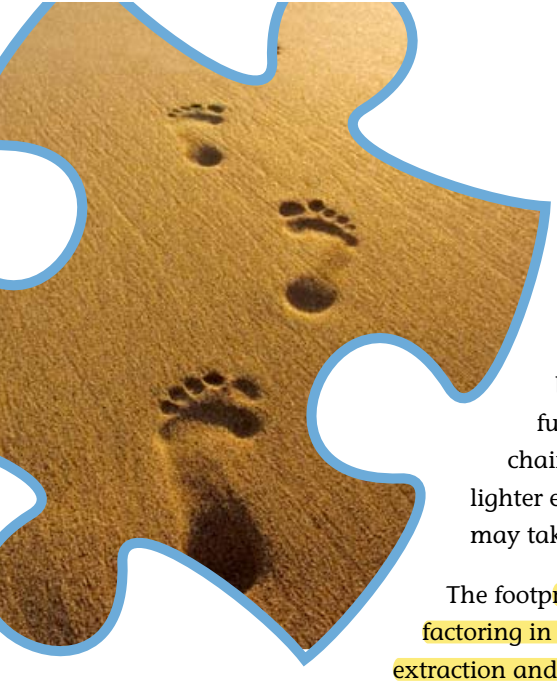
A "footprint" is a popular way of describing how human activities can impose different types of burden or impact on the global sustainability. Humankind leaves "footprints" for future generations to cope with. Reducing such footprints is one of the goals of a sustainability strategy.

A company footprint is the sum of the footprints of all products or services produced by a company. A product, in most cases, is made up of contributions from a chain of suppliers. It starts with raw material acquisition, and then moves on to the company's facilities (buildings [construction, furniture, heating, electricity], administration [office equipment and machines, etc.], process facilities [transportation, travel etc.], production processes and the product chain distribution, customers [downstream producers, distributors, retailers, etc.], consumers, disposal/recycling).

Therefore, a product's footprint is a measure of the direct and indirect material/resource consumption associated with all activities in the product life cycle. The allocation of the environmental burden is uneven along the various stages of the life cycle – the extraction of materials, for example, often takes place

| Maturity Level | Description | Span of control |
|---|---|---|
| 1<br>Ad hoc | Chaotic, success depends on heroic effort of individual. | Individual |
| 2<br>Managed | Requirements managed, measured and repeatable results on a project basis. | Project |
| 3<br>Defined | Standard processes, consistent across organization, measures of process and work products. | Organization |
| 4<br>Quantified process control, quantified objectives, special causes of variation corrected. | Value chain | Value chain |
| 5<br>Optimizing | Process improvement objectives continually revised to reflect changing business objectives: agile and innovative workforce. | Society |

**Table 1: Capability Maturity Model**



in developing economies rich in resources and with heavy environmental burdens, whereas further along the value chain processes with a lighter environmental impact may take place.

The footprint can be reduced by factoring in procurement/ material extraction and downstream activities (including consumer behavior) and bringing external stakeholders on board.

Reducing the footprint over the full life cycle is an important way of promoting sustainable production and consumption.

## Reducing the carbon footprint

A total product carbon footprint is a measure of the direct and indirect greenhouse gas (GHG) emissions associated with all activities in the product's life cycle. Products are both goods and services. Such a carbon footprint can be calculated by performing (according to international standards) a LCA that concentrates on GHG emissions that have an effect on climate change.

The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) have partnered to develop *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard*. The framework gives business and organizations an internationally accepted methodology to help quantify and report the GHG emissions associated with their operations. Businesses often have multiple objectives in developing such an inventory, but a primary objective is frequently to support the identification of GHG emission reduction opportunities. The accounting framework looks at both direct (Scope 1) and indirect emissions (Scopes 2 and 3), which are explained further below:

- **Scope 1** – Direct GHG emissions – these occur from sources that are owned or controlled by the company, for example emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc. or emissions from chemical production in owned or controlled process equipment.
- **Scope 2** – Electricity and heat indirect GHG emissions – this accounts for GHG emissions from the generation of purchased electricity

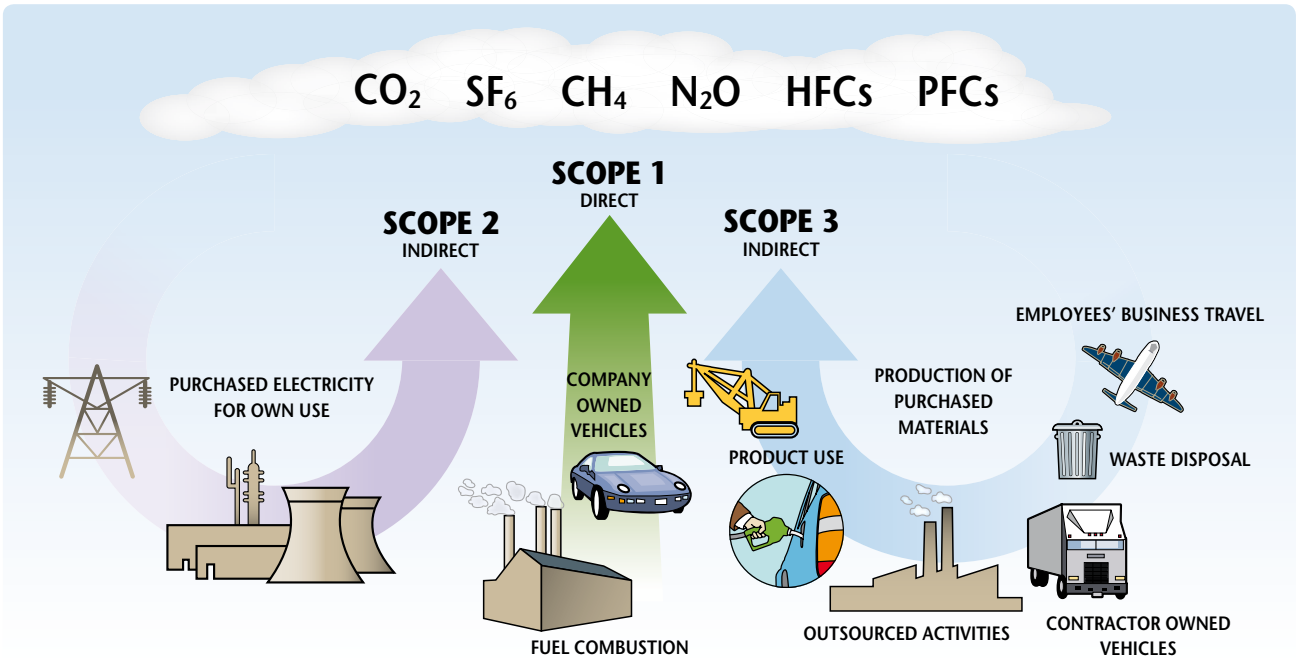



**Figure 3: Carbon footprint**

Source: Bhatia and Ranganathan, 2004.

and heat consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where the electricity is generated.

