EDECON

A GUIDE FOR SMEs ON

Eco-design for the construction industry

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The Centre for Sustainable Design®

An initiative of the University for the Creative Arts

European Commission

THIS GUIDE IS A PRACTICAL INTRODUCTION TO ECO-DESIGN FOR SMALL AND MEDIUM SIZED ENTERPRISES (SMEs) INVOLVED IN THE MANUFACTURE OF PRODUCTS AND THE PROVISION OF SERVICES WITHIN THE CONSTRUCTION INDUSTRY.

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1 Introduction

This guide is a practical introduction to Eco-design for small and medium sized enterprises (SMEs) involved in the manufacture of products and the provision of services within the construction industry.

The guide explores the meaning of Eco-design and its importance within the construction industry. It provides practical advice and tools for businesses firstly, to assess a product or service's environmental impacts throughout its lifecycle and then identify Eco-design strategies to address these environmental impacts.

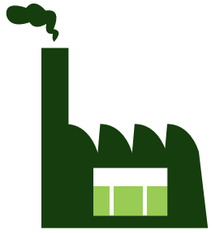
It is specifically aimed at those businesses, including manufacturers, assemblers, product designers and architects that are starting to consider the opportunities and first steps in improving the environmental performance of their products and services at the design stage and therefore does not cover organisational aspects of Eco-design (eg ISO14006) or general environmental management (eg ISO14001).

The guide focuses on Eco-design, but some social issues are highlighted because of their significance to stakeholders

The 7 Product Lifecycle Phases
The journey that a product takes from the source of materials to its end of life, where ideally it is reused or recycled (cradle to cradle)

Source

Transport



Manufacture

Packaging

Distribution

Use

End of Life

2 Why sustainability matters in the Construction Industry

The construction industry arguably has a greater impact on our society and quality of life than any other, providing the places where we live, work and socialise as well as the transport and services infrastructure to drive our economy.

Its economic importance within the European Union (EU) is enormous, with some 26 million workers (over 15% of total employment) dependent directly or indirectly on the construction sector. Annually, new construction and demolition projects alone, add around 1.3 trillion euros to EU economies.
Such a vast and resource intensive industry clearly has a very significant impact on our environment.

- More than half of all materials extracted from the earth (over 3 billion tonnes in the EU) are transformed for use in construction
- Around 1billion tonnes of waste are generated annually in the EU through construction and demolition.
- Buildings account for 42% of the energy consumed and around 35% of all EU greenhouse gas emissions.

The construction industry can play a key role in helping society to use resources more sustainably by reducing the environmental impacts associated with products and services through using materials efficiently, producing less waste and consuming less energy. The most effective way of reducing the environmental impacts of products is to address these issues at the design stage.

Eco-design is the integration of environmental considerations into product and service design and development aiming to improve performance throughout the product/service lifecycle

3
How to Use this Guide

The guide is divided into eight sections. The first three sections are introductory and explore the relevance and benefits of Eco-design to businesses in the construction industry. The following sections describe stages in the Eco-design process and provide tools and worked examples to enable the reader to undertake the first two steps of Eco-design on their own products and services. In sections 6 and 7 there are suggested actions using template tools that can be downloaded at http://ecodesign-een.eu/tools.asp

If the reader works through the guide sections in sequence and undertakes the actions it is expected that they will have gained a good general understanding of the concepts and practice of Eco-design and how it can benefit their business, specifically related to:

- Environmental impacts associated with their product or service
- The identification of Eco-design focus areas that can be investigated to address these impacts
- The development of an Eco-design strategy and action plan based on the scope for improvement in the key focus areas

Useful sources of further information and support are given in section 8.

4 How can Eco-design benefit your business?

Making your products and services more sustainable will also make your business more competitive. Some of the potential benefits of reducing the environmental impacts of products and services through Eco-design are:

Reduced costs

Eco-design can lead to reduced costs. Reducing the weight of a product (lightweighting), while maintaining functionality cuts the cost of raw materials and transport. For example castellated steel beams can use 25–50% less steel than traditional 'I' beams and reduce cost by an average of €44 per metre. Designing a product for ease of dismantling at its 'end of life', could reduce manufacturing costs through for example, reducing the number and variety of screws and other fastenings. Such reductions could be used to improve cost competitiveness leading to improved profitability. Conversely, being able to offer a product with demonstrably improved environmental performance can also give increased competitive advantage where markets are experiencing growing expectation for "greener" products.

