Design & Sustainability
A Scoping Report
for the *Sustainable Design Forum*

27th June 2005

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Acknowledgements

We would like to thank all the organisations and individuals who generously contributed to this scoping study as well as the Department of Trade and Industry and the Department of Environment, Food and Rural Affairs for supporting the project. A special thanks to Robin Murray and Jude Codner from the Design Council for their enthusiasm, direction and organisational support. A full list of people that contributed to the study is available in Appendix G.

Executive Summary

The UK Sustainable Development Strategy (March 2005) sets out a policy agenda that challenges design at all levels. Measures to accelerate sustainable consumption and production lie at the heart of the Strategy. This includes initiatives to promote the supply of sustainable goods and services ('supply push) as well as creating demand ('demand pull'). This scoping study explores the opportunities for design to help shift both production (products and processes) and consumption onto a more sustainable basis.

So far progress has been incremental and responsive rather than radical and anticipatory. There are a number of possible explanations. Many aspects of the policy agenda are sector specific and have yet to filter through to impact on business, design and/or consumers. Financial incentives are currently too weak to summon a major design response and various 'technical exemptions' limit impact. The full weight of the government commitment to sustainable procurement has yet to be realised in the market.

Business interprets sustainable design as a largely technological challenge with effort focused on incremental change to existing products. There has been some innovation in product to service solutions but little exploration of non-technical approaches that employ the power of design to stimulate demand for more sustainable consumption and lifestyle choices.

Product designers feel constrained in their power to impact change. Designers are often positioned too far down the product development process to have a strategic influence ending up responding to pre-determined design briefs. In large companies, marketing, brand development, engineers, strategic function as well as R&D department often play a larger role than designers. Progress is further hampered by the lack of entrepreneurial and sustainable design skills and limited knowledge of government policy.

On the demand side, there is some evidence of a switch to sustainable products and services but the overall impact on market share remains insufficient to summon a radical supply response. For consumers, the main purpose of sustainable design must be to shift consumption and lifestyle aspirations to a more sustainable basis. Sustainable design must therefore start from a consumer/user perspective.

The challenge of sustainability opens up a wide spectrum of design opportunities – from improving existing products to influencing users and consumers, to changing lifestyles. Our proposition is that the radical change that is required to meet the sustainability challenge will require design led consumer innovation to stimulate market signals for sustainable product supply. This creates a new positioning for design beyond changing products, to changing consumption and lifestyle aspirations.

Our findings show there is a gap between the goals of policy and the responsiveness of business, designers and consumers on the ground. A series of action-based proposals are put forward for initiating and prototyping new sustainable design activities.

Introduction

Why this project?
This scoping report on Sustainable Design in the UK was supported by the DTI, DEFRA and the Design Council. It was commissioned as a background document for the scoping meeting of the proposed *Sustainable Design Forum* in September 2005. The UK *Government Sustainable Development Strategy* (2005) proposes that a *Sustainable Design Forum* will 'bring together expertise and educate in eco-design, and promote best practice tools and approaches which can be adopted by designers' and to 'mainstream sustainability into product design'.

Our approach
This scoping study has carried out a literature review and consulted with selected stakeholders in sustainable design including the business sector, mainstream product and service designers, specialist sustainability designers, design educators, consumer interests, and government. The scope was largely limited to UK stakeholders with some international examples included for comparison. Over 40 people were consulted (see Appendix G) in April/May 2005 and a *Sustainable Design Skills Workshop* was held at the Design Council on 17th May. The purpose of the scoping study was to sketch out a first picture of the state of sustainable design in the UK and to identify opportunities for design offered by the sustainable development agenda as well as policy approaches to accelerate progress.

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1. The Government Policy Challenge

The UK Sustainable Development Strategy reveals a strong policy commitment to reduce the sustainability impacts of the British economy through influencing production, consumption and ultimately lifestyle choices and aspirations. Sustainable design can play a central role in supporting these changes, but to date its contribution has been peripheral. The proposed Sustainable Design Forum provides an opportunity to change this. This scoping study offers an overview of the current status of sustainable design in the UK and identifies opportunities for change. It is offered as a starting point for discussion.

A central core of the UK Sustainable Development Strategy is to improve 'efficiency' of both consumption and production. This report explores what role design is currently playing in this agenda and where the potential opportunities are for design to shift both production (products and processes) and consumption onto a more sustainable basis.

The policy agenda considers measures to address both sustainable production (products and processes) and sustainable consumption. On the production side there are various approaches to encourage 'supply side push' to sustainable product design:

- Increasing the *end of pipe costs* to producers (producer responsibility regulations such as the Waste Electronic and Electrical Equipment (WEEE); End of Life Vehicles (ELV's) and the draft Bio Waste Directives)

- Increasing the *costs of environmentally damaging inputs* (notably energy through the climate change levy)

- Regulating the *use of hazardous substances* (eg. through the Restriction of the use of certain Hazardous Substances (ROHS) Directive)

- Placing responsibility for sustainability impacts through the *life cycle of products* on producers through Integrated Product Policy (IPP) and the Energy Using Products (EuP) Directive – both still in early stages of development.

We would have expected these polices to create supply side push in the market for sustainable products, but found little evidence that this has been the case so far. The mainstream product design (MPD) industry and sustainable product designers (SPDs) are not aware of significant changes in the demand for their services, and the SPDs in particular claim that there is a notable lack of demand for sustainable product design.

There are a number of possible explanations. For many of the product related policy measures it is early days with some only coming into force this year or later. The producer responsibility Directives are also very product or sector specific – primarily directed at packaging, electronic and electrical products, vehicles and batteries which limits the scope of their impact. In addition, the focus has been largely on 'end of life' issues and may only indirectly affect design upstream – such as material substitution and extending product life. In many cases the financial incentives remain too weak to

summon a major impact on design, further dampened by various 'technical' exemptions. As targets become more stringent over time this may change as incentives are strengthened. On the longer-term horizon, the IPP and EuP offer much greater potential for product re-design through a more upstream, holistic and life-cycle centred approach.

"The IPP could mean that producers have responsibility for the impacts of their products at all stages of their lifecycle, not just through the standards to which they are manufactured, but by conditioning their use and having responsibility for a closed loop, zero waste system". (Green Alliance 2005; 14).

UK firms, both large and small, have been slow to anticipate the trends in sustainability policy both in the UK and internationally. They have been responsive rather than anticipatory. Where change has happened, the response has largely been technical changes to existing products undertaken primarily by in-house production engineers.

The indications are that the product policy approach is encouraging incremental rather than radical progress towards sustainable products and processes.

The Sustainable Development Strategy opens out a second major policy direction namely creating 'demand-pull' for sustainable products. There are a variety of elements to this strategy including:

- *Sustainable public procurement*: Government can have enormous influence in stimulating sustainable design through its own procurement program. The UK Government buys £13 billion worth of goods and services and £125 billion through the wider public sector each year. This scale of expenditure is a powerful 'demand pull' catalyst to spur the development and supply of sustainable products and services. There are multiple routes for influence from market creation to demonstrating leadership. A key challenge is how to firmly embed sustainability criteria into the enormous government investment in new buildings – such as schools and hospitals.

- *Consumer market*: The Government approach to sustainable consumption includes a whole raft of initiatives to help people make better choices – such as product information and labelling schemes; media campaigns as well as providing viable alternatives and positive incentives. A lot of innovative activity is going on at the local level such as the government funded 'ChangeLAB' program about effective local interventions to change lifestyles, attitudes and behaviour.

Both the 'supply push' and 'demand pull' agenda opens up a whole spectrum of opportunities for the design industry – many of which have yet to be fully realised.

For a more detailed overview of UK policy affecting product and service design see Appendix F.

2. The Response from Different Stakeholders

Key stakeholder groups[1] were consulted about the current status of sustainable design in the UK and the perceived constraints and opportunities for design to contribute to both the supply push and demand pull aspects of the sustainability agenda. Overall, we found little evidence of a supply side push in the market for sustainable products. Many in the design community felt that 'best practice sustainable product design' is yet to come of age and few genuine examples exist. Over recent years, both mainstream and specialist sustainability designers were not convinced of a significant growth in the demand for sustainable products and services. Without a significant shift in market share and a clear business case for sustainable design shaped by government policy incentives, progress will be slow, incremental and compliance led.

All key stakeholder groups – business, designers and consumers – tended to look to others to take the lead. The culture has been passive and responsive rather than anticipatory, radical and innovative – the exception being pioneers (in the corporate, design and consumer domains) driven by a personal commitment to the sustainability agenda. The following sections explore some of the factors behind the status quo.

Business

Lessons about how business has responded to the sustainable design challenge have been drawn from the two sectors reviewed in detail for the report: Fast Moving Consumer Goods (FMCG) and the Electronics sector. Sustainable design seems to be driven and work most successfully when it is linked to a broader corporate sustainability strategy; when there are pressing sustainability issues for the sector; or in response to a sector or business scandal.

Business interprets sustainable design as a largely technological challenge tackled through incremental improvements to existing products. The emphasis has been on single issues (such as toxicity or energy efficiency) and end of pipe solutions with some evidence of consideration of wider lifecycle impacts which is moving the focus more upstream towards front-end solutions.

In the sectors reviewed for this report, government legislation (such as producer responsibility regulations) so far has not created powerful incentives for re-design upstream – though this may change as targets and incentives are strengthened over time and a broader more integrated product policy based on full lifecycle impacts is introduced.

The technological response to sustainability accounts for the predominantly engineering approach to sustainable design within mainstream business. The emphasis has been largely on products and production processes with limited evidence of more radical solutions that challenge consumer aspirations towards more sustainable lifestyles or

[1] The full list of stakeholders consulted across business, design, design education, consumer groups and government is available in Appendix G.

experimentation with new design or business models based on wider ecological principles – such as bio-mimicry and bio-thinking approaches. A notable exception has been the exploration of innovations in the product-service mix with a whole range of service solutions being offered, particularly in the business-to-business sector (eg. Xerox – photocopying; Wikhahn – furniture; Interface – flooring; Electrolux – industrial cleaning). There is clearly considerable scope for design in experimenting in new product-service constellations as well as exploring opportunities for sustainable design in traditional service businesses such as transport, telecommunications and tourism.