- **Scope 3** – Other indirect GHG emissions – this is a reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities are the extraction and production of purchased materials, the transportation of purchased fuels and the use of sold goods and services.

The current corporate GHG standard has defined detailed criteria for the accounting and reporting of Scope 1 and 2 GHG emissions. The WRI and the WBCSD are now developing new standards for product and corporate value chain GHG accounting and reporting. To develop the new guidelines, the GHG Protocol Initiative is following the same broad, multi-stakeholder process used to develop the previous standards, with participation from businesses, policy-makers, NGOs, academics and other experts and stakeholders from around the world. The new standards and guidance will cover both product life cycle and corporate level value chain accounting and reporting. Building upon existing methodologies, the standards and guidelines will provide a harmonized approach for companies and organizations to inventory GHG emissions along their value chains and better incorporate GHG impacts into business decision-making.

## Reducing the water footprint

Water use is an essential environmental indicator for all activities in the product life cycle. Based on the pure measure of water quantity used, the associated environmental impacts of both direct and indirect water use are of eminent importance to identify the life cycle based water footprint of corporations (see Köhler, 2008). The UNEP/SETAC Water Assessment Project Group has developed a framework for an integrated assessment of water use in corporations and product value chains (Bayart et al.,2009). Methodologies are being elaborated for both reporting indicators of water use and the impact assessment evaluating damages on freshwater resources, ecosystems and human health. These approaches distinguish total water use, water consumption (where the water is no longer available in the watershed) and water-quality degradation (where the water is still available but with diminished quality), and are aligned with current LCA methodologies according to ISO 14040:2006.

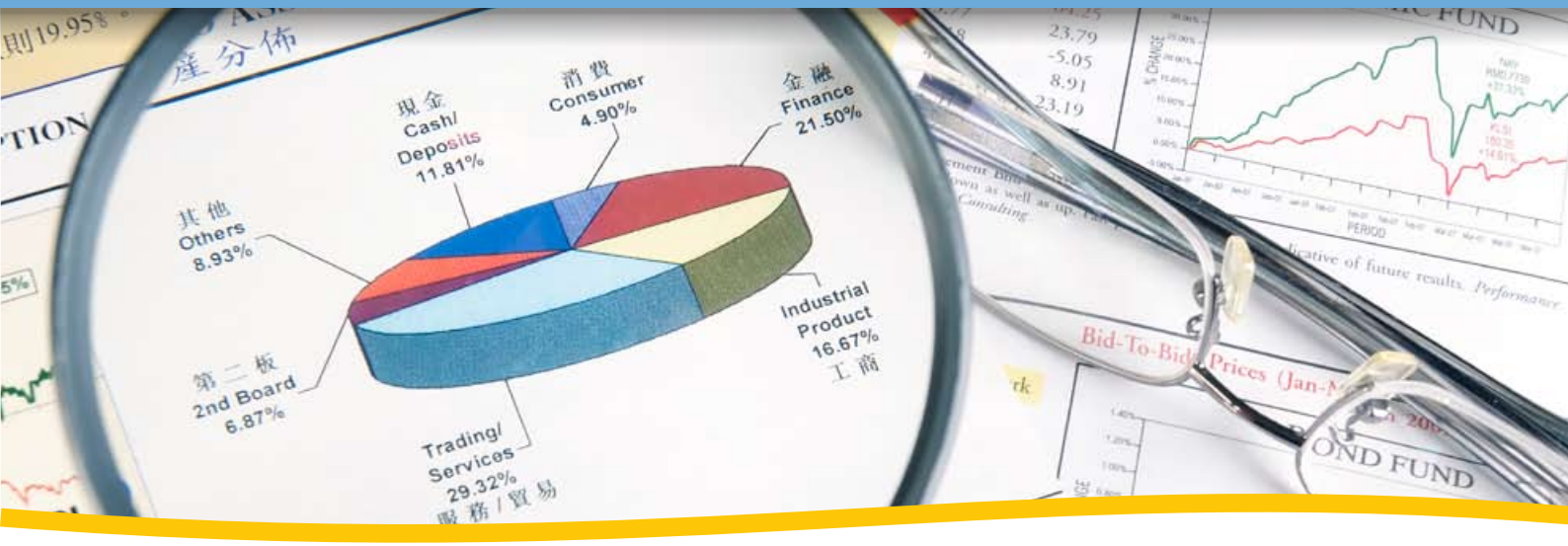
## What is resource efficiency?

Resource efficiency is a concept that has as the overarching aim of decoupling economic growth from resource use and environmental degradation. There are various aspects of resource efficiency: energy efficiency, water efficiency and material efficiency, in addition to land use and emissions intensity. Towards this end, enhancing resource efficiency reduces the environmental impacts of producing, processing and using goods and services, while also meeting human needs and improving wellbeing. LCA is a key method for improving resource efficiency.

Energy efficiency is closely related to the carbon footprint. A way to calculate the energy consumption of a product over its life cycle is through its "cumulated energy demand". By increasing energy efficiency and replacing fossil energy supplies with renewable energy, a product's carbon footprint can be reduced. In a similar way, improving water efficiency in industry and agriculture lowers the water footprint.

In times of supply shortage of fossil fuels and key materials on the world market and of competition on land, energy and material costs can be a significant factor in the overall cost of a product – examples are oil, steel and land for biofuels. Increasing resource efficiency will allow a decrease in direct material costs, and also in indirect costs such as those for energy, water, waste disposal and emission treatment. Of course, it will at the same time increase a business's competitiveness in the market.

# 3 Company case studies




While theory is one thing, it is vital for the viability of the very notion of sustainability in our world today that it is put into practice. In this section, we examine a number of case studies involving seven different organizations.

All of them are large companies and most of them operate on a global scale. Some of them operate in industries that, traditionally speaking, might have something of a negative reputation in an increasingly sustainability conscious world – industries that many members of the general public wouldn't normally associate with such long-term philosophies. They are thus ideally placed to show how to go about applying the theoretical ideas around LCM and the value chain in action.

3M

*"... that decency and sense of doing what's right manifests itself in its [3M's] ethics and business conduct and, to me, there is no better example of 3M's decency than the Pollution Prevention Pays program ..."*

George W. Buckley, Chairman of the Board, President and CEO, 3M

Founded over 100 years ago, 3M is a US-based multinational manufacturing group with over 55,000 products. It has companies in more than 60 countries, sales in almost 200 countries and employs over 76,000 people.