Meeting Customer expectations

Most large European construction businesses, retailers, utility companies, public authorities and governmental organisations require their suppliers and sub-contractors to demonstrate that they are managing their environmental impacts. Skanska, one of the world's leading construction companies aspires to leadership in sustainability and "will only do business with responsible suppliers and subcontractors who understand the nature of the products, materials and services they are supplying, and who recognise their responsibility to protect the environment…". Similarly, Kingfisher plc, Europe's largest home improvement retailer, has embraced the sustainability agenda and published ambitious targets which "aim is to make every customer's home zero carbon or, where possible, a net energy producer" by 2050. SMEs that supply or aim to supply organisations like these will be expected to demonstrate that they are managing their risks and helping their customer to meet their goals. Eco-design is the most effective way for SMEs to improve the environmental performance of their products or services. Those that do not rise to the challenge run the risk of losing out to competitors that are better prepared to meet increasingly demanding customer expectations.

Being prepared for Legislation

Full compliance with European directives and regulations are a requirement for doing business. For example:

- Regulation No 305-2011 on the Marketing of Construction Products (Construction Products Regulation) has a requirement for the sustainable use of resources and energy economy for construction works, their materials and components.
- Directive 2009/125/EC on Eco-design of Energy Related Products focuses on energy efficiency in use of electrical products but will broaden to include 'energy influencing products'. Requirements are in preparation on the performance of windows and insulation.
- Energy Performance of Buildings Directive aims to cut carbon dioxide (CO_2) emissions related to buildings and has a requirement for building energy performance data to be made available and for large air conditioning units to be regularly inspected. Although this Directive is concerned with whole buildings, it is expected that owners and tenants will be more likely to favour suppliers of products and services that contribute to better overall energy performance of the building.

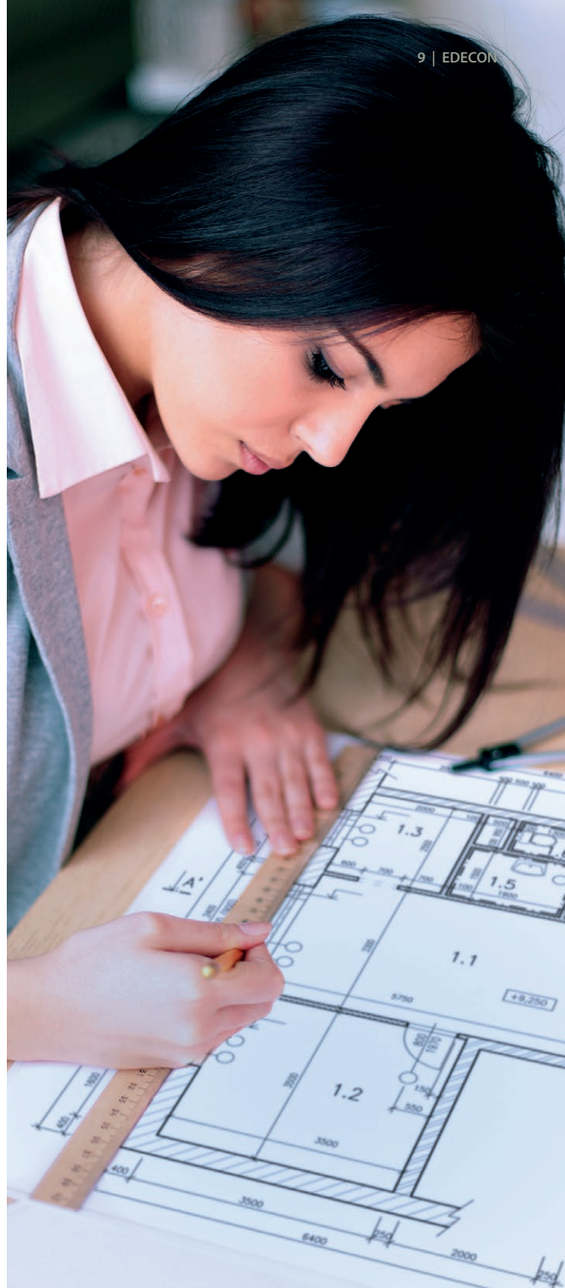
  Companies that can plan ahead for the requirements of future legislation and act on these through Eco-design will be better placed to take advantage of new market conditions.

