



Life Cycle Management



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KEY ASPECTS OF LIFE CYCLE MANAGEMENT

- Development of product-oriented management systems to proactively improve sustainability of products and product portfolios
- Pragmatic application of Life Cycle Assessment (LCA) techniques to model and understand environmental performance of product systems
- Recognition that companies have a responsibility to facilitate sustainable consumption among end-users, as well as deliver more sustainable production systems

1. Introduction

Companies worldwide are facing increased pressure from key stakeholders around a number of environmental issues. These include climate change and carbon management, water scarcity, and the rising cost of raw materials, energy and transport.

During the 1980s and 90s policymakers, researchers and innovative companies working towards sustainability typically focused on supply-side measures such as cleaner production and eco-efficient design. In recent years attention has increasingly shifted towards the question of how to stimulate new models of sustainable consumption as well as production.¹

In response there is growing evidence that sustainability is emerging as a substantial business opportunity area, and some of the world's leading companies are seeking competitive advantage through adopting external, proactive and product-focused environmental programmes. Some examples are given in Green to Gold published by Yale University Press.²

For these companies, environmental management and wider corporate responsibility issues are integrated at the visionary, strategic and operational levels of

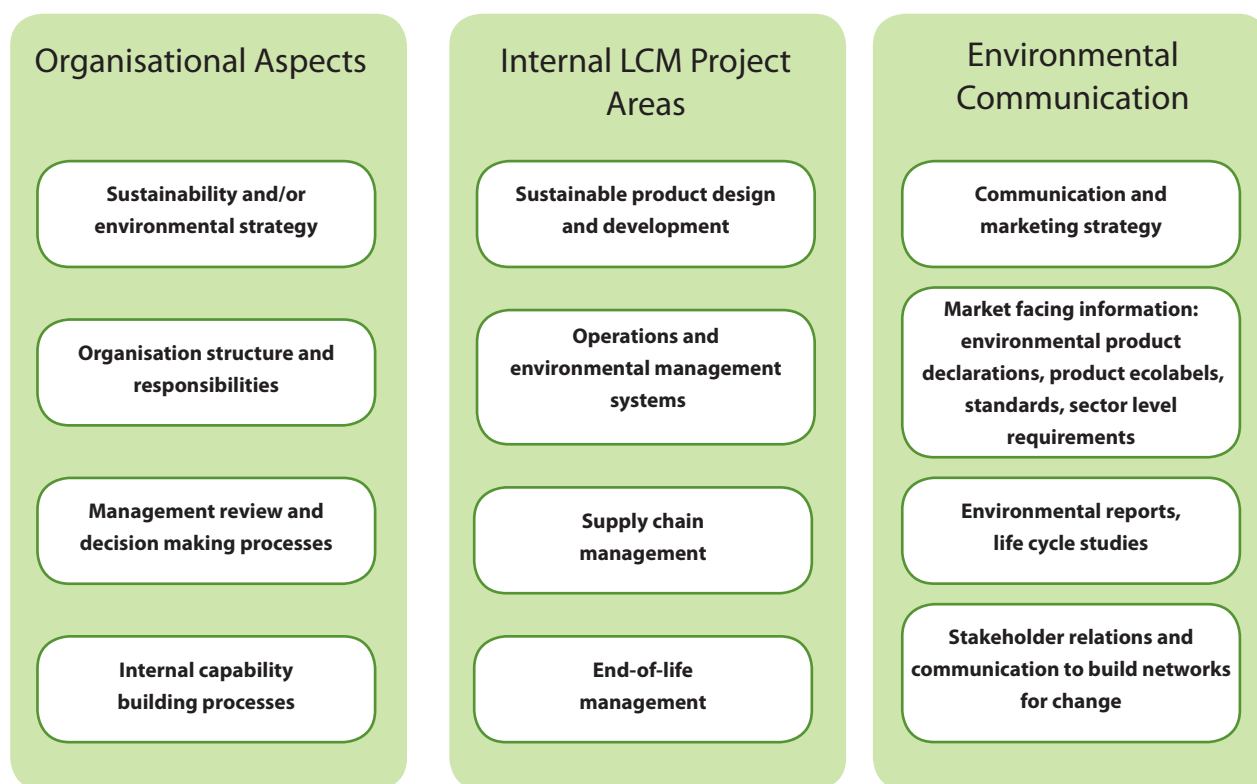
corporate decision-making. The market drivers may originate from business-to-business markets and government purchasing programmes, as well as from sectors of the public who are increasingly informed and have various motivations to purchase 'sustainable' products.