## What sustainability approaches does 3M use?

3M's commitment to sustainability pre-dates current thinking (Figure 4). Back in 1975, the group introduced the Pollution Prevention Pays (3P) program, which aims to prevent pollution at source in products and manufacturing process, rather than remove pollution already created. Established by Dr. Joseph Ling, it was a revolutionary concept at the time and it is still being used by 3M today as a corporate initiative to reduce or prevent any source of pollution or unnecessary energy consumption and to recycle. Over the years, the program has expanded, producing impressive, concrete results. The company has saved over US$1.2 billion since the program's inception.

An interesting aspect of the 3P program is that it is an entirely *voluntary* initiative. Innovative projects are recognized with 3P awards. A 3P coordinating committee representing 3M's engineering, manufacturing and laboratory organizations and the Environmental, Health And Safety Group administers the program.

In 2007, for example, 3M had a total of 438 3P projects running, reporting a total of 51 million kg of pollution prevented, as well as a reduction of 2.5 million tonnes of $CO_2$-equivalent greenhouse gases.

LCM is the company's second "arm" of sustainability. Since 2001, LCM has been part of corporate policy and is used by 3M as a process for:

- Identifying and managing the environmental, health, safety and regulatory risks and opportunities
- Efficiently using resources in 3M products throughout their life cycle.

Dr. Lienne Carla Pires, one of the LCM specialists in the group and LCM Coordinator of 3M Brazil, notes that "it [LCM] acts as an important support to our sustainability policies". It supplies 3M with a lot of information relating to environmental, health and safety (EHS) issues, which is used not only to highlight the risks in environmental, health and safety areas, but also to identify opportunities for projects under development in order to improve 3M goods in the market … and provide a "less impacting product at the end of the [sustainable value] chain", she says.

Another sustainability program, called Environmental Targets 2010 (ET 10), began in 2006. ET 10 contains a set of five-year environmental targets related to emissions and waste reduction, with targets for all the subsidiaries, adding up-to-date measurability to 3M environmental performance.

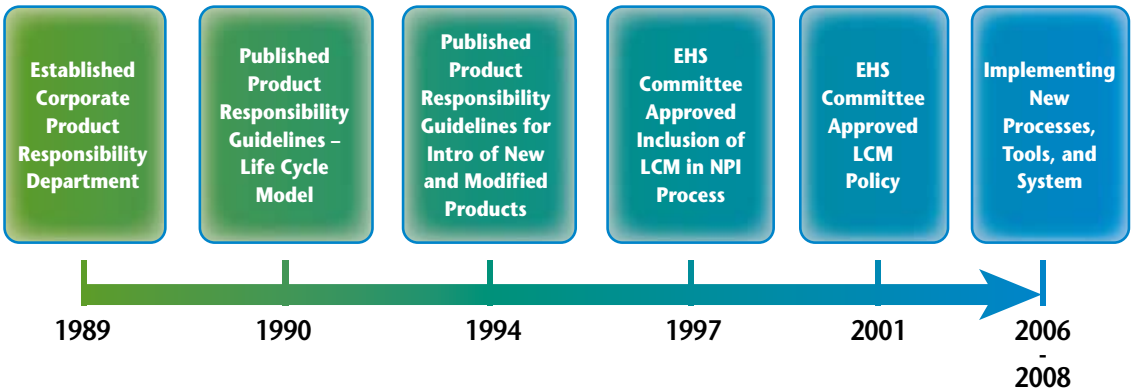



**Figure 4: Evolution of 3M's sustainable value chain policy**

## Who is on board?

LCM is a company policy that everyone in the company must comply with. Ms. Pires remarks that: "No policy like this will have results if everyone isn't on board. We had this problem in the beginning because people weren't involved and people didn't understand very well how the life cycle approach works." Among any programs, policies and internal standards, 3M's sustainability targets are strongly supplied by LCM/ET10/EHS metrics database information.

3M is now working on communication training around sustainability terms and exploring such benefits in 3M products/markets. Although it is something they are keenly aware of, 3M is a company that could not be accused of "greenwashing". Its support of sustainable policy has evolved over the last 30+ years in a measurable and exemplary manner.

Dr. Pires admits that one challenge has always been to convince other business people that LCM is worth it, that it brings benefits and rewards that are valuable financially to the company, something that is a challenge common to the whole group. "Little by little, other business people have begun to learn

about the process and then to ask themselves how they can avoid liabilities in the future."

In Brazil, the process has been a little bit slower. She notes that: "It's my personal view that this is related more to a cultural difference than anything else. We don't have so many regulations of environmental concern, but we are always talking to national agencies to try and get these kinds of regulations in line with international standards. … We're hoping that there will be a law limiting VOC [volatile organic compound] emissions by the end of this year."

## Working with suppliers and outsourcing

The area of supplier relationships can be a little difficult when it comes to implementing good LCM policy.  As a company, 3M is dealing with