New business models

Sustainability has led some companies to increase profits through changing their business models by considering novel ways of delivering their products and services to more precisely meet customer needs. Such thinking starts with the fundamental question 'What does the customer want – is it a product to meet a need or is it a specific outcome?' Product Service Systems (PSS) are business models that aim to provide a novel combination of products and services to fulfill specific customer demands. They can be valuable to businesses because they offer opportunities for diversification, for improving their market position or for better meeting customer demands. There are three basic types of PSS:

- Product oriented PSS, where products are sold, but with additional services added eg heating system installation and maintenance
- Use oriented PSS, where the product is not sold, but is leased or shared, eg construction equipment leasing or pay per use systems
- Result oriented PSS, where no product is sold and the customer purchases a result eg that waste is removed

In PSS the value is created more through service provision and less by material products. Therefore, material and/or energy efficiency in the system is increased, waste is reduced and products are more likely to be reused and recycled.



5

Eco-design Process

Eco-design is the integration of environmental considerations into the product and service design and development that aims to improve performance throughout a product or service lifecycle. Most environmental impacts can be effectively reduced by addressing them at the design stage. For instance, design specifies which materials (and to some extent where they come from) and which production methods will be applied. It also affects the potential reuse, recycling or disposal as well as the indirect impacts from the distribution of products and services.

Eco-design must take into account the whole lifecycle of a product or service and consequently the process should involve those that represent Research and Development, Design, Production, Procurement, Logistics, Project Management and Marketing.

The process of Eco-design can be broken down into three key stages

Stage 1:
Assessing Impacts

- Assessment of environmental impacts throughout the product/service lifecycle

Stage 2:
Formulating Design Strategies

- Developing environmental objectives and relevant design strategies
- Assessing the feasibility and desirability of design strategies

Stage 3:
Implementing Design

- Carrying out the design activity
- Monitoring and evaluating

The following sections take you through the first two stages of this Eco-design process and introduce two tools that can be used to improve your product or service's environmental performance. Each stage requires that you look at the challenge of Eco-design from a different viewpoint. The first stage is about understanding the impacts associated with your product or service throughout its lifecycle. The second stage is about how to focus your design strategy to reduce these impacts.

6 Assessing the lifecycle impacts of your product or service

The first step in improving the environmental performance of your product or service requires you to gain an understanding of the impacts associated with your product/service throughout its lifecycle. Consideration of how materials, energy and water are sourced and consumed and how waste is produced, from the selection of raw materials, through manufacture, use and disposal, can help to identify where the most important impacts are, and whether or not you are able to directly control them. This section describes a lifecycle approach that aims to improve understanding of the key environmental impacts of your products or services and introduces a simple but practical tool that you can use to do this.

Figure 1.
The Lifecycle Impact Tool (LIT)

ISSUE	Source	Transport	Manufacture	Packaging	Distribution	Use	End of Life
Materials							
Energy							
Water							
Waste							
Pollution							
Social							

The Lifecycle Impact Tool (LIT) provides a structured means of exploring the impacts of your product/service at each stage in its lifecycle. The lifecycle stages (columns in fig.1) are discussed in section 6.1 and the Issues (rows in fig. 1) are discussed in 6.2. Section 6.3 provides guidance on how the LIT can be used to determine the key lifecycle impacts or hotspots that can provide the basis for formulating design strategies.

6.1
Stages in the Lifecycle

The Lifecycle stages table below (table 1) relates to the journey that a product or service takes from the sourcing of materials to its *end of life*, 'cradle to grave' if it is disposed of or ideally 'cradle to cradle' if it is reused or recycles at *end of life*.