The lack of a robust business case is cited as one of the main reasons for the sluggish move towards sustainable product and service design. Other corporate drivers and barriers are summarised below.

Corporate Drivers	Corporate Barriers
Policy, regulation and voluntary standards (at sectoral, national and EU level) **Cost savings and efficiency** ('eco-efficiency' gains) **Labelling** – with mixed success **Public, NGO and media pressure** – acts as both motivator and barrier **Marketing and consumer driven** – 12% rise in demand - 2004 **Brand value/reputation** – strong links between sustainable design and branding **Corporate leadership** – Many business programs - as well as emerging corporate leaders - are now mandating sustainable products and design.	**Business case** – developing a robust business case that reaches beyond short term single issues that vie for attention **Lack of demand** – growing markets but still niche/small in terms of market share **Internalising external costs** – some efficiency gains but often results in net business costs **Lack of policy incentives** – insufficient tax breaks or grants

See Appendix B for a more detailed overview from the business perspective.

Designers

The consultation for this study focused on the response of product/industrial designers[2] to the challenge of sustainable product and service design.

Many mainstream product designers (MPDs) and all of the sustainable product designers (SPDs) consulted see sustainable design as essential and inevitable and envision a future in which 'sustainable design' is not a specialist area of design, but rather an attribute of good design.

But progress in putting this vision into action has been slow. One of the main reasons cited is the positioning of product designers within the product development process. Both MPDs and SPDs agree that product/industrial designers often enter the process too late and contribute little more than styling and 'add-on' functionality. Sustainability issues are best considered upstream in the business and product development process but designers often have little strategic influence at this stage. Our research showed design to

[2] A commonly used definition of industrial design is provided by the Industrial Design Society of America (IDSA): *"Industrial design is the professional service of creating and developing concepts and specifications that optimise the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer".*

be a multi-stakeholder activity in which engineers; marketing/brand experts; business strategists and research and development often play a larger and more significant role in product development.

Secondly, many mainstream designers see sustainability as one of many factors on a design brief and as a political/ethical issue, better left to the personal preference of the designer.

"You have many magnetic poles and you feel attraction from all of them and you tread a path between them that is the most appropriate for all stakeholders… sustainable design places more emphasis on one of these poles of attraction and in many design teams that is not seen as a better thing…and this emphasis comes at the expense of others."

- Respondent from mainstream design sector.

In contrast, sustainability designers place sustainability at the heart of their practice often seeing it as an extension of their own lifestyle and values. For SPDs the real challenge comes in convincing clients to place sustainability high on their list of concerns. Both mainstream and sustainability designers were in agreement that clients/consumers were the main constraint to taking the practice forward. And both looked to government to take the lead in creating incentives to motivate consumers (eg. through education and price incentives) rather than pro-actively using design to challenge consumer aspirations or create new demand-led market opportunities.

Thirdly, designers generally have little direct knowledge of government policy and how this can be used as a vehicle to motivate sustainable product design. SPDs are more aware of the new raft of policy initiatives and welcome them as opportunities to define not only new markets but also new business models.

Finally, lack of appropriate tools and skills for sustainable deign was often quoted as a barrier to sustainable design. MPDs are especially challenged to acquire the necessary skills and knowledge required to design sustainably, with many saying they are at a loss to know where to begin. Over 30 different skills were identified as important for sustainable design – ranging from facilitation to ecological and systems thinking.

"…the [necessary] skill set is massive, but there are also missing tools. LCA is good but you need CAD [computer aided design] systems that interact with LCA systems to make it easy and to help get young designers up to speed." Respondent sustainable design sector

Sustainable design in the UK focuses on the supply side of the equation – it is technology driven and product focused with LCA most often cited as an important tool for sustainable product designers. But there are signs of a non-technical, non-material approach to sustainable design emerging that is more about demand pull. Here the focus shifts from products to the consumer (and sustainable consumption) using design to challenge social norms, consumer perceptions and lifestyle aspirations. Methods used include creative visioning, facilitation and participatory methodologies that involve users in the design process as well as employing the power of communication design to shift

perceptions and aspirations. Some companies are now beginning to use design skills to shed new light on sustainability problems.

See Appendix C for a more detailed overview from the designer perspective.

Design Educators
The key issue here is whether the UK has the capacity to develop the skills needed to take forward the sustainable design agenda. Most mainstream courses do not incorporate sustainability modules within their curricula but a number of high quality specialist programs have sprung up. The UK is seen as an international leader in Sustainable Product Design Education (SPDE) but student demand remains low and there is poor awareness within the university management of the importance of SPDE. A boost in the demand for sustainable design services is needed – either directly from business or via government initiatives such as the sustainable procurement program and sustainability related HEFCE grants.

The sector is challenged by the broad skill set needed to practice sustainable product design. Over 30 different skills were identified by respondents ranging from facilitation and people centred skills to knowledge of manufacturing techniques, materials and environmental impacts (See Appendix D for the complete list of skills identified). It is impossible to incorporate such a broad skills set within a traditional academic curriculum. New, more innovative learning models are needed to respond to this challenge – such as open source, vocational, work-based and life-long learning. At the same time, transferable design skills (such as creativity; visual and cultural literacy; and people centred skills) can make a rich contribution to sustainability and create new employment opportunities beyond product design.

See Appendix D for a more detailed overview from the design educators' perspective.

Consumers
For consumers, the main purpose of sustainable design must be to shift consumption patterns to a more sustainable basis. Sustainable design must therefore start from a consumer/user perspective.

"The inefficiency in consumption is such a huge and important issue that the revolution of the twenty-first century will be about shifting inefficiency of consumption".

- Respondent from consumer advocacy group.

Can we rely on market signals from consumers to power a radical transformation in product and service design? There is some evidence of a switch to sustainable products and services in the UK over the past 20 years. For example, the Ethical Purchasing Index (EPI 2004) shows the market share for ethical products growing by almost 40% in the past 5 years with the most significant growth in 'green goods'. But, the impact in market share for most products is not enough to create the 'demand pull' necessary to signal a radical transformation in the supply of sustainable products and services.

Government policy is directed at improving the efficiency of consumption ('more for less') with sustainable product design being an important tier of this strategy. But recent evidence from the government's decoupling indicators shows that the efficiency gains that have been achieved have been eaten up by overall consumption growth (Defra 2005b). Others call for 'sufficiency' solutions where 'better instead of more' becomes the guiding design principle (Cooper 2000; Jackson 1996). The sufficiency case has yet to gain momentum amongst key stakeholder groups interviewed in this study, neither is it an integral part of government policy. But it is being taken forward through aspects of the sustainable design agenda.

"Focusing on breaking the link between more products = more consumption of natural resources will not be sufficient to move towards sustainability. We must now concentrate on the first correlation, more products = more well-being, and find a way to break it. The role of design then becomes not just about producing artefacts but also life scenarios and ideas of well-being". (Manzini and Jegou 2003)

This points to a new positioning of the role that design can play in the sustainability agenda. Design can contribute to the challenge of sustainable consumption not just by changing products but also by influencing social norms, consumption and lifestyle aspirations. Here user centred design as well as brand design, marketing and packaging design have an important role to play in influencing the psychology of consumption. Exciting, innovative and meaningful messages can help create a new vision of how people live their lives. Extending the brief of designers to be part of the creation of a new sustainable way of life is the challenge of those working at the cutting edge of sustainable design.

Many respondents felt that the link between design and consumption was a two way dynamic. Product design sets the context within which people act and at the same time everyday life informs product and service design. At the moment this dynamic is characteristic of a vicious downward spiral. Respondents presented a number of challenges to designers to create a virtuous feedback loop – in which sustainable design feeds sustainable consumption and vice versa.

- Don't rely on existing consumer signals – create new pathways for consumers to tread. For example, fair trade created markets that previously did not exist
- Create product-service design solutions that have a lighter material burden and meet as well as question people's need for ownership
- Create classic and iconic designs that favour timelessness over newness
- User centred design, creative visioning processes as well as communication and brand design are powerful ways to empower consumers as well as challenging social norms and influencing lifestyle aspirations
- Standardise information and labelling requirements and re-present sustainable consumption as something that is innovative and exciting
- Design strategies are needed to address both efficiency & sufficiency of consumption.

See Appendix D for a more detailed overview from the consumer perspective.

3. A New Positioning for Design

Our research shows that sustainable design has many potential entry points – to influence both production and consumption. Contributions are called for from various sectors of the design industry – from product engineers; product designers; communication and brand design, as well as user-centred and consensus based design processes. In this study, our consultation has focused on product design, although we have identified a role for other design professionals as well as involving users and consumers as co-creators in the design process.

Much of the focus to date has been on the role of design in creating more sustainable products, but a potentially more powerful and transformational role for design is at the other end of the spectrum – in influencing consumption choices and lifestyle aspirations. Participatory design methods put the needs and aspirations of users at the centre of the design process to co-create demand for new types of products and services; while communication and branding design sends powerful messages that help shift social norms and aspirations to be more in line with sustainable lifestyles.

Our proposition is that the radical change needed to meet the sustainability challenge will require design-led consumer innovation ('demand pull') to stimulate market signals for sustainable product supply ('supply push'). This extends the role of design beyond more sustainable products, to changing consumption and lifestyle aspirations. Opportunities to take this agenda forward are explored below.

