Design for Sustainability Guide

by Abby Mellick

Introduction

The DfS Guide is a 10 stage introduction to Sustainment Design for all design disciplines. This guide will help you gain insights into the cultural agency of design: the ability of design to help shape the values, expectations, desires, habits and behaviours of people. Its main purpose is to develop your intuitive sense for sustainability and to encourage you to discover the potential of your design projects to contribute to more sustainable ways of living and working. The idea is to get you to think comprehensively about the entire life cycle of designed things—production and user side—as well as about your own design process.

While this guide will provide you with practical information, it is not a 'cookbook' for sustainable design. There is no ulitmate guide for sustainable design, nor are any true 'experts' in it. Sustainable design involves issues of material impacts, but it also involves value judgements, observation, self-reflection and collaboration. More than anything, design for sustainability requires a 'learning' disposition. We all have to learn to conduct design activity differently to how we have in the past. This means identifying problems that we have sometimes not even thought about before, creating new concepts in light of what we have learnt through research, re-negotiating design briefs with clients to introduce them to these concepts and finally, applying these concepts in the design delivery process.

Most of what needs to change about how we do design happens in what is usually called the 'pre-design' or research phase. This guide is therefore focussed on what you need to think about, do, ask and research before designing anything. It is a design planning tool that will help you to lay out the key issues and impacts associated with the life cycle of your product—whether it be a graphic icon, item of clothing, appliance or a building—in this first phase of designing. This will enable you to see problems and find opportunities to create sustainment through what you design at the 'front-end', where it counts.

Over the next year, you will be able to source examples of products developed using this guide at the Product Portfolio page on this website.

As this is the first version of the DfS Guide, we would welcome and value your questions, comments and feedback on this guide.

Use this guide to:
• *work out and source* design problems and opportunities
• *explore* ideas for new products
• *design* a 'return brief' to introduce sustainable options to your client.

Go straight to the Guide.

Find out How to Use the Guide.

Or, find out more about the theory behind the guide by choosing from the menu on the left.

Further Introduction

Making products that demand different kinds of industrial, social and cultural relations can be as powerful an instigator of change as lobbying industries and governments to adopt more stringent environmental policies. There is, however, a strong resistance to thinking about product design in this way, in particular the idea that products themselves have design agency—not as projections of the designer's intent (though this is part of the process), but *in themselves*, in direct response to the environments they are taken up in. Products are generally understood as the end point of the design process rather than its beginning. But products change culture (just think of the mobile phone) and we think this cultural aspect of design is the most creative and important part of the design process.

This guide seeks to elaborate on this aspect of designing by extending your sense of what design is both responsible for and what it can make possible. It goes further 'upstream' than most 'how-to's'—in fact right back before the 'drawing board', so to speak, to consider the pre-design stage of the design process. This stage focuses on cultural knowledge, habits and senses—those aspects of design we don't generally notice or that at best play a performative role in the 'game' of consumerism.

This guide also goes further 'downstream', which might at first seem unpragmatic. Instead of the design process ending when you deliver your design to the client, this guide assumes that your responsibility for your product will extend right through the product's life cycle. In line with this, you will notice that this guide asks you to assume you won't encounter obstructions such as stubborn clients or resistant manufacturers. You will be making 'as if' decisions that are usually 'outsourced' regarding materials, manufacture, marketing and end-of-life. You might be thinking that 'in the real world' this doesn't happen. But this too is strategically important.

Unless you give yourself the possibility of exploring the best-case scenario, make leaps of faith and imagine different, more environmentally responsible industrial worlds, you will be less likely to come up with ideas innovative, viable and exciting enough to sell to those stubborn, resistant clients. The point is that it is extremely important for you, as a designer, to map the territory of your design before the details get filled in by others, to understand the problems and claim your responsibility in line with your recognition of the generative agency of design.

Extended Designer Responsibility?
This idea of *extended responsibility* is drawn from an industrial environmental management strategy called Extended Producer Responsibility (EPR). EPR attributes the burden of responsibility for the environmental consequences of products to their producers. Rather than just managing the 'downstream' effects of products when they become 'waste', the idea is to encourage more sustainable 'upstream' design decisions in relation to appropriate design, material choices, product life-span, energy efficiency, improved reuse potential, labelling of components to aid reclaiming materials for remanufacture or reuse, and establishing appropriate infrastructure to support both distribution and take-back programs.

In most high polluting countries such as the US and Australia, EPR is a voluntary arrangement because mandated EPR schemes have been deemed 'too costly'. But in northern Europe and some parts of Asia, EPR and product 'take back' are becoming common, particularly in the packaging and electrical and electronic sectors. There is, however, an increasing urgency to the issue of compulsory producer responsibility. This is in part due to the relation between the increasing cost and frustrating ineffectuality of 'end of pipe' municipal strategies such as curbside recycling and drop-off programs, and the accelerating flood of materially complex but

short-life products (particularly packaging and electronic gadgets).

For further reading on EPR see:
The EPR section of UNEP's site.
Centre for Design at RMIT's Return to Sender Program (Go to Sustainable Products, then to Product Stewardship).
Environment Science and Technology Feature article.
SEEBA's EPR resource - this is particularly good on the electronics sector.

UNEP's *Ecodesign: A Promising Approach* elaborates eight ecodesign strategies that have been very significant in our thinking through the cultural context of how to design for sustainability. These strategies extend from the 'pre-design' phase right through the life-cycle of the product. We recommend that you read this publication. In terms of this particular guide, it is worth detailing their pre-design phase called *New Concept Development*. These strategies provide food for thought in exploring design ideas, but should not be blindly adhered to—such ideas depend for their success on appropriate application and how users will respond to them. UNEP's New concept strategies are:

a) *Dematerialisation*. This is the replacement of a material product with an 'immaterial' substitute which fulfils the same need (email replaces paper-based communications). The EcoDesign Foundation has been doing some research into Dematerialisation strategies;

b)*Shared use of the product*. Such as when several people make joint use of a product without actually owning it (such as with car pooling);

c) *Integration of functions*. The idea here is that materials and space are saved if several functions or products can be integrated into a single product;

d) *Functional optimization of product (components)*. 'Auxiliary' functions, such as the quality or status that the product expresses, may be realisable in an improved and less polluting way. For example the over-elaborate packaging of luxury goods.

We would add here the need to make products *appropriately adaptable* to changing circumstances in terms of their purpose, meanings, material composition, functionality and structure. Clues as to how to do this are provided throughout the design stages of the Guide.

Focus on Relational Design

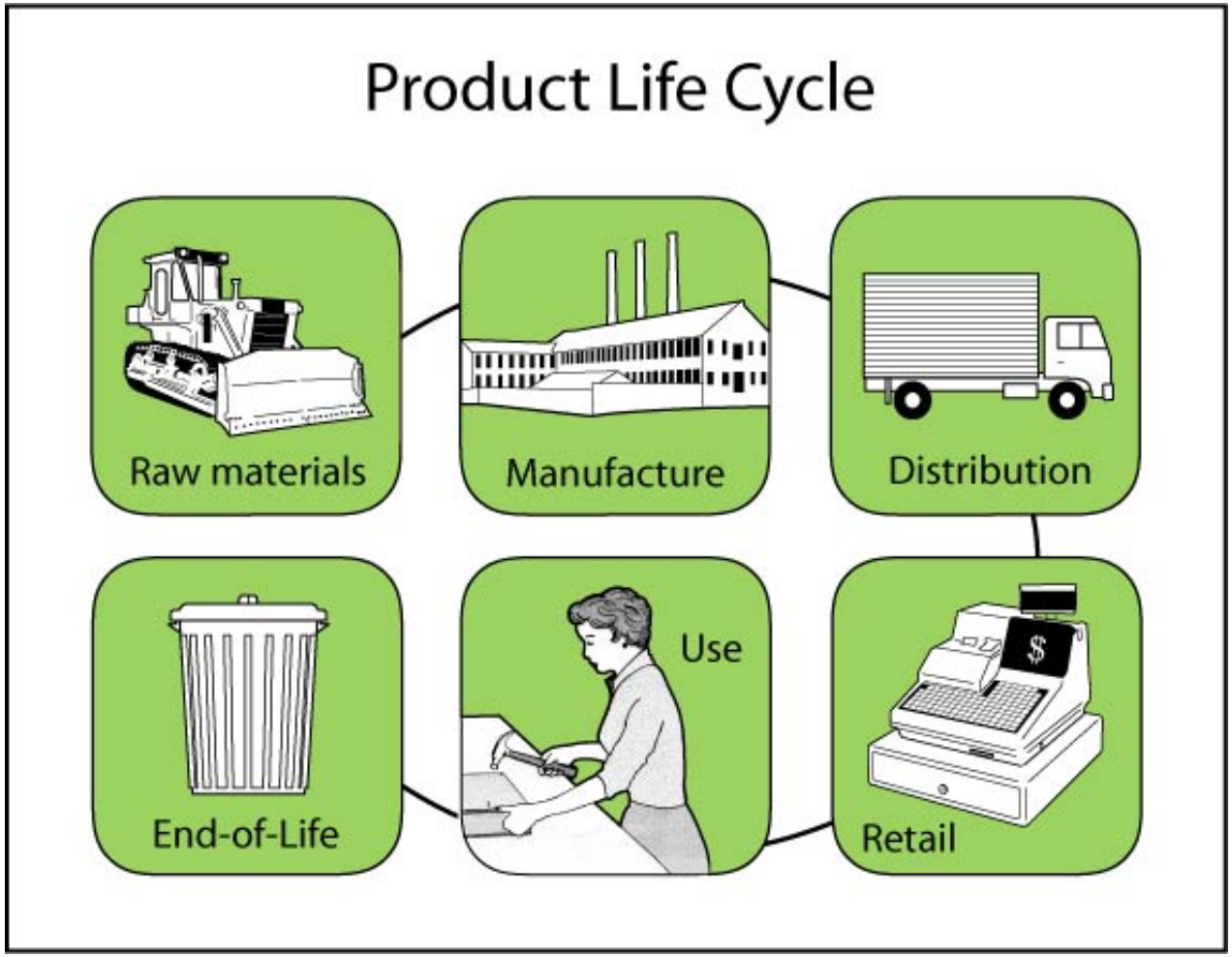
Sustainment design is about integrating the projection of what you are designing with *how* and *why* you are designing it. The assumption is that every product of design exists in a system of relations that exist 'before' and 'after' any specific product. This system includes the product, its users, the environments it depends upon and of course you, the designer. It is the interrelations of these aspects that are modified by design and cause far reaching cultural and environmental effects. The focus of this guide is therefore on working out and designing these relationships as much as it is on the product *per se*—in fact they are considered 'part' of the product. Considering a product as a system of relations is very useful in drawing attention to the cultural context as well as the material consequences of your designs.

The word design is translated in Latin-based languages with a word that is very similar to project, (for instance *progetto* in Italian). This word comes from the Latin *pro-jectum*, that means 'thrown towards'*. Think of your product-to-be as a pebble being thrown in a pond. As it hits the water, it creates a ‘ripple effect’ that moves outwards in all directions. Now run this image backwards. The ripples move inwards, toward the pebble. Sustainment design requires you to jump back and forth between these two dynamics: what your ‘pebble’ will generate and what generated your ‘pebble'. Designing in this relational way is not easy, as there are many variables that will have to be taken into account along the way; the ripple effect always depends for example on a range of other things, like the condition of the water. You are not however striving to make your product 'perfect'. This is impossible, as the stupidity of even the highest-end 'smart' machines when faced with the normal unpredictability of life, show. What you *are* trying to do is to understand what you are sending out into the world, and using this understanding to design more sustainably.

The additional knowledge you secure in the process of relational design can open up choices and opportunities that weren't previously available to you. You can, for example expend your effort in designing more short-life products, giving new ephemeral form to the old, unsustainable habits of our 'throw-away' culture, or you can explore the creation of new forms that embody and communicate sustainment like adaptable, modifiable and modular designs. The process can also sometimes have unexpected results. It is not assumed, for example, that some thing must be designed (though this goes against the grain of *product*ivist logic). It may be more appropriate in a given situation to design a different way of doing things that doesn’t actually require new material forms, such as designing a strategy for the co-operative use and maintenance of products. Arriving at such a design decision would only be possible as a result of understanding the designing relations a product exists within. More radically, this could lead to the 'un-designing' or elimination of a product. (On elimination design see Sustainments newsletter for April 2002).

Go to Examples for 'snapshots' of relational design scenarios.

* From editorial note in Ezio Manzini 'Prometheus of the Everyday' *Discovering Design: Explorations in Design Studies* Richard Buchanan and Victor Margolin eds. (Chicago and London: University of Chicago Press, 1997) 221.


Product Life Cycle
Raw materials
Manufacture
Distribution
End-of-Life
Use
Retail

The **Product Life-Cycle** maps the basic stages of a designed product's life from raw materials (recovery or extraction), through manufacturing, distribution, retail and promotion, use and end of life. This mapping is useful in learning that each designed thing has a past and a future as well as being inseparable from numerous processes. It also lays the groundwork for understanding how all of the material 'inputs' and 'outputs' associated with a product are part of the design of that product, and how understanding those inputs and outputs can contribute to more sustainable designing. The Product Life Cycle forms the basis of Life Cycle Assessment (LCA), a methodology that seeks to understand the main impacts associated with each stage of a product's life. LCA is generally used as a tool to compare the relative environmental merits of similar products or services. Some of the key benefits of LCA however, are in the learning potential of the process rather than the outcome, which invariably and necessarily provides a selective picture. For example, LCA entails communication and collaboration between stakeholders and informs the development of an intuitive sense for the dynamics of the product system ('life cycle thinking'). LCA is part of the International Standard Organisations suite of voluntary Environmental Management Systems called the 14000 standards. For further information on this system of environmental management, visit the International Standards Organisation.

Impact Assessment (IA), which makes up a stage of the LCA process (LCIA), is about evaluating life-cycle inputs and outputs in terms of the significance of their environmental impacts (measured in terms of 'impact categories' such as 'global warming potential' or 'human toxicity'). Like all standardised tools that have grown out of the Ecologically Sustainable Development (ESD) charter, there are many problems associated with accounting for situational differences. The attempt to standardise impact measurements along scientific criteria is also thwarted by the inevitable value-choices involved in the selection of impact categories as they apply to any one product system. Furthermore, the impacts associated with one output, say a particular chemical, will likely impact on air, water, land and animals differently and at different rates.

IA is perhaps more effective as a planning tool used to predict the impacts associated with an activity, say a major building development or even the planning of a city. Again, however, while impact assessment looks and sounds scientific, it is always to some degree a work of interpretation, and can (and has) been used to justify projects that are fundamentally unsustainable. Despite these problems, Impact Assessment is one of the most useful concepts we have encountered because it shows that each designed thing always has effects beyond itself and can be used to promote relational thinking. This guide draws on both the practices of LCA and IA.

For further reading on LCA and IA:
The Centre for Design at RMIT is the key locus for LCA activity in Australia.
The UNEP Production and Consumption Unit provides a comprehensive and useful set of resources on the history, processes and application of Environmental Impact Assessment.
For a look at ways the concept of 'impacts' has been employed as a planning tool to promote design for sustainability, visit the publications archive on the Team DES website.

The Relational Product System

The Product Life Cycle offers a very good way of reading products and mapping their impacts, but it does not

situate products within their functioning environments, which is where most of their impacts occur and where the greatest opportunities can be created for designing sustainments. By focussing too hard on the product and not enough on the product's environments of use or even cultural meanings, overarching problems, like the far too short lifetimes of products, are not addressed.

