Introduction to EcoReDesign™

Improving the environmental performance of manufactured products

How products contribute to environmental problems

Environmental problem	Brief description	Product implications	Product examples
Air pollution	The release of hazardous or toxic gases to the environment. Typical pollutants include carbon dioxide, nitrous oxides, sulphur dioxide, ozone, volatile organic compounds, etc.	Emissions throughout the product life cycle, i.e. materials extraction, processing, product manufacture, distribution, use, and recycling and disposal.	Automobiles Electrical and electronic products Commercial and domestic furniture Packaging Miscellaneous consumer durables
Water pollution	Water pollution is the release of hazardous or toxic substances to our waterways and marine environments. Typical pollutants include heavy metals, organochlorides, etc.	Use of washing detergents, wetting agents and surfactants in appliances which enter sewerage systems and require treatment. Heavy metals and other hazardous substances leaching from landfilled or dumped appliances and computers into aquatic ecosystems.	Clothes washers (re detergents) Dishwashers (re detergents) Electrical and electronic products
Global warming	Global warming is occurring due to the enhanced 'greenhouse effect' - absorption of solar radiation by gases such as carbon dioxide and methane.	Primarily energy-using products where electricity is generated through coal-burning power stations. This includes the majority of electricity-using products in Australia. Products with high embodied energy materials, e.g. aluminium, ceramics, steel.	Transportation products, e.g. vehicles, buses Electrical and electronic products Gas-using products Space heating and cooling systems Water heating systems Medical and scientific equipment
Ozone depletion	A layer of ozone in the upper atmosphere protects the earth from ultraviolet radiation. The ozone layer is thinning due to the presence of chlorine compounds such as CFCs, HFCS, halons, trichlorothene, etc.	Demand for chlorine production by appliance and aerosol manufacturers. Accidental and intentional release of ODS when product is discarded, landfilled, reconditioned, shredded, etc.	Refrigerators and freezers Air conditioners Polyurethane foams in furniture Extruded polystyrene Aerosols Miscellaneous consumer durables
Landscape degradation	Landscape degradation can take many forms, including deforestation, erosion, salinisation, removal of topsoil, landfilling, etc.	Landfilling solid waste, e.g. discarded products such as electrical/electronic products, furniture, packaging. Construction and demolition products.	Electrical and electronic products Commercial and domestic furniture Miscellaneous consumer durables
Solid waste	Occupies landscape resources that could otherwise support more productive land uses, e.g. agriculture, housing. Areas for landfilling are also a reducing resource in some urban areas. Poor management of landfills can lead to toxic substances leaching into aquatic ecosystems. Landfills can contribute to visual pollution.	Solid waste arising from discarded domestic, commercial and industrial products and materials. If not recovered for product/component reuse or materials recycling, end-of-life products are likely to be landfilled.	Packaging Electrical and electronic products Construction products Commercial and domestic furniture Miscellaneous consumer durables
Acidification	Oxides of nitrogen and sulphur react with water to form 'acid rain'. This can damage both the natural and built environment.	Products that directly or indirectly utilise energy sources with a high sulphur content, especially in relation to the distribution or transport stage of a product's life cycle	Any products transported by means that utilise energy sources with a high sulphur content[1] Metals produced through smelting high sulphur ones
Resource depletion	Most of our current sources of energy and many of our raw materials are non-renewable. Known supplies are limited and are being depleted at a rapid rate.	Use of materials derived from scarce, finite, threatened or non-renewable natural resources	Commercial and domestic furniture Packaging Electronic products containing precious metals and rare earth materials Miscellaneous consumer durables
Visual pollution	Visual pollution can occur as a result of damage to the natural environment, through litter, landfilling, etc.	Disposable or consumable type products prone to littering Discarded durable products	Packaging Electrical and electronic products Commercial and domestic furniture Miscellaneous consumer durables
Reduced biodiversity	Biodiversity is reduced when the number of plant and animal species is reduced at a local, regional or global level.	Products made or derived from biological resources, e.g. timber	Commercial and domestic furniture Packaging Miscellaneous consumer durables

1 United Nations Environment Programme/Industry and the Environment, (1996), Draft PROMISE Manual on Ecodesign, Appendix 7, p. 3.

THE COMPETITIVE MARKET FOR ENVIRONMENTAL QUALITY

Any business that strives to remain competitive, open to new markets and new opportunities, will recognise the challenges - and the opportunities - of global demands for environmental quality.

Products which are more energy-efficient, which reduce water consumption, decrease pollution and reduce end-of-life waste, now have a clear competitive edge in the market. In much of the world, the demand for such products - and the investment to create them - is a response to increasingly stringent environmental regulations and standards.

In other rapidly developing economies, such as Asia, demand is also growing because of resource shortages which place constraints on the nature of development.