Table 1. Product Lifecycle stages

Source	Transport	Manufacture	Packaging	Distribution	Use	End of Life
The first stage in the lifecycle, eg the extraction of quarried products to be used in cement, the refining of oil for plastics production or the harvesting of timber for wood frame products. Alternatively if you are looking at this as an assembler of construction product components, then you might consider this stage to represent the production processes for those components.	The transport of materials from source to your factory gate. This could include the material packaging and the mode of transport, eg shipping, road, rail and air.	Includes those processes involved in the production of your product from the point of arrival of materials to the point at which the product leaves your premises.	The type and quantities of product packaging employed.	The modes and distances required to transport the product or service from your premises to the customer which depending on your business model could be a construction site, builders merchants or end-user etc.	The processes involved in use, eg energy or water consumption by 'active' products or services eg electric drills or emissions during application for 'passive' products like paints and adhesives. This stage can also include installation and maintenance processes and therefore might include items such as painting for exterior timber products or servicing for mechanical products.	The processes involved in dealing with the product/service when it has reached the end of its life, which might be during demolition or renovation for services, structural and cosmetic products like piping, wiring, lintels, windows and wall coverings or replacement for mechanical/electrical products like heating and ventilation. In the construction industry a product's life commonly spans several decades and consequently end of life opportunities are likely to change, in terms of future regulation, market forces and treatment.

Different businesses may have specific additional lifecycle stages that are particularly relevant to their product/service or sector. Businesses also differ in the influence that they have on each stage, but this does not mean that these stages are irrelevant. Taking into account a stage where a business has little or no influence can reveal a potential risk area.

Different product or service categories will vary considerably in the significance of their impacts at each of the lifecycle stages. For example, many quarried products and timber products are likely to have their greatest impacts at the materials sourcing stage, where the processes of extraction or harvesting are likely to have impacts related to biodiversity and pollution of land, air and water with relatively low or even negligible impact during use. These are described as 'passive' products. Conversely, 'active' products are those with their greatest impacts during use and include those categories which consume energy and water in operation. For example electrical products, like heating and air conditioning units consume most energy during use and products like toilets consume more water in use than in production.

6.2 Issues in the Lifecycle

In section 6.1 we looked at the stages in the product and service lifecycle, here we look at key product/service-related environmental issues at different stages in the lifecycle. We also introduce Social (non-environmental) issues which relate to the way in which people, predominantly those involved in the extraction of raw materials, and production of the product and installation are affected.

Materials

This issue is potentially very wide ranging and should involve all of the materials and third-party produced sub-components in a product or used in the provision of a service. Some materials like non-sustainably sourced timber and timber derivatives can be directly related to issues of loss of biodiversity and deforestation. Sourcing timber from well-managed forests that carry an accreditation like the Forest Stewardship Council (FSC) accreditation logo can demonstrate best practice.

Some materials are far more damaging to the environment and society than others (eg toxic, explosive or corrosive). Some materials are non-renewable or are becoming scarce (eg oil reserves, some metals). Some materials are highly resource-intensive to produce, transport or recycle (eg plastic is much lighter to transport than glass but more difficult to recycle in some EU countries).

Example

The manufacturer of painted wooden doors would need to consider a range of issues:

- Does the timber come from a well-managed forest and can this be demonstrated to customers and other stakeholders as required?
- Are the paint finishes, adhesives and other fastenings compliant with legislation?
- Could the paint and primer be low odour, low emissions, eg low volatile organic compound (VOC)?
- Can the paint finish be more resilient to reduce the cost and environmental impacts of maintenance and repainting?
- Does the paint finish or other treatments have any limiting effects on the reuse or recycling/energy recovery options at end of life?
- Is the brassware and/or ironware on the door (eg knocker and letter box) manufactured by a third party in a way that minimises local environmental pollution and respects the welfare of factory workers?

Key Questions

What materials are used and which of these have the greatest impacts across the product lifecycle?

Quick Wins

Reduce the weight of materials and seek alternative materials which are less environmentally damaging.

Energy

Energy from the combustion of fossil fuels, including, coal, oil and gas leads to the emission of carbon dioxide (CO_2) and other greenhouse gases eg methane (CH_4) which are causing our climate to change. The need to reduce CO_2 emissions to avoid the worst effects of climate change has led governments around the world to set emissions reduction targets (EU is committed to a 20% reduction by 2020) supported by a wide range of policy measures, some of which place legal requirements on business. For passive products like concrete, the majority of energy is consumed and CO_2 emitted during manufacture but for active products, most of the impact arises during the use stage. Products that are designed to consume lower energy in use or to conserve energy, like efficient glazing and home insulation needs to be installed and maintained effectively to avoid what can be described as 'the performance gap'. It is therefore important that designers and manufacturers provide clear guidance to third-party installers and maintainers.