Industrial Ecology

Industrial ecology is a relatively new field of study and practice that focuses on the relations between industry and the environment and redressing the failures of industry to relate production processes to environmental consequences. It is therefore an important contributor to working toward more sustainable economies and cultures. Growing out of the sciences, industrial practice and policy design, Industrial Ecology focuses on DfE, materials selection, LCA, materials and energy flow analysis, industrial park and organisational design.

For general information on Industrial Ecology, visit International Society for Industrial Ecology at Yale University. It has an international quarterly journal published by MIT Press with IE news and information, a forum and peer reviewed papers.

IE Resources

international society for industrial ecology

governance | publications | membership | ISIE events | home

Welcome to the home page for the International Society of Industrial Ecology (ISIE). ISIE is a new society that promotes industrial ecology as a way of finding innovative solutions to complicated environmental problems and facilitates communication among scientists, engineers, policymakers, managers and advocates who are interested in how environmental concerns and economic activities can be better integrated.

>> ISIE INTERNATIONAL CONFERENCE EXPANDED

>> ISIE STUDENT CHAPTER

>> INDUSTRIAL ECOLOGY IN HIGHER EDUCATION

>> NEW JOBS POSTED

>> ISIE WEBSITE IN JAPANESE

>> MEMBERS-ONLY SECTION -- ISIE MEMBERS LOG IN HERE

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Publications

Each member of ISIE receives the society's newsletter as well as a subscription to the *Journal of Industrial Ecology*, an international, peer-reviewed, multi-disciplinary quarterly published by MIT Press for Yale University and headquartered at the Yale University School of Forestry & Environmental Studies.

- The *Journal of Industrial Ecology* is designed to foster both understanding and practice in the emerging field of industrial ecology. Since its premiere in spring 1997, the *Journal* has provided a forum for continuing exchange of information and opinions through contributions from scholars, environmental managers and policymakers, and advocates involved in environmental science, management, and policy.

- The *ISIE newsletter* is a members-only publication dedicated to providing insider news and information about the ISIE and the field of industrial ecology. If you are a member and would like to contribute news or a letter to the editor please send email to isienews@rci.rutgers.edu.

ISIE Newsletter, Volume 2

Issue 1 (February 2002)

Issue 2 (June 2002)

Issue 3 (October 2002)

Issue 4 (December 2002)

Volume 2, Issue 4

December 2002

ISIE News

Attention Industrial Ecologists

- Catch up on activities in Brazil and Russia
- Read conference reviews and new conference listings
- Attend ISIE II: ***Industrial Ecology for a Sustainable Future*** 29 June – 2 July 2003

Inside this issue:

ISIE II Planners Face an Embarrassment of Riches

Hundreds of Abstracts Have Been Submitted

More than 350 abstracts have been submitted to date for the Society's 2nd major conference. Planners had anticipated space for less than half that number of presentations during concurrent conference sessions. They are now organizing additional paper and poster session opportunities, given the large number of excellent submissions.

Organized by The International Society for Industrial Ecology and The Center for Sustainable Systems (CSS) at the University of Michigan's School of Natural Resources & Environment, the second International ISIE Conference will be held in Ann Arbor, Michigan from 29 June–2 July 2003.

Titled ***Industrial Ecology for a Sustainable Future***, the conference will highlight the contributions that industrial ecology can make towards attaining a sustainable future for the planet and its population. Short courses will provide an opportunity to learn about different IE techniques. Poster and platform presentations will introduce research. Exhibitors will showcase products and services. Ample opportunity will be provided to network and exchange ideas.

Conference co-chairs are Gregory Keoleian of the University of Michigan and Edgar Hertwich, of the Norwegian University of Science and Technology.

Register Early
for the 2nd ISIE Conference in
Ann Arbor, Michigan, USA
(29 June-2 July, 2003).
www.yale.edu/is4ie

Director's Message: Moving Forward

John Ehrenfeld, executive director

As I write this column, 2002 is rapidly drawing to a close. 2002 has been a very good and important year for the ISIE. A few words on what has happened seem appropriate for this issue. The major event for the Society this year was the appointment and election of the individuals and committees that will form the leadership of the ISIE as it continues its move from a fledgling, somewhat informal organization to a more established institution. And not a moment to soon. As Executive Director, I have watched the demands grow well beyond what Beverly Chevalier, the ISIE Program Coordinator, and I can handle.

The ISIE office at Yale can manage the everyday activities pretty well, but the development of policies and a long-range strategy to put the Society on an even keel for the long term needs strong governance. We now have a Council in place to act as the policy-setting leadership together with the President. They face a number of important issues including our relationships with other societies, and developing a strategy for fostering industrial ecology in academia and in its practical counterparts in industry and government. Sorting out the place of industrial ecology in an intellectual world with many overlapping ideas and practices is a daunting, but important task, and one that needs the best thinking our

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Editor's Corner

Closing the Loop **Clint Andrews, editor**

During the past few months I've had an opportunity to visit several universities whose faculty and students participate in the industrial ecology community. I've been particularly impressed with the Ph.D. students I've met.

Some, such as the Clarkson University program in upstate New York, USA, work within a discipline-plus tradition, where they are, say, chemical engineers first, and industrial ecologists second. Others, such as those at Yale University and the Norwegian University of Science and Technology, work in a more purely multidisciplinary environment centered on industrial ecology. Still others, such as those at the Helsinki University of Technology in Finland, study in related fields like environmental management and environmental sociology, but are fascinated by industrial ecological ideas.

These students share a common concern for their professional futures. Discipline-plus students will clearly be the best situated for traditional academic jobs. Multidisciplinary students can do well in industry, government, or the non-profit sectors. But I have a sense that our community is attracting more good students than good jobs. We need to redress this imbalance, preferably by identifying opportunities for bright new Ph.D.s to continue working in this field.

I will continue to visit European colleagues this Spring as my sabbatical continues, so let me know what's up. Email me, or find me in person at the Science Policy Research Unit, University of Sussex, England.

Send your letters to the editor and news about ISIE members to:

Clint Andrews at <isienews@rci.rutgers.edu>

ISIE Leadership Elected

The polls closed on 16 December 2002 for the election of the International Society for Industrial Ecology's first elected President and Councilors. The roster of candidates read like a Who's Who of industrial ecology.

Thomas Graedel will serve as the Society's first President for a two-year term. Braden Allenby will serve as President-elect and will assume the presidency when Graedel's term expires.

Elected Council members are:
3-years René Kleijn and Clinton Andrews
2-years David Allen and Helge Brattebø
1-year Stefan Bringezu and Barbara Karn

In addition to the officers elected, the governing body of the Society includes Kristan Cockerill, Secretary; Mak Dehejia, Treasurer; and a six-person nominating committee (Valerie Thomas, John Holmberg, Claudia Binder, Yuichi Moriguti, Ray Cote, and Anthony Chiu). The editor of the Journal of Industrial Ecology also serves as a Councilor, ex officio.

John Ehrenfeld will continue to serve as ISIE's Executive Director.

ISIE II

The International Society for Industrial Ecology invites you to join us at the 2nd International ISIE Conference:

Industrial Ecology for a Sustainable Future

29 June - 2 July, 2003

The University of Michigan

Ann Arbor, Michigan USA

Special issues to be highlighted are sustainable transportation and sustainable consumption. These will be addressed in special discussions and dedicated discussions.

Find more conference details at the ISIE website **www.yale.edu/isie.**

Click the link for 2nd ISIE INTERNATIONAL CONFERENCE .

New Members of ISIE

Julian Allwood, United Kingdom
Tony Baptista, USA
Sarah Boyd, USA
Tapas Das, USA
Angeline de Beaufort-Langeveld, Netherlands
Panagiotis Deriziotis, USA
Ann Dougherty, USA
Deborah Gallagher, USA
Charles Griffith, USA
Ling Han, China
Ermelinda Harper, USA
Paul Holle, Netherlands
Jennifer Howard-Grenville, USA
Danielle Kahn, USA
Gareth Kane, United Kingdom
Sang Yong Kim, South Korea
Cheryl Laskowski, USA
Kwiho Lee, South Korea
Jens Legarth, Denmark
Michael Lemon, USA
Kim Lenti, USA
Thomas McKone, USA
Daniel Müller, USA
Uyiosa Omoregie, Nigeria
Nigel Potter, Canada
Jean-Daniel Saphores, USA
Graham Street, United Kingdom
Tomhiro Tasaki, Japan
Eino Timola, Finland
Ronald Turco, USA
Melissa Vernon, USA
Joe Wong, Canada
Chunyou Wu, China

Submit Member News notes to ISIE@yale.edu

Conference Listings

Greentech 2002 Conference & Exhibition on Environment Management
January 31-February 1, 2003, Le Meridien, New Delhi, India

Internet Conference on Ecocity Development
February - June 2003, http://seagate.sunet.se/archives/et-frej.html

Fifth International Conference of the European Society for Ecological Economics: "Frontiers 2: European Applications in Ecological Economics"
February 12-15, 2003, Tenerife, Canary Islands, Spain

Final Conference of the Eco-Effizienz Project
February 13-14, 2003, Ausburg, Germany

Take it Back! 2003: Stewardship in the New Economy
February 24-26, 2003, Alexandria, VA

Ninth International Conference on Urban Transport and The Environment in the 21st Century
March 10-12, 2003, Crete, Greece

Eighteenth International Conference on Solid Waste Technology and Management
March 23-26, 2003, Pittsburgh, PA, USA

CERES 2003 Conference: Advancing Sustainable Governance
April 1-2, 2003, New York, NY, USA

Orbit 2003
April 30 - May 2, 2003, Perth, Australia

International Conference on Sustainable Energy, Planning & Technology in Relationship to the Environment
May 14-16, 2003, Halkidiki, Greece

Green Engineering: Defining the Principles
May 18-22, 2003, Sandestin, Florida, USA

2003 IEEE International Symposium on Electronics and the Environment
May 19-22, 2003, Boston, MA, USA

Fourth International Conference on Ecosystems and Sustainable Development
June 4-6, 2003, Siena, Italy

National Association of Environmental Professionals 28th Annual Conference
June 23-26, 2003, San Antonio, Texas, USA

SSGRR 2003 Summer Conference
July 28 - August 3, 2003, L'Aquila, Italy

Second International Society for Industrial Ecology Conference
June 29-July 2, 2003, Ann Arbor, Michigan, USA

Logistics Management 2003
September 24-26, 2003, Braunschweig, Germany

Eleventh International Conference on Modelling, Monitoring and Management of Air Pollution
September 17-19, 2003, Catania, Italy

2003 IEEE International Symposium on Technology and Society
September 24-26, 2003, Amsterdam, Netherlands

International Conference on Sustainable Planning & Development
October 1-3, 2003, Skiathos, Greece

GIN2003: The 11th International Conference of the Greening of Industry Network
October 12-15, 2003, San Francisco, California, USA

2003 Open Meeting of the Human Dimensions of Global Environmental Change Research Community
October 16-18, 2003, Montreal, Canada

Visit the ISIE Web Site for Details About Listed Conferences
www.yale.edu/is4ie

Regional Reports: Tropical and Arctic Industrial Ecology

New Environmental Initiatives in Brazil

Flávio de Miranda Ribeiro

In spite of living in a developing country, Brazilians are becoming very sensitive to environmental issues. Improvements in environmental legislation, increasing numbers of firms using certified environmental management systems, growing interest in cleaner technologies and increasing educational opportunities in the area show that the Brazilian government, production sectors and people in general are aware of the importance of being earnest, in environmental terms.

Nevertheless, in Brazil industrial ecology is still just a concept, taught at universities and present as a theme in academic research. There is growing curiosity within some industries, the most *pro-active* ones, on what it means and how they can take advantage of its new ideas.

Moreover there are several initiatives to use advanced environmental management concepts that move production (and consumption) towards more sustainable patterns. One of these are the establishment of ecoparks (called *Ecopolos*) in Rio de Janeiro State. Stimulated by tax reductions 14 firms joined their strengths to reduce waste and consumption of water and energy. Two of these ecoparks already have been inaugurated, and the expectation is to involve 110 firms in 6 different districts.

> **"[We]** need to develop industrial ecology further as a management science rather than a curiosity-driven enterprise"

Another important enterprise was the creation of the São Paulo Cleaner Production Roundtable, a multisectorial forum to discuss and disseminate related concepts, including industrial ecology. Headquartered at CETESB, the São Paulo State environmental agency (the only Brazilian institution to sign the International Declaration on Cleaner Production, in 1998), this roundtable comprises five working groups that come together periodically.

Yet another important initiative is the Brazilian Life Cycle Institute, a non-government organisation that congregates firms, universities, research institutes, NGOs and government to foster LCA use in the country. Indeed, a great number of research institutes and consultant companies are appearing, suggesting that a great market for advanced environmental practices is emerging.

My colleagues and I in the pollution prevention group at the Universidade de São Paulo believe that promoting pollution prevention techniques, LCA, cleaner production processes and industrial ecological systems are highly effective means to protect our environment and save natural resources. These measures are becoming even more important in countries like Brazil, where there is so much natural richness, or in other words, so much to lose.

Flávio de Miranda Ribeiro<flavio.miranda@poli.usp.br>

Ecological Modernization in the Barents Region of Russia

Clinton Andrews

This frigid northwestern corner of the former Soviet Union is a hinterland with a difference: not only is it a mining center, where towns have utilitarian names like *Nickel* and *Apatite*, but it was a closed military region throughout the Cold War. The recent tragic sinking of the submarine *Kursk*, off Murmansk, symbolizes the origins and nature of the region's current environmental problems.

The good news is that there are serious efforts underway to improve the environmental situation in the Barents region. Indigenously, the Kola Science Center of the Russian Academy of Sciences (which has had an Industrial Ecology Institute, so-named, since 1989) has completed a remarkably thorough baseline characterization of environmental conditions in the region, responding in part to allegations by Scandinavian countries of transboundary pollution. Radiological maps clearly identify a few military hotspots such as the nuclear submarine base in Murmansk, but they also identify mining enterprises as an important source. Air pollution maps show the devastating effect of nickel smelting on downwind landscapes (also familiar to North Americans who have visited Sudbury, Ontario). Yet counts of flora and fauna—and of hunting and fishing takes—seem to suggest that the environmental damage has a relatively small geographic range.

More problematic for today's Russians is the economic status of the Barents region, which has lost military significance and remains vulnerable to the boom-bust cycles associated with the mining industry. A multi-country research consortium has been created to strengthen regional economic ties and to invent new development strategies. The Barents Euro-Arctic Council includes Russia, Finland, Sweden, Norway, Denmark, Iceland, and the European Commission. Recent efforts have documented that there are relatively weak and unidirectional links, involving primarily Russian retailers distributing foreign products to Barents markets.

A workshop organized by Janne Hukkinen at the Helsinki univer-

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Membership Renewal

If you haven't already done so, be sure to renew your ISIE membership.

Renew online at www.yale.edu/is4ie/onlinemember.html

Conference Reports

Special Report from the Joint ISIE/SETAC Symposium

Ottar Michelsen

ISIE joined with the Society for Environmental Toxicology and Chemistry (SETAC) to organize a conference in Barcelona, Spain on 3-4 December 2002. This was the second time around for the two organizations.

In November last year, SETAC held the 9th LCA case symposium in connection with the first conference for ISIE in the Netherlands. The intention was, of course, to enable people to take part in both conferences and to generate closer connections between the two organisations.

This year a majority of participants took part in both conferences and it seemed like most appreciated the joint event.

SETAC held the 10th LCA case symposium with emphasises on recycling, close-loop economy and secondary resources. Reuse of construction materials turned out to be a hot topic at the moment and several studies were presented. An ever-returning question was how to include land-use changes and impact on biodiversity. There seem to be a striking need to work further on this topic.