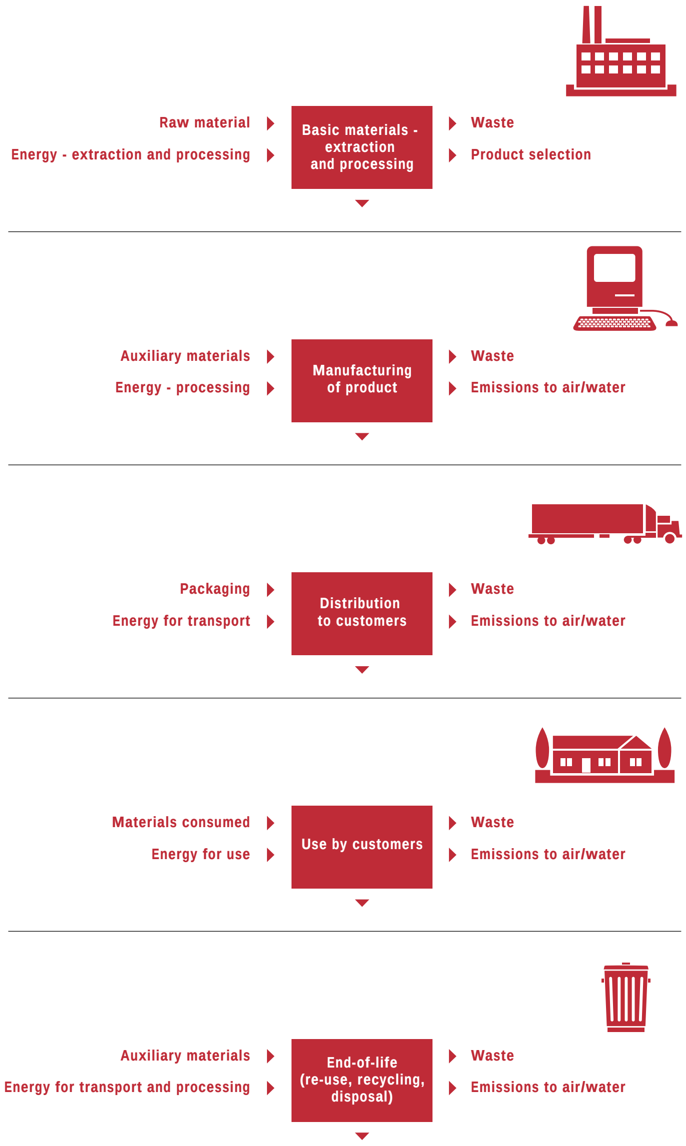
Australian products intended for export have to meet these new global-market standards for environmental quality. Local products will have to compete against imports with an ‘environmental edge’.

From 1994 to 1997, seven Australian companies participated in a program, known as EcoReDesign, to redesign their products for this new green market. By the end of 1996, a series of products from those companies stand as a demonstration of what ‘design for the environment’ can achieve - for business success and for the environment. The products reflect an important change of industry perspective, from treating the environment as a threat, to viewing it as an opportunity for new productive and sustainable endeavours.

This booklet is a summary of the more detailed manual - *A Guide to EcoReDesign* - which provides a step-by-step guide for companies who wish to produce products which are ‘cleaner and greener’. A video: *Good Design, Better Business, Cleaner World* has also been produced to accompany that manual.

The Schiavello HOTdesk™ seriously explores the implications that changing work practices, information technology and environmental issues, may have for the design of commercial office furniture.

Environmental Impacts at different stages of the life cycle



This figure is adapted from the *PROMISE* manual (draft 1996), Delft University of Technology, TME Institute, TNO Product Centre, The Netherlands.

Section 1 **Products and the Environment**

All products, be they refrigerators, beverage containers, office chairs or telephones, contribute to a range of environmental problems. These problems arise from the creation, use and disposal of products - they are referred to as whole life cycle (or ‘cradle to grave’) environmental impacts.

Environmental impacts are largely determined by the way a product is designed and produced - the material it is made from, its length of life, the nature of its use, whether it is designed to be recycled, and so on. EcoReDesign is an approach to ‘designing-out’ as many environmental problems as possible, whilst still producing a high quality, cost effective product.

Global range of Dishlex dishwashers from Southcorp have a six-star energy rating, and a AAA water rating using less than 18 litres for a full load.

Section 2 **Strategies for EcoReDesign**

The environmental impacts of a product and its associated packaging can be reduced through a variety of strategies. The key to success is selecting the most appropriate and effective strategies for a particular product to reduce the environmental impacts which have been identified.

A process for selecting the most appropriate strategies from the list below is described later, in section 3: The EcoReDesign Process.

Design for resource conservation

(i) Use minimal material
Weight reduction is a critical objective as it reduces the cost of manufacture, the cost and weight for transport, saves resources and energy, and results in less material at the end-of-life.

(ii) Use renewable resources
Renewable resources include materials manufactured from plant or animal sources which are harvested on a sustainable basis. Examples of such materials include timber, paper, cardboard, starch or sugar-based plastics, soy-based inks and vegetable dyes. Renewable energy resources include solar, hydro, tidal and wind power.