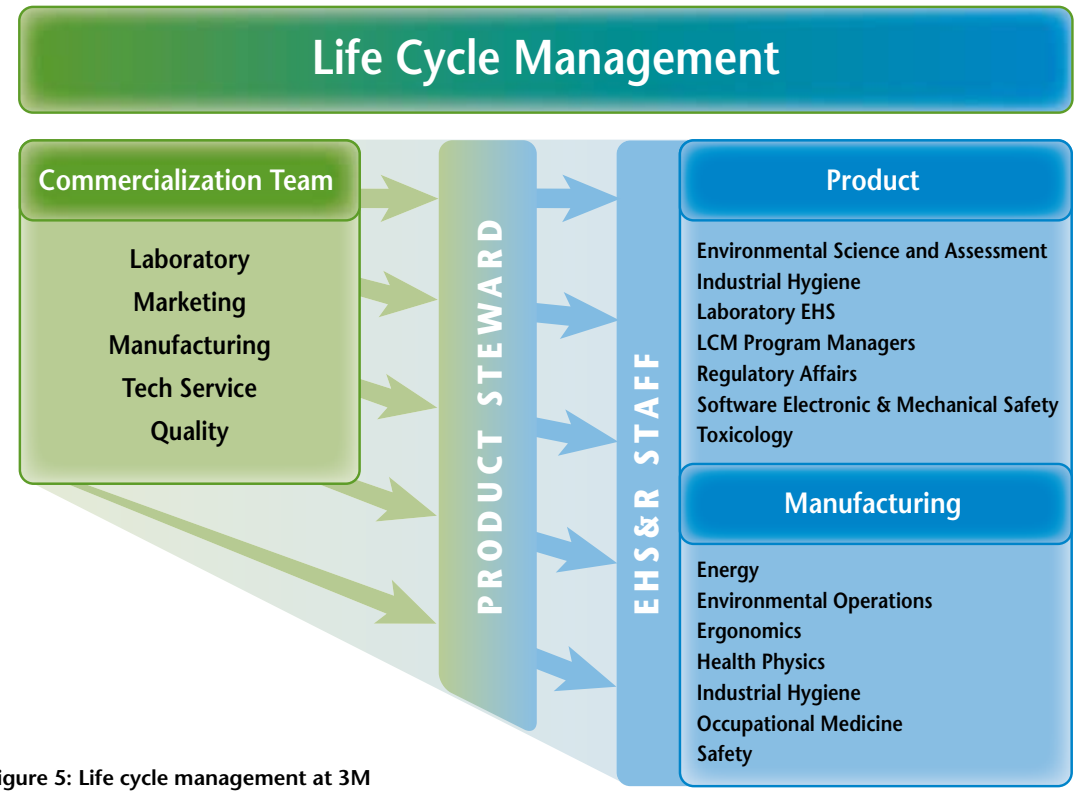



**Figure 5: Life cycle management at 3M**

other companies outside its control – companies who are, in turn, dealing with a host of other firms that may or not have sustainability at the heart of their business philosophy. On the other hand, it is also an area that presents the opportunity for the client company to extend its forward thinking to the supplier company; to "spread the gospel" of sustainability, as it were.

When 3M needs to establish a new supplier, it surveys the company through questions on environmental, health and safety standards and those related to labor conditions and issues like child labor. The company doesn't ask for certification, but it does weight the questions depending on the product in question.

## Alcan Packaging

*"There will always be some companies who can do something cheaper, but you can have a competitive edge if you can ensure an advanced environmental and social performance of your product."*

Gerald Rebitzer, Director of Product Sustainability

Alcan Packaging is a world leader in specialty packaging serving the food & beverage, medical, beauty, pharmaceutical and tobacco industries. With a presence in 131 sites in 31 countries, it employs approximately 30,000 people.

### Sustainability and the bottom line

Sustainability is equally vital to a company's bottom line from the point of view that it is something that can give companies an edge over their competitors in terms of the broader "quality" of what they produce in industries where it might not be profitable to compete on price alone. "It's also that the customers can trust us; that we are delivering improvements in sustainability, because there will always be some companies who can do something cheaper, but you can have a competitive edge if you can ensure an advanced environmental and social performance of your product," says Gerald Rebitzer, Global Director of Product Sustainability.

### Who is on board?

Dr. Rebitzer believes that, while it's a little ambitious to presume that all co-workers and executives in the company are already fully in tune with the sustainability ethos, all the key people (for instance in management, R&D, communications, EHS, and sales & marketing) are very well aware of it, support it and drive it. Indeed, in many companies sustainability is driven mainly from the EHS department, whereas in the Alcan Packaging case, Dr. Rebitzer feels that there is more leverage and a greater excitement level specifically among the R&D and sales & marketing community because they are getting involved in a creative and innovative process that is responding to the exigencies of the market.

"What is a key notion in all of this is that of continual improvement. It's not about creating one sustainable product, but about continually improving the complete product portfolio... Sometimes it's nice to have an innovative frontrunner, but if you improve overall by 5%, you probably achieve more than having just one outstanding product."

On the whole, the Alcan Packaging philosophy is that it is not a project, but an ongoing business process to bring sustainability into the realm of normal business procedures and to be ultimately looking to improve the entire product portfolio.

## What sustainable approaches does Alcan Packaging use?

Product stewardship is "Alcan-speak" for product sustainability, LCA, and other life cycle approaches. "It's the same thing; just using different words," says Dr. Rebitzer.

The sustainability or relative sustainability within the company is measured in a very quick and efficient way using a tool known as ASSET™ (Alcan Sustainability Stewardship Evaluation Tool, patent pending).

So is ASSET™ an asset that has a positive effect on the company's bottom line?

"Definitely, but I don't think that we can measure it at this point in time in terms of monetary benefits. I think that it's very similar to something like Quality Management, where you manage the quality of your product and here, it is quality in the sense of sustainability," says Dr. Rebitzer.

"Our strategy is to partner with our customers and work with them to find solutions that consider a broad range of social, environmental and economic factors when considering packaging and product impacts. Our main customers are important brand owners (be it in food, cosmetics, pharmaceuticals, healthcare or tobacco products) and they, in turn, are engaged with consumers and retailers to drive the sustainability agenda. So it's very much customer driven. They are looking to us to help them to improve the life cycle sustainability performance of the product with regard to packaging, which is a very tangible thing for the end consumer," says Dr. Rebitzer.

## Working with suppliers and outsourcing

### And what about the challenge with regard to suppliers?

"It's more difficult to manage than internal operations, but you can also manage this situation. For instance, we have a Social Responsibility Directive which applies to our company and also to our suppliers and this is also connected to audits, for instance, especially in 'at risk' areas," says Dr. Rebitzer.

Alcan Packaging buys raw materials for their packaging products, some of which may be sourced in countries where there is limited legislation guaranteeing acceptable social standards with regard to labor or environmental concerns. The company's own directives can thus cross borders to effectively enforce stronger sustainability issues in regions where there is a dearth of adequate legislation locally.

"If you're talking sustainability, there can be two approaches: one can be having a big department in charge of sustainability which makes studies related to sustainability in the company. This is not what we are doing. Basically, we have a network. For instance, product development is a key driver and I have a network of around 20 product development people for whom 20-50% of their job is to drive this LCM and this use of the ASSET™ tool in their area," concludes Dr. Rebitzer.

Alcan Packaging also has regional champions who drive the process: it is a network approach incorporating the standard functions where R&D as well as sales & marketing are probably the most relevant ones.

# The Dow Chemical Company

*"Sustainability requires making every decision with the future in mind. It is our relationship with the world around us – creating economic prosperity and social value while contributing to the preservation of our planet."*

Dow statement on sustainability

Based in the USA, The Dow Chemical Company is a global, diversified chemical company that has 46,000 employees worldwide and a turnover of US$58 billion.

## Sustainability and the bottom line

Dr. David Russell, Dow's Global Technical Leader for Sustainability and LCA, sees sustainability as a logical extension of the process of providing products and services such as those from Dow. Ultimately, sustainability must focus on the *consumer*, and center on how to satisfy requirements for products and services in the most *efficient and sustainable manner possible*. He also believes that the adoption of LCM within a company does have a positive effect on the bottom line as it assists in the thinking that will produce the successful products of tomorrow.