This shift in focus can be recognised through the development of product-oriented environmental management systems. These management systems use life cycle thinking as their basic conceptual approach to consider environmental impacts along product life cycles.

2. What is Life Cycle Management?

Life Cycle Management (LCM) is the systematic application of life cycle thinking in business practice with the aim of providing more sustainable goods and services. It involves the development and implementation of a product-oriented management system; this seeks to improve the sustainability of an organisation's product portfolio(s) across the entire life cycle and value chain.³

Figure 1. Elements of Corporate Life Cycle Management.



Organisations adopting an LCM approach will embed the principle of continuous environmental improvement within their management practices. Furthermore, they will support their visionary, strategic and operational decision-making with information and data that describe the complete life cycle and value chain of their products.

LCM is not a single tool or method but a product management system. It provides a framework for organisations to structure activities, and product-related environmental information to improve product sustainability. It requires an organisation to expand the scope of its environmental management activities from specific operations and/or sites, to encompass the complete product life cycle from cradle to grave (and beyond); this is commonly termed life cycle thinking. The same type of thinking is described in the book *Cradle to Cradle* by William McDonough and Michael Braungart.⁴

An organisation implementing an LCM programme commonly considers organisational aspects, internal LCM project areas, and communication of the company's environmental profile, as illustrated in Figure 1.

Organisational aspects

Successful implementation will depend upon solid integration within the organisation. A clear and compelling vision and well-defined strategy are important foundations. However, embedding responsibility, accountability and defined processes to deliver a strategy are critical to successful implementation. In particular, because LCM is by nature a cross-disciplinary business area, implementation requires several business functions to embrace the concept and take responsibility to drive forward LCM strategy and practice. Business management must signal a clear mandate that sustainability is an organisational priority; otherwise action owners may perceive LCM tasks as low priority.

Certain aspects of life cycle thinking may require additional expertise and/or specific skills to be developed. For example, the use of life-cycle-thinking tools, specific technical environmental issues, and development of environmental management systems are aspects of LCM that may require an organisation to gain new knowledge and competence.

BOX 1: BUSINESS BENEFITS OF ADOPTING AN LCM APPROACH

- Product and service innovation
- Insight and foresight to proactively engage with emerging market trends and adapt to the sustainability paradigm
- Product and brand differentiation
- Increased competitive advantage and improved access to markets
- Improved reputation and customer relationships beyond the point of sale
- Improved efficiencies, and reduction in regulatory costs
- Liability and risk reduction
- Social responsibility including staff engagement and retention through alignment of company values with personal values

Internal project areas

LCM provides an overarching framework for coordinating responsibility and staff engagement within relevant business functions, and encompasses all stages of a product's life cycle. Internal projects will typically focus on addressing key priorities at selected life-cycle stages.

Sustainable product design and development

requires both analysis of the issues and creativity to find the best solutions. For research and development of new and/or improved products, embedding life cycle thinking and the use of life cycle tools are priorities for implementing LCM.

Another key aspect is innovation in **supply chain management**. Ensuring key suppliers are improving the environmental performance of their own products and processes can lead to a cascade of sustainability insights, learnings and opportunities to create value. Maximising collaboration along the supply chain is critical to both managing risk and delivering improved transparency and sustainable product performance.⁵

With respect to **operations and environmental management systems**, in-house environmental issues may be diverse and include energy efficiency, carbon management, manufacturing efficiency and waste reduction, process emissions, product packaging and efficient logistics, as well as communications and marketing aspects. Environmental management systems such as the Landcare Research Enviro-Mark® NZ scheme⁶ are recognised methods to systematically manage these issues, in line with the globally recognised standard for environmental management, ISO14001.

Product stewardship (or product **end-of-life management**) is an increasingly visible area of organisational responsibility, which may offer first-mover advantages and opportunities to strengthen customer relationships. An effective end-of-life strategy

often provides key input for product design, operations and business strategy as well as a route to strengthen communication with markets and other life cycle stakeholders.