(iii) Use materials which do not deplete natural resources
Timber, for example, should be harvested from plantations; rainforest timbers should be avoided.

(iv) Use recycled and recyclable materials
Commonly-used materials can be found in a recycled form such as: steel, aluminium, paper, cardboard, plastics, rubber and glass. Recycled materials can save resources and energy. Products should also use recyclable materials which are not only technically recyclable but for which there is a viable collection and reprocessing system in place.

(v) Use waste by-products
Waste products from one process can often be used as a raw material for another process.

Design for low impact materials

(i) Avoid toxic or hazardous substances
Toxic substances may cause serious effects on the health of humans and the environment such as: poisoning, respiratory problems, cancer, nervous system damage or birth defects. They include lead, mercury, cadmium, arsenic, chromium, nickel, selenium, fluoride, tin, copper, cobalt, phenols, endocrine disrupting chemicals and chlorinated organic solvents.

(ii) Avoid ozone-depleting substances
Hydrochlorofluorocarbons (HCFCs), a common replacement for chlorofluorocarbons (CFCs), have a much lower ozone-depletion potential(ODP) than the CFCs they replaced. However hydrofluorocarbons (HFCs) and hydrocarbons (such as propane and pentane), which have zero ODP, are now the preferred refrigerants.

(iii) Avoid or minimise the production of greenhouse gases
Greenhouse gases include carbon dioxide, methane, nitrous oxides, carbon monoxide, non-methane volatile organic compounds, perfluorocarbons and HFCs.

(iv) Use materials with low embodied energy
Consider the energy used directly or indirectly to produce a material (‘embodied’ in the material).

Design for cleaner manufacturing

This is closely related to ‘cleaner production’, which began with a focus on environmental impacts in the manufacturing stage, but now encompasses a more integrated range of approaches to increase production efficiency and reduce risk to humans and the environment. These include waste minimisation, recycling, optimising material flows, reducing energy efficiency and ecodesign.

"Design for cleaner manufacturing" refers to strategies which reduce environmental impacts during the production stage of the product life cycle. Some of these are:

- improving control of manufacturing processes and improving operating practices;
- eliminating process wastes through production modifications and material substitution;
- reducing energy consumption;
- minimising the variety of materials and selecting low-impact materials and processes;
- concentrating and separating materials (including water) for reuse in the process or as a by-product, rather than mixing and diluting them for disposal as waste;
- changes in production techniques including simplifying assemblies, automating processes and introducing new technology where appropriate; and
- continuous environmental monitoring and systemised environmental management.

For more detailed cleaner production strategies the Cleaner Production Demonstration Project Information Kit is available from Environment Australia: Freecall 1800 803 772.

Design for efficient distribution

(i) Reduce the weight of the product and its packaging
Reducing weight means less energy required for transport. Primary packaging material can be reduced by choosing strong, lightweight materials and designing efficient packs. Consideration should also be given to re-useable and/or recyclable packaging.

(ii) Ensure that transport packaging is re-useable and/or recyclable
The environmental impact of transport packaging can be reduced through source reduction (lightweighting), designing re-useable packaging or recycling.

(iii) Choose an efficient transport system

Design for energy efficiency

Products which consume energy during use (such as domestic appliances and commercial equipment) have a significant impact on the environment. Gaining maximum efficiency can be helped by the following.

(i) Look for synergies
Products are intermeshing systems - improving the efficiency of one element can mean beneficial changes in other parts.

(ii) Look for waste
Waste can occur in many forms, including leaks, stand-by energy, cycling losses and components working against each other.

(iii) Design for part-load operation
Many items of equipment are optimised for operation at full load. This condition rarely occurs. Aim for high efficiency over the possible range of operational conditions.

(iv) Design for a range of conditions (not just those of a test set-up)
Rarely do field conditions match those of a standard test. It is important that products function efficiently under real world conditions.

(v) Plan for ongoing efficiency improvement
Some energy-efficient features may be too difficult for the product being developed today, but may become possible in the future. Plan today, for future up-grades.

(vi) Use computer modelling to support laboratory and field work
Simple computer models can be very useful for wide-ranging 'what if?' studies.

Design for water efficiency

Many of the principles listed above also apply to water efficiency. The aim at all times should be to minimise water usage, in production, use and re-use. Water should be recovered and re-used. Consumers use of a product is also critical. Energy and water labels encourage consumers to buy the most efficient product, but consumer education is also required to ensure that the product is used in the most efficient way.

Design for minimal consumption

The quantity of ancillary products consumed during use should be minimised; eg, detergents, coffee filters, batteries, toner, etc.

Design for pollution prevention

Products may emit harmful substances during use; for example: volatile organic compounds (VOCs) from paints and other products containing solvents; ozone from electronic equipment, etc. Select materials free from volatile substances and design out emissions.

Design for durability

The durability of a product can be extended by:

- identifying and eliminating potential weak points in the design, particularly for operational parts;
- ensuring the product is designed for likely misuse as well as the intended use; and
- designing for easy maintenance, repair and upgradability.