"As people are becoming more knowledgeable in this area, there's much more of a driving force coming back up the value chain, asking us for products that can help our customers and our customers' customers to do what they want," says Dr. Russell.

Quantifying the progress or success of a sustainability policy within any company can be a challenge, as implementation will vary, depending on each separate case. With Dow, there seems to be a clear awareness of the benefits of being ahead of the curve in delivering on this issue. This means that groups within the company want to know where they are situated in terms of various sustainability aspects and on which areas of sustainability they should focus. This is leading the development, for example, of new processes for basic chemicals and efforts to bring about the development of making standard plastics from agricultural raw materials like sugar cane.

## What sustainability approaches does Dow use?

The company has seven ten-year goals and Dow is currently on its second set, which is targeted at 2015. All are designed around different aspects of sustainability:

- Sustainable chemistry
- Breakthroughs to world challenges
- Energy efficiency and conservation
- Addressing climate change
- Contributing to community success
- Product safety leadership
- Local protection of human health and the environment.

Sustainable chemistry is Dow's "cradle-to-grave" concept. This includes:

- A lifecycle view of products, processes and product uses
- Using resources extremely efficiently to minimize Dow's footprint
- Improving the quality of the environment
- Providing positive value and return for all stakeholders
- Enhancing the quality of life of current and future generations
- Progress reports on all these aspects are posted on the company website.

## Who is on board?

Within Dow, Dr. Russell believes that "people are becoming much more knowledgeable and articulate about what sustainability is, and what it means to the company."

Sustainability is the context of the second set of goals. In the first set, the focus was much more inside the company, or, as Dr. Russell puts it, "more on environment, health and safety rather than today's broader sustainability goals". But even at that stage back in 1996 when Dow defined the first set of goals, the company began to consider the ideas of the triple bottom line and had incorporated sustainable development and eco-efficiency into business strategies as one goal. As a result, Dow has been communicating and talking about this for many years. Nowadays, Dr. Russell feels that "just about everyone in the company has at least a rough idea of what sustainability is and people in positions of leadership have a very clear idea of what it is."

On a day-to-day level, the company gets down to the business of applying LCM through implementing and monitoring initiatives that contribute to the ten-year targets, and communicating results through regular contact and meetings. "In all of those meetings – whether it's a global communication meeting with the CEO or it's your local manager – the company's four strategic themes, of which one is setting the standard for sustainability, provide a consistent context for Dow employees," he says.

"What we don't want to do is to have this as a program or poster on the wall that people hear about perhaps once a year. It has to be something that becomes the lifeblood of the company. So in order to have something ingrained like that, you have to make sure that it's not just there as a conceptual goal, but that it's something that is considered and discussed at most meetings – that it becomes part of the way we work," says Dr. Russell.

"There's a lot of repetition needed to get to that stage. I don't think we're there yet, but it is part of what we want to do, and we are well on the way," he concludes.

## Working with suppliers and outsourcing

Dow's corporate values are centered on integrity and respect for people. Carrying on the responsibility through supplier cooperation depends on how one does it. Dr. Russell believes that one normally outsources in order to access cheaper or more flexible or more expert resources. This could be looked at holistically and it could be concluded that that action in itself is providing employment where it is most needed. However, in the case of transferring jobs from one location to another, it needs to be looked at carefully so that the social implications of the action are understood.

# Eskom

*"Sustainability is critical to any business, if that business wants to be around in the future."*

Gina Downes, Chief Advisor, Environmental Economics

Established in 1923, South Africa-based Eskom is the largest electricity utility on the African continent. In fact, based on a net maximum capacity of 38,744 MW, it ranks among the top 13 utilities in the world.

## Sustainability and the bottom line

### How does sustainability affect the bottom line?

"Sustainability is critical to any business, if that business wants to be around in the future. Certainly, with power stations, you're building something that you want to be functional for 40, 50, even 60 years. So we have to ask ourselves questions like … Are we putting them in the right place for the next 60 years? Are they the right design for the next 60 years? The community that's going to live nearby – how is it going to affect them for the next 60 years? You can't see yourself as a stand-alone entity," says Gina Downes, Chief Advisor, Environmental Economics.

## Who is on board?

### Are employees at Eskom all on board with the sustainability ethos?

"Very much so," says Ms. Downes, "all very aware and in tune." She does note, however, that because Eskom is a vertically integrated company, at an operational level, people tend to focus on their immediate area of responsibility. As a result, there can be quite a

lot of work involved in looking at the holistic picture and providing advice in balancing all the requirements of the business.

The industry that Eskom is involved in and the manner in which 90% of its electricity is produced (i.e., through coal-burning stations) is one that is not immediately synonymous with sustainability. Nevertheless, the evolution of the company's LCM has been a progressive one that has been growing impressively over the last decade in size and effectiveness. It helps that this improving situation comes against a background of leading legislation in the South African Republic.

Ms. Downes notes that: "Ten years ago, much depended on self-regulation. Our government has done a lot to change that over the last decade, with new legislation in place or yet to be enacted; a lot of it to do with air quality, waste and environmental impact management Nowadays, when I sit on committees, I very rarely have to explain to people what sustainability or LCM is and why we should do it. Everybody is fully aware of it."

## What sustainability approaches does Eskom use?

Sustainability functions are part and parcel of Eskom's line divisions and research. Ms. Downes explains that she is involved mostly with factoring life cycle impact assessment information into Eskom's sustainability policies – usually for new investments, but also for major investments on existing assets. In this regard, Eskom generally looks at new power stations – what kind of technology is used and where they are sited, and how these decisions translate in the long term (looking at a timeframe as far out as 2050).

When it comes to dealing with specific power stations, Eskom also has a Generation Environmental Management Department to ensure that all future proposed projects are subjected to an environmental impact assessment. These are undertaken by independent consultants. From an assurance point of view, a more strategic view is taken in that Eskom integrates with the long-term

planning functions that optimize the electricity supply around forecasts of demand and supply over 25–30 year time horizons.

The normal day-to-day activity for the specialists in the Climate Change and Sustainability Department is in assessing the implications for the business of international, national and local regulatory and research initiatives. Often this means outlining a number of different options open to Eskom for consideration of the approach to take in balancing electricity demand and supply with sustainability aspirations.

Sustainability has different nuances, depending on the industry and on the local environmental circumstances. In the case of Eskom, the company is operating in a country where there is a relative scarcity of water. Eskom piloted dry-cooling technology on power stations, which uses less freshwater. The trade-off of such a necessary move is an efficiency loss on the station, which in turn leads to a relatively higher emissions problem. "These sort of tradeoffs are country and even region specific," says Ms. Downes, illustrating how it remains a challenge for any company to fully integrate life cycle thinking into decision-making. Referring to recent research conducted for Eskom by the universities of Sydney and Cape Town, Ms. Downes indicated that there has been significant progress in value theory that allows companies to evaluate these trade-offs explicitly and transparently.