Embodied carbon can be a useful measurement in making design choices. It relates the weight of carbon emitted throughout the full product lifecycle to the finished weight or unit of product. For example it is estimated 900Kg of CO_2 are emitted for every tonne of Portland Cement that is fabricated. Measuring the embodied carbon in a product is technically demanding and so other indicators like the examples in section 7.3 might be more feasible for SMEs.

Example

Concrete mouldings:

- Concrete and cement production accounts for up to 8% of all man-made carbon emissions.
- The manufacture of Portland Cement accounts for most of these emissions, which come directly from the chemical process of manufacture and from the very high energy required to drive the process.
- Significant energy is also consumed in extracting and transporting quarried raw materials and in the manufacture and distribution of fabricated concrete products eg mouldings and blocks or powder mixes.
- At 'end of life' concrete is typically broken down and transported to landfill or other uses as aggregate. The energy required at this stage is dependent upon the required treatments for final use, ie crushing and transport mode and distances.
- The embodied carbon in concrete is directly related to the amount of Portland Cement in the mix. By replacing 30% of the cement in structural concrete with fly ash (a waste product from the power industry) the embodied carbon can be reduced from 180 to 127 Kg per tonne.

Key Questions

Where are the most intensive uses of energy and greatest carbon emissions in the product/service lifecycle?

Quick Wins

Reduce energy consumption in the product/service lifecycle. For 'active' products this is likely to be during the use stage.

Water

Europe's fresh water resources are under increasing pressure from population growth, land-use change, increasing demand from industry and agriculture and changes to our climate. In recent years we have witnessed some of the driest springs for over one hundred years and models suggest that the risk of summer drought conditions will significantly increase.

Using water efficiently and reducing demand where possible conserves a valuable, universally required and frequently limited resource, it saves money on water tariffs and indirectly reduces carbon emissions related to distribution and waste water treatment. It is estimated that in the UK companies can reduce their carbon footprint by one kilogram for every cubic metre of water saved. The inefficient use of heated water is common and represents a significant and avoidable waste.

The importance of measuring the embodied water and water footprint of products throughout their lifecycle is becoming more widely recognised, but as yet there is no internationally agreed standard of measurement. That said, where the process of assessment is the same it can provide helpful comparisons. For example it takes up to 260 litres of water to produce 1 Kg of steel and 440 litres to produce 1 Kg of copper. Water footprinting can also be used to assess an entire business or its elements.

Example

Toilets:

- Water is consumed in the extraction of clay as a raw material and in porcelain manufacture but with 5,000 flushes per toilet per year in the average family home, the greatest consumption of water in the lifecyle of a toilet is during use.
- Toilets use about 30% of the total water used in a household.
- Through design improvements, the latest low-flush and dual flush toilets use between 4 and 6 litres of water per flush compared to the older, but still widely available single flush toilets which use 13 litres per flush.

Key Questions

Where are the most intensive uses of water in the lifecycle?

Quick Wins

Reduce water consumption throughout the product/service lifecycle. For 'active' products this is likely to be during the use stage.

Waste

Each year in the European Union, 3 billion tonnes of waste is thrown away, 90 million tonnes of which is deemed hazardous; both of these figures are on the increase. Waste includes any and all waste produced throughout the product

lifecycle from raw materials, manufacturing process as well as transit packaging in distribution and the final product itself at 'end of life'.

Waste is a cost, with some waste materials costing more than others to deal with. Some types of waste are controlled by legislation on waste handling, storing and disposal. Waste to one business may be (or could be) a resource for another, like the use of fly ash from the power industry as an alternative to cement in concrete structures and products. Ultimately, waste should be designed-out from the beginning, but the waste hierarchy of 1) reduce it, 2) reuse it and 3) recycle it is an effective approach for dealing with waste.