Durable products should always be designed to allow for future upgrades.

Design for disassembly

At end-of-life, products need to be disassembled so that different materials can be separated for recycling, reuse, repair, or re-manufacture. Design options include:

- minimising the number of separate components and materials;
- avoiding glues, metal clamps and screws in favour of ‘push, hook and click’ assembly methods;
- making fasteners from a material compatible with the parts connected;
- designing interconnection points and joints so that they are easily accessible;
- designing the product as a series of blocks or modules;
- use of in-mould identification symbols for plastic resins (based on ISO 1043); and
- locating unrecyclable parts in one area that can be quickly removed and discarded.

Design for re-manufacture

Re-manufacturing is another way of avoiding waste. Re-manufacturing involves collection of used products, disassembly, replacement or refurbishment of damaged components, assembly and resale.

Design for re-use

Re-useable products tend to have a lower impact on the environment than single-use products. Design for re-use requires:

- ensuring that the product is strong enough to withstand repeated collection, handling, washing (if required) and re-use/refilling;
- cleaning processes which ensure that health and hygiene standards are met for food, beverage and personal care products; and
- use of in-mould labels rather than paper and plastic labels (which can be washed off or accidentally removed).

Design for recycling

Materials used in a product could have a secondary use at end-of-life, either for the same product or for a different product.

Design for degradability

Degradability is only useful if the product is likely to be disposed of in a composting facility or a bioreactor landfill.

Design for safe disposal

Products should also be designed for safe disposal at the end of their life. Products which contain toxic materials should be labelled with instructions for decontamination and disposal.

Section 3 **The EcoReDesign Process - Approaching the redesign of a product.**

The design strategies listed above need to be related to a particular product and its enviromental and market characteristics. The strategies are not able to be applied all at once, some will turn out to be contradictory in certain circumstances. The EcoReDesign process provides a systematic way of identifying appropriate and achievable design strategies to improve the environmental performance of a product - and enhancing all its other characteristics essential to its market success. It involves three phases:

Phase 1 The product selection and general product analysis

Phase 2 An analysis of the product’s environmental impact and setting design directions

Phase 3 The realisation (prototype, testing, adjustment) of a new design to reduce environmental impacts

Imaging Technologies’ Swap Shop is a vending machine for toner cartridges and other office consumables which can also operate in reverse - by taking used cartridges back for recycling.

Phase 1: Product selection and general product analysis

Usually selection of a product will be determined by market pressure. The purpose of the general product analysis (GPA) is to produce a report on the selected product, as a background dossier for Phase 2 (the workshop). The report should cover as many of the following issues as possible:

Market

- key attributes of the product - function, aesthetic, quality, cost, etc.;
- current size of the market, including trends, past and future predictions;
- other factors affecting market - costs, regulations and standards, consumer interests; and
- any environmental issues identified within the market.

Competing products

- identification of a competing product (in the global market) with the best environmental profile.

The company - resources and capabilities

- outline of the company - history, size, facilities, resources, environmental policy; and
- a list of people able to be involved in ERD project, and their expertise.

Pressures or potential for change of product

- environmental issues, new materials, new technology; and
- new customer demands or niches.