4. Mapping the Opportunities

The UK Sustainable Development Strategy presents a challenge to the systems of production and consumption to become more sustainable. Sustainable design is one of many initiatives that will further this agenda. This section develops a framework to map the terrain – showing how government policies create design opportunities along a spectrum from changing products, changing consumption and ultimately influencing lifestyle choices and aspirations.

Donella Meadows from the Sustainability Institute[3] offers a simple model to show the different points to exert leverage in a system – which we have adapted to illustrate how sustainable design can exert influence across the full spectrum from production, consumption and lifestyle choices. Table 1 explains the nine different leverage points which offer a way to think about the range of different entry points for sustainable design. They are presented in increasing order of effectiveness.[4]

[3] The Sustainability Institute in Vermont focuses on developing tools and methods to understand the root causes of unsustainable behaviour in complex systems. (www.sustainer.crg)

[4] leverage point 9 (changing amounts and quantities) being the least effective and leverage point 1 (paradigm shift) being the most effective.

TABLE 1

9 ways to intervene in a system

Donella Meadows (1997; 1999;2001) in a series of papers has developed a set of 9 leverage points to intervene in a system with the aim of facilitating change. Leverage points are listed here in increasing order of the degree of change which they can stimulate. Starting with changing physical quantities (such as making products more resource efficient) to shifting values and mind-sets (paradigm shift).

LEVERAGE POINT		HOW IT APPLIES TO SPD	
9. *Amounts/ quantities*	*Changing physical quantities than can be measured and quantified. Much of the environmental agenda has focused on this level.*	*Can products be more efficient?*	*This is concerned with reducing amounts of waste, energy and material resources. many product design approaches begin at this level through efficiency, end of pipe and single issue solutions.*
8. *Redesign the structure*	*Redefine products and production processes, which determine materials use, emissions and waste.*	*Will redesign make it more sustainable?*	*This level of change would look at the materials and structure of a product in order to make it more recyclable/non-toxic/biodegradable.*
7. *Stocks relative to flows*	*Changing the ratio of stocks to flows can influence system flexibility and stability.*	*How can products become flows of services?*	*Redefining products as flows of services can enhance efficiency through increased flexibility and durability.*
6. *Feedback loops/reduce delays*	*Working with feedback is about working with information (consequences/ impacts) rather than the physical part of the system. Feedback loops are more flexible, fluid and responsive than earlier leverage points*	*How is feedback incorporated?*	*Environmental and social impacts are measured and treated as feedback loops to inform redesign of products, services and processes. LCA is an example of visualising impacts to inform product design.*
5. *Information flows*	*Can be thought of as missing feedback loops and providing missing information flows often takes the form of visualizing consequences and impacts.*	*How is information conveyed?*	*Information about products is conveyed through advertising/marketing and on packaging. It forms a primary interface with consumers.*
4. *Critical nodes*	*Locating critical nodes in a network is crucial for determining the effectiveness of intervention. Understanding what/who constitutes key nodes within a network can help to focus change or leverage opportunities within webs of relationship.*	*Who are the players involved?*	*Understanding who the key players are in product development (consumers, government, business and designers) and their 'push/pull' relationship to each other will enable designers to take advantage of opportunities/challenges*
3. *Changing the rules of the system*	*Formal and informal rules define the parameters about how the system works. They can be formal regulations, economic incentives as well as informal social norms and practices.*	*Can design help change 'the rules'?*	*Brand positioning can create perceptions/trends that affect economic parameters and social norms and affects what a business' product/service offer will be.*
2. *Self-organisation*	*Systems do not always respond to changes (such as government policy) in predictable ways. They have the capacity to learn, adapt and respond creatively—in other words, self-organise.*	*How can design be bottom-up?*	*Bottom-up participatory design processes that involve users/consumers can be creative ways to shift awareness and behaviour.*
1. *Paradigm shift*	*Paradigm refers to the collective 'mind set' of the system which carries with it powerful assumptions. Paradigms can change systems at a fundamental level and can happen in a millisecond.*	*How can design impact sustainable lifestyles?*	*Creative design inputs into envisioning future sustainable lifestyles can lead to a complete shift in perception about what is possible and desirable—with consequent impacts on demands for services and goods.*

For example, the lowest leverage point is at the level of changing physical quantities (such as reducing resources, waste, energy). In design terms, this relates to incorporating single issues to improve existing products – such as reducing waste, material and energy use. The final and most powerful point of intervention is at the level of values and 'mind-sets'. This is about using the power of design to help shift consumption and lifestyle aspirations towards a more sustainable vision. Some cutting edge designers (such as Ezio Manzini from Milan Polytechnic) are already extending the role of design into creating a vision for sustainable everyday life and re-defining the types of products and services which would emerge in such a society. Many use ecological principles as a guide to defining the broad parameters of a future sustainable vision – such as bio-mimicry and bio-thinking design methods.

The framework can be used to think about different ways that design can exert influence on the system of production and consumption at different points. Table 2 uses this schema to map out how government policy presents a range of design opportunities along this spectrum. It shows examples of government policy directed at changing products (such as the WEEE Directive), those that are incorporating lifecycle feedback loops into product policy (such as Integrated Product Policy); to efforts aimed at changing consumption and lifestyle aspirations (such as through sustainable public procurement and participatory design of public services).

This opens up a full range of opportunities for different aspects of design to contribute to this agenda. In increasing order of effectiveness this includes: incorporation of single environmental issues into existing products; product re-design; product-service solutions; using closed loop feedback in design; improving information flows in packaging and communication design; using product design and marketing messages to re-define social norms; engaging bottom up participatory and user centred design processes; to using design inputs to envision future scenarios for sustainable everyday life and new emergent products and services. Examples of tools and methods that designers can use at different points in the spectrum are also identified in Table 2. A short description of selected tools and method is given below – a more detailed overview is provided in Appendix A.

5. Tools and Methods to Help

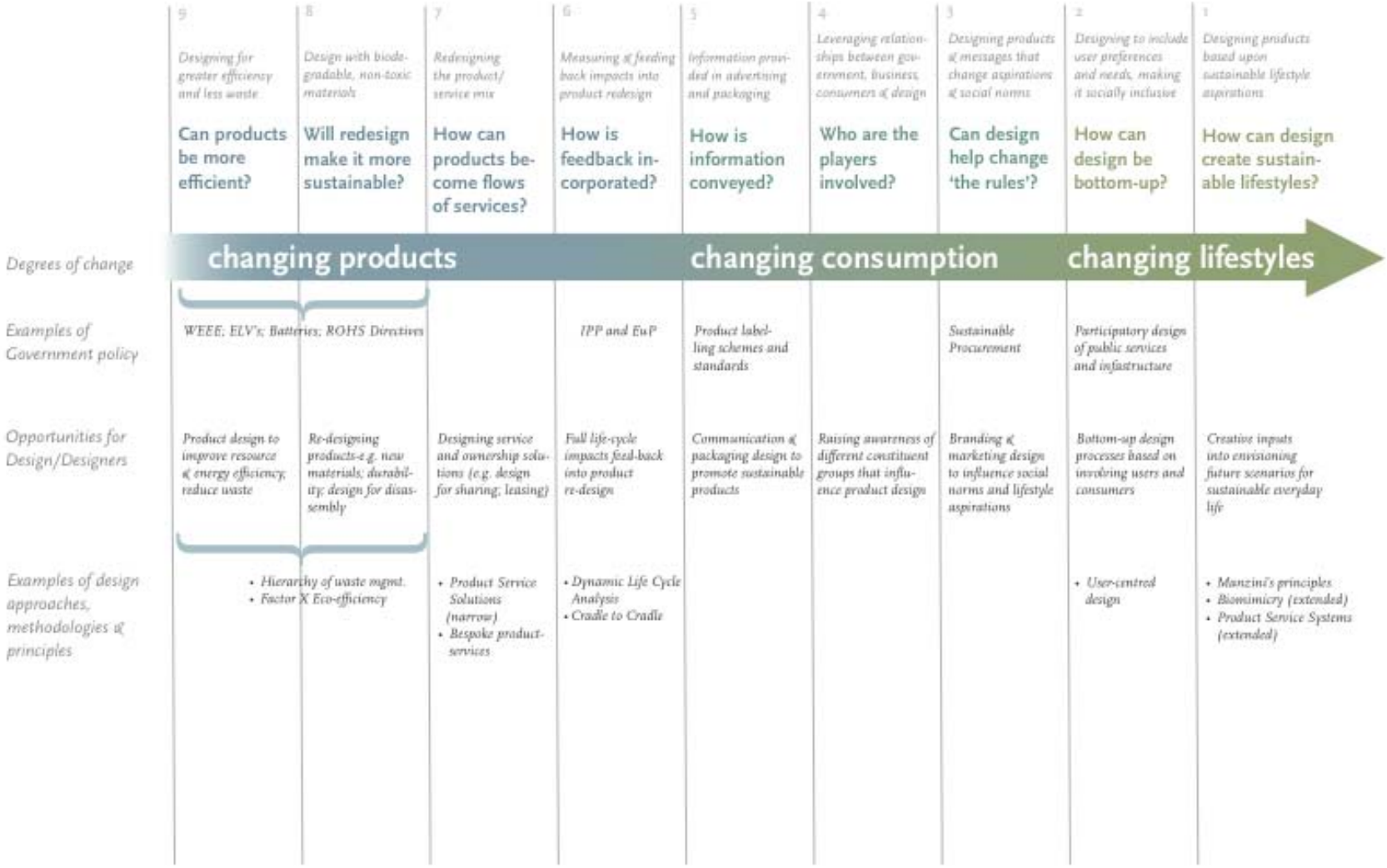
The tools and methods in Table 2 are presented below in the order of those that are primarily product focused to those that are primarily user/consumer focused.

Hierarchy of Waste Management: This is an early design model whose primary emphasis is the 'reduction' of waste, followed by the 'reuse' of product, components and materials in design. Third on the hierarchy is 'recycling'. This model led to the earliest eco-design product focused strategies – reduce, reuse, recycle.