# Ford of Europe

*"Ford is committed to continue making mobility more sustainable. The scale of the challenge means that it's not enough to introduce two or three new environmental products and leave it at that. Ford of Europe's PSI [product sustainability index] demonstrates how sustainability can be integrated into mainstream product development to the benefit of our customers and the environment. And it demonstrates how committed and serious we are in taking a leading role in the automotive industry in addressing these issues."*

John Fleming, President and CEO, Ford of Europe

Ford is one of the largest car manufacturers in the world. In Europe: it owns Volvo Cars Corporation and operates 22 manufacturing facilities including joint ventures and 2 development centers. The publication in August 2007 of its 38-page *Product Sustainability Index Report* was a first for the automotive industry (certified against ISO 14040 for LCA by external assessors). As well as detailing the Ford approach to sustainability, it is also a fact that the three of its cars designed with sustainability in mind have delivered improved environmental, social and economic sustainability performance compared to their predecessors and other models.

## Sustainability and the bottom line

With regard to the question of how sustainability affects the bottom line, Dr. Wulf-Peter Schmidt, Sustainability Manager with Ford of Europe, says that it is more of "a matter of long-term strategy" for the company. "It's not so much something which gives a short-term return on investment. It's more a question of making sure that new product by new product, it's going in the right direction; to keep track of the progress, to make sure that we don't go backwards, but to build on continuous improvement towards sustainability."

## Who is on board?

The whole approach comes from the top down, which, according to Dr. Schmidt, is "not adding too much bureaucracy and is tailored to existing processes rather than adding a parallel, new work stream."

At all levels throughout the company, sustainability targets are being measured against the reality on the ground – from senior management down to workers on the shop floor.

## What sustainability approaches does Ford use?

Ford uses a product sustainability index (PSI) tool. Dr. Schmidt says: "We have different tools for the different main functions of the company (product development, manufacturing, human resources, etc.) and this is the one that covers product development."

The PSI is a result of boiling down what is relevant in and can be influenced by product development. It is essentially LCM under another name but looking at environmental, economic and societal aspects. Dr. Schmidt was responsible for developing this tool over the last eight years or so to its present state, but he is not involved in it on a day-to-day basis any more. This is because the philosophy from the very beginning was not to have an additional central team that is steering sustainability from a distance, but to develop a tool that can be handed over to and owned by the existing main functions and departments, and it is these people (e.g., vehicle integration engineers for product development) who apply this sustainability management tool when they are developing a new vehicle, for example.


"Of course, we develop several new vehicles in parallel, so there is not one person in product development doing that, but rather it's included in the product development process: you set some targets, and compare them with the status, using gateway and milestone reports and so on. There are quality aspects that you target: there are cost aspects, safety aspects, environmental aspects, and so on. Then there is a section called product sustainability and that tries to combine the different targets that we have in different areas so that you have an overview which illustrates what it means from a sustainability perspective," he notes.

## Working with suppliers and outsourcing

On the issue of outsourcing, Ford does hold strong requirements for suppliers – "not only on the issue of environmental considerations, but also of social considerations". These requirements are included in the Terms and Conditions for all suppliers and are further communicated to suppliers through direct relationships with buyers and quality engineers and within the curriculum of required supplier training sessions. These communication efforts are especially focused on those regions of the world where government enforcement of laws – environmental or social – may be lacking. This task is the responsibility of the Head of Global Purchasing who ensures that Ford's suppliers comply with the sustainability requirements of the company. Requirements include certification to environmental standards and reporting protocols as well as third-party labor assessments and training for individual factories supporting Ford production. In this way, the ethos of sustainability and LCM is spread from the company to its suppliers in an integrated fashion that is key to success and supplier cooperation.

# United Technologies Corporation (UTC)

*"Along with profitability and operational excellence, corporate responsibility is an essential priority at UTC."*

George David, UTC Chairman and Louis Chênevert, President and CEO, UTC

United Technologies Corporation (UTC) is a US-based multinational organization whose activities include the manufacture and servicing of elevators, aerospace systems and aircraft, security systems, and air-conditioning and power generation equipment.

In 2007, the corporation employed 225,600 people and had a turnover of US$54.8 billion. With locations in 62 countries, UTC does business in some 180 countries.

While the company's goals and focus on sustainability come from corporate functional groups, it is the combined efforts of its business units that moves the company forward.

## What sustainability approaches does UTC use?

At the core of UTC's actions on product sustainability is the voluntary elimination of the use of selected materials of concern. These include lead, mercury, cadmium, hexavalent chromium and chlorinated solvents. UTC began voluntarily eliminating these materials in 2001, with a stated primary goal to do away with them in new products by the end of 2010.

"It's a corporate-driven program to reduce these materials; a requirement for the businesses to seek, wherever possible, to reduce these materials," says Wayne Wnuck, Environmental Engineer, Environment, Health and Safety. He points out that it was a process that started slowly initially but gathered pace as time went on. "It continues to be a part of our corporate goals and I expect that it will expand in the future in terms of including more substances."

Senior leadership at both the corporate and operating unit levels is held accountable for meeting UTC's sustainability goals; those set for 2010 are measured on an absolute basis. "Plans are developed and progress is reviewed quarterly," says Mr. Wnuck. "For example, our goal to reduce absolute GHG emissions from our operations by 3% annually from 2007 to 2010 is particularly aggressive, considering our experience since 1997 was about 2% annually."

"As of 2008, new buildings UTC owns or leases will be designed as a minimum to LEED [Leadership in Energy and Environmental Design] certified standards, with LEED Gold as a target. The company recently completed its 1.5 million square foot (140,000 square meter) Otis TEDA Elevator Centre. Located in China's Tianjin Economic-Technological Development Area, it is expected to reduce energy use by 25%."

"I think that in our case you can say that we have some concrete results, given the difficulties in measuring these things. We have reported our progress in eliminating materials of concern in our corporate responsibility reports for the last several years – it's something that can be quantified, even if it's not comprehensive."

## Who is on board?

The LCM philosophy comes from the top down in UTC: UTC's chairman was the one driving it from the outset. The intention was to be ahead of the curve by seeking to eliminate materials of concern before they were proscribed in certain jurisdictions (such as the European Union) and by extending that to other jurisdictions where those restrictions weren't in place.