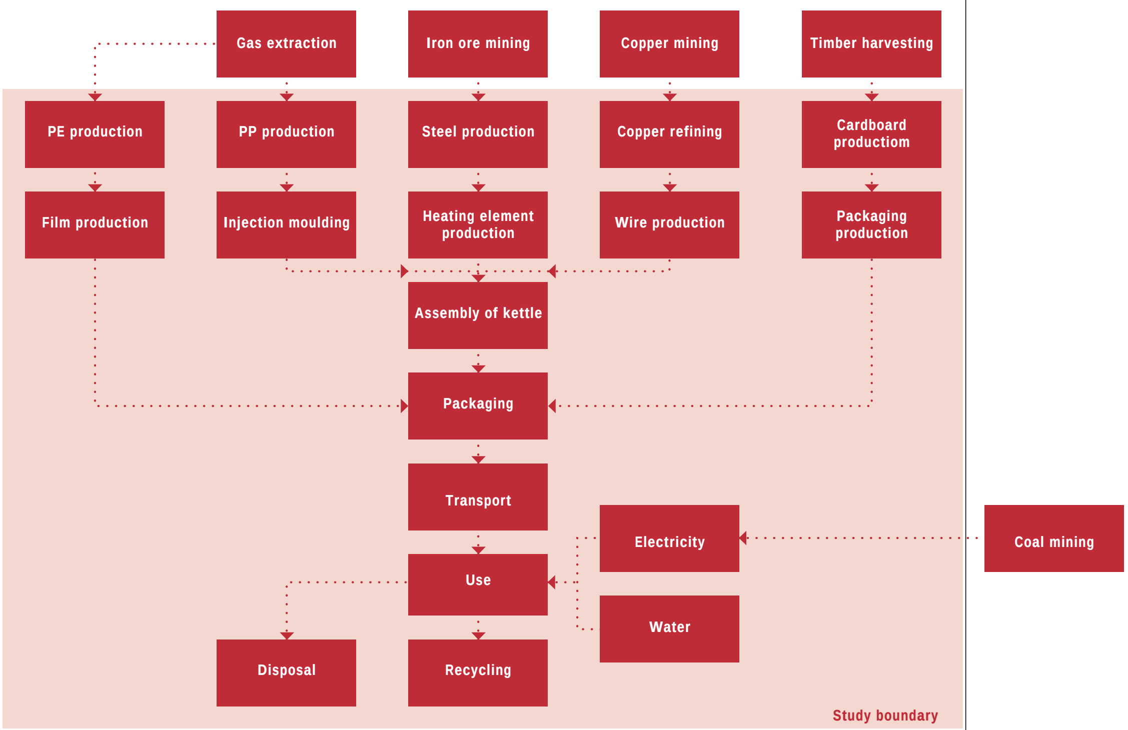
Product information

- a broad description of the product (function and components), key design/production features, its history; a listing of material used, current patterns of disposal of the product at end of life;
- a list of all production processes involved in fabricating the product and all the components of the product and the source of those; and
- data on the use of the product, resources consumed (if any), frequency of use (if relevant), emissions generated, expected average life-time.

Process tree

The general product analysis should include a process tree or flow chart for the product. A process tree is useful in identifying all of the key stages in the product life-cycle. The process tree should identify all of the major upstream stages, such as raw material extraction and processing, and all of the major downstream stages, such as packaging, distribution, transport, use, disposal and recycling. An example is shown below.

Process tree for an electric kettle



Phase 2: An analysis of the product's environmental impact and setting design directions

After selecting the product and developing a general product analysis, the environmental profile of the product has to be analysed in more detail so that appropriate environmental design strategies can be established. This always involves a life-cycle perspective; however the detail of the analysis will vary depending on the project and the resources that are available. The process tree (part of the GPA) is also important in this phase. It can help to identify life-cycle stages that might otherwise be overlooked. It can also be very useful in defining the 'boundaries' of what is, and is not, considered important enough to be studied in more detail.

2.1 Life-cycle Assessment

Life-Cycle Assessment (LCA) is a tool for assessing the environmental impacts associated with a product taking into account all stages of its life-cycle. LCA involves considering the inputs to a product and all of the environmental by-products of each phase in its production, use and disposal. Such a process normally involves four steps:

1. a scoping and goal definition stage where the aims and the boundaries of the study are defined;
2. an inventory analysis of materials, resources and energy used and environmental releases from all stages in the life of a product or process;
3. an impact assessment, examining potential and actual environmental and health effects related to the use of resources and environmental releases; and
4. an improvement assessment, identifying the changes needed to bring about environmental improvements in the product or process.

There are many software packages which can be used to carry out an LCA and provide quantified inventory data and information on impacts. These packages generally adopt the standards of the Society of Environmental Toxicology and Chemistry (SETAC) which, along with the International Standards Organisation, has established international guidelines, standards and a code of practice for LCA.

Simplifying the LCA process

Many companies find LCA to be too complex, expensive and time consuming for everyday use. As a result, various shortcuts have been developed to speed up the process when a quick decision is required; for example, during the product design process. These shortcuts are often called 'streamlined' approaches to LCA.

The aim of a streamlined LCA for the design process should be to:

- gain an overview of the major environmental impacts of a product throughout its life-cycle; and
- identify the environmental priorities that will be addressed through the design process.

One streamlined process used in EcoReDesign is a Life Cycle Impacts Scan which involves three steps:

(i) a flow chart or process tree (part of the GPA);
(ii) a limited inventory analysis; and
(iii) an impact assessment matrix.

These can be prepared by company staff with the assistance of environmental experts (if required).

The MEC-Kambrook Axis Kettle reduces energy consumption in use with a double wall for better insulation, and a temperature indicator which tells the user whether it is necessary to reboil.

(i) Process Tree
In the EcoReDesign process the process tree is completed in phase 1 of the GPA. (See phase 1).

(ii) Limited Inventory Analysis
The second step of the Life Cycle Impact Scan is to prepare a basic inventory of materials, resources, energy, wastes and emissions related to the life-cycle stages which have been identified as important. As a minimum, the following information should be collected:

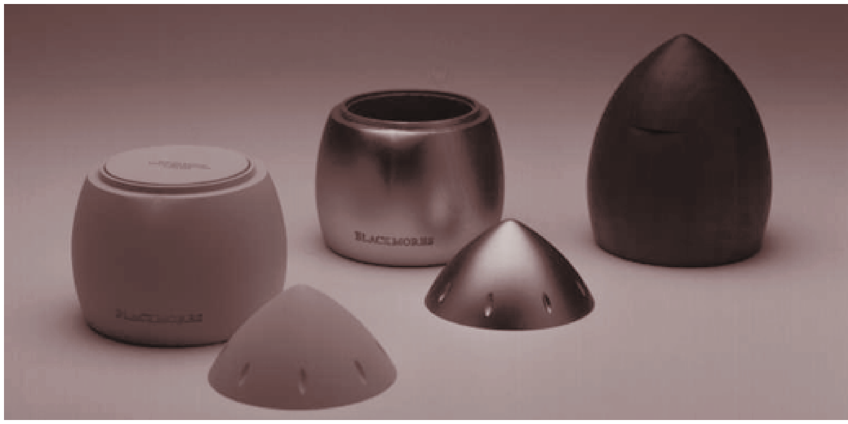
Materials and resources (eg water)
- What materials/resources are used?
- Are they renewable or non-renewable?
- What quantities are used?

Energy
- How much energy is consumed in production, use and disposal?
- What form is the energy that is used (coal, gas, oil, etc.)?
- How is the product transported, and how far?

Wastes and emissions
- What wastes and emissions are produced?
- Are any of them toxic or hazardous?

This analysis will require input from suppliers, customers and other organisations.

A matrix can be used to summarise this information, as illustrated with a sample matrix for an electric kettle.



New packaging concepts from Blackmores combine a lightweight disposable package and an attractive, strong and re-useable container.

Simple inventory matrix for production of an electric kettle

	Input of materials	Energy use	Wastes & emissions
Production of basic materials	Total weight = 1100 kg 20 materials including: polycarbonate (290 kg) polypropylene (419 kg) PVC (105 kg) copper (186 kg)	15 materials or components are imported by ship, using energy in transport The smelting of copper uses large amounts of energy	PVC produces chlorinated waste and some mercury residue in water discharge PC and PP wastes are insignificant Copper smelting is a polluting process - air emissions include sulphur dioxide (acid rain)
Manufacturing	Negligible	Assembly uses compressed air - energy consumed is negligible Testing kettle uses .05 megajoules	Wastes and emissions insignificant
Distribution	Consumer packaging uses: cardboard (520 g) paper (12 g) polyethylene (16 g) paper (12 g) Transport packaging uses wooden pallets	Kettles transported to retailers by truck - average distance 400 km Fuel = diesel	Emissions from transport include CO_2, NO_x, ozone, etc.
Product use	Water heated in the kettle over 5 years is assumed to be 12,775 litres	Kettle is used around 7 times per day - energy required to heat 1 litre is 0.355 MJ Over 5 years consumption = 4084 MJ	Air emissions, solid waste and waterborne waste from electricity production
End of product life	Negligible	Transport to landfill site by diesel truck landfill (average life 5 years)	Kettle is currently disposed of in landfill Approximately 20% of cardboard packaging is recycled

(iii) An impact assessment matrix

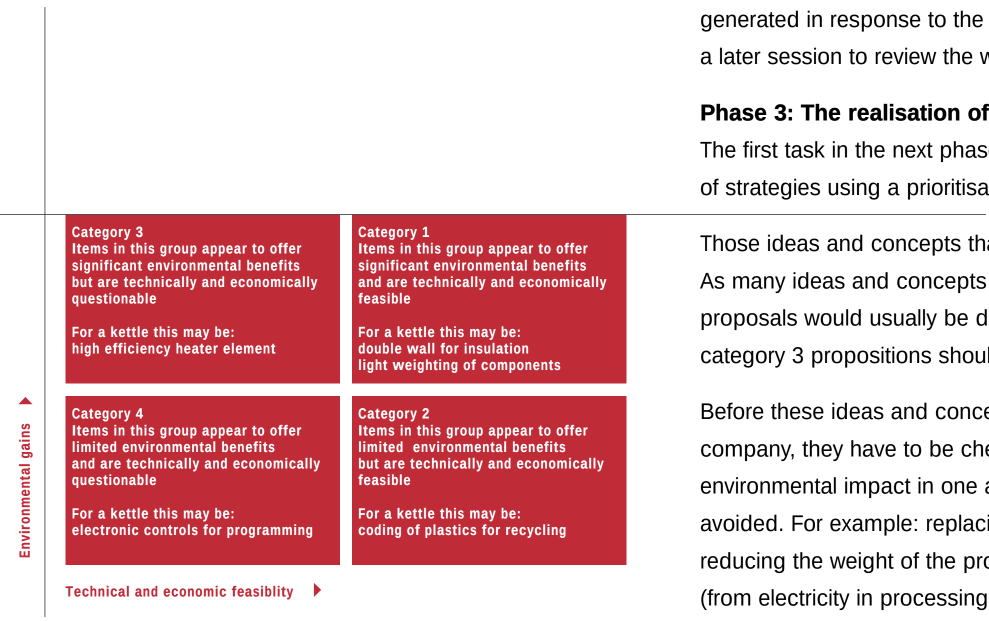
The third step of the Life Cycle Impact Scan is to analyse the impacts that the product has on the environment. An impact assessment matrix is a useful tool for analysing those impacts, in relation to the product life-cycle.