Factor X eco-efficiency concept: Eco-efficiency is a product based approach that focuses on increased resource and energy efficiency through technological innovation that allows

TABLE 2

Changing products, consumption & lifestyles through policy & design



consumption to be doubled while environmental impacts are halved (Factor 4 effect). Practical examples include office furniture by *Herman Miller* and *the FRIA Cooling Chamber* designed by Ursula Tichner.

Dynamic'Life Cycle Assessment (LCA): LCA is a design tool in which all the stages of a product's 'life' are considered through design (material extraction; production; distribution; use and disposal). Extended versions can incorporate social and economic impacts. LCA is one of the key methods recommended in the *Product Sustainability Toolbox* (ACCPE 2004).

Cradle to cradle: McDonough and Braungart (2002) are pioneers of this approach, a central tenet of which is the restoration of cycles, one biological the other technical. Materials are tracked using a life cycle from cradle to cradle rather than eco-efficiency's cradle to grave. This calls for 'closed resource loops' in which waste from one industry becomes 'food' or raw materials for another.

Product service systems (PSSs): The key idea behind PSS is that consumers do not specifically demand products, but rather are seeking the utility these products and services provide. By using a service to meet some needs rather than a physical product, more needs can be met with lower material and energy requirements. There are many examples of this approach in business to business services (eg. Xerox – photocopying) and some penetration into consumer markets (mobile phone services).

Bespoke product-services
Hand crafted and bespoke products are an example of decentralised, high quality product design that incorporates a large service element; fosters durability through consumer attachment, care and repair as well as reducing resource intensity per worker. The customer's involvement in the design process ensures a high level of appreciation for the product with consequent sustainability gains in terms of longer product life.

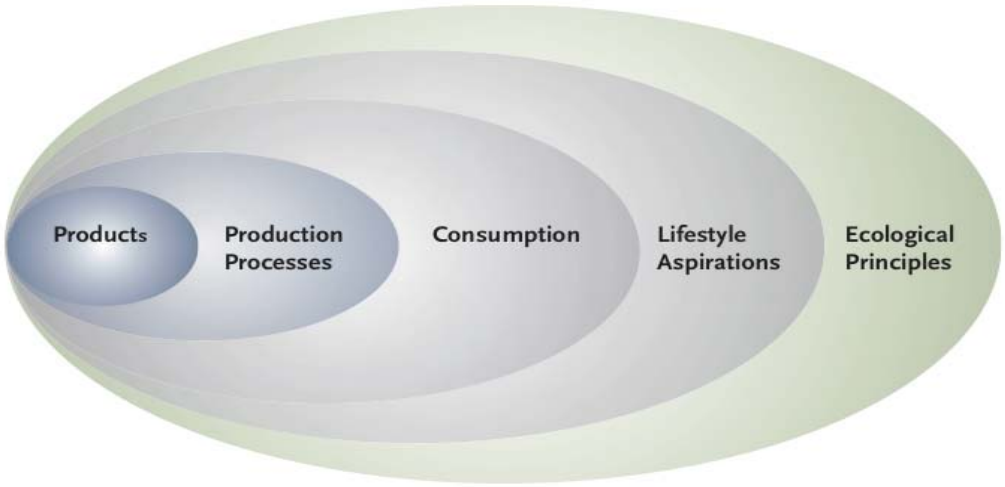
User-centred design: This is a bottom up emergent process which starts with the needs of users/consumers as the basis for the co-creation of goods and services. This participatory design process can also be used to challenge perceptions and values, using sustainable consumption and lifestyles as a starting point for the design process. It is characterised by a systems wide view of design problems in which relationships and context are primary. It has been pioneered by Christopher Day in architecture and the Red Program at the Design Council in the design of public services and infrastructure.

Manzini's principles: Manzini has developed some of the most advanced thinking in the practice and theory of sustainable design that starts from a systems wide perspective and questions the role that goods and services play in a sustainable future. Designers have a role to play in envisioning sustainable everyday life and the types of goods and services that would be needed in such a society.

Biomimicry (extended): This is a growing field in which the design of products mimic nature by utilising biological and ecological principles. Observations of natural systems

have inspired a number of new products and have shifted design from a largely technological to ecological and biological paradigm. Although originally product focused, the extended version uses broad ecological principles as the basis for sustainable consumption and lifestyle choices.

The diagram below shows that some sustainable design methods start from influencing products and production processes whereas others start from influencing consumption and lifestyle aspirations within broad ecological principles.



Some sustainable design methods start from influencing products and production processes (supply push), e.g. Factor X and eco-efficiency. Other sustainable design methods start from influencing consumption and lifestyle aspirations within broad ecological principles (demand pull).

6. Ways Forward

Our findings show that there is a gap between the goals of policy and the responsiveness of business, designers and consumers on the ground. There is need for some further initiatives to catalyse an emergent sustainable economy using the full range of policy opportunities that this agenda opens up. The following series of action-based proposals are put forward for initiating and prototyping new sustainable design activities to contribute to this agenda.

CHANGING PRODUCTS

6.1 Forum to promote best practice eco-design tools and methods

Objective: To promote best practice sustainable design tools and methods to a wider audience to raise design practice beyond compliance.

The role would be to champion best practice eco-design tools, methods and approaches and promote their use in the UK as a business opportunity, rather than as a compliance tool.

- Expand the remit of Envirowise towards a best practice/gold standard approach
- Link with existing centres of excellence (eg. Centre for Sustainable Design) and use their expertise to champion and promote best/better practice
- Act as an innovative 'hub' of the proposed ACCPE sustainable product body to explore tools and methods that can promote the transition from incremental to radical change in sustainable design.
- Create a stakeholder forum featuring all 'sustainable design' actors to take the agenda forward (eg. DC, CIM, PIRA, INCPEN, CFSD, EC) to act as a 'standards' council.

6.2. Factor 10 Forum

Objective: To champion radical innovation in sustainable design to deliver factor 10 gains in resource and energy efficiency.

- Start up funding for projects/experiments/research to deliver Factor 10 solutions. This might be via a Factor 10 sectoral competition (linked to the Sector Sustainability Challenge and NESTA)
- Experiments in product to service solutions (such as leasing; bespoke services and care and repair) to maximise resource and energy efficiency and consumer acceptance
- Exploration of sustainable design solutions in traditional services sectors such as transport, telecommunications and tourism
- A platform for information sharing and to promote 'best practice' examples in factor 10 design solutions within specific sectors (eg. development of bio-plastics; shifting from the hydrocarbon to the carbohydrate economy)

CHANGING CONSUMPTION AND LIFESTYLES

6.3 Design Led Sustainable Consumption Forum:

Objective: To champion design-led approaches that focus on shifting consumption and lifestyle aspirations to a more sustainable basis.

- R&D projects based on bottom-up, participatory design processes that co-create products and services within a future sustainable vision (using RED within the Design Council linked with other European partners such as the Milan Poytechnic)
- Develop collaborative projects with sustainable design establishments; consumer and public bodies both in the UK and internationally. Practical projects include developing design responses to the consumer challenges set out in this report; secondment of a Sustainable Product Designer into the National Consumer Council
- Student competitions in design led sustainable consumption projects (eg. via the RSA and D&DA).
- Corporate partnerships to explore the role of packaging, communication and brand design in influencing social practices and lifestyle aspirations (building links with Forum for the Future's Sustainable Marketing Program)
- Founding a centre of sustainable urban lifestyles in London (a version of the Eden Project for the Inner City) which acts as a hub for citizens, business and tourists as well as hosting trade fairs (as an alternative to the Ideal Home Exhibition) and other events to spearhead this growing sector.
- Development of a green card to provide information about and means of accessing sustainable products and services (with discounts).

6.4 The Natural/Ecological Design Forum

Objective: To explore how ecological and biological principles can be used to inspire radical design approaches; to inform new economic and business models (eg. closed loop systems) and sustainable consumption and lifestyle choices.

A series of practical projects are proposed to link design more strongly with ecological and biological science.

- Series of high profile workshops facilitated by international leaders in this area to stimulate interest as well as addressing specific business and design challenges
- Establishment of a Biomimicry Guild, Laboratory and web-site as a way to cultivate the use of biological/ecological knowledge to the business and design
- Support for R&D, consultancy and 'experimental' in-house corporate placements by leading ecological/natural design practitioners (linked with Schumacher College and the Centre for Natural Design).

6.5 Demand creation for sustainable design

Objective: To create innovative ways to stimulate demand for sustainable design services

- *Trojan Horse Programme:* A series of 'in-residence' design placements – for example, placement of top designers within corporate sustainability departments or placement of sustainable product designers within an in-house corporate design department to respond to specific business challenges.
- Create exemplars of sustainable design consultancies/SME's through national competitions.
- A corporate/client working group to explore how to procure sustainable design services from design service providers
- *Corporate Challenge:* Sustainable design competitions for design graduates with corporate scholarship/funding placements linked with 'Trojan Horse Programme'.
- *Sustainable Public Procurement program* - to commission a series of radical briefs for the sustainable design community to respond to which links clearly into the emerging sustainable public procurement initiative. Link with key areas of government procurement – such as education, health, and prisons. If 1% of all public procurement was allocated to innovative sustainable solutions this would create a £160 million demand for the schools program in London alone.
- *Sustainable Design within a Business Network* - to build design skills within an existing sustainable business network (such as Forum for the Future's Business network; Kyocera Mita's Greencard network).

SKILLS, STANDARDS AND START-UPS

This section is about developing the skills to respond to the sustainable design challenge; creating professional standards as well as promoting small-scale start-ups.

6.6 Open source skills & learning portal

Objective: To develop an open source Sustainable Design Academy for skills and experience sharing

The workshop for skills in sustainable design recommended that existing initiatives be linked together through an open-source portal. The proposal suggests not a new institution but a means of accessing existing ones.