Mr. Wnuck does note that: "It may seem surprising to include chlorinated solvents with the heavy metals. Historically they were used in aerospace for cleaning and other applications. We had a very measurable direct impact associated with their use."

## Sustainability and the bottom line

As to the question of whether or not the progression towards a full-fledged LCM philosophy affects the bottom line of UTC, Mr. Wnuck is somewhat philosophical: "That's a difficult thing to measure. We like to think so, but, quite honestly, it's really hard to say with any certainty. I think that applying such a philosophy to a company will inevitably positively affect the bottom line.

"Nowadays, a lot of companies are talking about eliminating toxic materials from their products, but a few years ago, not many of them were."

# Veolia Environnement

*"The expansion of our business demands the continued expression of the values that underpin our shared ambitions and guarantee our future success."*

Henri Proglio, Chairman and CEO, Veolia Environnement

Based in France, Veolia Environnement is a multinational group with over 1,400 companies operating in 68 countries and an annual turnover of €32.6 billion. It has over 300,000 employees. The company is active in water treatment, waste management, energy and transport.

The Environmental Risks and Impacts team deals with evaluating environmental impacts – "using the various tools and methodologies that are available, looking at their advantages and drawbacks, making sure that they're operational either for our operations people, or for decision making in our company, or in a call for tenders," says Emmanuelle Aoustin, R&D Program Manager on the team.

## What sustainability approaches does VEOLIA Environnement use?

The Environmental Risks and Impacts team has a number of activities that try to disseminate not only the tools but also the concept of LCM – in meetings, presentations, brainstorming sessions and so on. The team is in charge of disseminating knowledge and fostering initiatives and it pursues ongoing efforts to do so and to favor individual creativity. "While we don't always use the phrases LCM or LCA, the idea is always to make sure that the company is socially and environmentally responsible with activities inside and outside the company boundaries. It's quite complicated to disseminate the LCM concept, but the ideas behind what we call LCM is to make sure that, when we take a decision in the company or when we go for one technology versus another, or one treatment option versus another treatment option, the solutions we are choosing have the lowest environmental impact – within the boundaries of Veolia Environnement, but also for society as a whole," notes Ms. Aoustin.

The most complete and robust type of sustainability tool Veolia Environnement uses is LCA, but Ms. Aoustin's team often makes use of a combination of different approaches. These include cost benefit analysis and environmental risk assessment, as well as the use of bio-indicators and other biodiversity approaches. While its water footprint evaluation is still at a development stage, Veolia Environnement has engaged in an extensive company and world-wide evaluation of the carbon footprints of its services.

As an example of putting such notions into practice on a day-to-day basis, Emmanuelle Aoustin mentions the challenge of emissions reductions. While there is a goal to reduce emissions from operating plants, the use of chemicals and energy is required to achieve this. The production of the chemicals and the energy will also have a negative impact on the environment, so it is important for Veolia Environnement to measure all aspects of the situation – balancing one against the other so as to achieve the optimum sustainable solution.

## Who is on board?

With the majority of its revenue coming from its water and waste management sectors, the very notion of sustainability has always been at the heart of Veolia Environnement's corporate thinking: "It is my personal opinion that a large number of staff are fostering LCM approaches without knowing it. Dissemination and interactions have allowed different departments (e.g., technical, innovation, purchasing, marketing, communication, strategic planning) within Veolia Environnement to strengthen and broaden their LCM initiatives."

"By definition, Veolia Environnement is very much preoccupied with its environmental impact: all our contracts, discussions with stakeholders and others are based on sustainability criteria. Because we offer core environmental services, then we are at the core of sustainability for our clients, municipalities or industries," says Ms. Aostin.

Veolia Environnement is a services supplier to municipalities and industries. Hence the company's LCM approaches are for the benefit of its customers: not only are they linked by contract, but also towards sustainability. Moreover, the company's growing presence in China and Latin America makes it all the more important for the company to play a social and environmental role in these areas, which are themselves evolving quickly.

# 4 Applying life cycle management to create value

The cases presented in the previous section described several different approaches that have been used by companies to implement LCM in their operations. Among these concepts and tools are (eco-)design approaches, green procurement, LCA, LCC, eco- and energy labeling, environmental product declarations, ecological and carbon footprint analyses, environmental performance indicators, and social sustainability assessments and approaches – in addition to organizational and capability development approaches that are essential for actual implementation.

The link between using LCM and the bottom line is more obvious for companies that have already advanced along their sustainability journey. As the case studies in the previous section show, companies often began using LCM and related tools with the objective of preventing pollution and decreasing materials of concern (3M, Dow and UTC). Frequently, this was also part of a risk analysis with the aim of maintaining the right to operate following pressure from non-governmental organizations, civil society and increasing demands from new legislative initiatives.

Other reasons for using LCM include saving money and increasing efficiency. Other key eco-efficiency program targets since the 1990s have been reducing energy, reducing the use of materials and saving water. In addition, the cost-effective mitigation of environmental impacts remains a key objective (3M, Eskom and Veolia Environnement).

Companies are also using LCM to support key choices in technology (Veolia Environnement) or key decisions in investment (Eskom) and product development (Ford and Alcan Packaging).

Companies have various positions on the direct impact of sustainability and the use of LCM on their bottom line: some consider that it brings a more long-term return on investment while others note that they are already seeing a short-term gain.

For organizations dealing with final customers and/or consumers, sustainability is seen as offering a competitive advantage (Alcan Packaging, Dow and Veolia Environnement). Sustainability and LCM awareness is increasing among customers and the issue is now becoming part of any discussion among partners in the value chain.

Partnering with customers and suppliers to achieve the minimum impact within the complete value chain creates value and benefits society at large. The concept of materials stewardship developed by leading companies in the mining industry embodies a range of activities throughout the value chain and in partnership with all stakeholders, required to ensure the optimal and appropriate use of minerals, metals and the products they go into.

Thus, using LCM as part of sustainability approach within the entire value chain has evident positive consequences on the bottom line of companies.

# 5 The way forward

Companies don't need to take on this challenge alone: more and more, businesses are working together globally. Cooperation means that important systemic approaches are being generated. These can reinforce gains achieved through process and technical solutions within production and distribution cycles. Adopting an approach to make value chains more sustainable will allow businesses to meet these twenty-first century challenges.

Sustainable business practices are not just good for the world: they are good for business. Business leaders have a central part to play in ensuring sustainable development. Decision-makers must answer the question of how to ensure sustainable business practices into the future so that resources are not depleted or permanently damaged and that social and economic value is created. This issue brief has shown how businesses can use LCM to navigate their products through the value chain, leaving behind the lightest possible footprint in an ongoing developmental process.