A simple impact assessment matrix can be constructed by setting out, along one axis, the major environmental impacts and on the other, a list of the life-cycle stages, relevant to the product. In each of the cells created in the matrix, there is space to note any features of the product that contribute to environmental problems and to estimate the nature and scale of the particular impact. A sample matrix is shown below, with the first line filled in for an electric kettle. The matrix can be added to and refined at the EcoReDesign workshop.

Life-cycle stage	**Production of basic materials**		**Manufacturing**		**Distribution**		**Use**		**End of product life**	
	Raw materials extraction	**Processing**	**Auxiliary materials used**	**Process energy**	**Packaging**	**Energy for transport**	**Materials consumed**	**Energy in use**	**Re-use - recycling**	**Disposal**
Waste /resource depletion: non-renewable materials; water usage; energy degradation (waste heat)	*Depletion of oil for plastics - not significant*	*Poly carbonate is a high energy polymer*	*Plating of metal components, silver in solder joints*	*Energy use by injection moulding machines and assembly equipment - not significant*	*Card board and plastic used in packaging - not significant*	*National transport network from manufacturing facility- not an issue on a per kettle basis*	*Water - and possibly cleaning agents - not significant*	*Large wattage element - major area of impact*	*No recycling or reuse system available*	
Global warming (CO_2, methane..)										
Ozone depletion (CFCs …)										
Air pollution (SO_x; NO_x; O_3; particulates; smog)										
Water pollution (eutrification; heavy metals; other toxics..)										
Solid waste (landfilling, leaching)										
Biodiversity (loss of genetic material)										
Land degradation (soil loss; desertification; salinity)										
Visual pollution										

Extract from a brief for an eco-kettle
The project is to design an environmentally sensitive electric kettle for the world market, addressing as many of the following issues as possible: energy efficiency (high priority), recycled and recyclable materials (high priority), design for dissassembly (medium priority), form and function evoking 'green and high-tech' image to customers (medium priority).

Key features: immersion element 2000-2400 watts (200-260 volts); cordless; 2 litre capacity, minimum boil 1 cup; 5 year life minimum; switch off automatically, fastest switch time to reduce boiling; insulation to keep boiled water hot enough for use for at least 30 mins; water temperature indicator; effective water level indicator visible when filling kettle.



2.2 EcoRedesign Workshop

The EcoReDesign process uses a guided workshop to fill out and analyse the environmental impacts of a product (using the impact assessment matrix described above, or the report prepared by an LCA consultant) and to consider creative design responses to those impacts. The workshop needs participants to cover each of the areas below (although one person can cover more than one area):

- technical/production systems and processes;
- technical/materials;
- technical product-specific issues;
- markets/marketing/consumer interests;
- design;
- environmental analysis; and
- management/business/strategic planning.

Lateral thinking is as important to the outcome as technical expertise. This is essentially a 'design think-tank', with the strategies in section 2 of this booklet providing some general background ideas for this exercise.

The workshop will generally conclude with some critical evaluation of the 'value' of various ideas generated in response to the environmental profile of the product. It is usually necessary to set aside a later session to review the workshop outcomes.

Phase 3: The realisation of a new - environmentally-improved product
The first task in the next phase is to collate the workshop material into a hierarchy of four groups of strategies using a prioritisation matrix, as shown.

Those ideas and concepts that fall into category 1 can generally be implemented in the short term. As many ideas and concepts as possible from category 2 can also be incorporated. Category 4 proposals would usually be discarded. A further company review can determine how many of the category 3 propositions should be further researched.

Before these ideas and concepts can become part of the management or business plan for the company, they have to be checked for any conflicting directions. A design decision which reduces the environmental impact in one area can sometimes increase the impact in another. This must be avoided. For example: replacing steel with aluminium may reduce the CO_2 levels from transport (by reducing the weight of the product) but increase the CO_2 produced in processing and manufacture (from electricity in processing of bauxite into aluminium).

Finally, the review and research process will 'coalesce' to produce some key directions and decisions, and the outline of the new product will be clear enough to write a brief for detailed design, development and prototyping.

The EcoVend by Nida Group Pty Ltd consumes 60 per cent less energy than comparable machines.

Taking it all to market.

Any product developed through an EcoReDesign process is a response to new market conditions; and the success of all the EcoReDesign work will come down to marketing. No matter how clever the new product is, how attractive or functional it might be, how much it has reduced environmental impacts, its new features will have to be exposed to the market.

The EcoReDesign demonstration projects (and other similar projects) suggest that it is not difficult to gain 50-80% improvement in environmental terms for products which retain all their other market characteristics, including cost. Proceeding to sell those gains can be a challenge for traditional marketing strategies. Some general points of advice can assist this process:

- ensure that credible and authoritive environmental messages get to the consumer;
- enter the product in existing environmental awards and competitions to gain exposure;
- look to schemes and programs administered by government and statutory authorities which assist in marketing high environmental performance products (such as energy ratings);
- consider ‘green groups’ as a good source of marketing assistance; and
- ensure that the product conveys the message directly - use it to educate the consumer.