- Establish an open source Sustainable Design Academy (incubated by the Design Council) to enable access to a variety of information on existing courses/materials and events as well as offering short courses, and modules for existing curricula.
- Develop this 'sustainable design scoping study' as an open source, living document linked to the portal.
- Training of the trainers program for life long learning

- Work with existing educational establishments to incorporate sustainability literacy into professional qualifications and explore the possibility of the development of professional eco-design standards.

6.7 Promoting new sustainable design service provision

Objective: To promote sustainable design through funding and 'positive discrimination' of new sustainable design based start-ups or building existing competencies

- A special innovation fund for start-up SME's focusing on sustainable design
- Grants for design consultancies wanting to build competencies/skills or conduct a sustainable design project
- 'One-stop-shop' for green design service providers, consultancies and SME's offering a package of support services (start-up funding; incentives; awareness raising and training; networking events)

PROMOTING POLICY COHERENCE

6.8 Mapping out the policy terrain

Objective: To promote policy coherence with other initiatives that impact on design and its relationship to sustainable production and consumption.

One question that was continually raised during our consultation was how the proposed Sustainable Design Forum would relate to the plethora of other initiatives (including the Sustainable Consumption Round Table; the Sustainable Consumption and Production Business Taskforce; the new business led Sustainable Procurement Taskforce; as well as the new Products Body proposed by the ACCPE and currently under consideration by Defra). An important first task for the new Sustainable Design Forum will be to map out the existing terrain; build links and define a fruitful relationship with these groups.

Design & Sustainability: A Scoping Report

Summary Appendices

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Bibliography

Appendix A: Overview History of Sustainable Product Design, Tools & Methods

1. History of Sustainable Design

Eco-design, which attempted to integrate environmental concerns into the design of artefacts and the built world did not emerge as a discrete discipline until the mid 1970's. However, its roots lie in earlier concerns expressed by ecologists such as Leopold (1887-1948) and Naess (1912)); and socio-economic and political critiques and visions for a more sustainable worldview, offered by people such as Mumford (1895-1990); Bookchin (1921)) Packard (1914-1996); Nader (1934) and Schumacher (1911-1977). Many cite the publication of Rachel Carson's *Silent Spring* in 1962 as a catalyst for environmental concern and Victor Papanek's *Design for the Real World* in 1971 as sparking the emergence of the eco-design movement.

The Bruntland Report (1987) prompted the second wave of environmental concern along with the green consumer revolution which regarded design as important in the development of more mainstream eco-products and in enhancing consumer acceptance of these. By the early 1990's designers were beginning to take these messages on board stimulated by 'design for the environment' being placed on the corporate agenda (Mackenzie 1997; Burrall 1991).

Throughout the 1990's to the present day, a plethora of exciting new developments are pushing the boundaries of design. Ezio Manzini (2003) is part of a growing movement to broaden the remit of designers towards creating a vision for sustainable everyday life that re-defines the need for different types of goods and services. New approaches based on biological and ecological systems (inspired by the earlier work of D'Arcy Thompson (1921) as well as natural patterns and morphological processes (such as Alexander's Pattern Language 1977) are shifting the agenda. At the same time, the work of Walter Stahel at *The Product Life Institute* and others are spear-heading the new dematerialisation trend via reconfiguring 'product service systems'.

2. Tools and Methods

There is a rich and diverse range of tools, methods and principles for Sustainable Product Design. For a comprehensive review see Sherwin (2001) and Charter and Tichner (2001). In this section, we provide illustrative examples of the different types of tools and methods that are available. Most of those surveyed are concerned with improving resource and energy efficiency of single products as well as reducing waste and toxicity impacts (such as Factor 4, 10 and 20 models). Design methodologies informed by this approach tend to start with a product focus, initially incorporating single issues (such as the use of some new material such as recycled plastic or energy efficiency solutions). More sophisticated models adopt a lifecycle approach, addressing all impacts along a product's lifecycle (material extraction, production, distribution, use and disposal) which in extended versions includes full triple bottom line impacts.

Broader approaches extend beyond single products to address larger ecological and social (eg. relating to consumption and lifestyle) questions in a systemic framework. These

methods draw from principles of ecology, biology and a vision of a future sustainable society to inform the different types of products and services which would then be needed.

The tools and methods are presented below in rough order of those that are primarily product focused to those that are user/consumer focused.

Hierarchy of Waste Management: This is an early design model whose primary emphasis is on waste reduction and management. It promotes the 'reduction' of waste as the primary goal, followed by the 'reuse' of product, components and materials in design. Third on the hierarchy is 'recycling', some way below its perceived priority design status. This model led to the earliest and perhaps most simple eco-design product focused strategies – reduce, reuse, recycle. (Sherwin 2001; 23).

Factor X eco-efficiency concept:
Eco-efficiency is a product based approach that focuses on increased resource and energy efficiency through technological innovation. Von Weizsacker, Lovins and Lovins (1997) have argued that greater eco-efficiency could allow consumption to be doubled while environmental impacts are halved, the 'factor four effect'. Practical examples of products that have achieved this level of increased energy and materials productivity include office furniture by Herman Miller; the 'hypercar' developed by the Rocky Mountain Institute; and the FRIA Cooling Chamber designed by Ursula Tichner (Cooper 2000).

Life Cycle Assessment (LCA):
Life cycle principle/assessment is a concept in which all the stages of a product 'life' are considered through design (material extraction; production; distribution; use and disposal). It is one of a range of tools that support life cycle management, - minimizing environmental burdens throughout the product/service lifecycle. Life cycle approaches consider local as well as global impacts and attempt to incorporate environmental factors into early stages of design. Decisions made at various points in the lifecycle have effects both up and down stream, for example recycling wastes back into the lifecycle system can potentially reduce resource use at its extraction. Extended versions can incorporate social and economic impacts. LCA is one of the key methods recommended in the Product Sustainability Toolbox developed by the Advisory Committee on Consumer Products and the Environment (ACCPE 2004)

Cradle to cradle: This approach calls for more radical design solutions to bring our economic and social systems into harmony with the wider ecological systems on which they depend. For McDonough and Braungart and (2002) design of products and services needs to enrich the environment rather than deplete it. The language of this agenda is more about inspiration, creativity and innovation – moving away from reducing and minimising destructive impacts of products and services – towards restoration and enrichment.

"eco-efficiency only works to make the old, destructive system a bit less so. In some cases it may be more pernicious, because its workings are more subtle and long term" — McDonough and Braungart (2002; 62)

Cradle to Cradle design advocates 'closed resource loops' in which waste from one industry becomes 'food' or raw materials for another. Products are seen as 'technical' or 'biological' nutrients which must return to a resource pool for further use. Technical nutrients include items such as refrigerators, televisions and other appliances and their materials remain within technical cycles. Biological nutrients (the products or services of organic-based materials) are designed to safely return to organic cycles. Also known as 'zero waste' or 'closed loops'. The Cradle to Cradle approach has been pioneered by designers Bill McDonough and Michael Braungart and used in practice by Gunter Pauli in 'ZERI Clusters' .

Product service systems PSS):
Other design innovations that broaden to include the social dimension have been developed by pioneers such as Walter Stahel (founder of The Product Life Institute in Switzerland). According Walter Stahel:

"for an increase in resource productivity well beyond factor 4, or even factor 10, innovative strategies for new solutions are needed, attacking problems on a systems level instead of on a product level". (Stahel 2001).

The key idea behind PSS is that consumers do not specifically demand products, but rather are seeking the utility these products and services provide. By using a service to meet some needs rather than a physical product, more needs can be met with lower material and energy requirements. There are many examples of this approach in business to business services (eg. Xerox – photocopying; Wikhahn – furniture; Interface – flooring; Electrolux – industrial cleaning) and some penetration into consumer markets such as mobile phone services. A number of international programs and networks have been set exploring this approach (such as SUSPRONET and MEPSS). PSS can be used at an extended systems level (eg. to understand service needs of consumers) as well as being more narrowly focused on individual product-service combinations.

Bespoke products-services
Small scale, bespoke products provide an alternative to mass production based on high quality, made to measure products that are durable and timeless. This is as much about addressing sufficiency of consumption as improving efficiency. Hand crafted products (such as shoes and furniture) are an example of product design that incorporates a large service element; fosters durability through consumer attachment, care and repair as well as reducing resource intensity per worker. A case study of the contribution that custom made products (in this case shoes) can make to sustainable design concludes that:

"With the production of hand-crafted made-to-measure shoes, it can be concluded, strategies of sufficiency (better instead of more) can be carried out. This labour-intensive production method allows for the creation of eco-efficient, decentralised and resource-

preserving jobs. At the same time, durability, reparability and a high level of appreciation for the product leads to ecological gains. The customer's involvement cements his or her willingness to us the product for a long time". (Ax 2001)

Four step model of ecodesign innovation
This is a model that straddles both product and systems focused approaches. It was developed by Charter and Chick (1997) as a 4 step model of design innovation: Repair deals with end of pipe solutions. Refine product design through the concept of eco-efficiency. Redesign and Re-think will require significant leaps in design strategy from a more systemic perspective.

"To move beyond 'Re-design to Re-think will requires significant leaps in thinking, driven by the emphasis on creative problem-solving and opportunity seeking. An essential element of this process will be the development of a more systematic infrastructure to enable the cyclical flow of resources and energy within the product systems, as outlined in the emerging concept of 'industrial ecology"(Charter and Chick 1997)

Biothinking/Biomimicry: This is a growing field in which the design of products and services mimic nature by utilising biological and ecological principles and processes. Ed Datchefski and Janine Benyus are pioneers in the field in which observations of natural systems have inspired a number of exciting new product designs. The principles they use to guide product design are summarised below.