Example

An assembler of steel frames for construction might consider the following Eco-design options:

- Can cellular or castellated lightweight beams be used rather than more conventional 'I' beams to improve the efficiency of materials use and 'end of life' waste management costs?
- Can the number of components and types of fastenings be reduced to simplify dismantling at 'end of life'?
- Can structures be modularised for a greater degree of off-site construction, where waste management is generally easier and more cost effective to control?
- Can improvements be made to reduce transit packaging waste, introduce reusable systems or eliminate packaging altogether?

Key Questions

What types and quantities of waste arise throughout your product/service lifecycle and where can waste be avoided through reduction, reuse or recycling?

Quick Wins

Reduce waste throughout he product/service lifecycle. Consider increasing the use of recycled material in your product and design for ease of maintenance in use and reuse or dismantling at end of life, through using fewer components and screws.

Pollution

Emissions to air, water and land can cause localised pollution, in the form of air quality reduction, soil contamination and degradation of water courses. Emissions in industry are strictly regulated within the EU (eg Directive on industrial emissions 2010/75/EU). However the degree of regulation and enforcement varies considerably around the world. Some products, eg airborne dust from particulate materials like cement and volatile organic compounds (VOCs) from some paints and coverings can lead to air quality issues particularly in the indoor environment.

Example

Paints and adhesives:

- Some building materials such as paints, adhesives, wall boards, and ceiling tiles slowly emit formaldehyde in application and use.
- VOCs including formaldehyde can cause breathing difficulties, irritation and discomfort to people in the indoor environment.
- Manufacturers of these materials could explore alternative water-based solvents to reduce or eliminate emissions of VOCs and improve environmental performance during the products use.

Key questions

Where are the most significant emissions in the product/service lifecycle?

Quick Wins

Consider alternative materials and solvents that have lower environmental impacts throughout the lifecycle.
Consider alternate means of transport that reduce emissions.

Social

Although the focus of this guide is on Eco-design, social issues relating to the treatment of workers in the supply chain are included as an issue for consideration by SMEs. Those SMEs supplying products and services to large retailers and construction companies are probably already familiar with providing information on their management and understanding of labour and welfare conditions in their supply chain. Failure to demonstrate that these issues are being managed responsibly could lead to delisting as a supplier and damage to the brand.

The International Labour Organisation (ILO) sets global standards on worker welfare and there are a number of product specific independent product certifications that aim to guarantee fair standards, like the Fairtrade Mark as well as industry-wide schemes like SA8000, Social Accountability in industrial processes and BES 6001 *The Framework Standard for the Responsible Sourcing of Construction Products.*

Example

Natural stone paving:

- Natural stone is used frequently in for example, quality exterior paving.
- It can be significantly less expensive to use imported rather than local materials.
- However quarrying practices particularly in some developing countries can be grossly exploitative of workers and the environment.
- There has been considerable public concern regarding Indian Sandstone, although there are examples of responsibly sourced Indian Sandstone, there have also been allegations of bonded labour and that children make up to 25% of the workforce in some quarries.
- For many customers a reassurance that the stone was sourced responsibly can be an important part of the product's intrinsic quality.
- Reuse of recovered stone, locally quarried stone or stone that carries an independent certification of responsible sourcing can provide a guarantee of fairness in the supply chain.
- There are also many stone-like alternatives which use cement and waste materials like fly ash and red earth waste recovered from industrial processes.

Key Questions

Who touches your product or service throughout the lifecycle and where can you reasonably be expected to have ensured the fair treatment of workers in the supply chain

Quick Wins

Consider demonstrating that your materials are ethically sourced by achieving a standard like SA8000[1] or BES6001[2].

1. SA8000 www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&pageId=937
2. BES 6001 www.bsigroup.co.uk/en-GB/bes-6001-responsible-sourcing-of-construction-products

6.3 Using the Lifecycle Impact Tool (LIT)

The matrix below can assist you in understanding the impacts associated with your product or service. Some of the issues may not be relevant to your specific product or service. For example no energy will be consumed by a lavatory in use (except pump and macerator toilets) and the issue of water consumption will be largely irrelevant across most if not all lifecycle stages for a timber frame product. The tool therefore will allow you to eliminate some issues and lifecycle stages and highlight areas where the major impacts do arise. A completed matrix is useful because you can easily see which issues and at what lifecycle stage you will need to focus (the hotspots) when you come to consider which impacts to reduce at the design stage (section 7). As an illustration the LIT below (figure 2) has been completed for a hypothetical timber-framed glazed window.