Communication of company profile

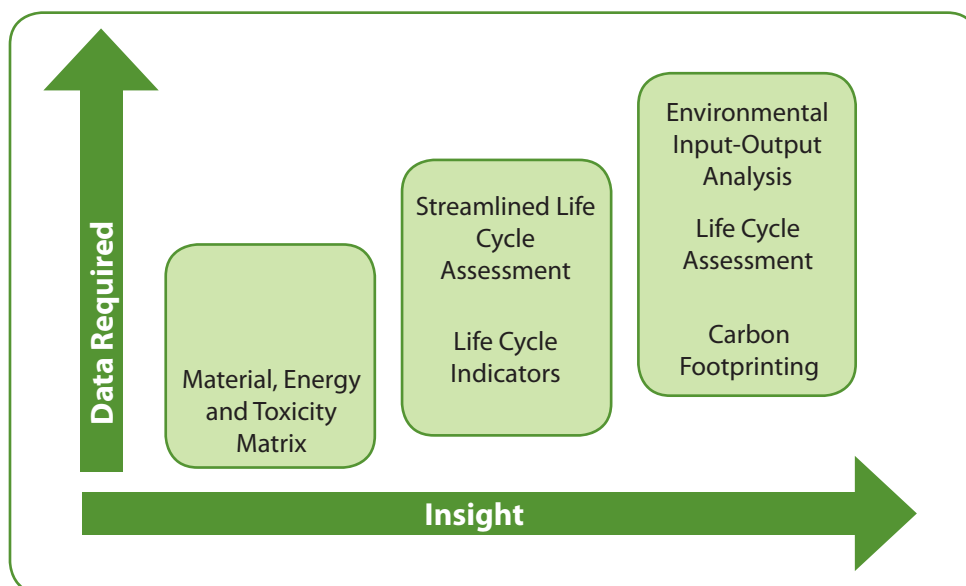
Consumers and business-to-business markets increasingly expect transparency and accountability regarding the sustainability performance of products. In particular, New Zealand food and beverage exporters need to be critically aware of consumer concern around our nation's distance to export markets. Offshore market perceptions of 'food miles' and the authenticity of sustainability claims are issues that require proactive use of life cycle tools and adoption of LCM approaches by exporters.⁷

Communication and management of brand reputation regarding sustainability are a growing business requirement in many industrial sectors. LCM enables organisations to communicate with integrity, firstly by demonstrating a detailed understanding of their product's life cycle environmental performance, and secondly by building proactive improvement programmes based upon life cycle thinking and an understanding of an organisation's strategic product-related environmental issues and opportunities. In short, LCM supports businesses in communicating with integrity and validating market claims appropriately.

3. Benefits and Drivers for LCM

The more generic benefits of LCM are summarised in Box 1. It can be seen that a company may use LCM to differentiate itself in the marketplace, achieve competitive advantage, and reduce its liabilities.

One of the main drivers for realising these benefits is ecolabelling. Manufacturers that develop products with improved life cycle performance will be better

Figure 2. Examples of Life Cycle Tools.¹³

positioned to meet the market requirements embodied in product ecolabels, Environmental Product Declarations (EPDs), and – increasingly – other business-to-business contractual arrangements. For an introduction to the types of ecolabels relevant to specific markets, see the UK Government’s document on ecolabelling⁸ and the NZ Government’s ecolabelling directory.⁹

Also, product environmental legislation is increasingly moving towards a consideration of product-life-cycle issues, rather than specific policy instruments focusing on individual issues or life cycle stages. The EU Directive on the Eco-design of Energy-using Products (EuP Directive)¹⁰ is an example of this more recent life-cycle policy approach. The EuP directive requires producers or importers of specific product types within the EU to perform an ‘assessment of product life cycle performance’, and to publish a product ‘ecological profile’. The European Commission recently communicated a proposal to extend the scope of this directive to a wider range of products with ‘significant environmental impacts’.¹¹ This communication included proposed measures such as *minimum requirements* and *advanced benchmarks*. Offshore policy changes such as these ones may be relevant to New Zealand exporters.