Ed Datchefski (2001)	Janine Benyus (1997)
Cyclic: products should be part of natural cycles, made of grown material which can be composted or become part of a man-made cycle like closed loop recycling **Solar:** all energy used to make or run the product should be from renewable energy in all its varied forms, most of which are driven by the sun **Efficient:** increasing efficiency of materials and energy use means less environmental damage. Products can be designed to use $1/10^{th}$ of what they did before **Safe:** products and their by products should not contain hazardous materials **Social:** product manufacture cannot exploit workers	1. Use waste as a resource 2. Diversity and cooperate to fully use the habitat 3. Gather and use energy efficiently 4. Optimise rather than maximise 5. Use materials sparingly 6. Don't foul your own nest 7. Don't draw down resources 8. Remain in balance with the biosphere 9. Run on information 10. Shop locally

This type of approach shifts design from a largely technological and industrial to an ecological and biological paradigm. This approach can be used for product focused design (eg. using functional solutions informed by biological organisms to inform product function and aesthetic) as well as extending the principles to wider systems (eg. communities, organisations, local economies)

User-Centred Design
There are several collaborative processes emerging in the area of sustainable design that seek to involve both practitioners and users in the research and design phases of products and processes. This approach can also be seen as a socially inclusive process that strives for consensus through design and which can successfully include practitioners from a wide variety of disciplines and knowledge areas. This approach is characterised by a holistic, system-wide view of design problems and their contexts. It has been pioneered by Christopher Day in architecture and by Hilary Cottam and colleagues at the Design Council in the design of public services and buildings (in health, education and prisons).

Pattern Language
This design method developed by Christopher Alexander (1977; 2002) and colleagues at *The Centre for Environmental Structure* in Berkley starts from a systemic perspective which sees relationship, pattern and context as the primary starting point for design. The design method involves deep observation of social and natural patterns as the basis for creating harmonious and coherent relationship between the human-made and the natural environment.

Natural pattern has provided the inspiration for the design of the new education centre at the Eden Project. The entire building is based on the Fibonacci sequence and the golden proportion which form the basis of the geometry which underlies plant growth.

Manzini's principles
Manzini has developed some of the most advanced thinking in the practice and theory of ecodesign that starts from a systems wide perspective and questions the role that goods and services play in a sustainable future. He uses three principles (Manzini 1993):

- *From consumption to care:* Developing products that require care and with which the use can establish an emotional relationship
- *From consumption of products to utilisation of services*: Looking at the concept of utilisation, going beyond the notion of possession and personal consumption
- *From consumption to non-consumption*: In which the reduction of needs can experienced as an increase in social quality.

Ezio Manzini in *Sustainable Everyday*, (2003) starts from a wider system perspective to envision sustainable everyday life in an urban context. This then creates a challenge for design in re-defining the need for different types of products and services:

"…the transition towards sustainability in its everyday dimension, can be described as follows: in a short period billions of people must redefine their life projects. Although differing greatly, the new directions they can and will want to take have a common vector—one which should take us in all our diversity toward a sustainable future".

These latter design approaches tend to start from wider systemic principles and then work backwards to re-define what types of products and services would be needed and how they would be delivered in a sustainable society. Starting from this perspective leads to more innovative and radical transformation of product and service design.

Appendix B: Perspectives from Business

1. The Business Response to the Challenge of Sustainable Design

Our research shows some interesting generic characteristics of how business has responded to the sustainable design challenge. Overall there has been a general shift in focus of 'the product development process' from end-of-pipe solutions to designing-out and front-end solutions further upstream. This has seen the emphasis change from tackling single issues to considering the full impacts of the products or services and can be described as a move to the earlier product development stages. The approach has been incremental (i.e. small step changes to existing products) and chiefly technology-driven using lifecycle thinking and approaches – rather than a more systemic or radical approach to devising new business models and new types of products and services. There also seems to be a bias towards measurement and assessment of product impacts, rather than product improvement – with an apparent assumption that the former automatically leads to the latter. The gap between the number of product impact studies & tools versus the number of improved or sustainable products would confirm this. In the sectors reviewed for this report, government legislation (such as producer responsibility regulations) is unlikely to provide sufficient incentives for re-design though it can and does help improve the impact of products in other 'non-designed' ways. In general, the practices of small and medium size enterprises (SME's) are not seen as being as advanced in sustainable design methods as multinational business though it remains to be seen if corporate products are *actually* more sustainable.

2. Corporate drivers and barriers towards sustainable products and services

Corporate Drivers	Corporate Barriers
Policy, regulation and voluntary standards (at sectoral, national and EU level) **Cost savings and efficiency** ('eco-efficiency' gains) **Labelling** – with mixed success **Public, NGO and media pressure** – acts as both motivator and barrier **Marketing and consumer driven** – 12% rise in demand in 2004 **Brand value/reputation** – strong links between sustainable design and branding **Corporate leadership** – Many business programs & policies - as well as emerging corporate leaders - are now mandating sustainable products and design.	**Business case** – developing a robust business case that reaches beyond short term single issues that vie for attention **Lack of demand** – growing markets but still niche/small in terms of market share **Internalising external costs** – some efficiency gains but often results in net business costs **Lack of policy incentives** – insufficient tax breaks or grants

3. The role of the designer: Some interesting themes are drawn for the role of the designer in the sectors (Fast Moving Consumer Goods & Electronics) reviewed for this report:

Driving sustainable design:

- Sustainable products are only one (small but growing) part of a broader sustainability agenda within business usually driven by sector specific issues (i.e energy use/recyclability in electronics; ingredients & formulation in FMCG's)
- Sustainable design seems to be driven and work successfully in business through: hook up to a corporate/business program or policy; when there are pressing SD issues for the sector/business (i.e. water scarcity); when there was a sector or business scandal
- Sustainable design – or ecodesign/design for the environment as it is often known in business – is an increasingly accepted and practiced term. It helps connect a sustainability strategy to products and materialise a management system.

Influencing sustainable product/design strategy:

- Sustainability issues are best considered upstream in the business and product development process. Often, designers have little early strategic influence here.
- Industrial designers are only part of the design process – others marketers; engineers/developers; strategic functions; and/or research and development play a larger role and have more significant influence over the resultant product impacts.

Practices of sustainable design:

- There is evidence that the development of sustainable products can (and at present is) happening without designers and is taking place in other 'product development' departments (such as mechanical, electrical or chemical engineering). In certain cases design is externally outsourced, meaning it is seen and managed as an external service provider
- At present there seems little link between corporate sustainability generally and even sustainable product innovation targets specifically – and design skills. Companies often use other non-design disciplines to conduct this
- Current business models and approaches view sustainability as a largely technical/technological issue which accounts for the predominant engineering approach

Moving forward:

There are one or two weak signals from companies that show possible paths as well as a unique set of skills for designers to contribute to sustainability:

  - The emergence of a non-technical, non-material approach to sustainable design – especially relevant for creative designers - that is more consumer (and sustainable consumption)-focussed and has the potential to challenge consumer mind-sets and purchasing patterns. This might see more emphasis user centred and communication design development.
  - Occasionally companies use design skills for fresh thinking and new insight - to conceive new ideas and approaches and shed new light on sustainability problems as well as future visioning.

Transferable and identified design skills could make a rich contribution to sustainability within business beyond the approaches to sustainable product design. We need to further define this contribution and make the business case.

Appendix C: Perspectives from Designers

1. Sustainable Design
Sustainable Design has not yet been taken up by the majority of mainstream product designers (MPDs) in the UK. There are however, small pockets of specialists working as sustainable product designers (SPDs) who demonstrate a comprehensive knowledge of sustainability issues/practice and whose views contrast strongly with MPDs.

MPDs tend to see sustainability as one of many factors on a design brief and as a political/ethical issue, better left to the personal preference of the designer. *"You have many magnetic poles and you feel attraction from all of them and you tread a path between them that is the most appropriate for all stakeholders… eco/sustainable design places more emphasis on one of these poles of attraction and in many design teams that is not seen as a better thing…and this emphasis comes at the expense of others."*

By contrast, most SPDs place sustainability at the heart of their practice (often seeing it as an extension of lifestyle) and believe mainstream product design focuses too exclusively upon economics and marketability. *"Mainstream design is all about economics…whether it can sell, producing thousands of units."*

2. Integrating sustainability in the product development process
One of the challenges in mainstreaming sustainable product design in the UK is to identify who is involved in the product design/development process. Both MPDs and SPDs agree that professional designers often enter the process late and therefore contribute little more than styling, 'add on' functionality or efficiency. In contrast, research shows that the most significant social/environmental impacts are achieved when sustainable design is incorporated at the earliest/conceptual stages.

Therefore, it is important to recognize that design is an activity many stakeholders take part in; engineers, project directors, marketing/brand experts, business strategists and manufacturing/production, users/consumers to name a few. Often decisions about whether to incorporate sustainability concerns into the design and development of a product happens at strategic corporate levels at which designers rarely have access. This may account, in part, for their general lack of awareness/understanding of sustainability as it applies to government policies. Most designers also fail to see an opportunity to create new pathways for consumers with respect to sustainable products and the shift in consumption patterns and lifestyles that they can stimulate.

3. Challenges/barriers to designing sustainably
Both MPDs and SPDs agree there are many products on the market that display *aspects* of sustainability but generally feel that 'best practice sustainable product design' has yet to be achieved for a variety of reasons: failure of business to place sustainability on the design brief (designers believe business isn't asking because consumers aren't demanding/ government isn't requiring), lack of awareness (on the part of designers, business and consumers), lack of appropriate tools/methods/knowledge sharing and the prohibitively large skill set that SPD requires.

MPDs are especially challenged to acquire the necessary skills and knowledge required to design sustainably, with many saying they are at a loss to know where to begin. They are challenged not only to acquire the necessary design skills but to understand what questions to ask at the critical early stages of a project. SPDs in contrast, have the skills and knowledge but often have trouble convincing clients to place sustainability high on their list of concerns. All designers queried felt there was tremendous potential for government to motivate business but felt it should be doing more.