In the ISIE meeting the scope broadened out, and it is obvious that most people working with IE regard LCA as only a part of the field. The topic of the meeting was "Industrial Ecology: From theory to practice" and included aspects such as chain management, closing loops, use of environmental indicators, mapping of material flows and organisational dilemmas in environmental work.

More information about the joint symposium is available at the SETAC web pages: http://www.setac.org/lca10.html

Ottar Michelsen <ottar.michelsen@iot.ntnu.no>

Lifecycle Approaches to Sustainable Consumption

Edgar Hertwich

Sustainable consumption is an issue that receives increasing attention of both the scientific and the policy community. It was a confluence of research and policy interests that brought together a diverse group of researchers for a successful workshop titled "Lifecycle approaches to sustainable consumption." The workshop, held on 22 Nov. 2002 at the *International Institute for Applied Systems Analysis* (IIASA, Laxenburg, Austria), was supported by the Japanese *National Institute for Advanced Industrial Science and Technology* (AIST) and endorsed by the *United Nations Environment Programme* (UNEP). The workshop was a first of a series of workshops to be organized by the research center for life-cycle assessment of AIST as part of a 3-year research project designed to help Japan meet its CO2 targets under the Kyoto protocol in part through efficiency increases and changes in consumption and use patterns on part of consumers.

The workshop was organized as a staccato of short presentations. The presenters came from a wide range of backgrounds, including energy analysis, life cycle assessment, consumer economics, and marketing. The first session focused on methods to assess the environmental burden from household consumption. The second session focused on economic and social aspects of consumption. Communication and consumer behavior was the focus of the next session. The last session focused on the life cycle of products and services.

Here are a few highlights. Mark Goedkoop and Durk Nijham presented an analysis of the environmental load of Dutch households. The work presented is, to my knowledge, the first analysis of this type to take into account the differences between the emissions intensity of products produced domestically and those imported. Harald Thorne-Host, using Norwegian cars to illustrate, questioned whether efficiency increases were sufficient to achieve sustainable consumption, given the rebound effect and

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Conference Reports

Industrial Ecology Shows Strong Presence at NATO Workshop on Sustainability

Kristan Cockerill

In October 2002 NATO sponsored a workshop in Maribor, Slovenia on Technological Choices for Sustainability. Explicitly and implicitly, industrial ecology was a prominent feature at the meeting. Although seeing NATO and sustainability in the same title seems a bit odd at first, it reflects the growing understanding that the idea of sustainability is far reaching and has relevance for all organizations and all issues.

The meeting prompted lively discussion about what questions we need to address and generated ideas for integrating sustainability in unique ways. While the meeting was intended to focus on how scientists and engineers can contribute to sustainability efforts, many of the speakers acknowledged that technological choices cannot be segregated from social and cultural issues.

"seeing NATO and sustainability in the same title seems a bit odd at first"

The workshop emphasized sustainability metrics and presentation topics ranged from thermodynamics to pedagogy to tapping new food supplies. The diversity was reminiscent of the 2001 ISIE meeting in the Netherlands (although on a much smaller scale!). Two talks included industrial ecology explicitly as the subject matter. Scott Butner from Pacific Northwest National Laboratory presented a paper suggesting that industrial ecology has become synonymous with industrial symbiosis and that there are gains to be had by extending the metaphor to other ecologic concepts such as biomimicry and temporal progression to address sustainability concerns. I presented the results from my research documenting that industrial ecology is being introduced in higher education largely in technical disciplines and the implications that this continued focus on technical aspects may have on IE's ability to advance ideas in sustainability.

While not explicitly using the moniker industrial ecology, numerous talks were clearly IE-relevant. David Shonnard at Michigan Technical University presented the Green Engineering textbook project that he has developed with David Allen at University of Texas and with the U.S. Environmental Protection Agency. Peter Salinger, representing multi-national corporation BASF, discussed their program to include eco-efficiency analysis in making decisions about products and processes. Alexander Komarov of the Russian Academy of Science presented a model for analyzing various silvicultural regimes to develop sustainable forest management practices. Roland Clift of the University of Surrey talked about the tendency for supply chains to "export unsustainability" and metrics for ensuring that social benefits are included in sustainability assessments. Other papers covered eco-efficiency reporting, cleaner production strategies, and environmetric strategies.

Meeting organizers, Subhas Sikdar at the US Environmental Protection Agency, Peter Glavic at the University of Maribor, and Ravi Jain at the University of the Pacific, did an excellent job in ensuring that attendees represented the diversity within NATO, including nations recently invited to join the alliance. Structured much like Gordon Conferences with everyone present for all sessions, the gathering provided tremendous opportunity for attendees to interact and to learn about research being conducted and applications being developed throughout Europe –east and west.

The intersections between industrial ecology and making technological choices seem obvious to researchers and practitioners who have positioned themselves within industrial ecology. Seeing industrial ecology as an integral part of a meeting focused on sustainability reflects IE's growing presence as a tool for achieving a sustainable future. The workshop's lively discussions about what it will take to make sound technological choices reflected clear links to the ongoing discussions about what industrial ecology is and what it should and can do to promote sustainability. Workshop products will be published.

Kristan Cockeril <kmcockerill@dowbiggin.com>

NATO Workshop on Environmental Risk Comparisons Inspires Collaborations

Clint Andrews

Comparative risk analysis was the focus of another NATO workshop in Anzio, Italy on 13-16 October 2002. With 22 participants representing 19 nations, there was a broad range of opinions and experience regarding risk assessment. Where other forums have pitted advocates of risk assessment against advocates of the precautionary principle, this group reframed the problem. Their recommendations focused on balancing the demands for both substantive and procedural rationality, or put differently, for recognizing that risk assessment and communication are interdependent.

Participants from the Mediterranean and Black Sea regions saw their cultural diversity and similar environmental problems as a research opportunity: Italian, Greek, Spanish, Turkish, Bulgarian, Russian, Jordanian, Israeli, and Egyptian scientists have inaugurated efforts to compare how their populations respond to similar water supply problems.

The systemic approach and long term perspective for which industrial ecology is known were present at this workshop, accompanied by a focus on what it takes to turn environmental knowledge into sound public and private decisions. For more, contact workshop organizer Igor Linkov <igor.linkov@icf.com>.

Clint Andrews <isienews@rci.rutgers.edu>

Conference Reports

Environmental CyberInfrastructure Planning

H. Scott Matthews

This workshop took place on 30 October-1 November 2002 in Boulder, Colorado, USA, and it was sponsored by the U.S. National Science Foundation and the National Center for Atmospheric Research. For those of you unfamiliar with the terminology, CyberInfrastructure (CI) is an NSF/research community buzzword for the development of a near-term hierarchy of support for everything from operating systems, through software and instrumentation, all the way up to complex computer modeling. In effect, CI will be a significant focus of future U.S. NSF funding as they try to ensure that the necessary 'basic needs' of the research community are being met. Nearly all of these activities will be relevant to those of us doing research in industrial ecology. Our work depends on understanding the links between identified environmental or ecological stressors and their impacts.

The environmental component of 'CI' is effectively everything from sampling up to climate change models (that's obviously quite a large range). NSF has already prepared white papers on the needs and requirements of CI, and the purpose of this workshop was partially to develop a white paper specific to environment.

There's the obvious concern within the community that the 'environmental' component will not get its fair share, and that Information Technology Research-type programs will result that tend to be dominated by purely technical and generic network and computational proposals - and that those are what will be funded. Thus the goals were to identify the low-hanging fruit as well as the longer-term issues and approaches to support them.

The invited audience of roughly 100 people - mostly environmental science/ecological types, I might add - really covered the spectrum. The workshop really depended on the work of 4 working groups: Collecting and Making Data Available, Generating and Using Data, Collaboration Tools and Strategies, and Creating a New Kind of Environmental Scientist.

I chose the fourth group, which was basically an educational panel (I.e. 'How to educate the next generation?'). Our working group really tackled the educational issues. You'll all be happy to hear that interdisciplinary efforts are one of the main impetus behind the push to realizing progress in ECI. However, there will remain a large fundamental computer/technology component of all work. Another major part of our discussions was the need to link the entire "K-16" educational system, in many cases by infiltrating the existing overloaded curriculum rather than creating new courses.

Highlighted needs from the other three other groups include: global support for data archiving and interconnection; citation rules for constantly-evolving datasets; hierarchical plans of funding responsibilities from all federal agencies; the need for structure, process, and protocol in data development and access; biodiversity data and analysis; funding support for digital libraries; computer model code sharing; and access to supercomputing power and processes for data analysis.

This was a very high-level workshop, and I was pleased to participate. The initial draft of the working paper should be coming out soon, but if you are interested in seeing the complete agenda of the meeting, or the ongoing progress, you can track that at the website:http://www.ncar.ucar.edu/cyber/index.htm

H. Scott Matthews <hsm@cmu.edu>

Barents Region Industrial Ecology

(continued from page 4)

sity of Technology on 9-10 December 2002 focused explicitly on industrial ecological approaches to the problems of the Barents region. A small, high-level group investigated descriptive issues (what's known, what's not) and prescriptive issues (what should be done). Workshop participants identified several potential technical projects to develop optimal multi-mineral extraction and processing schemes, find uses for mine tailings, and manage market volatility. They also recognized that the Barents region is a perfect natural experiment on how institutional context (Soviet communism vs Russian capitalism) affects industrial ecosystem structure.

Among the important findings for the broader research community were the need to develop industrial ecology further as a management science rather than a curiosity-driven enterprise, and to recognize that the industrial ecology field contains several distinct learning communities with equally valid research agendas on environmental, technological, and socioeconomic issues. For more go to http://www.hut.fi/Units/Civil/EM/BarentsWorkshop.html.

Clint Andrews <isienews@rci.rutgers.edu>

Conference Reports

Lifecycle Approaches to Sustainable Consumption

(continued from page 5)

rising affluence. Faye Duchin extended the metaphor of product-life cycle and applied it to social life cycles, showing the environmental importance of social transitions, such as going from being a student to starting a family. Pål Strandbakken and Eivind Stø introduced an investigation of the importance of eco-labels in five European countries. While most respondents in Germany and Norway would identify their national labels, the type I eco-label (the Blue Angel and White Swan, respectively), they did not know the EU flower eco-label. They actively consider eco-labels in decision making about consumer products such as toilet paper. In Italy and Spain, the most of the respondents
did not know the eco-labels, but were interested in the environmental impacts of hotels and vacations. Andreas Biel presented evidence that negative ecolabels were universally effective, while only environmentally concerned groups responded to positive ecolabels. Kirsten Gram-Hanssen showed that the energy use of identical row houses or flats in Denmark can vary up to a factor of 3, confirming the importance of user behaviour.

For more information go to http://www.iiasa.ac.at/~hertwich/. For information on future workshops and activities, try http://www.uneptie.org/sustain and http://unit.aist.go.jp/lca-center/english/top.htm.

Edgar Hertwich <Hertwich@iiasa.ac.at>

Job Postings

Endowed Professorship Holcim (US) Inc. Professorship of Sustainable Enterprise, and Faculty Director of the Corporate Environmental Management Program. University of Michigan Business School, Ann Arbor, MI, USA.

Faculty Position in Life Cycle Assessment. Iowa State University, Ames, Iowa, USA.

Fellowships in Science, Technology and Public Policy , Kennedy School of Government, Harvard University, Cambridge, MA, USA

Professor of Environmental Policy Sciences, Institute for Environmental Studies of the Faculty of Earth and Life Sciences. Vrije Universiteit Amsterdam, Amsterdam, The Netherlands.

Research Assistant (Ph.D. student) for agent-based modeling of industrial ecosystems, E.J. Bloustein School of Planning and Public Policy. Rutgers University, New Brunswick, New Jersey, USA.

Visit the ISIE Website for Details About Listed Job Positions
www.yale.edu/is4ie

ISIE Website Features

General Features

- Conference Listings & CFP Announcements
- Dissertation Listings
- *ISIE News* Back Issues
- Job Postings

Members Only Features

- Membership Directory
- Membership Statistics
- Special offers for ISIE members
- Announcements
- Latest issue of *ISIE News*

New Tools & Websites

Linking To (and From) Industrial Ecology

Reid Lifset

Lists of links to websites are so ubiquitous as to be annoying. Yet, well focused and annotated lists can be useful and stand out from the crowded world that is the Internet. Thus, it has always been a challenge for the *Journal of Industrial Ecology* (*JIE*) to identify appropriate links to carry on its website. Exacerbating this predicament has been a steady flow of requests to carry links to other websites. Given industrial ecology's vast topical interests, deciding which links belong and which do not, could be a full time job all by itself–and one that could make as many enemies as friends.

In addition to the central website maintained for the *JIE* by MIT Press at <http://mitpress.mit.edu/JIE>, the *JIE* maintains an ancillary website at <www.yale.edu/jie>. This latter website contains information that does not fit well into main website because of the constraints of the format used by MIT Press for its journals. It is on this ancillary site, for example, that the list of IE-related dissertations (that is now on the ISIE web site) was launched. This website contains–with a little trepidation– several sets
of links thought to be of interest to the industrial ecology community:

- Bibliographies of industrial ecology publications,
- Published research agendas related to the field,
- Special issues of other journals on topics related to industrial ecology,
- Manufacturing and environmental management information by industry sector,
- On-line environmental calculators, and
- Group and member lists of environmental experts

Given the porous boundaries of the field, no effort has been made to make the set of lists all-encompassing as this would be a quixotic task. Instead, categories of links that have well defined boundaries and appear to have specific value to the industrial ecology community, or not be duplicated elsewhere, have been chosen. Some of these categories of links are experimental. The *JIE* and the ISIE are looking at how to better coordinate their respective web resources as part of the overall evolution and integration of the two. Please contact the *JIE* if you have suggestions of links to add to the list.

Reid Lifset, Journal of Industrial Ecology
<indecol@yale.edu>

ISIE Student Chapter: Get to Know Us

Anahita Ahmadi

Industrial Ecology graduate students are enrolled in a real diversity of doctoral programs. Get to know a few of them by reading below. We will update the ISIE student chapter website soon after the holidays with all of our members' information, including their research interests. The Student Chapter wishes you all the best during the Holiday Season!

Amit Kapur is an advanced doctoral student at Center for Industrial Ecology, Yale University. His research focuses on building scenarios for copper use to estimate future developments on regional and global levels with respect to resource use, environmental burdens, and technical advances. The scenarios would serve as a benchmark tool to define indicators and formulate possible policy and technological interventions to address sustainable management of copper. Amit's dissertation builds on the extensive work done on the contemporary global copper cycle as part of the Stocks and Flows project at Yale.

Anup Bandivadekar is pursuing the Technology and Policy Program (TPP) at Massachusetts Institute of Technology (MIT). The mission of TPP is to provide an integrative education to scientists and engineers who wish to lead in the development and implementation of responsible strategies & policies for exploitation of technology for the benefit of their communities. Anup is working with Professor John Heywood in the Sloan Automotive Laboratory on assessment of technology alternatives and policy options, on both the demand and supply side of the automobile market, in order to reduce the fuel consumption of the U.S. light-duty vehicle fleet. He believes that the IE framework provides a great deal of insight in studying complex policy problems such as this.

Brendan Williamson is a Chemical Engineering Ph.D. candidate in the Environmental Manufacturing Management (EvMM) program at Clarkson University. EvMM promotes the development of a research topic by the student in conjunction with an industrial internship. Brendan's cohorts (including myself) went to Xerox in the summer of 2000. From this came a co-authored publication presenting a life-cycle inventory of black toner, which showed significant gains in the recycling of toner both within the manufacturing process and from consumer waste returns. Future research will focus on toner particle separation by density. Particle separation is a key to recycling toner from increasingly ubiquitous color copiers and printers.

Next time we will profile students in programs outside the USA.