It is worth noting that product-oriented environmental policy is most developed in the European Union. Producers in Europe are increasingly held responsible for their products’ environmental performance at all stages of the product life cycle due to Extended Producer

Responsibility (EPR) directives in several product sectors and Integrated Product Policy (IPP) initiatives.¹²

4. Support Tools for LCM

Life cycle thinking is a conceptual approach that considers the ‘cradle to grave’ impacts of products, i.e. impacts occurring during the extraction of raw materials, processing, manufacture, distribution, use and end-of-life stages. It is the key principle underlying Life Cycle Management, and expands the focus of attention from specific processes or life cycle stages to include the impacts of a product over its entire life cycle. A range of life cycle tools exist for guiding life cycle thinking. These range from quantitative analytical assessment methods to targeted use of creative tools such as brainstorming and scenario modelling for sustainable ideation. Figure 2 shows a number of analytical tools positioned in relation to increasing data complexity and insight delivered. Generally the more data are included within a model, the greater the insight gained.

Appropriate use of these tools will support an organisation in prioritising work and focusing on the relevant stages of their product life cycle(s). It is important to note that undertaking a comprehensive Life Cycle Assessment (LCA) is not necessarily a prerequisite for implementing LCM: LCM is a dynamic process and can start with a small goal, using limited resources available, and get more ambitious over time.

5. Steps to Implementing an LCM Programme

For a business to implement LCM, an essential prerequisite is a positive **attitude and desire** to reduce environmental impacts, to engage with the complex sustainability agenda, and ultimately to expand the scope of traditional management responsibility along the product life cycle. Some businesses have a clearly defined sustainability vision for their organisation that provides a mandate for life cycling thinking; for others, a process of organisational 'soul searching' may be required before adopting an LCM approach. Some of the more challenging aspects associated with this shift in thinking are: accepting the need for greater disclosure and transparency regarding environmental issues, recognising the need to communicate and work with a wider range of stakeholders, and taking more responsibility for the upstream and downstream impacts of the business's products.

There are three (overlapping) stages to adopting an LCM programme:

- Review and develop an understanding about the life cycle issues associated with the organisation's products and product portfolios
- Define an LCM strategy and prioritise actions
- Implement LCM projects within an organisation.

The first stage involves developing a better **understanding of the life cycle issues associated with the organisation's product**, and reviewing marketplace requirements. This is commonly achieved by conducting a quantitative life cycle study of the product or service. Key aims of a life cycle study may be to:

- Identify environmental hotspots in an existing or proposed product
- Compare the environmental impacts associated with two or more products
- Identify opportunities for innovation and greater efficiency
- Inform the direction of an LCM strategy and key environmental improvement goals
- Educate the organisation in life cycle thinking.

A streamlined LCA may be sufficient initially, but conducting a more comprehensive LCA study may be appropriate if existing data are poor, or greater insight is required. Alternatively a focused literature review may identify previous studies and give some indication of the key environmental impacts and relevant issues.

A life cycle study typically focuses on the quantifiable environmental impacts, but a review of market-related

environmental issues is equally important to define an appropriate LCM strategy from a commercial perspective. This may include consideration of existing and developing issues such as environmental product requirements (mandatory or voluntary), market and customer needs and perceptions, competitor activity, new materials and technology trends, and any other factors affecting the market.

Following the environmental review from both a scientific and market perspective, the second step is to **define an LCM strategy and prioritise actions** the company should take forward. Defining a clear environmental or wider sustainability vision is likely to be part of this process. The LCM strategy will typically address stakeholder and market issues, while also aiming to reduce the overall life-cycle environmental impacts. Actions may initially be prioritised by focusing on environmental 'hotspots' (areas of the product life cycle that account for significant environment impact) and areas of 'low hanging fruit' where rapid progress is possible.

It should be noted that environmental issues are often categorised as relevant based on a mix of both subjective perceptions and scientific understanding. These two sets of justifications may not always align, and a company strategy and actions may have to respond to both interpretations of 'green'. For example, a company may prioritise improvement of the environmental performance of product packaging due to customer or staff perceptions, while also being aware that the improved packaging contributes relatively little to reducing the overall life-cycle environmental impacts of the product.

The third stage is **implementing LCM projects within an organisation**. This revolves around two tasks:

- Embedding an environmental improvement mindset and associated action plan into an organisation's deliverables
- Empowering individuals to take ownership of issues or new projects within their already busy work lives.

Regarding the first task, turning an executive-level strategy PowerPoint slide presentation into a culture of continuous environmental improvement is not easy! However, it is fundamentally important to explicitly recognise and define where environmental issues fit among other competing business targets and priorities. This is a key aspect in motivating individual action and organisational accountability.