This reflects the generally passive role that designers take with respect to business. MPDs especially stated that they were unlikely to begin to design sustainably until their clients asked them to do so (and noted that this would not happen until consumer demand increased). A few SPDs are aware of the new raft of government policies and see them as opportunities to define not only new markets but new business models, (such as designing sustainable products and licensing the design to manufacturers) but they are in the minority.

Another concern held by both MPDs and SPDs is the large and varied skill set required to design sustainably. Over 30 different skills have been identified in this study which range from the highly specific (prototyping, materials selection) to the high-level/multidisciplinary (ability to facilitate change, strong collaborative skills and an understanding of global issues/trends). Most SPDs felt that on the job training was essential to prepare young designers for this area of specialty and many MPDs are simply not interested in taking on an intense course of study/skills acquisition. The following motivators and barriers to sustainable design were cited by MPDs and SPDs:

Motivators	**Barriers**
Competitive/economic advantage	Requires larger skill set
Desire not to be ‘left out’	Designers not in influential positions
Compliance w/gov. regulations	Unpopular/misunderstood
Market/consumer demand	‘Tough sell’ to consumers/clients
Corporate responsibility concerns	Perception of higher cost w/SPD
Personal motivators	Lack of appropriate tools/methods
Connection to nature	Lack of government support
Alignment of ethics with profession	Lack of consumer demand

4. Motivating Designers

When designers were asked how to forward sustainable product design in the UK, both groups responded that public awareness of sustainability was key (in stimulating consumers to ask for sustainable products and for business to place it high on their agenda). Without acquiring additional business/entrepreneurial skills, most designers are unlikely to take the lead in identifying opportunities that government policy may provide.

Designers also feel that creating more/better case studies and design competitions (with rigorous guidelines) that were highly publicized and supported by government is a way to build interest and support from within the design community. This underscores the

relatively passive role that designers tend to take with regard to sustainable design and their contention that they must wait for consumers to demand sustainable products from business who in turn will require them to design sustainably.

5. The challenge

The challenge is how to raise awareness of the business and creative opportunities that sustainable product design holds for designers. This will take a variety of forms; new markets and business models stimulated by government legislation; the potential for competitive edge that sustainable products can represent for business; and new creative challenges/modes of designing. This will require support/funding at the government level (perhaps led by the Design Council) to raise awareness of these issues with designers as well as new formats/methods for ongoing and life-long education to provide them with the necessary skills. On the positive side, both MPDs and SPDs see sustainable design as essential and inevitable and envision a future in which 'sustainable design' is not a specialist area of design, but rather an attribute of good design.

Appendix D: Perspectives from Design Educators

1. Sustainable Design Education
The UK is seen as a leader in specialist Sustainable Product Design Education (SPDE), but most mainstream design programmes do not incorporate sustainability courses into their curricula. A few specialist programmes place it at the heart of their offer— but there is very little middle ground. Most of these programmes have been founded and are sustained by highly motivated individuals who have formed a strong, informal network that provides support and a loose framework for knowledge sharing.

2. Integrating sustainability design into existing curricula
One of the biggest issues confronting educators is whether to integrate sustainability into mainstream design education or offer it within in separate programmes. In general, Mainstream Product Design Education (MPDE) focuses primarily on equipping students for positions within traditional product design which sees the mainstream marketplace as the main employer. Research found pockets of excellence within SPDE and facets of many programmes that are successful, but educators tend to agree that no one institution has successfully addressed all the issues.

3. Motivators, constraints and opportunities
Among the biggest challenges to SPDE is the relatively low demand by students which is related to a low demand by business for SPDs. Both, SPDEs and SPDs cite the extensive skill set required for sustainable design (see Appendix D) as one of the primary challenges/barriers. This may account for the low level of student demand for these specialist programs.

Government may contribute towards breaking this cycle by stimulating demand for sustainable design services eg. through the sustainable public procurement program and working in partnership with business to create projects for students and recent graduates. An untapped resource may be the increasing ranks of recent SPDE graduates who are eager to put their knowledge to use and several schemes to achieve this are currently in the planning stages. Government has the opportunity to further support SPDE through funding, leadership, incorporating sustainability more firmly in HEFCE, and progressing the greening of university campuses. All of these measures will give a needed boost to student recruitment and raise awareness on the part of university management of the importance of SPDE.

On other fronts, a few key institutions and groups have attempted to stimulate awareness/demand by establishing research institutions within their universities whose remit is to provide links with both business and communities to further SPD practice, create/compile case studies and stimulate designers to take a more entrepreneurial role. Several small but active student groups have also established themselves as important sources of knowledge-sharing as well as job placement and resource hubs.

Many SPDEs advocate the development of alternative educational frameworks that allow educators, recent graduates and practitioners to undertake the life-long learning that SPD

requires. These frameworks will need the support of government and business in order to flourish. Several educators suggested the Design Forum take the lead in developing a ‘hub’ or ‘portal’ that could become a much-needed knowledge-exchange and resource framework within the SPDE community that would also serve as a resource to business and design practitioners.

Appendix E: Perspectives from Consumers

1. Progress towards sustainable consumption

According to the Oslo Symposium on Sustainable Consumption (1994):

'The use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the lifecycle, so as not to jeopardise the needs of future generations".

There is some evidence of a switch to sustainable products and services in the UK over the past 20 years. For example, the Ethical Purchasing Index (EPI 2004) shows the market share for ethical products growing by almost 40% in the past 5 years with the most significant growth in 'green goods' (eg. sales of energy efficient household appliances topped 50% of market share in 2003). Some relative de-coupling has been achieved but not enough to offset the negative environmental impacts of overall consumption growth (Defra 2005b). Research into consumer attitudes reveal that convenience, habit and tight budgets are more important influences on consumption trends than environmental concerns. There still remains a large gap between environmental values and consumer behaviour in the market-place.

In the UK, sustainable product design is seen as an important route to improve the 'efficiency' of consumption (achieving more for less). Policy has focused on de-coupling the link between consumption of products/services and environmental impact. For others, sustainable consumption goes beyond efficiency gains to de-coupling the link between consumption and quality of life (Cooper 2000; Jackson 1996; Heiskanen and Pantzar 1997). Within sustainable design, some are focusing on 'efficiency' gains of consumer products and services ('more for less'), whereas others are focusing on 'sufficiency' solutions where 'better instead of more' is the guiding design principle.

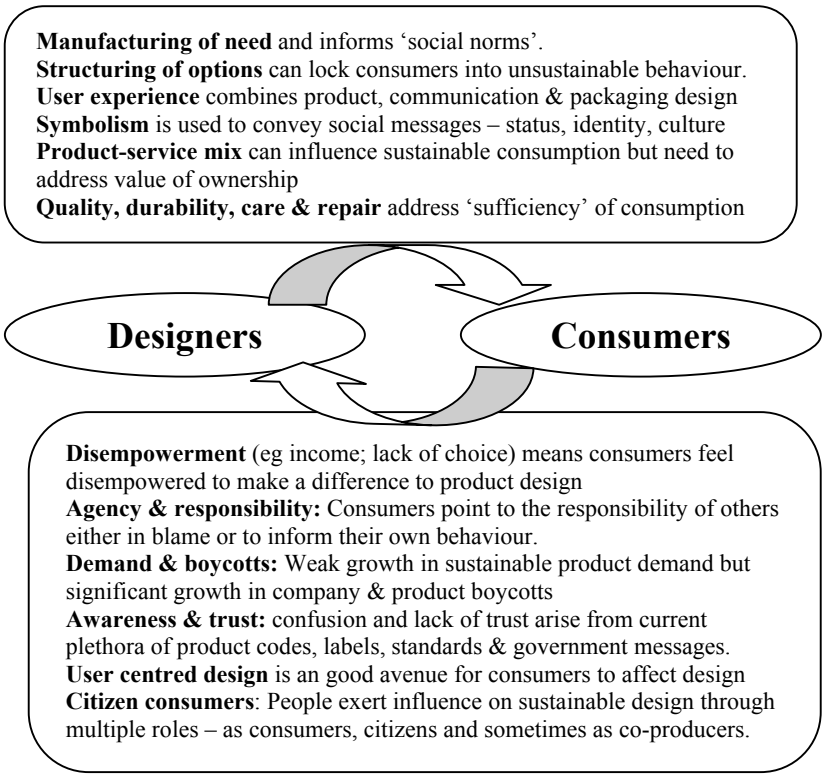
2. Motivators and barriers

Products and services not only satisfy our basic needs for food, housing and transport, but in our material culture we imbue them with status, social identify and meaning. To understand motivators and constraints to sustainable consumption we are influenced as much by what others around us say and do and our own habits as we are by price and values.

Influences	Barriers
Rational Choice: Weighing up costs and benefits to maximise individual benefits. Assumes behaviour flows from values but in reality there is a large value-action gap.	**Budget targets & cost perceptions:** Higher prices can exclude sustainable choices. There is a general perception that sustainable products & services are costlier.
Social Norms: We model our behaviour on others. Goods convey social information – such as status, identity, culture.	**Convenience/habit:** People are unwilling to change habits and over-estimate the inconvenience of consuming sustainably.
Cognitive Shortcuts: Unconscious process that relies on habit, cues and symbols (eg. brand logos) to simplify routine decisions.	**Awareness:** People are confused by current information and options and lack trust in information providers.

3. Consumption : design : consumption

This is a two-way dynamic – product design sets the context within which people act and at the same time everyday life informs product and service design. Our review revealed multiple pathways in which design affects consumption and consumption affects design. The challenge is to find ways to switch from a vicious cycle to a virtuous cycle in which design becomes part of the solution rather than part of the problem.