Anahita Ahmadi <ahmadia@clarkson.edu>

ISIE

International Society for Industrial Ecology

Industrial ecology has been defined as "the study of the flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of resources" (White 1994).

The International Society of Industrial Ecology (ISIE) promotes industrial ecology as a way of finding innovative solutions to complicated environmental problems and facilitates communication among scientists, engineers, policymakers, managers and others who are interested in how environmental concerns and economic activities can be better integrated.

International Society for Industrial Ecology
c/o Yale School of Forestry
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Director's Message: Moving Forward *(continued from page 1)*

community can provide.

We continue to grow by about 10 new members a month. Slow but steady. As we grow in numbers, we also grow in interests. There are now several smaller informal 'work groups' formed or forming around sub-topics of industrial ecology. We will need to develop a policy and mechanisms to support these groups beyond the ad hoc way we have addressed their needs so far. The unexpectedly large number of abstracts submitted (over 350) and requests for time for side meetings for the 2003 meeting raise questions about the need for extending the meeting or perhaps holding it annually. We are continually adding functions to the ISIE website. But now after a few years we need a more formal plan. Our 2002 experiments with joint meetings in Japan and Europe were quite successful, and we need to think about more formal arrangements.

Then there is the always present concern about financial stability. We have in place a Treasurer and Finance Committee to produce a financial strategy that will keep us healthy once the grants that were instrumental in getting us going run out in 2003. Their task is also daunting, as our present dues structure cannot support the activities of the Society including the bundling of the *Journal*.

Finally, many of you have asked me what the new governance structure means for my continuing involvement. I do not see much change and look forward to continuing for at least a couple more years. I accepted this job always expecting to work with an elected body and look forward to working with them. In any case, I have been working from the start under the guidance of our ad hoc Steering Committee which now dissolves. Let me finish this note by expressing my personal thanks and those for the membership at large to the members of the Steering Committee, which has provided the policy and strategic guidance in anticipation of the formal structure we now have. So as it is said, "Ca plus le change, ca plus le meme."

John Ehrenfeld <john.ehrenfeld@alum.mit.edu>

Recycling

Recycling has been criticised in recent years for being quite an energy intensive process (particularly when there is a demand to 'conceal' the first life of a product, as with pure white, recycled office paper), and for not having enough impact on the unsustainable expansion of material culture. In the case of the increase in 'recyclable' disposable products like cameras, it could be argued that it is even promoting this expansion. Recyclate should be treated as a scarce resource, certainly not as a justification for a new product.
If you are interested in the recycling debate, see Tim Cooper's *Beyond Recycling* paper.

Centre for Sustainable Consumption

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The Centre for Sustainable Consumption was established to respond to the need for greater understanding of sustainable consumption. Its research focuses on consumer behaviour and the environmental impact of household goods.

Product Life and the Throwaway Society Seminar, 21st May 2003, Sheffield Hallam University

What do we offer?

- **consultancy services** for industry on consumer attitudes and household behaviour, to assist in new **product development** and effective **waste management**
- **expert advice** for government and non-governmental organisations (NGOs) on strategy and policy relating to sustainable consumption, waste and the environmental impact of consumer products
- increased public understanding through high quality **research and teaching**, often in collaboration with other academic institutions

One of our primary areas of expertise is in the **life span of household goods**. Staff contributed to the 1994 New Economics Foundation report *Beyond Recycling*, the 1997 *Eternally Yours Congress* in the Netherlands, and the E-SCOPE report *Prospects for Household Appliances* (summary here, copies available on request). Staff will be speaking at the Eternally Yours conference *Time in Design* in October 2003.

We have a research programme on product-service systems, and in 2000 produced a report, *Products to Services*, for Friends of the Earth.

An interdisciplinary seminar exploring the relationship between consumption and Christianity in the context of sustainable development was held in 2002. The proceedings are available, price £10, from Danielle Green at the address at the foot of this webpage.

In recent years, we've worked for a wide range of private and public sector clients, including companies, local authorities and environmental organisations. Centre leader Dr Tim Cooper acted as Specialist Advisor to the House of Commons Environment Select

Committee for its enquiry *Reducing the Environment Impact of Consumer Products*.

Our current work includes:

- a European Commission project on consumer acceptance of product-service systems
- a project using quantitative and qualitative methods to investigate the impact of consumers on product life spans
- a series of case studies on the UK market for the repair of household goods
- a study of the potential for product life span labelling
- delivering postgraduate and undergraduate teaching programmes

The Centre is supported by the School of Sport and Leisure Management and partly funded by the Art and Design Research Centre (ADRC) of the School of Cultural Studies. Its output formed part of the ADRC's submission in the last Research Assessment Exercise, which was ranked 5.

Due to the multidisciplinary nature of our work, staff involved in projects include specialists in consumer behaviour, design, engineering, economics, food, energy and environmental management.

Further information is available from **Tim Cooper**

 0114 225 4838

 0114 225 2881

 t.h.cooper@shu.ac.uk

- Leisure Industries Research Centre
- Food staff biographies
- Back to Food home

School of Sport and Leisure Management, 1140 Owen Building, City Campus, Howard Street, Sheffield S1 1WB Telephone **0114 225 3506** Fax **0114 225 2881** E-mail slminfo@shu.ac.uk

1. Design Precedents

Because we need to understand more about how we have designed in the past in order to design more sustainably in the future, we need to start the design process with an understanding of what kinds of things have a determining influence on our designing. This might sound a bit nonsensical, but it really isn't. No design is 'original' in the sense that it has no heritage. Everything we design has some design precedent in the world and in our minds. For example, even if a piece of music sounds entirely new, with careful listening a mix of recognisable elements will emerge that nonetheless together in this new form might 'break new ground'. So before we begin designing anything, we have to carefully consider these precedents and what we can learn from them.

Exercises:

1 Create 3 headings across a page: Me; Product; Uses.

2 Under 'Me' write a short (20 word) statement about why you are designing this product. Then list all of the ideas you have or are starting to assemble related to this task: other designs you have seen and your impressions of them; elements you want to incorporate but you are not yet sure how to; influential images and other cultural forms. What is your overall impression of your product-to-be, what do you want it to communicate to the world?

3 Thinking about what needs your product must serve, what it must be able to do (function) and over what period of time, list under 'Product' as many specific products as you can that already do some or all of these things, even if not made specifically for the intended purpose. So for example, if you are designing a display for notes, messages, reminders (noticeboard) you might also list 'refrigerator' as a precedent.

4 Under 'Uses' list all the ways that you know people use the above products: how often and when are they used, are they used differently in different environments? What habits have they created: do people use them carefully and look after them or are they run fast and hard until they fall apart? You may need to interview users of these products to get a good picture of the range of these uses (See User Research on the left menu).

5 Select a 'proxy' product to work with. If possible, it should be nearing the end of its use-life. This product should be a 'benchmark' that is, what you consider to be the next best product around to what you are designing, perhaps a 'competitor'. By the time you finish this guide, you will know this product inside out and rather than replicating its successes, should be aiming to learn from its errors. The point here is to support front-end decisions by learning more about their consequences.

2. Secondary Products

One way of understanding the idea that design itself designs both in terms of and beyond its designated function (see Relational Design), is to think of these aspects as 'secondary products' that bear material implications. What we now need to do is use the information we gathered in the previous exercise for some future planning. What will your design in turn, design? This is how we start to discover impacts and what we need to find out about them. We can then use this information to reflect upon on our design plans.

Exercises:

1 Create three headings across the page: Materials; Meanings; Uses.

2 Using your proxy product, list under 'Materials' as many of the material relations this product depends upon as you can. Leaving aside for the moment what the product itself is made out of and the impacts associated with that, here we are concentrating on the use-phase of your product's life and the reference material flows it entails. What resources will your product itself need in order to operate (energy sources, water, cleaning products, labour) and at what rate over time; what other associated products will it need (for example notice-boards need pins or magnets; pens need paper, refills, pen holders, pencil cases, liquid paper etc.)?

3 The category of 'Meanings' is a little less straight forward. Meanings depend on the relationship between a product and its users: it refers to the perceptions your product will generate and depends upon over its life.

- How do you think the designer of your proxy product would have answered the following questions?

- What will your product be valued for?
- What kinds of feelings do you want it to create in its users?
- What do you want to be remembered about your product?
- How do you want the relationship between your product and its user/s to evolve?
- Now how would you answer them about your product?

As a starting point, go back to Step 1 where you listed impressions about what you want your product to communicate and why. In Stage 7 we will take the idea of designing meanings further, into the category of product styling.

4 The category of 'Uses' in this stage refers to the practical relations your product will create over its useful life. Who will use your product and how/why will they use it? Imagine a specific user, perhaps your 'ideal' user and describe them in as much detail as possible. As you discovered in Step 1, product users intervene in the intended design of products and create their own uses, which can radically alter the impacts of the product. You are now in a position to double guess some of the unintended interventions of users and increase the *usability* of your product, which has materials circumvention or 'Dematerialisation' potential. Looking carefully at your proxy product, Are there any uses that you think its designer failed to account for and what tells you this? What secondary uses do you think your product might invite?

3. Some Questions about *need*

This step is about justifying the existence of your product. This is probably the most difficult stage, because we are usually itching to get to the making of things. So why should you have to do this? Partly because, as strategic designer Professor Ezio Manzini has said, the world is full of too much making and not enough designing. In other words, we live in a world abundant with unsustainable products that are half thought through at best, mostly designed on 'autopilot'. Software encourages the full rendering of partly realised ideas and the time frame between concept and manufacturing has become shorter and shorter. In these conditions, we have to think much more carefully about needs.

The question about what we need is a very difficult one to answer in our consumer-driven culture because *wants* have become indistinguishable from *needs*. A successful product sets up new parameters of need, but with far too many products, the needfulness of these needs falls apart under the most cursory consideration (you would have noticed, for example, the almost hysterical ergonomics of recent toothbrush design, and perhaps asked yourself do we really need such multi-textured, multi-coloured, hyper-flexible toothbrushes? Not only do these toothbrushes have a bigger bill of materials, require more manufacturing, marketing and packaging, but suddenly, they make a plain handled toothbrush, even one with a replaceable 'head', look 'poor quality'!). We need to learn what it is we need—we can't just rely on our intuitive feelings about needfulness.

The ways in which we currently meet our need to 'create' or 'make' for example, also adds to the problem of over production. Our current ecological circumstances clearly indicate that we need to learn to design for less materially intensive ways of living and working. So you need to ask yourself: is your product needed, why is it needed, can this need be met in other ways that reduce the need for yet another product in the world? Design for sustainability means asking yourself these questions and finding new ways of answering them. This implies a process of reflection, discovery and change.

Exercises:

1. List the needs your proxy product meets.
2. Briefly indicating the implications of each of the following, consider how else these needs could be met, for example:
3. Could these needs be met by a *service* rather than a product?
4. Could these needs be met by *sharing* an existing product?
5. Could these needs be met by *modifying* an existing product?
6. In Step 1 you were asked what needs your product will serve and what products already meet these needs. Now go back to your response and think about these needs again. List them in priority.
7. Are all of these needs clearly needed? Why?
8. How will your product meet each of these needs more effectively and successfully than previous products?
9. What needs not being met by other products will your product meet?
10. What future 'needs' might your product *invent*?

4. Projected Use-Life

Many life cycle analyses demonstrate that the most materially and energy intensive part of the product's life is the use phase. (If you have not yet done so, look at Product Life Cycle for the methodology of LCA). In fact, the use phase of a product's life is crucial to consider for several key reasons.

Product lives are mostly determined by how long we use them for. But this is often more a measure of how they look than their usefulness. Our cultural habit of throwing things away before their material lives are over ripples back to the production side, encouraging the design of short-life, 'disposable' products. Short-life products are also the result of comparative functional obsolescence, particularly with technologies. So we are encouraged to buy 'the latest' technologies, even if we never take advantage of their suites of new 'whiz bang' functions. Carefully considering how products are used provides a designer with a lot of cultural information, which can lead to the emergence of new product concepts. How we use designed things determines how we value them, how long they will last and what kinds of products we will want to buy in the future. A careful consideration of these factors in the design process can even circumvent the need for environmental management strategies like recycling, by putting design for reuse first.

This stage is particularly concerned with what we can learn about designing for use-life from a *materials* perspective. In Stages 7 and 9 we incorporate other use-life considerations, like interface semantics and semiotics, though as you will see these aspects need to be considered in relation.

Exercises:

1 Following on from what you noted about your proxy in Stage 2, answer the following, as applicable:

2 What does the appearance of the product tell you about its handling, i.e. what parts look most worn out, what parts look unused?

3 Are the worn parts of the product integrated or are they able to be replaced?

4 Do you think this product has been shared or mainly used by a single user?

5 Do you think the product has been well cared for? Why?

6 Is the product hard to clean or care for?

7 Do you think the materials chosen for this product support or detract from its durability in use?

8 What amendments might you make from a materials perspective, to extend the product's life?

9 How long do you think your proxy product was designed to last for? What tells you this?

10 Is the product reusable, upgradable, disassemblable?

11 Does the product indicate to you how to manage its materials at the end of its life?

12 Now referring back to 'Uses' in Stage 1 and 2, map out the intended or 'ideal' first and subsequent use-lives of your product, for example it is a short-term product that can be reused several times for the same purpose (e.g. most baby products) or perhaps a long-life, adjustable product (e.g. some baby products: chairs and beds)? Considering what you have learnt above, write a general description of the material requirements needed to support this and subsequent use-lives of your product, for example, "my product needs to be made from durable, non-toxic materials that do not scratch easily, maintain their appearance and that are easy to clean. The least durable parts (for example, fabrics, foam backings) need to be easily and entirely removable, surface fabrics need to be dark and reinforced in certain areas. All materials need to be joined without adhesives so they can be easily pulled apart at end-of-life. Now consider the following:

13 How will you ensure your product is resource efficient during its use i.e., how will you design it to use less or no energy, water, chemicals for its operation and maintenance?

14 Can you design out the need for exterior sources of energy (e.g. utilise manual pumps or passive body heat?)

15 Will the product be at all hazardous to its users and in what circumstances? Will it give off fine particles or fibres, off-gas VOCs, emit endocrine disrupters? How can you modify any hazards this product may pose to users, or how can these be made obvious to users?

16 How will users learn how to best use, maintain, repair, reuse and prepare your product for end-of-life processing? What if any of these instructions will be embedded into the product materials; will you employ labels, embossing, manuals or ongoing support services?

5. Lean Design

One of the biggest problems we face is the inappropriate application of materials, i.e. high quality, highly environmentally impacting plastics making up mostly short-life, 'disposable' products. These materials are being wasted. Following on from the requirements you have established in projected use-life, this stage asks you to carefully consider the material commensurability of your product: how appropriate are the materials chosen for this product? Lean design is not, as the term might suggest, simply about production-side 'lightweighting'—which is often cited as a way to slash the energy bill of products (embodied and/or in use-life) as well as the overall costs of manufacture, transport and end-of-life materials 'output'. While important, this is only part of the picture if the overall volume of products continues to increase, if production and end-of-life management is more environmentally costly, or if these products afford more materials intensive uses. And there might in fact be good reasons to create a comparatively materials intensive product (for example replacing a lightweight, recyclable product package with a long-life, durable, multi-use product dispenser or container). This stage is about getting you to start to think more 'culturally' about materials: how certain materials tend to 'communicate' certain meanings. The choice of materials in a product can, for example, play a major role in whether users will bother to care for it and consequently how long it will 'live' for. This process can also be habit changing: it can circumvent the need for a user to purchase a range of similar products. A key ambition of the lean design principle is to modify the desire for the accumulation of lots of things as well as encourage a more careful, forward-thinking 'consumption'. The following questions should be answered intuitively. Make a note of what you can't answer as Step 6 is a more detailed materials research exercise.