The issues to be resolved often require cross-disciplinary action, with responsibility and activity driven by

Figure 3. Formway LIFE Chair: disassembled and assembled.



teams comprised of representatives from several business functions. In some cases LCM may justify new resources to facilitate the process. However, even with new resources, the key implementation method remains cross-disciplinary integration. In other words, management personnel must be willing to accept responsibility for the environmental issues identified as relevant to their organisational area, and actively encourage their staff to deliver according to an organisation-wide prioritised plan.

It will be obvious that implementing an LCM programme that 'makes a difference' is no small task, and takes a number of years to become embedded in an organisation's vision, strategy and operations. The next section discusses an example of this process in action at a company called Formway Furniture.

6. Formway: A New Zealand Life Cycle Management Case Study

Formway is a medium-sized New Zealand business that has developed an LCM approach within its business. Formway designs and manufactures commercial

office furniture for sale in Australasia and has built significant commercial partnerships internationally through licensing and royalties on intellectual property. Formway's products include the LIFE chair and the innovative HUM workstation system.

During development of the LIFE chair in 1998, Formway identified that sustainability and, in particular, environmental issues were emerging as a potential point of differentiation in the global marketplace. A strategic decision was made to design the LIFE chair with a central aim to 'lead the target market with best product environmental performance'. When the LIFE chair was launched to the market in 2002, the marketing included statements describing the product's environmental performance over the whole life cycle, the overall product environmental concept and benefits to the user, and the raw materials and manufacturing processes.

Since the launch of the LIFE chair, the number of environmental product standards and certifications applicable to furniture products has increased and there were more than 20 around the world by 2008.¹⁴ Although several competitor 'eco-designed' office seating products are now available, the LIFE chair has

continued to retain its pre-eminent position by securing recently developed 'Type 1' environmental product labels in several offshore markets, as well as being the first furniture product in New Zealand licensed by the Environmental Choice New Zealand ecolabel. Meeting the requirements of these third-party-audited ecolabels has enabled the LIFE chair to access the rapidly expanding global markets for green building products, and is proving to be a significant business advantage for both Formway and its international business partners. The insight and proactive attitude of the design team back in 1998 has enabled Formway to build an improved product environmental profile and strong product marketing story, and has ensured longevity of the product in the marketplace.

In addition to product certifications, a detailed Life Cycle Assessment (LCA) study of the LIFE chair has been completed to gain deeper insight into the life cycle environmental impacts of the product and identify improvement areas for subsequent product development. The LCA study was co-authored with staff at Landcare Research and the University of Auckland, and recently published¹⁵ in the peer-reviewed *International Journal of LCA*, adding legitimacy to this piece of work.

After the LIFE chair launch in 2002, the company continued to use external consultants and in-house student projects to conduct several LCAs and streamlined life cycle studies of products, materials and processing technologies. By 2006 demand in the marketplace had increased to the point where Formway could justify employing a full-time environmental manager to develop its Life Cycle Management Programme involving all relevant aspects of the organisation.

Figure 4 shows the focus areas of Formway's LCM programme. The four main project areas are:

1. 'Eco-Innovation' during product design ensures products are designed with a robust approach to reducing life cycle environmental impacts. LCA studies are undertaken that underpin the decisions made during design and development.^{16,17} The results of these LCA studies are now informing and steering the company's environmental strategy, as well as detailed design decisions within product development projects.
2. 'Supply chain management' concerns procedures and specific projects that aim to improve the sustainability of products and services purchased by Formway.
3. 'Environmental management systems' are in place

to improve in-house processes and operations within Formway's own manufacturing sites. These have been developed and certified using the Landcare Research Enviro-Mark[®]NZ scheme.⁶

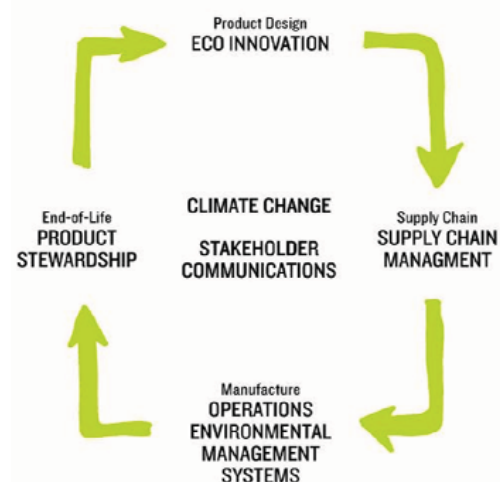
4. 'Product stewardship' for end-of-life furniture is an area of developing importance to Formway. A number of practical options are currently under development and being trialled by the company for customers.