4. The Consumer challenge to designers

- Design can contribute to the challenge of sustainable consumption not just by changing products but also by influencing consumption and lifestyle aspirations through user centred design and creative visioning processes as well as via communication and brand design
- Create design strategies to address both 'efficiency' and 'sufficiency' of consumption
- Sustainable design must be good design – the majority of consumers are unwilling to compromise on quality or function or put pressure on tight budgets
- Don't rely on existing consumer signals – create new pathways for consumers to tread. For example, fair trade created markets that previously did not exist.
- Create classic and iconic designs that favour timelessness over newness. Designers will have to find ways of overcoming the idea of old-fashioned!
- Create product-service design solutions that meet as well as questioning people's need for ownership

- Different information, codes and standards is confusing to consumers. They requested a move towards standard information and labelling standards
- Re-present sustainable consumption as something that is innovative and exciting and not a burden.
- Extend choice, access and convenience – consumers want to choose between sustainable products rather than between sustainable and unsustainable options
- Develop design ideas with sustainable consumption as the starting point.
- Focus on user-centred, bottom up design processes that enable users and consumers to be co-creators of products and services

Appendix F: UK Policy Affecting Product and Service Design

The Sustainable Development Strategy offers a raft of initiatives that may directly or indirectly impact on sustainable design. In this short scoping study, we have focused on three elements of government policy: the sustainable consumption and production (SCP) strategy; sustainable public procurement and product-related policy.

1.Sustainable Consumption and Production (SCP): The central core of the UK Government commitment (UK Government Framework on SCP 2003; and UK Government Sustainable Development Strategy 2005); is to improve 'efficiency' of consumption and production ('doing more with less') through improving resource productivity, boosting business competitiveness and decoupling economic growth and environmental degradation. Encouraging process product re-design is an important route to put policy into practice and this agenda is being pursued through a range of specific product related commitments and support programs[5] – including the multi-stakeholder Sustainable Design Forum to educate in eco-design and promote best practice tools and approaches is central to this commitment.

2.Sustainable Public Procurement: The use of public procurement to stimulate the market towards the provision of sustainable goods, services and buildings is a common theme across the EU and OECD and is central to the UK Sustainable Development Strategy. The UK Government buys £13 billion worth of goods and services and £125 billion through the wider public sector per year and can act as a catalyst in spurring the commercialisation or spread of sustainable products and supporting infrastructure.' (Green Alliance 2005b; 4)

The UK Sustainable Procurement agenda is being taken forward through three key sectors: Schools, NHS, and Local Government. Key initiatives include the appointment of a Sustainable Procurement Taskforce to develop a national action plan; specified targets for water, energy use and procurement in the Framework for Sustainable Development on the Government Estate (currently under review); and procurement support[6]. Specific products and services that have been targeted include timber products; food; cars as well as construction. Already, public sector purchases are mandated to buy a range of everyday products in accordance with minimum environmental standards.

PFI is a central pillar of government procurement representing a major proportion of investment in new public buildings. There are good practice examples but the challenge is how to firmly embed sustainability criteria in the process (Green Alliance 2004).

[5]Such as funding for technologies critical to the future of the UK economy; the new SCP Business taskforce; integrated product policy; sustainability support for business and innovation; the Sector Sustainability Challenge; the Business Resource Efficiency and Waste Programme; Envirowise support for business in environmental techniques; Carbon Trust support to business and the public sector in reducing carbon emissions; and the Waste and Resources Action Plan to create markets for recycled materials and products.

[6] Via Regional Centres of Excellence, NHS Purchasing and Supply Agency; Procurement website; as well as building sustainable development into procurement courses.

3.Product-Related Policy

Integrated Product Policy
This is a broad agenda emerging from Europe that seeks to create a coherent policy framework aimed at reducing the environmental impacts of products at different points in their lifecycle. This should prevent a product's impacts being shifted from one phase to another – for instance, energy efficient to produce but energy wasteful to use. The EC published a 'White Paper' in 2003 which sets out five key principles of IPP: life-cycle thinking; working with the market; stakeholder involvement; continuous improvement; and it will employ a mix of policy instruments with a leaning towards voluntary measures. There are no requirements for implementation as yet.

To put IPP into practice, the *UK Advisory Committee on Consumer Products and the Environment* (ACCPE) recommends linking environmental issues to product streams; has developed a 'tool box' of measures for a more coherent approach to sustainable product policy[7] and propose the establishment of a products body (currently under consideration). A more radical proposal suggests that the IPP "*could mean that producers have responsibility for the impacts of their products at all stages of their lifecycle, not just through the standards to which they are manufactured, but by conditioning their use and having responsibility for a closed loop, zero waste system*". (Green Alliance 2005; 14)

Energy Using Products (EuP):
Out of the broad IPP framework emerges specific product related policy such as the eco-design for *Energy Using Products* (EuP) framework Directive which is likely to be agreed later this year. EuP can clearly be interpreted as a 'producer responsibility' initiative and if passed should 'provide a framework for setting design requirements for products, initially on energy efficiency, but potentially for a wider range of environmental impacts. However, its reach may be restricted by the qualifying provisions' (Green Alliance 2005; 12). The EuP is likely to have significant impacts on design but this will be incremental as not all products will be affected at once.

Waste Electrical and Electronic Equipment (WEEE)
The objective is to set requirements for the separate collection, treatment and recycling of waste electrical and electronic equipment including defining specific producer obligations. These include providing for the financing of the collection, treatment, recovery and environmentally sound disposal of the proportion of WEEE for which each producer is responsible. There are potentially significant impacts for product design providing incentives for producers to adopt eco-design techniques to reduce their recycling costs. The Directive also requires producers to avoid designs that hinder reuse, recycling or recovery of products. UK regulations are planned to come into force in January 2006.

Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (ROHS) This is a sister Directive to WEEE that is planned to come into force

[7] Including rating and labelling schemes; expanding the Market Transformation Programme for energy efficiency, Internet accessible product information; green procurement and supply chain initiatives.

in the UK in July 2006. The regulations prohibit specified heavy metals and brominated flame retardents in electrical and electronic equipment accelerating the re-design of thousands of products. The Directive is weakened by certain exemptions for technical viability and it is unclear what the net environmental impact will be as restricted substances are replaced with alternatives that may have different or greater environmental consequences. Both WEEE and ROHS will affect all producers that export to the EU and are already catalysing international policy change in line with EU requirements[8].

End of Life Vehicles Directive

The main aim is to reduce the amount of waste from vehicles at the end of their life. The UK ELV Regulations (2003, 2005) require producers to pay costs of take-back and treatment (from 2007) and set rising re-use, recycling and recovery targets; as well as restricting the use of heavy metals in new vehicles. There are potentially significant impacts for sustainable product design including measures to design out specified heavy metals; design for recycling; and incorporation of secondary raw material into material specification. Future requirements propose that all vehicle design to demonstrate that they are 95% reusable, recyclable or recoverable. This type of producer responsibility legislation that tailors costs payable to specific manufacturers products has great potential for impact on upstream design. But low costs of meeting recovery and recycling targets relative to retail price of vehicles diminishes the power of this incentive.

[8] The influence of product related policy is stretching well beyond EU markets and is seen by many multinational companies as an opportunity rather than a trade barrier. Parts of North America and China are bringing in ROHS legislation and many Japanese manufacturers are already WEEE compliant.

Appendix G: Stakeholder Consultation

Design

Daniel Weil	Partner, Pentagram
Dorothy Mackenzie	Chairman, Dragon Brands
Martin Bontoft	User research & design strategy, IDEO
Ed Datschefski	Biothinking International
Neil Tierney,	Lightweight Medical/O2 Net.
Kartina Koffler	Affiliated to Viadynamics Ltd.
Jean Paul Frazer	Exergy Design Ltd
Chris Sherwin	Designer/Forum for the Future
Tom Greenwood	Sustainable Product Designer and Researcher ESP Design/o2 network
Janine Benyus,	Biologist/Design Consultant

Design Education

Martin Charter,	Director, Centre for Sustainable Design, Surrey Institute of Art & Design
Anne Chick	Network Leader, Sustainability in Practice Network, WestFocus Reader in Sustainable Design, Faculty of Art, Design & Architecture, Kingston University
Kate Fletcher	Ecodesign Consultant
Alastair Fuad-Luke	Lecturer/consultant
Karen Blincoe	Director, ICIS, Denmark
Seaton Baxter,	Centre for the Study of Natural Design, School of Design, University of Dundee
Emma Dewberry	Cranfield University
Leslie Mair	Middlesex University
Miles Park	Surrey Institute for Art and Design
Toni Spencer	Lecturer in Eco Design, Goldsmiths College, University of London.
Julian Lindley	Surrey Institute for Art and Design

Business

Andrew Jenkins	Boots
Henry King	Unilever
Jane Bickerstaffe	INCPEN
Philip Price	Envirowise
Helen Hughes	WRAP
Mark Barthell	WRAP
Beatrice Otto	Sustainable Business Catalyst

Consumers

Ed Mayo	Co-Chair Sustainable Consumption Roundtable, Director, National Consumer Council.

Jill Johnston	Policy Director, National Consumer Council
Maxime Holdsworth	National Consumer Council
Paul Steedman	National Consumer Council
Alan Knight	Sustainable Consumption Roundtable; SAB Miller plc
Frank Trentman	Cultures of Consumption Programme, Birkbeck College, University of London
Tim Cooper	Centre for Sustainable Consumption, Sheffield Hallam University.
Elisabeth Shove	Department of Sociology, Lancaster University

Government Policy

Andy Davey	Department of Environment, Food and Rural Affairs (Sustainable Procurement)
Steve Andrews	Department of Trade and Industry (IPP; EuP; ROHS)
Andrew Lunnon	Department of Trade and Industry (WEEE)
Steve Norgrove	Department of Trade and Industry (ELV's; Batteries)
Ben Shaw	Green Alliance
Julie Hill	Green Alliance

Project Steering Group

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