Exercises:

1. Compile a materials audit of your proxy product including if possible packaging, noting any materials that you do not recognise or know about.
2. What is the nature of your knowledge about these materials—why do you think these materials have they been used in this particular product?
3. What kinds of inherent qualities do these materials possess?
4. What do they 'say' or mean to you, what do they bring to mind?
5. How does the product packaging relate to the actual product: are product and packaging materially and/or symbolically commensurable (e.g. a 'green' cleaning product packaged in durable, reusable cleaning gloves; a paper product that doubles as its own envelope or package)? If not, can you see how product and packaging might be integrated?
6. How else do you think the number and amount of materials used in this product be could be minimised?
7. Can the product be made to fold, nest or otherwise reduce in transport volume (related to Stage 8)?
8. Do you know whether the materials in this product include heavy metals, toxic substances, persistent organic compounds?
9. How do the materials in this product interface with each other—for example are components glued together, welded, snap-locked, and how do these interfaces impact on the end of life management of this product (this relates to Steps 7 and 10)?
10. Could the product be made more lightweight—does it need to be so big, heavy or materially complex? Why?
11. What will happen to the materials at the end of the use-life of the product, for example can they be recycled into another product or are they only able to be down-cycled to a lesser quality product, thus merely delaying landfilling?
12. What are some of the alternative materials that might have been considered for this product (e.g.bamboo for timber products)?
13. Are any of the materials to your knowledge derived from renewable sources (plantation products, soy-based inks and dyes, starch or sugar-based plastics)? Might they have been?

14 Could this product have been made out of reclaimed materials (what about reclaiming materials from products it replaces or has made obsolete)?

15 Given these considerations, summarise how the design of this product might be made leaner, i.e. more appropriate?

6. Manufacture Issues

The manufacture of the materials that go into making your product, the supply and transport of those materials (which we look at in Step 8), the assembly of your product—these are all 'outsourced' areas of design that the designer does not often consider or even know about (which you may have discovered in the previous Stage). However as a designer for sustainability you have a responsibility to find out about the Industrial Ecology of your product. This stage comprises a research exercise. The point is to answer as many of the questions listed below as you can, in order to see how and where your product may mitigate against and even reverse production side impacts. These questions may sometimes be difficult to research and answer, however the process of attempting to do so is a learning exercise in itself—you may be surprised at how little people know about the environmental impacts of what they are already caught up in doing. You could compile this information graphically in a process chart, but make sure you indicate 'known' and 'unknown' aspects, rather than erase what you do not know from the picture.

Exercises:

1 Returning to the materials audit list you made in the last stage, try to find out about the materials you do not recognise. In the case of a product that has only one or two materials, add to the list as many of the materials needed for the use of this product as you can (recall secondary products in Stage 2). Answer the following:

2 From what, where and how were these materials sourced?

3 Where and by whom were they manufactured?

4 What are the manufacturing processes for these materials?

5 Is there just one way to make these materials or are there many alternatives and how do they compare?

6 Are any of these materials recycled or otherwise drawn from prior product sources?

7 What kinds of energies are used in manufacture and product assembly (renewable or gas/coal based?) and what are the energy and water efficiency strategies employed, for example, do the manufacturers use cogeneration (the co-production of electricity and thermal energy using a single fuel) processes?

8 What are the machining requirements for the manufacture of this product, for example does it require the development of new tooling?

9 Where and if possible by whom was this product assembled?

10 Do the manufacturers/suppliers/assemblers have Environmental Management Systems in place to organise and monitor such strategies?

11 What do you know about the health risks for those involved in manufacturing these materials (for example particulates, emissions, noise)?

12 Are they sources of acid rain, ozone depleting chemicals, or do they contribute to local air pollution?

13 How does the supplier/manufacturer/assembler relate to their immediate environment, for example how do they manage pollution issues and what happens to material off-cuts?

14 How do they relate to other local ecologies, for example do they utilise local resources?

15 Do they/ are they planning to practice Extended Producer Responsibility? What are the legislative restrictions imposed on the manufacture of this product and what voluntary agreements does its production come under?

16 What kind of product recovery infrastructure do the supplier/manufacturer/assembler have in place (relates to Steps 8, 10)?

17 What kinds of measures would need to be implemented to manufacture this product more sustainably, for example, would it be possible to demand manage any aspect of the supply or manufacture of this product?

18 Can any aspect of this product be remanufactured (remanufacturing is the process of disassembly, component refurbishing and reassembly of products to meet first-use performance standards. It has a strong educational benefits, as manufacturers get to see exactly where and how products become worn in use)?

19 In summary, what do you think are the main environmental impacts associated with putting this product together?

20 How might these impacts have been reduced or reversed in the front-end design process?

7. Product Styling

Now you have made certain decision about the kind of product you are going to design and have done some research into manufacturing processes, you need to work out how you can style this product appropriately to promote sustainable use. Product meanings arise in the relationships between users and products. These relationships are both physical and symbolic—prompted by product 'affordances', tacit user know-how as well as by new meanings promoted by marketing strategies (which we look at in Stage 9).

As contemporary product buyers, we tend to expect products to aesthetically declare their functions and 'performance' (one of the most obvious examples is to be found perhaps in car detailing). As designers, we are often encouraged to style products 'gratuitously', that is, in a way that denies any need to create symbolically commensurate and integrated forms. The principle of commensurability discussed in 'lean design' is therefore also relevant here. Designers are often approached with bad design specs and more or less asked to 'spread some cool design' over the surface of the product*. But the world certainly doesn't need any more iMac-style telephones destined to join the 80% of new products that fail to be wanted, let alone needed. Often, the more 'specific' a product's styling gets, the more limited it will be in terms of usability and desirability. A piece of furniture with fixed shelving dedicated to the sizing of today's technology is an obvious example here, and will find itself unable to absorb the demands of technological innovation. Quite unapologetically, we wish to promote a different culture of styling—one that is about communicating and making desirable more sustainable ways of living and working. The spirit of invention is invited by sustainable design, but it needs to move in a different direction to the current aesthetically driven one. Products need to be styled more responsibly in relation to *what* they communicate (symbolic meanings) and *how* they communicate to users (interface semantics); in all, in ways that are more commensurate with their functional lives. This is not to advocate a 'modernist' representational approach, but rather to make the point that styling is, literally and symbolically, the key to a 'successful' product. It is about the ways in which products look, feel and even act toward users. The following questions are designed to help you reflect upon and apply direction to styling decisions you have perhaps already intuitively made.

* From Chris Heatherly, chief strategist at Frog Design, based in Sunnyvale, Calif. which appeared in "Cool Design Won't Save a Dud Product" by Bob Parks posted on ID Forum March 2001.

Considering the styling of your proxy product, ask the following questions:

1 What does this product 'know' about you, for example ergonomically (e.g. a rubber glove 'knows' I have 5 fingers); but also about what you need (e.g. it knows I need protection; assistance with grip); like and dislike (e.g. to keep my hands dry)?

2 What doesn't this product know about you (e.g. I don't need colour co-ordinated gloves; I don't know enough about the tolerance and performance of synthetic rubber, and tend to use the gloves inappropriately, like for handling some chemicals)?

3 What and how does this product communicate about its use-life to you, (for example, does it 'look' disposable)?

4 How does this product communicate about its materials to you, for example through labels, embossing, manuals? (related to Stages 4,6)

5 How does this product invite your understanding of how it works, for example through labels etc. (related to Stages 4 and 9).

6 If electrically dependent, how does the product encourage being turned off (research shows that turning a product off entirely rather than putting it on standby mode will not cause additional wear')?

7 How flexible is the product; can it be adapted to several uses or ways of use? If a technological product, is it designed for intergenerational compatibility?

8 Is the product assemblable and repairable or is it an ‘all-in-one’ that can only be put together and/ or taken

apart and repaired by an external source?

9 Following on from Stage 5, what and how will product packaging communicate to users? If surface signage is to be used, will this be adaptable, removable, reusable and generally low impacting?

8. Distribution Issues

We have learnt to sense that most things are deliverable or available at a cost. These costs however rarely include the environmental costs of supply and transport, not to mention the common scenario of ‘goods’ fast approaching obsolescence (or already obsolete), languishing in warehouses. Ask the following questions of your proxy—they may make a difference to how you see your own product taking shape.

Exercises:

1. How are materials distributed between materials supplier, manufacturer, assembler?
2. When assembled, is the product packed, how and with what? Where are these packing materials searched from and what happens to them at end-of-life?
3. How is the product distributed to ‘point of sale’ and where is it stored? How is it looked after?
4. How is the product distributed/delivered to users?
5. What packing requirements does this entail?
6. Is the product distributed in bulk or on demand? How are user expectations dealt with, for example if distributed in bulk, is a waiting period incurred?
7. How is the product repaired: does it need to be sent away requiring more transportation?
8. How is the product managed at the end of its life in relation to transportation issues?

9. Retail and Use-Life Management

This step concerns the ‘point of sale’ or equivalent and the support systems that will sustain the product's value over its use-life and encourage careful 'consumption'. This involves both material aspects, like repair and technical support, but also symbolic, 'declarative' aspects: the ways in which products are branded, promoted, represented and 'placed', as well as the ways in which these strategies are undertaken. Incidentally or intentionally, these aspects communicate certain meanings about products to users (this is again an issue of commensurability). The extents to which these meanings are supported by the design of products has a significant role in determining product use-life and influencing innovations in use.

The idea that things are 'disposable' for example is an idea that has been learnt and has become a cultural habit. Clearly, most things are not 'disposable', they are just 'hidden' in landfill. This has a variety of ongoing environmental effects, not least on the 'need' for newer versions of those same things. In order to change such cultural habits, we have to intervene at the promotional level and make other kinds of behaviours, such as product reuse, more visible and desirable. This means creating and promoting new kinds of associations and stories about products.

As the designer, you are best placed to think about how you could promote your product's specific sustain-abilities: durability, adaptability, *share*ability, reliability, mobility etc. Your first task then is to develop 'stories' about your product; its 'character profile', its 'lifestyle', 'career', appreciative users, putting it into future scenarios (where it has aged gracefully, for example). These could form the basis of promotional strategies for new but also remanufactured or used products, indicating that something is 'better than new 'cause it has a story' (to quote David Mamet). In doing this exercise it might be worth talking to other designers about their product 'stories' (how did this product come into being?). It is sometimes useful to unpack prevalent 'stories' about products to discover the unsustainable associations they have created, which you might be able to 'jam' or design against. A good place to start here is with a critical observation of advertising media. (Nb. the *Eternally Yours* book listed in the Resources section, which we are told may soon be available on the net, provides some great examples of such strategies).

Conversely, there might be ways to 'agree' your product into use, i.e. showing how it will save the user money. Though price is a powerful influencer of choice, it is not necessarily a behaviour changing mechanism. An important issue commonly raised in relation to price reduction strategies is what will 'consumers' spend the balance on? Another problem is the reduction in symbolic value 'cheap' products entail. Strategies to mitigate the 'cheapness' of plastic bags by 'pricing them up' at 'point of sale' are, for example, having great success in modifying how they are both seen and used (see Planet Ark's website). Another 'agreement' strategy is showing how a product will gain in value over time or improve quality of life (as distinct from elevating materialistic life styles).

The following questions relate to practical issues associated with this stage of the product's life. Some of them suggest research tasks—particularly in relation to the practices of retailers and their relation to manufacturers. It is worth noting that this stage of a product's life often falls off the agenda of LCA—therefore knowing about this stuff gives you a bit of a market edge!

Exercises:

1. What implications does sustaining the value of your product have on use-life management, for example what support services will be needed in relation to technical support, repair, customer service and how are these responsibilities distributed? What problems can you identify in relation to this?

2. How will the user be informed of these management responsibilities and of their own responsibilities in relation to the care of the product? How will this product be displayed and sold—will it require packaging and if so how can this be integrated into the product or otherwise reused?

3 What will be the material expenditure associated with the promotion and sale of this product, for example literature, lighting? How can this be reduced? (Problems associated with informational marketing strategies are discussed in Designing a Competition Logo.)

4 How can you reduce the material impacts of advertising, for example could the product have a website that could function as its site of sale, instruction, support? (related to Step 9)

5 Could this product be sold over the internet and if so how could you eliminate or reduce packaging and transport environmental costs?

6 How can you make the materials required to pack, distribute etc. present to the buyer, part of the product 'package'?

7 If sold in conventional shops, what Environmental Management Systems do the retailers employ?

8 Will they take back packaging and manage its return to manufacturers or what other kinds of strategies do they have in place?

10. Post-use Management

If you design your product as well as possible there should be nothing to waste at the end of its first entirely sustainable use-life. It should be fully consumed or inertly biodegradable, entirely disassemblable, reusable or recyclable in low impacting ways into other, needed products. Its material value will either be fully retained or transformable in a low or no impact manner into equally valued materials whose life purposes will more than make up for any environmental impacts. Your product will spend its life communicating sustainability sustainably with 'users' who will use, maintain, repair and care for it properly.

Additionally, by using your product, users will develop new sustainable habits and new insights into the other unsustainable products in their lives. The manufacturer will organise for the low impact collection of these materials to be fed into low impacting and exceptionally managed materials recovery and remanufacture programs...sounding a bit idealistic?

Even if all these things could be achieved, the perfect product does not exist because no matter how carefully you design something, environments are not and will never be entirely calculable (this, in a nutshell, is the main problem with scientifically derived environmental management systems). We can however, work toward creating sustainments even though the world is full of designers, products and processes 'sustaining the unsustainable'. The more sustainments that are designed—ethical products aware of the power of design—the more the possibility of a more generally sustainable culture will arrive.

This last set of questions is about consolidating what you have learnt by doing this guide. This is followed with a design process audit and a redesign task—tips for writing a 'return brief' incorporating some of what you have learnt.

Exercises

1. How many use-lives will your product potentially have, and drawing on your research summarise how its design will support this?(materials, material interfaces, instructions, infrastructure etc.)
2. Will the user be able to disassemble the product easily, for example are the components comprehensively labelled?
3. How will information about the management of post-use be included with product; where will prompts/instructions be located (for example on an internal computer chip; manuals, embedded into the materials)?
4. Will there be any kinds of incentives offered to users for the return of products or parts; will these incentives also be sustainments?
5. Will there be any kinds of feedback mechanisms in place, any way that users can document their experiences or otherwise participate in the design process so that the designer can learn from the culture of use the product has designed?
6. Your last task before rewriting the design brief is to summarise the audit of your design process. To do this, we suggest you use your log information to draw an 'ecomap': a visual schematic representation of your work process. Draw a simple diagram of your work space and try to locate the sites of intensity of energy or materials use. This is a quick way to identify key areas of unsustainability in your process, but should not replace a more thorough assessment of the main ecological impacts associated with the material and energy inputs and outputs you have logged. What changes or adjustments to your work process do you need to make, and how might the physical assembly of your space assist in this? For further information on this process see Eco- Mapping.

7 Finally, visit Seven Tips for a Return Brief . For help with research, check out User Research.

Please communicate with us about this guide - Comments and Questions Welcome.

Resources

This guide predominantly draws on the work the EcoDesign Foundation has done in sustainable design for the last 10 years. As far as other guides go, we have found J.C. Brezet and C.G. van Hemel *Ecodesign: A Promising Approach* (Paris: UNEP 1997) to be one of the most useful product design guides produced—see Further Introduction for their 'New Concept Development' strategies. Another more recent guide by Helen Lewis and John Gertsakis et.al.*Design and Environment: A Global Guide to Designing Greener Goods* (Sheffield: Greenleaf, 2001) was reviewed in the January 2002 issue of the Sustainments newsletter. Most guides and checklists however do not account substantially enough for the cultural contexts that are, as we hope to have suggested in this Guide, the key aspect of designing for sustainability.