Climate Change and Stakeholder Communications have been identified as two priority overarching project areas that require coordination across the company's functions.

Additional details about Formway's LCM activities can be found described on Formway's website¹⁸, and in the Ministry for the Environment case study 'Sustainable design at Formway'.¹⁹

In summary, the life-cycle-thinking approach has gained traction across the company in recent years and has led to several projects including, most recently, development of a product stewardship programme for end-of-life furniture. The evolution of LCM at Formway is fairly typical of companies adopting an LCM approach. Often an early step involves commissioning a life cycle study of a selected product. This enables the company to become familiar with life cycle techniques and acts as a springboard for integrating life cycle thinking into other activities. Over time, a coordinated strategy and set of activities emerges around product-oriented environmental management, and LCM becomes institutionalised within the company.

Figure 4. Life Cycle Management at Formway.



7. Conclusions

An increasing number of businesses are now embracing life cycle thinking, realising that they have a responsibility to consider the upstream and downstream impacts of their products – and that competitive advantage can be gained from adopting such a perspective. Life Cycle Management (LCM) provides a pragmatic framework to implement proactive, product-oriented environmental management strategies based on life cycle thinking. The key aim of LCM is to embed life cycle thinking within an organisation's decision-

making, and deliver products and services that support sustainable production and consumption in society, at the same time as adding economic and social value to stakeholders in the value chain.

In summary, successful Life Cycle Management provides a foundation for the development and delivery of products that provide pragmatic solutions to sustainability issues while also adding commercial value to organisations.

MORE INFORMATION

For more information about activities at Landcare Research that support Life Cycle Management in New Zealand please contact:

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Examples of companies implementing Life Cycle Management:

3M: http://solutions.3m.com/wps/portal/3M/en_US/global/sustainability/policies-standards/life-cycle-management/InterfaceFLOR: <http://www.interfaceflor.com/Default.aspx?Section=3&Sub=4>

Other companies do not use the term 'Life Cycle Management' but are effectively implementing life cycle thinking in their operations and management systems. Examples include:

Nokia: www.nokia.com/A41039019
Resene Paint: www.resene.co.nz/comn/envissue/howgreen

Some international links:

The Life Cycle Initiative supported by the United Nations Environment Programme (UNEP), and SETAC is coordinating international activities to support implementation of Life Cycle Management: <http://lifecycleinitiative.unep.fr/>

The International Conference on Life Cycle Management takes place every two years. Presentations at the 3rd International Conference, held in August 2007, can be found at: www.lcm2007.org

The LCA Centre, Denmark, has a page of links to companies using the life cycle approach: <http://www.lca-center.dk/cms/site.aspx?p=4015>

A Life Cycle Management business portal is hosted by EPA Victoria in Australia: www.epa.vic.gov.au/lifecycle

Further reading:

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Remmen A, Jensen AA, Frydendal J 2007. Life Cycle Management. A business guide to sustainability. Paris, United Nations Environment Programme. Available at: <http://www.unep.fr/shared/publications/pdf/DTIx0889xPA-LifeCycleManagement.pdf>

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NOTES

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- ⁸ UK Government ecolabelling advice: <http://www.defra.gov.uk/environment/consumerprod/glc/index.htm>
- ⁹ NZ Government ecolabelling directory: www.med.govt.nz/templates/ContentTopicSummary37890.aspx
- ¹⁰ European Commission Directive 2005/32/EC on the eco-design of energy-using products (EuP).
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- ¹⁵ Gamage G, Boyle C, McLaren S, McLaren J 2008. Life Cycle Assessment of commercial furniture: a case study of the Formway LIFE chair. International Journal of LCA 13: 401–411.
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- ¹⁷ Gamage G. PhD thesis. University of Auckland. Forthcoming.
- ¹⁸ www.formway.com
- ²⁹ Ministry for the Environment 2007. Case study "Sustainable Design at Formway". Wellington, MfE.



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