Incorporating EcoReDesign into your company

Having taken a product through an EcoReDesign process, it is important that the skills and experience developed through this process are built on by incorporating them into your business plan or management system.

For small companies, without formalised management systems, it is important that EcoReDesign principles are applied to all product developments, and not just to ‘green products’. For larger companies, and those with formalised management systems, EcoReDesign can become an integral part of the continuous improvement process, particularly in relation to product development.

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Journals and newsletters

EcoReDesign Newsletter
Quarterly newsletter of the National Centre for Design at RMIT, GPO Box 2476V, Melbourne, Vic 3001, T (03) 9660 3902, F (03) 9639 3412, email: cfd@rmit.edu.au

Loose Leaves
Monthly newsletter of the Society for Responsible Design, PO Box 73 Rozelle, NSW 2039, T (02) 9564 0721, F (02) 9564 1611.

The International Journal of Life Cycle Assessment
Quarterly journal, Ecomed Publishers, Rudolf-Diesel-Strase 3, D-86899 Landsberg, Germany.

The Journal of Cleaner Production
Elsevier Science Ltd, The Boulevard, Langford lane, Kidlington Oxford OX5 1GB UK, T +1865 843 000, F +1865 843010.

Cleaner Production
The newsletter of the UNEP Cleaner Production Network, email: icpic@unep.fr

Warmer Bulletin
Bi-monthly journal covering waste minimisation and resource recovery from around the globe. World Resource Foundation, Bridge House, High Street, Tonbridge, Kent TN9 1DP, UK, T +44 (0) 1732 368333, F +44 (0) 1732 368337,
email: Kstrange@worldres.demon.co.uk

Waste Management and Environment
Monthly magazine, Minnis Business Publications, PO Box 134 Balmain, NSW 2041, Australia, T 008 810 669.

Organisations

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Royal Melbourne Institute of Technology, GPO Box 2476V, Melbourne 3001, Victoria Australia, T (03) 9660 2362 F (03) 9639 3412 email: cfd@rmit.edu.au

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EcoDesign Foundation
PO Box 369, Rozelle , NSW 2039, Australia, T (02) 9555 9412 F (02) 9555 9564
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EcoRecycle Victoria
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Co-operative Research Centre for Waste Management and Pollution Control
University of NSW, Sydney, NSW 2052, T (02) 9385 5038, F (02) 9313 8246.

Environment Australia
Community Information Unit, Freecall 1800 803 772.

Energy Victoria
115 Victoria Parade, Fitzroy, Vic 3065, T (03) 9412 5666, F (03) 9412 6887.

New South Wales Environment Protection Authority
GPO Box 1135, Chatswood, NSW 2057, Australia, Pollution Line, Freecall 131 555 (NSW).

Sustainable Energy Development Authority (NSW)
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email: seda@seda.nsw.gov.au

Internet

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http://www.cfd.rmit.edu.au

Consortium on Green Design and Manufacturing, University of California
http://euler.berkeley.edu/green/cgdm.html

Green Design Initiative, Carnegie Mellon University
http://www.ce.cmu.edu:8000/GDI

Environmentally Conscious Design and Manufacturing Lab, University of Windsor
http://ie.uwindsor.ca/ecdm_lab.html

Journal of Environmentally Conscious Design and Manufacturing, University of Windsor
http://ie.uwindsor.ca/ecdm/journal/

UNEP Working Group on Sustainable Product Development
http://unep.frw.uva.nl

The Centre for Sustainable Design, Surrey Institute of Art and Design
http://www.surrart.ac.uk/cfsd.htm

Section for Environmental Product Development, Technical University of Delft
http://duto02.tudelft.nl/research/mpo/index.html

O2 Global Network
http://www.wmin.ac.uk/media/O2/O2_Home.html

EcoCycle - Environment Canada
http://www.doe.ca/ecocycle/

Pré Product Ecology Consultants
http://www.pre.nl/

Cleaner Production Case Studies Directory
http://www.erin.gov.au/net/environet.html
Australian and New Zealand Environment and Conservation Council
http://www.environment.gov.au/portfolio/library/pubs/fs_anzecc.html

The Greenhouse Challenge
http://www.dpie.gov.au/resources.energy/environment/greenhouse/challenge.html

CADDET Energy Efficiency
http://www.caddet-ee.org

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Introduction to EcoReDesign is a summary of the 112 page publication,
A Guide to the EcoReDesign Process (1997). An accompanying video,
The EcoReDesign Program, is also available.

Further Ecodesign Resources
Environmental Design - Industry Supplements are available
on specific industry sectors:

- textiles;
- building products, fittings and furniture;
- electrical and electronic appliances; and
- packaging.

Further resources and sources of information can be obtained
from the Centre for Design web-site: http://www.cfd.rmit.edu.au/dfe.html