A Few Recommended Books:

Beukers, Adriaan and Ed van Hinte. *Lightness:the inevitable renaissance of minimum energy structures*. Rotterdam: 010 publishers, 1998.
Beck, Ulrich. *Ecological Politics in an Age of Risk*. trans. Amos Weisz, Cambridge: Polity Press, 1995.
Buchanan, Richard and Victor Margolin (eds.). *The Idea of Design* . Cambridge: MIT Press, 1995.
Buchanan, Richard and Victor Margolin. (eds.) *Discovering Design: Explorations in Design Studies* . Chicago: The University of Chicago Press, 1995.
Frascara, Jorge. *User-Centred Graphic Design: Mass Communications and Social Change* . London: Taylor & Francis, 1997.
van Hinte, Ed (ed.) *Eternally Yours: Visions on Product Endurance* . Rotterdam:010 publishers, 1998.
Fry, Tony. *A New Design Philosophy: an introduction to defuturing.* Sydney: UNSW Press, 1999.
Fry, Tony. *Remakings: Ecology, Design, Philosophy.* Sydney: Envirobook, 1994.
Graedel, T.E and B.R Allenby. *Industrial Ecology*. New Jersey: AT & T /Prentice Hall, 1995.
Manzini, Ezio. *The Material of Invention: Materials and Design.* Cambridge: MIT Press, 1989.

McKenzie Mohr, Doug and William Smith. *Fostering Sustainable Behaviour: an introduction to Community-Based Social Marketing*. Gabriola Island: New Society Publishers, 1999.
Norman, Donald. *The Design of Everyday Things*. New York: Doubleday, 1990.
Papanek, Victor. *The Green Imperative: Ecology and Ethics in Design and Architecture*. London: Thames and Hudson, 1995.

Some Relevant Links For design issues:

This is an excellent design for sustainability resource site from Goldsmiths College, University of London Demi Design for Sustainability
Eternally Yours is an organisation with broad design affiliations that focuses on how the relationships between people and the products we buy and use designs the value, durability and quality of products.
SusHouse project is a European research project concerned with developing and evaluating scenarios for transitions to sustainable households.

For materials information:

http://www.ebuild.com
http://www.timbershop.wilderness.org.au
http://ecospecifier.rmit.edu.au/flash.htm

For energy information and issues:
CADDET (Centre for the Analysis and Dissemination of Demonstrated Energy Technologies) is an international agency for the exchange of information on renewable energy projects including biomass, geothermal, hydro, solar, wind, waste and PV. Extensive case studies with technical data and contact details.

For toxics and hazardous substances information:

Index of toxic or hazardous substances.

Links to important current and emerging legislative drivers for design for sustainability:
The EU's WEEE (Waste Electrical and Electronic Equipment)Directive
The EU's Directive on Packaging and Packaging Waste
Australia's voluntary National Packaging Covenant
The EU's End-of-life Vehicle Directive
The EU's EEE (Environmentally-friendly Electrical and Electronic) product proposal (whereas the WEEE legislation is concerned with the end-of-life processing of the product, the EEE initiative focusses on the full life-cycle of the product).
The EU's Energy Label and Energy Star Program

For other useful references, go to the links section of the EDF website.

demi guide to design for sustainability

SEARCH

GO

This website contains lots of information on design for sustainability. You can explore it by clicking on the map which shows this information clustered in six sectors. To get the best out of demi use the map in combination with the keyword weblinks and the free search.

demi has been written, unless otherwise stated, by researchers at Goldsmiths College, University of London as part of a UK Government-funded project

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Packaging and packaging waste

1) OBJECTIVE

To harmonise national measures concerning the management of packaging and packaging waste to provide a high level of environmental protection and to ensure the functioning of the internal market.

2) ACT

Council Directive 94/62/EC of 15 December 1994 on packaging and packaging waste [Official Journal L 365, 31.12.1994].

3) SUMMARY

1. The Directive covers all packaging placed on the market in the Community and all packaging waste, whether it is used or released at industrial, commercial, office, shop, service, household or any other level, regardless of the material used.

2. The Directive provides that the Member States shall take measures to prevent the formation of packaging waste, which may include national programmes and may encourage the reuse of packaging.

3. The Member States must introduce systems for the return and/or collection of used packaging to attain the following targets:

- recovery: 50% to 60%;
- recycling: 25% to 45%, with a minimum of 15% by weight for each packaging material.

4. The Directive lays down essential requirements as to the composition and the reuse, recovery and recycling of packaging; the Commission is to promote the preparation of European standards relating to the essential requirements.

Provisions concerning proof of conformity with national standards must be applied immediately.

5. The Council is to decide no later than two years after the entry into force of this Directive on the marking of packaging. The identification system for the materials used will be prepared on the basis of Annex I no later than 12 months after entry into force.

6. The Member States are to notify the drafts of the measures which they intend to adopt within the framework of the Directive, excluding tax measures, prior to adopting them.

7. To provide the necessary Community data on waste management, the Member States must ensure that databases on packaging and packaging waste are established on a harmonised basis so that the implementation of the objectives of the Directive can be monitored.

8. The Member States are to report regularly to the Commission on the application of the Directive.

9. Member States will ensure that users of packaging are given the necessary information about the management of packaging and packaging waste.

10. The identification system and the structure of the databases will be adapted to scientific and technical progress.

11. This Directive provides for a transition period during which packaging manufactured before its entry into force may be marketed.

Act	Date of entry into force	Final date for implementation in the Member States
Directive 94/62/EC	31.12.1994	30.06.1996

4) IMPLEMENTING MEASURES

Decision 97/129/EC - **Official Journal L 50, 20.02.1997**
Commission Decision of 28 January 1997 establishing the identification system for packaging materials pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste.
The Decision establishes the numbering and abbreviations on which the identification system is based, indicating the nature of the packaging material(s) used and specifying which materials are subject to the identification system.

Decision 97/138/EC - **Official Journal L 52, 22.02.1997**
Commission Decision of 3 February 1997 establishing the formats relating to the database system pursuant to European Parliament and Council Directive 94/62/EC on packaging and packaging waste.
The formats serve to harmonise the characteristics and presentation of data on packaging and packaging waste, making them compatible from one Member

State to another. The data will be used to monitor attainment of the objectives of Directive 94/62/EC. Provision of data is compulsory only in respect of the following packaging materials: glass, plastics, paper and fibreboard and metals.

Decision 97/622/EC - **Official Journal L 256, 19.09.1997**
Commission Decision of 27 May 1997 concerning questionnaires for Member States reports on the implementation of certain Directives in the waste sector (implementation of Council Directive 91/692/EEC).

Decision 1999/177/EC - **Official Journal L 56, 04.03.1999**
Commission Decision of 8 February 1999 establishing the conditions for a derogation for plastic crates and plastic pallets in relation to the heavy metal concentration levels established in Directive 94/62/EC on packaging and packaging waste.

Decision 1999/652/EC - **Official Journal L 257, 02.10.1999**
Commission Decision of 15 September 1999 confirming the measures notified by Belgium pursuant to Article 6(6) of Directive 94/62/EC of the European Parliament and the Council on packaging and packaging waste.

Decision 2001/171/EC - Official Journal L 62, 02.03.2001
Commission Decision of 19 February 2001 establishing the conditions for a derogation for glass packaging in relation to the heavy metal concentration levels established in Directive 94/62/EC on packaging and packaging waste.

Decision 2001/524/EC - Official Journal L 190, 12.07.2001
Commission Decision of 28 June 2001 relating to the publication of references for standards EN 13428:2000, EN 13429:2000, EN 13430:2000, EN 13431:2000 and EN 13432:2000 in the Official Journal of the European Communities in connection with Directive 94/62/EC on packaging and packaging waste.

Report [COM(1999) 596 final - **Not published in the Official Journal]**
Interim Report from the Commission to the Council and the European Parliament according to Article 6.3(a) of Directive 94/62/EC on packaging and packaging waste.
The interim report provides the Council and the European Parliament with the information they need in order to examine the practical experience gained in the Member States since 1998 and the findings of scientific research and evaluation techniques such as eco-balances. The report focuses primarily on "practical experience gained in the pursuance of the targets" (see point 3).
One third of the packaging for soft drinks, mineral water and wine in the European Union is reused. The packaging materials concerned by reuse are mainly glass and PET (polyethylene terephthalate). Some Member States have reuse systems in the milk products sector, though Directive 94/62/EC does not set targets in that area. It should be added that reuse systems are available to a much greater extent in the northern Member States than in the southern Member States.
Regarding recycling, the targets set by the Directive have proven realistic, with only slight geographical differences. The only material for which the recycling rate is still low is plastic.

5) FOLLOW-UP WORK

On 7 December 2001, the Commission presented a proposal for a directive of the European Parliament and of the Council, amending Directive 94/62/EC on packaging and packaging waste [COM (2001) 729 final - Official Journal C 103, 30.04.2002].
This proposal lays down new, more ambitious targets for recovery and recycling, to be met by 30 June 2006. The overall recovery and recycling targets must be between 60% and 75%, and 55% and 70% respectively. Specific recycling targets were also fixed according to materials: 60% for glass, 55% for paper and cardboard, 50% for metals and 20% for plastics (mechanical and chemical recycling only). Greece, Ireland and Portugal were given until 30 June 2009 to meet these targets.
The proposal signals the need for new definitions of "raw material" and chemical recycling. It includes an interpretation of the definition of packaging.

Codecision procedure (COD/2001/0291)
On 29 May 2002, the Economic and Social Committee delivered its opinion.
On 3 September 2002, Parliament approved the Commission proposal subject to certain amendments.

On 25 November 1996 the Commission put forward a proposal for a directive on marking of packaging and on the establishment of a conformity assessment procedure for packaging [COM(96) 191 final - Official Journal C 382, 18.12.1996].
The proposal harmonises the marking of re-usable and recyclable packaging practised on a voluntary basis by economic operators. It also establishes a conformity assessment procedure applicable to all the packaging covered by Directive 94/62/EC.

Co-decision procedure
First reading: On 25 February 1999 Parliament approved the Commission's proposal subject to 12 amendments [Official Journal C 153, 01.06.1999].
An amended proposal from the Commission incorporating the amendments it has accepted is awaited. The legal basis for this proposal has been renumbered following the entry into force of the Treaty of Amsterdam.

Last updated: 05.09.2002

THE NATIONAL PACKAGING COVENANT

The National Packaging Covenant was launched in August 1999.

The aim of the Covenant is to provide more effective management of used packaging based on the principles of shared responsibility and product stewardship.

The National Packaging Covenant has two tiers:

1. **The Covenant - The framework or umbrella document that establishes the policy approach and sets the broad parameters. It is the key document.**

2. **The National Environment Protection Measure (NEPM) or regulatory safety net - Focuses on brandowners and is designed to catch the "free loaders" and encourage companies to sign the National Packaging Covenant. The NEPM is secondary to the National Packaging Covenant.**

KEY DOCUMENTS

Following is a set of key documents relating to the National Packaging Covenant:

- **Overview of the National Packaging Covenant/NEPM**

- **The National Packaging Covenant**

- **The NEPM**

- **Independent Assessment of Kerbside Recycling in Australia, Revised Final Report - Volume I - January 2001**
and Appendix A - Environmental Assessment Methodology Details
If you are having trouble downloading these files, simply right click on the above link and choose "Save Target As..." (IE) or "Save Link As..." (NN)

ACTION PLANS - TRANSITIONAL FUND

Signatories to the National Packaging Covenant are required to produce Action Plans. Industry/company signatories are also required to contribute to the transitional fund. Following is advice/guidance on payments by companies to the Transitional Fund, together with advice on putting together an Action Plan and Guidelines for acceptance of that Action Plan:

Transitional Fund

Click here to view the Transitional Fund table showing contributions by turnover for company signatories. Please note that company signatories are required to make three annual contributions regardless of when they sign the Covenant.

For further information about the Transitional Fund, please contact:

Mr Gerard Van Rijswijk
Executive Director
Association of Liquidpaperboard Carton Manufacturers
P O Box 6250
North Sydney NSW 2606
Tel: +61 2 9954 4588
Fax: +61 2 9954 4546
Email: gvan@alc.asn.au

- **Action Plan Development Guidelines**

- **Action Plan Pre-Registration Assessment Guidelines**

- **Action Plans :**

Following are Action Plans - by category - submitted and approved by Covenant signatories:

- **For companies click here**
- **For governments click here**
- **For local governments click here**
- **For industry associations click here**

- **Signatories to the National Packaging Covenant**

- **Signing on to the National Packaging Covenant**

Following are contact details for signing on to the Covenant:

Ms Barbara Butt
Environmental Stewardship Team, Sustainable Industries Branch
Environment Australia
P O Box 787
CANBERRA ACT 2601
Tel: +612 6274 1679
Fax: +612 6274 1640
E-mail:barbara.butt@ea.gov.au
http:\\www.environment.gov.au/epg/covenant/

- **Presentations on the National Packaging Covenant by the PCA**

Management of end-of-life vehicles

---

1) OBJECTIVE

To prevent waste from end-of-life vehicles and promote the collection, re-use and recycling of their components to protect the environment.

2) ACT

Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles [Official Journal L 269, 21.10.2000].

3) SUMMARY

1. Following the Council Resolution of 7 May 1990 on waste management policy, the Commission proposed various measures to combat certain categories of waste. Several waste streams have therefore already been the subject of Community regulation (waste oil , waste batteries and accumulators , waste packaging , sewage sludge).

2. The 5th Community action programme in the field of the environment and sustainable development stresses the need to modify both methods of production and development and consumer behaviour.

The Community approach to waste management is based on two complementary strategies:

- avoiding waste by improving product design;
- increasing the recycling and re-use of waste.

3. By Resolution of 14 November 1996, the European Parliament called on the Commission to legislate on waste streams, in particular end-of-life vehicles, on the basis of product liability. The Commission took the view that a specific directive was necessary given the importance of this type of waste. This position

is shared by the OECD Working Party on waste streams, whose 1995 report considers the treatment of end-of-life vehicles as a priority towards the overall objective of reducing waste.

4. The Directive defines an end-of-life vehicle as any type of vehicle which is waste within the meaning of Directive 75/442/EEC. The scope of the Directive therefore covers:

- any end-of-life vehicle designated as category M1 or N1 (as defined in section A of Annex II to Directive 70/156/EEC);
- two- or three-wheel motor vehicles and their components.

5. Waste prevention is the priority objective of the Directive. To this end, it stipulates that vehicle manufacturers and material and equipment manufacturers must:

- endeavour to reduce the use of hazardous substances when designing vehicles;
- design and produce vehicles which facilitate the dismantling, re-use, recovery and recycling of end-of-life vehicles;
- increase the use of recycled materials in vehicle manufacture;
- ensure that components of vehicles placed on the market after 1 July 2003 do not contain mercury, hexavalent chromium, cadmium or lead, except in the cases listed in Annex II. The Commission must amend the Annex in the light of scientific and technical progress.

6. The Directive also introduces provisions on the collection of all end-of-life vehicles (Article 5). Member States must set up collection systems for end-of-life vehicles and for waste used parts. They must also ensure that all vehicles are transferred to authorised treatment facilities, and must set up a system of deregistration upon presentation of a certificate of destruction. Such certificates are to be issued when the vehicle is transferred, free of charge, to a treatment facility.

7. The last holder of an end-of-life vehicle will be able to dispose it free of charge ("free take-back" principle). Producers must meet all, or a significant part of, the cost of applying this measure.