As this issue brief has underlined, sustainable development is not only about ethical behavior and social responsibility – it is also about developing a core business operation that will thrive in the emerging global economic environment. The leading global companies in the future will be those that use strategies and methods that help address the world's major challenges – poverty, climate change, resource depletion, water scarcity, globalization and demographic shifts, to name a few.

## UNEP, SETAC, industry partners and their common vision

These organizations believe that key principles and criteria for sustainable products and life styles from a life cycle perspective are needed to support consumers' decisions towards the selection of more sustainable goods and services.

Principles and criteria should encompass information on those product aspects for which the sustainability relevance relies, in particular, on the "use" or the "end of life" phases. Environmental impacts from cars and televisions are more relevant in the use phase (rather than in the production and recycling phases), which is not the case for all electronic products – for instance, in the case of printers, the paper used is most relevant and for tools like drilling machines it is the manufacturing phase, as these tools are used only a few minutes per year. Therefore, from a sustainability point of

view, double-sided printing and leasing of tools are promising technical solutions and business models.

Another key area for cooperation is the integration of sustainability aspects into research and development and subsequent engineering and maintenance processes. This encompasses the managing of descriptions and properties of a product through its development and useful life, mainly from a business/engineering point of view. It has emerged as a means of improving the product development processes across the value chain to deliver enhanced business value. It will also allow companies to count on function-oriented business models that aim to provide both sustainable consumption and production through the generation of a marketable set of products and services. This is achieved as a result of an innovation strategy that shifts the business focus from designing and selling physical products to selling a system of products and services that are jointly capable of fulfilling specific client demands.

Principles and criteria for products and strategies addressing life cycle issues are emerging as a viable contribution to be offered to business and consumers through the continued joint cooperation between UNEP, SETAC and industry partners.

# A way forward for companies

## Look for your success story

Examine the examples in this issue brief to identify those that are most meaningful for your organization, culture, markets and value chain. Explore internally for additional examples of efforts to make the value chain more sustainable. Brainstorm with your colleagues on ideas that could be replicated in your company and identify potential benefits you may see and challenges you may face from selected examples. Discuss the cases with top management and move ahead with the selected one(s).

## Build awareness

Begin to build awareness internally. Integrating sustainability-oriented LCM within a company facilitates constructive stakeholder dialogue to align company strategic planning with customer and public expectations. It also provides assurance that internal company programs promote value chain sustainability. LCM must be integrated into routine business processes, assuring that any sustainability initiative is fully aligned with the business strategy. What is important are organizational capabilities, providing a road map for the effective implementation of programs that gradually build capacity for action and broaden the boundaries of concern – from local facilities to the value chain and eventually to civil society. LCM must be aligned with proven process improvement methods.

## Spread the word

Communicate broadly. One key challenge for companies is to reduce their total footprint over the life cycle of a product by reducing individual footprints at the level of *suppliers*, *customers*; and, perhaps moist pointedly of all, *consumers*. (This applies equally to other aspects of sustainability performance, such as social performance.)

Great potential for improvement exists with consumers: the world markets are, after all, essentially consumer driven. In the past, company efforts and policies to reduce their footprint have focused on production processes and have yielded some significant results. Today, however, it is increasingly recognized that footprints can also be reduced by looking at procurement/material extraction as well as downstream activities, including consumer behavior and interrelations between product components (e.g., product and packaging).

This may require working with a company's suppliers and providing them with knowledge and training on how to measure and reduce their own footprints. In the same way, a footprint can be reduced by examining the use phase of products and addressing carbon-intensive lifestyles. This can be done by engaging with retailers (innovation and choice editing) and consumers (choice influencing). For instance, consumers can be provided with information on how to use products in an efficient way. Everyone has a role, one step, one action and one conversation at a time.

In your plan, consider the key people along the value chain who can help make a difference and plan their involvement and tasks carefully. Monitor progress and acknowledge the team at every step. Develop a "life cycle meter" that shows how the company is moving to the next level. Any improvement is already a success. Be part of it.

# 6 The partnership

The United Nations Environment Programme (UNEP), the Society of Environmental Toxicology and Chemistry (SETAC) and industry partners promote sustainable development thinking and practice in production and in general business strategies.

Sustainable development objectives and a company's bottom line come together in the important discussion of life cycle issues.

With the publication of the ISO 14040 standard series dealing with LCA, UNEP and SETAC, aware of the need for dissemination and implementation, jointly began to work on the articulation of existing efforts around life cycle thinking and established the UNEP/SETAC Life Cycle Initiative in 2002.

The UNEP/SETAC Life Cycle Initiative aims to promote life cycle thinking globally and facilitate the knowledge exchange of over 1,000 experts worldwide and four regional networks from different continents.

The Initiative's first phase established three important fields of work (LCM, life cycle inventory and life cycle impact assessment) and a cross-cutting area (social impacts along the life cycle).

The Phase 2 strategy, through 2012, will demand close collaboration with key actors in the field of product policy, management and development to support them in using sustainability-driven life cycle approaches with a strong focus on applicability and based on lessons learned from leading organizations.

The partnership between UNEP, SETAC and industry partners has the overall objective of promoting, assisting and supporting the use of life cycle thinking and life cycle approaches, including LCM, by companies and by their suppliers, customers and value-chain partners and by sponsors and partners of the UNEP/SETAC Initiative with the purpose of furthering sustainable innovation and global trade of more sustainable products.

## United Nations Environment Programme

The United Nations Environment Programme (UNEP) Division of Technology, Industry and Economics (DTIE) helps governments, local authorities and decision-makers in business and industry to develop and implement policies and practices focusing on sustainable development.

## Society of Environmental Toxicology and Chemistry

The Society of Environmental Toxicology and Chemistry (SETAC) is a global professional, non-profit organization comprised of more than 5,000 individuals from more than 80 countries in the fields of environmental chemistry and toxicology, biology, ecology, atmospheric sciences, health sciences, earth sciences and environmental engineering.

# 7 Training tools and publications

## UNEP and SETAC training tools & publications

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# Other training tools and publications


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*Ecosystems Training Pack* (2009) (at http://www.wbcsd.org/web/connectingthedots.htm).

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This issue brief shows how companies can incorporate life cycle management strategies and tools into their business practices and operations. Life cycle management tools can be used to ensure sustainability in business and to increase revenues, strengthen corporate credibility and ultimately enhance shareholder value. Here, we discuss how leading companies use these tools successfully and provide a "toolbox" of resources for companies wishing to find out more about implementing life cycle management throughout their operations.

One thing is clear: sustainable development isn't just about ethical behavior and social responsibility. It is also about developing a core business operation that will thrive in any global economic environment.

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