8. The storage and treatment of end-of-life vehicles is also subject to strict control, in accordance with the requirements of Directive 75/442/EEC and those of Annex I to the Directive. Establishments or undertakings carrying out treatment operations must strip end-of-life vehicles before treatment and recover all environmentally hazardous components. Priority must be given to the re-use and recycling of vehicle components (batteries, tyres, oil).

9. At the moment, 75% of end-of-life vehicles are recycled (metal content). The aim of this Directive is to increase the rate of re-use and recovery to 85% by average weight per vehicle and year by 2006, and to 95% by 2015, and to increase the rate of re-use and recycling over the same period to at least 80% and 85% respectively by average weight per vehicle and year. Less stringent objectives may be set for vehicles produced before 1980.

10. Member States must ensure that producers use material coding standards

which allow identification of the various materials during dismantling. The Commission must establish European standards on material coding and identification.

11. Economic operators must provide prospective purchasers of vehicles with information on the recovery and recycling of vehicle components, the treatment of end-of-life vehicles and progress with regard to re-use, recycling and recovery. On the basis of this information, Member States must report to the Commission every three years on the implementation of the Directive. The Commission must then publish a report on the implementation of the Directive.

12. Member States may transpose certain of the Directive's provisions by means of agreements with the economic sectors concerned.

Act	Date of entry into force	Final date for implementation in the Member States
Directive 2000/53/EC	21.10.2000	21.04.2002

4) IMPLEMENTING MEASURES

Decision 2002/525/EC - **Official Journal L 170, 29.06.2002**
Commission Decision of 27 June 2002 amending Annex II of Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles.

Decision 2002/151/EC - **Official Journal L 50, 21.02.2002**
Commission Decision of 19 February 2002 on minimum requirements for the certificate of destruction issued in accordance with Article 5(3) of Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles.

Decision 2001/753/EC- Official Journal L 282, 26.10.2001
Commission Decision of 17 October 2001, concerning a questionnaire for Member States' reports on the implementation of Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles.

5) FOLLOW-UP WORK

Last updated: 22.02.2002

Environmentally friendly end use equipment – proposal for an EuE Directive

The Commission is currently examining strategies as to how other policy areas can integrate environmental aspects. This proposal demonstrates how such integration can be achieved in practice.

The working paper contains an initial draft text for a directive which **harmonises requirements concerning the design of end use equipment to ensure the free movement of these products within the internal market, aiming to improve their overall impact on the environment**, and thus providing an efficient use of resources and a high level of environmental protection compatible with sustainable development.

The intention is to shape one framework directive by merging two initiatives - the EEE (impact on the environment of electrical and electronic equipment) and the EER (energy efficiency requirements) - on which previous consultations already took place.

A workshop on implementation issues of the EEE draft Directive took place on 21-22 February 2002.

An experts' meeting for life cycle data for eco-design of EEE took place on 9 October 2002.

A stakeholders' workshop on the EER draft Directive took place on 30 April 2002.

The working document aims at laying down one single framework for the setting of eco-design requirements and at providing the possibility for setting more detailed requirements.

This paper is intended to generate interest and feedback from stakeholders. Information concerning further developments relating to this proposal will be published on this website.

Working paper for a proposed DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for Eco-design of End use Equipment

KEY ISSUES
WHAT'S NEW
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INDEX
INFORMATION
FEEDBACK

The European Commission would like to invite comments from all interested parties on the concepts which are described in this paper. Comments may be sent via e-mail to the following address:

Michail.Papadoyannakis@cec.eu.int OR Andre.Brisaer@cec.eu.int

Relevant comments will in principle be published here, unless the sender explicitly requests the comment not to be published. Anonymous comments will not be published. The Commission reserves the right not to publish comments which it receives.

The Commission analyses carefully the contributions to see whether and to what extent, the views expressed can be accomodated in the Commission proposal.

A stakeholders' meeting for discussing the initiative and the working paper took place on 18 November 2002. The issues presented and the comments discussed are available here.

Last update: 20/01/2003

Labelling household appliances

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1) OBJECTIVE

To harmonise national measures relating to the publication of information on the consumption of energy and of other essential resources by household appliances, thereby allowing consumers to choose appliances on the basis of their energy efficiency.

2) COMMUNITY MEASURES

Council Directive 92/75/EEC of 22 September 1992 on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances.

3) CONTENTS

1. The Directive applies to the following types of household appliances, even where these are sold for non-household uses:

- refrigerators, freezers and their combinations;
- washing machines, dryers and their combinations;
- dishwashers;
- ovens;
- water heaters and hot-water storage appliances;
- lighting sources;
- air-conditioning appliances.

2. Household appliances offered for sale, hire or hire-purchase must be accompanied by a fiche and a label providing information relating to their consumption of energy (electrical or other) or of other essential resources.

3. The supplier must establish technical documentation sufficient to enable the accuracy of the information contained in the label and the fiche to be assessed. This documentation must include:

- a general description of the product;
- the results of design calculations, where necessary;
- test reports;
- where values are derived from those obtained for similar models, the same information for these models.

The supplier shall make this documentation available for inspection purposes for a period ending five years after the last product has been manufactured.

4. Suppliers must provide:

- a free label, to be attached to the appliance by the dealer in the appropriate position and in the appropriate language version;
- a product fiche, contained in all the brochures relating to the product or, where these are not provided, in all other literature provided with the appliance.

Suppliers are responsible for the accuracy of the information contained in the labels and fiches that they supply and are deemed to have given their consent to the publication of the information.

5. Where appliances are offered for sale, hire or hire-purchase by catalogue or by other means whereby the potential customer is unable to see the appliance displayed, the essential information contained in the label or fiche must be provided to the potential customer before purchase.

6. Information on airborne noise provided pursuant to Directive 86/594/EEC, and other public information relating to the appliance in question and provided pursuant to other Community legislation, must be included on the label or fiche.

7. Member States must take the necessary measures to:

- ensure that all suppliers and dealers established in their territory fulfil their obligations under this Directive;
- prohibit the display of labels, marks, symbols or inscriptions relating to energy consumption which do not comply with the requirements of this Directive and which are likely to cause confusion, with the exception of Community or national environmental labels;
- launch educational and promotional information campaigns aimed at encouraging more responsible use of energy by private consumers.

8. Where Member States have grounds for suspecting that the information contained in labels or fiches is incorrect, they may require suppliers to furnish evidence.

9. The Commission is assisted by an advisory committee.

10. The Directives adopted in implementation of the present Directive must specify:

- the exact definition of the type of appliances to be included;
- the measurement standards and methods to be used in obtaining the information relating to energy consumption;
- details of the technical documentation required;
- the design and content of the label;
- the location where the label shall be fixed to the appliance;
- the content and where appropriate the format of the fiche, on which must be included the information appearing on the label;
- the information details to be provided in the case of mail-order offers for sale.

11. This Directive cancels Directive 79/530/EEC. Directive 79/531/EEC is considered as implementing this Directive for electric ovens.

4) DEADLINE FOR IMPLEMENTATION OF THE LEGISLATION IN THE MEMBER STATES

01.07.1993

5) DATE OF ENTRY INTO FORCE (if different from above)6) REFERENCES

Official Journal L 297, 13.10.1992

7) FOLLOW-UP WORK8) COMMISSION IMPLEMENTING MEASURES

Directive 94/2/EC - **Official Journal L 45, 17.02.1994**
Commission Directive of 21 January 1994 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric refrigerators, freezers and their combinations.

Directive 95/12/EC - **Official Journal L 136, 21.06.1995**
Commission Directive of 23 May 1995 implementing Council Directive 92/75/EEC with regard to energy labelling of household washing machines. Amended by Directive 96/89/EC - Official Journal L 388, 28.12.1996.

Directive 95/13/EC - **Official Journal L 136, 21.06.1995**
Commission Directive of 23 May 1995 implementing Council Directive 92/75/EEC with regard to energy labelling of household electric tumble dryers.

Directive 96/60/EC - **Official Journal L 266, 18.10.1996**
Commission Directive of 19 September 1996 implementing Council Directive 92/75/EEC with regard to energy labelling of household combined washer-dryers.

Directive 97/17/EC - **Official Journal L 118, 07.05.1997**

Commission Directive of 16 April 1997 implementing Council Directive 92/75/EEC with regard to energy labelling of household dishwashers.
Amended by the following measure:
Directive 1999/9/EC - **Official Journal L 56, 04.03.1999**

Directive 98/11/EC - **Official Journal L 71, 10.03.1998**
Commission Directive 98/11/EC of 27 January 1998 implementing Council Directive 92/75/EEC with regard to energy labelling of household lamps.

Energy efficiency: ENERGY STAR Programme

1) OBJECTIVE

To coordinate the labelling of energy-efficient office equipment using the "ENERGY STAR" logo.

2) ACT

Council Decision 2001/469/EC of 14 May 2001 concerning the conclusion on behalf of the European Community of the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficient labelling programs for office equipment [Official Journal L 172, 26.06.2001]

The detailed arrangements for implementing this Agreement at Community level have been put forward in:
Regulation (EC) No 2422/2001 of the European Parliament and of the Council of 6 November 2001 on a Community energy-efficient labelling programme for office equipment [Official Journal L 332, 15.12.2001]

3) SUMMARY

1. **Context**
Office equipment (personal computers, monitors, fax machines, scanners, copiers, printers, etc.) accounts for a large proportion of electricity consumption in the tertiary sector. In the context of the Community's international commitments, particularly in the area of climate change (notably the Kyoto Protocol), and given its objectives in such areas as sustainable development, the energy-efficiency initiatives take on special significance. The coordinated labelling programme (known as ENERGY STAR) will enable consumers to identify energy-efficient appliances and should therefore result in electricity

savings that will help not only to protect the environment but also to ensure the security of energy supply. The programme may also help to encourage the manufacture and sale of energy-efficient products.

EC-USA Agreement

2. **General provisions**
The Agreement, concluded for five years, sets up, between the United States and the Community, a common labelling programme for energy-efficient office equipment. ENERGY STAR is the name of the joint programme and logo and is a US-registered service mark owned by the United States Environmental Protection Agency (EPA).

3. **Participation in the programme**
Participation in the programme is voluntary, and the Agreement makes provision for manufacturers, vendors or resale agents of the products in question to register as participants in the programme and to be authorised to use the "ENERGY STAR" logo to identify their products, provided that these meet the requirements set out in Annex C to the Agreement (e.g. low-power "sleep" mode option for monitors). The Agreement basically covers the office equipment listed in the Annex thereto (monitors, computers and operating systems, but also fax machines, scanners, copiers and printers).

The products identified by the ENERGY STAR logo are tested at the participants' installations or by an independent testing laboratory. The management bodies designated by the two signatories may also test or examine products in order to verify whether they comply with the specifications set out in the Agreement.

4. **Management of the programme**
Each party designates a management body to be responsible for the management of the ENERGY STAR Programme: on the one hand, the United States Environmental Protection Agency (EPA) and, on the other, the Commission, which has assigned the task of setting and reviewing the technical specifications and of monitoring the application of the programme within the Community to an appropriate body, viz. the European Union Energy Star Board. This body, which is made up, in part, of national representatives, will advise and assist the Commission in the management of the programme.

The Agreement sets out guidelines on the proper use of the ENERGY STAR name. These guidelines cover not only the use of the logo as a label but also the use of the ENERGY STAR name in educational documents, advertisements, etc.

5. **Amendment and termination of the Agreement**
The parties are free to amend the Agreement (e.g. addition of a new item of equipment) by mutual agreement of the two management bodies. They may also terminate the Agreement at any time by giving three months' notice, in which case the European Community will no longer be able to use the ENERGY STAR mark, since it is the property of the EPA.

Community Regulation

6. **Objective**
The objective of the Regulation is to lay down the relevant rules for the

implementation of the above-mentioned Agreement in the European Community.

7. **Management at Community level**
The implementation of the ENERGY STAR Programme within the European Community is managed by the Commission, which has set up, for this purpose, a management body known as the European Union Energy Star Board (EUESB) (see point 4). The Regulation also provides for the participation of the various parties affected by the programme such as the manufacturers, retailers, environmental protection agencies, etc.

One year after the entry into force of this Regulation, and at twelve-monthly intervals thereafter, the EUESB will be required to submit a report on market penetration by products bearing the logo and on the technologies available for the reduction of energy consumption.

8. **Implementation**
Within six months of the entry into force of the Regulation, the Commission will adopt a Working Plan incorporating an implementation strategy for the subsequent three years. The Plan, which will be reviewed each year, will help in the elaboration of:

- energy efficiency improvements;
- a non-exhaustive list of office equipment products which should be considered as priorities for inclusion in the ENERGY STAR Programme;
- outline proposals concerning educational and promotional campaigns aimed at raising consumer awareness;
- proposals for coordination and cooperation between the Energy Star Programme and other voluntary energy labelling schemes (such as the Community eco-label).

One year after entry into force of the Regulation, the Member States must inform the Commission of the measures they have taken to comply with it.

9. **Assessment**
Before 15 January 2005 (date of renewal of the Agreement) the Commission will submit to the European Parliament and the Council a report assessing the energy efficiency of the office equipment market in the Community and the effectiveness of the ENERGY STAR Programme, and proposing, if necessary, complementary measures.

Act	Date of entry into force	Final date for implementation in the Member States
Regulation 2422/2001/EC	14.01.2001	-

4) IMPLEMENTING MEASURES

5) FOLLOW-UP WORK

Last updated: 11.01.2002

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on Waste Electrical and Electronic Equipment

and

on the restriction of the use of certain hazardous substances in electrical and electronic equipment

COM (2000)347

The European Commission has adopted a proposal for a Directive on Waste Electrical and Electronic Equipment (WEEE) and a proposal for a Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment. The proposed Directives are designed to tackle the fast increasing waste stream of electrical and electronic equipment and complements European Union measures on landfill and incineration of waste. Increased recycling of electrical and electronic equipment, in accordance with the requirements of the proposal for a WEEE Directive, will limit the total quantity of waste going to final disposal. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge. In order to prevent the generation of hazardous waste, the proposal for a Directive on the restriction of the use of certain hazardous substances requires the substitution of various heavy metals and brominated flame retardants in new electrical and electronic equipment from 1 January 2008 onwards.

The press release and document are available by clicking the language icons below.

Press release

es da de el en fr it nl pt fi sv

Full text of the proposal

es da de el en fr it nl pt fi sv

(**pdf** ~340K)

Follow the progress of this proposal in the legislative process on the **Prelex database.**

last update: 04/03/2003

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ecospecifier

a guide to sourcing environmentally preferable materials

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project team

project details

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about ecospecifier

Welcome to EcoSpecifier. EcoSpecifier's aim is to help architects, designers, builders and specifiers shortcut the materials sourcing process. It's broader aim is to help create a more sustainable physical environment by increasing the use of environmentally preferable materials. EcoSpecifier is a joint initiative of the Centre for Design at RMIT, EcoRecycle Victoria and the Society for Responsible Design.

EcoMaterials- what and why?

life cycle context of materials

dealing with suppliers

trends among major suppliers

sponsors

ecospecifier fundamentals

The increased use of EcoMaterials is only one contribution towards developing sustainable outcomes. An over-emphasis on EcoMaterials can also be problematic when not considered as part of an overall suite of issues. It is vital to avoid evaluating any material in isolation of its life cycle impacts. Specifying most materials requires a judicious process of inquiry within the time, cost and knowledge constraints of practitioners.

information resources

publications

organisations

world wide web

salvaged/recovered materials suppliers

recycled plastic resins suppliers

sponsors

information resources

The following sources contain a variety of information related to EcoMaterials, ecodesign, sustainable architecture and building and Life Cycle Assessment. Contact us at ecospecifier@rmit.edu.au if you have suggestions for new inclusions, corrections or general feedback. We are particularly interested in sources of practical information that are readily accessible by designers, builders and specifiers in Australasia.

materials directory

This directory contains information about EcoMaterials that are commercially available in Australia. Its practical aim is to help architects, designers, builders and specifiers shortcut the materials sourcing process. Please ensure that you read the disclaimer. Contact us at ecospecifier@rmit.edu.au if you have suggestions for new inclusions, corrections or general feedback. We are particularly interested in hearing from suppliers about new materials.

composites

concrete/ masonry/plaster

finishes/ sealants/adhesives

glass

metals

plastics/rubber

reconstituted wood

textiles

miscellaneous

composites

composites

Boral Recycled Asphalt
Duroloid
Duroloid Bulletin Board
Marmoleum/Artoleum
Millennium

Boral Recycled Asphalt

Click here before Printing

Material / Product Description
A mixture of graded aggregates with a bitumin binder.

Applications
A variety of paving applications including roads, carparks and pedestrian walkways.

Claimed Environmental Improvements
Contingent upon the specific application, the product can contain up to 20% post-consumer recycled asphalt.

RECYCLED CONTENT, RECYCLABILITY & WASTE AVOIDANCE	
Contains post-consumer recycled content	✔
Contains industrial waste (that would otherwise be landfilled)	
Potential for extended material/product life	
Extended Producer Responsibility Scheme	
High potential for re-use	✔
Recyclable where collection scheme exists	
Packaging eliminated, reduced, reusable etc	
Potential for in-use low maintenance	
Uses materials in least processed state	
LOW TOXICS	
Substantially reduced off-gas/particulate emissions	
Low/non-toxic alternative treatments	
Non-toxic emissions from production process	
No listed carcinogens emitted during production	
Low impact disposal when discarded	
REDUCED GREENHOUSE RELATED IMPACTS	
Reduced Greenhouse or energy impacts	

Potential for reduced energy consumption during use	
Low energy use during processing/production	
SUSTAINABLE SOURCES, BY-PRODUCTS, BIODEGRADABILITY	
Contains agricultural by-products	
Uses abundantly available raw materials	
Uses materials from sustainable sources	
Advanced levels of biodegradability	
OTHER VITAL SIGNS	
Material safety data sheets	
Environment policy	
Environmental product information available	
Environmental claims independently verified	
Ecolabels, awards & other relevant accreditation	
ISO 14000/EMAS accredited	
Complies with relevant Australian Standards	✔

SUPPLIER

Boral Asphalt
15 Powers Road Seven Hills
NSW 2147
Telephone:(02) 8801 2000
Facsimile:(03) 8801 2011
Website: http://www.boral.com.au

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Duroloid

Click here before Printing

Material / Product Description
A linoleum finishing product. Available in 32 metre rolls, or cut to length.

Applications
Developed for use on desks, table tops, counters, bars, walls, partitions and doors.

Claimed Environmental Improvements
Manufactured from natural, renewable materials, and is biodegradable at the end of its life.

RECYCLED CONTENT, RECYCLABILITY & WASTE AVOIDANCE	
Contains post-consumer recycled content	
Contains industrial waste (that would otherwise be landfilled)	
Potential for extended material/product life	
Extended Producer Responsibility Scheme	
High potential for re-use	
Recyclable where collection scheme exists	
Packaging eliminated, reduced, reusable etc	
Potential for in-use low maintenance	✓
Uses materials in least processed state	
LOW TOXICS	
Substantially reduced off-gas/particulate emissions	✓
Low/non-toxic alternative treatments	
Non-toxic emissions from production process	
No listed carcinogens emitted during production	
Low impact disposal when discarded	✓
REDUCED GREENHOUSE RELATED IMPACTS	
Reduced Greenhouse or energy impacts	
Potential for reduced energy consumption during use	

Low energy use during processing/production	✓
SUSTAINABLE SOURCES, BY-PRODUCTS, BIODEGRADABILITY	
Contains agricultural by-products	
Uses abundantly available raw materials	✓
Uses materials from sustainable sources	✓
Advanced levels of biodegradability	✓
OTHER VITAL SIGNS	
Material safety data sheets	
Environment policy	✓
Environmental product information available	✓
Environmental claims independently verified	
Ecolabels, awards & other relevant accreditation	
ISO 14000/EMAS accredited	✓
Complies with relevant Australian Standards	

SUPPLIER

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VIC 3189
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Facsimile: (03) 9553 2131
E-mail: gryan@iaccess.com.au

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Duroloid Bulletin Board

Click here before Printing

Material / Product Description
A uni-coloured linoleum with very high cork content, both functional and decorative. Also provides thermal and noise insulation.

Applications
Suitable for offices, schools and residential spaces as bulletin boards. Can be integrated with office furniture. Not suitable for exterior use.

Claimed Environmental Improvements
The board is produced from 100% natural materials.

RECYCLED CONTENT, RECYCLABILITY & WASTE AVOIDANCE	
Contains post-consumer recycled content	✔
Contains industrial waste (that would otherwise be landfilled)	✔
Potential for extended material/product life	
Extended Producer Responsibility Scheme	✔
High potential for re-use	
Recyclable where collection scheme exists	✔
Packaging eliminated, reduced, reusable etc	
Potential for in-use low maintenance	✔
Uses materials in least processed state	
LOW TOXICS	
Substantially reduced off-gas/particulate emissions	✔
Low/non-toxic alternative treatments	
Non-toxic emissions from production process	
No listed carcinogens emitted during production	
Low impact disposal when discarded	
REDUCED GREENHOUSE RELATED IMPACTS	
Reduced Greenhouse or energy impacts	

Potential for reduced energy consumption during use	✓
Low energy use during processing/production	
SUSTAINABLE SOURCES, BY-PRODUCTS, BIODEGRADABILITY	
Contains agricultural by-products	
Uses abundantly available raw materials	
Uses materials from sustainable sources	
Advanced levels of biodegradability	
OTHER VITAL SIGNS	
Material safety data sheets	✓
Environment policy	✓
Environmental product information available	✓
Environmental claims independently verified	
Ecolabels, awards & other relevant accreditation	✓
ISO 14000/EMAS accredited	
Complies with relevant Australian Standards	✓

SUPPLIER

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Facsimile: 02 9674 8345
Toll Free: 1800 066 319
E-mail: molly@iaccess.com.au

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Marmoleum/Artoleum

Click here before Printing

Material / Product Description
Linoleum floor covering, available in both sheet and tiles, in a wide range of colours and patterns.

Applications
Its durability and long lifespan make it suitable for educational, health and commercial applications, as well as for residential use.

Claimed Environmental Improvements
Composed of abundant/sustainable natural materials, the product has been optimised for improved environmental performance throughout its entire lifecycle.

RECYCLED CONTENT, RECYCLABILITY & WASTE AVOIDANCE	
Contains post-consumer recycled content	
Contains industrial waste (that would otherwise be landfilled)	
Potential for extended material/product life	✔
Extended Producer Responsibility Scheme	
High potential for re-use	
Recyclable where collection scheme exists	
Packaging eliminated, reduced, reusable etc	
Potential for in-use low maintenance	
Uses materials in least processed state	
LOW TOXICS	
Substantially reduced off-gas/particulate emissions	✔
Low/non-toxic alternative treatments	
Non-toxic emissions from production process	
No listed carcinogens emitted during production	
Low impact disposal when discarded	✔
REDUCED GREENHOUSE RELATED IMPACTS	
Reduced Greenhouse or energy impacts	

Potential for reduced energy consumption during use	
Low energy use during processing/production	
SUSTAINABLE SOURCES, BY-PRODUCTS, BIODEGRADABILITY	
Contains agricultural by-products	
Uses abundantly available raw materials	✓
Uses materials from sustainable sources	✓
Advanced levels of biodegradability	✓
OTHER VITAL SIGNS	
Material safety data sheets	✓
Environment policy	✓
Environmental product information available	✓
Environmental claims independently verified	✓
Ecolabels, awards & other relevant accreditation	✓
ISO 14000/EMAS accredited	✓
Complies with relevant Australian Standards	

SUPPLIER

Forbo Floorcoverings
15 Ferndell Street Chester Hill
NSW 2162
Telephone:(02) 9738 4848
Facsimile:(02) 9645 4270
Website: http://www.forbo-krommenie.com

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Millennium

Click here before Printing

Material / Product Description
A linoleum sheet surface. Available in a range of colours, in rolls of approximately 14-17 lineal metres, or cut to length.

Applications
Suited for use on desks, counters, bar and table tops, walls, partitions and doors.

Claimed Environmental Improvements
Manufactured from natural, renewables materials, and is biodegradable at the end of its life.

RECYCLED CONTENT, RECYCLABILITY & WASTE AVOIDANCE	
Contains post-consumer recycled content	
Contains industrial waste (that would otherwise be landfilled)	
Potential for extended material/product life	
Extended Producer Responsibility Scheme	
High potential for re-use	
Recyclable where collection scheme exists	
Packaging eliminated, reduced, reusable etc	
Potential for in-use low maintenance	✓
Uses materials in least processed state	
LOW TOXICS	
Substantially reduced off-gas/particulate emissions	✓
Low/non-toxic alternative treatments	
Non-toxic emissions from production process	
No listed carcinogens emitted during production	
Low impact disposal when discarded	✓
REDUCED GREENHOUSE RELATED IMPACTS	
Reduced Greenhouse or energy impacts	

Potential for reduced energy consumption during use	
Low energy use during processing/production	✓
SUSTAINABLE SOURCES, BY-PRODUCTS, BIODEGRADABILITY	
Contains agricultural by-products	
Uses abundantly available raw materials	✓
Uses materials from sustainable sources	✓
Advanced levels of biodegradability	✓
OTHER VITAL SIGNS	
Material safety data sheets	
Environment policy	✓
Environmental product information available	✓
Environmental claims independently verified	
Ecolabels, awards & other relevant accreditation	
ISO 14000/EMAS accredited	✓
Complies with relevant Australian Standards	

SUPPLIER

Duroloid Pty Ltd
236 Wickham Road Moorabbin
VIC 3189
Telephone:(03) 9555 9921
Facsimile:(03) 9553 2131
E-mail: gryan@iaccess.com.au

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concrete masonry plaster

Australian Mud Bricks
Blast Furnace (BF) Slag Concrete Aggregate
Boral Plasterboard
Boral Envirocrete
Boral Recycled Roadbase
Boral Rollpave
Coal Ash Aggregate
CSR Hebel AAC Blocks,Panels & Lintels
Earthbricks
Georgica Earthbricks
Gyprock Fibre Cement
HardiPanel Compressed

finishes sealants, adhesives

Aquapro (Matt Finish)
BIO Ceramic Tile Adhesive
BIO Cork Adhesive
BIO Enamel Lacquer
BIO Natural Oils
BIO Paint Stripper
BIO Varnishes
BIO Wall Paint HD
Ceratech Radiation Control Coating
Citristrip
Colour Coat
Cork Flooring
Gripcore Sheets and Gripset Range
Keim Mineral Paints
Laminex - High Pressure Laminate
Living Proof Paint
Livos Dubron Natural Wall Paint
Livos Kunos Natural Oil Sealer
Murobond Aqua Glaze
Murobond Cement Paint
Murobond Pentimento Limewash
Murowash
Organoil Timber Finishes
Paint Odour Eliminator
Porter's Milk Paint
Porter's Original Distemper
Procor 75
Ready Floor
Solarfoil
Soyplex Form Release Oil
Taubmans Bristol
Tech-Dry Earth Bonding Emulstion
Xpex

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Canterbury Windows
CertainTeed
PPG Azurlite
Smart Glass
Solarglass (using PPG Azurlite & Sungate 500)
Tyrol Windows
Velux Skylights

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metals

Aluminium Concertina Foil Batts
Aluminium Sunscreen Louvre Systems
Crane Enfield Metals Aluminium Extrusions
G James Recycled Aluminium Extrusions
JWI Sunshield Louvres
King Slide Product No. 8103-***2-ESA
Kleenflo Divertor Valve Filter
Ronstan Architectural Rigging Systems
Silver Batts
Smartflo Guttering System
Solar Mesh
Solartube
Termi-mesh
Western's Home Ventilators

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Atlantis Drainage Cells
Atlantis Ecological Tanks
Atlantis EcoPave
Atlantis GrassPave
Atlantis Strip Filter Drain
Atlantis Wall Drainage
Autex Insulation
Concrete Underlay
Dunlop Carpet Underlay
Ecoflex Wall Systems
Flexitec Bobble Pave
Flexitec Drainage Paver
Flexitec Fallsafe Pavers
Flexitec Playground Safety Edge
Flexitec Solid Paver
Flexitec Stable Mats
Freudenberg Ecoplan & Ecoment Rubber Floorcovering
Fusiontherm Pipe System
Gem Plastics Concrete Underlay
Gem Plastics Damp Course
Gem Plastics Handy Rolls
Horizontal Drainage Cell
Impactamat
IPS Polyethylene and Nylon Pipes and Fittings
Megaflow Panel Drain
PolyDrain
Polyester Insulation
Proflex Rubber Flooring
Recoplas
Regupol Equine Rubber Safety Surfaces
Regupol Everlast Recycled Rubber Flooring
Regupol Impact Sound Absorbing Underlay
Regupol Pavers
Reln Effluent Drain
Reln Plastic Septic Tank
Reln Stormwater Collection and Distribution Pits
Reln Surface Water Drainage Grate
Replas Products
Rib Loc Series 2000 Stormwater Drainage Pipe
Rib Loc Series 2000 Low Head Irrigation Pipe
Rib Loc Series 2000 Sub-Surface Drainage Pipe

Skylight Tiles
Specialised Rubber Services Flooring System
Sprinkle Edges
Stan-stat
Stormflex Pipe
Stratum Jeune
Stratum Path
Stratum Plus
Tred-Safe
Triangle Electrical Cabling
Tyrex™ Playcare
Tyrex™ WorkerCare
Tyrex™ CustomCare
Unimould
Visy Plastics
Water Divertor
Wharington RECOPOL™
Winter Windows

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recons wood tituted

- Bamboo Floors
- Bamboo Flooring & Lining Boards
- BT Bamboo
- Building Bitz
- Certified F.S.C Timber
- Crosstrack flooring
- Easiboard
- Enviroven
- Golden Cypress (Cypress Macrocarpa)
- Joinex
- Joinex Window Joinery
- 'Preserve with ACQ' treated timber
- Radially Sawn Timber
- Recycled Timber
- Rescued Timber
- Resource Tipshop
- Tanalith E Treated Timber
- Uniclic - laminate flooring
- Urban Salvage Recycled Tmbers
- Wonder Board
- Wunderlay Natural Timber Floor

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textiles

textiles

Bidim Geofabric
Carpet Tile
Carpet Underlay
Earth Plus Modular Carpet Tiles
Echo Screen
Eco BATTs
Envisions Carpet
Floorspace Coir
Floorspace Seagrass
Floorspace Sisal
Higgins Insulation
Homfrey Hycroft carpet
Macquarie Fabrics Collection
Natural Fibre Underfelt
Natural Floorcovering Centre Coir, Sisal and Seagrass
Play It Again Sam
Raw Cloth
Rebtex Sisal
Redux Collection
Smith Family Carpet Underlay
Swewi Leather
Thermowool
True-Blue Carpet Underlay
Volclay Voltex
William McDonough Collection
Woolmark or Fernmark Carpets

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4 Seasons Cellulose Insulation
Battmans Natural Insulation
Celltherm
Eco Pebbles
Energymasta Cellulose Insulation
Envirospray 300
GranitgardTM
Solomit Strawboard Panels
Stratica
Thermospray 800
Woolcell Bulk Insulation