Figure 2.
The Lifecycle Impact Tool, completed for a hypothetical timber-framed glazed window*

ISSUE	Source	Transport	Manufacture	Packaging	Distribution	Use	End of Life
Materials	Potential biodiversity Impact of timber harvesting	NA	Weight of materials in product	NA	NA	NA	Waste disposal/ use of saw mill offcuts & dust
Energy	Energy required to manufacture (glass, steel fastenings) and timber processing	Distances transported	Impact of Kiln drying (timber) & glass cutting	NA	Transit efficiencies to user	Performance of the window in terms of heat loss, heat gain, day lighting and ventilation Coating replacement (timber), durability of windows/replacement cycle	NA
Water	Water consumed in glass and steel manufacture	NA	NA	NA	NA	NA	NA
Waste	Waste from Manufacture opportunities (glass, timber)	Wastage in transit	Waste and additional raw materials usage (timber, glass)	Options to reduce packaging	Wastage in transit	NA	Recycling & recovery
Pollution	Emissions from glass & steel manufacture	NA	Dust from timber saw	NA	NA	NA	Methane from landfill of timber
Social	NA	NA	NA	NA	NA	Window - heat loss, heat gain, daylighting and ventilation	NA

* Source: Adapted from The Windows Sustainability Action Plan-Defra, October 2010

The matrix is completed by working through the boxes for each issue and considering the following questions:

Is this issue relevant and applicable to my product at this lifecycle stage?

If no: We mark this box as Not Applicable (eg water consumption in distribution for the window example in figure 2) and move on to the next box.

If yes: We then ask the following question:

Does this issue give rise to significant environmental impacts at this lifecycle stage?

If no: We describe the impact in the box but indicate that it is of low significance, by for example colouring the box red (eg energy consumption in materials transport for the example in figure 2) and move on to the next box.

If yes: We describe the impact and indicate it is of high significance; a hotspot, by colouring the box green as in the example in figure 2.

In the hypothetical example in figure 2, the hotspots coloured in green, show where to focus design efforts to reduce the significant lifecycle impacts of a timber-framed glazed window product.

- Biodiversity and energy in sourcing of materials
- Energy used and waste created in manufacturing processes
- Energy efficiency, durability and maintenance of windows in use
- Recovery of materials for reuse or recycling during building demolition or refurbishment
- Production of methane when landfilling timber

In the next section we explore how to decide upon design strategies to address the environmental impacts identified as hotspots.

ACTION:

Before moving on to section 7, we suggest that you complete a LIT to identify the impact hotspots for one of your products or services – a blank LIT template can be downloaded at http://www.ecodesign-een.eu/tool.asp?dt=Edecon&id=28

7 Formulating an Eco-design strategy

Having used the LIT to identify the most significant environmental impacts or the hotspots in the product or service lifecycle, we will now consider the design options which provide the greatest opportunities to reduce these impacts. In Table 2, below five Design Focus Areas are highlighted, which are applicable to all types of construction product or service. Design Focus Areas are chosen for consideration based on which hotspots the business aims to address. Remember that the actions we take to improve our product or service's environmental impact can also benefit our businesses in other ways and we can see examples of this in the table.

Table 2. Design Focus areas and how they address impacts

		Key Questions	Environmental Benefits	Business Benefits
DESIGN FOCUS AREAS	Design for Material Sourcing	When you specify materials and components, do you consider the impact on the environment related to weight, volume, use of recyclates, embedded energy and water and impacts on biodiversity?	• Reduced resource depletion • Reduced embodied energy/water • Reduced transport burden • Reduced carbon dioxide (CO_2) emissions • Reduced impact on biodiversity	• Reduced transport costs • Improved Image/access to markets
	Design for Manufacture	Have you considered changing manufacturing processes to reduce energy and water use, waste and recycling of waste?	• Reduced CO_2 emissions and depletion of water resources • Reduced resource depletion	• Reduced energy costs • Less waste - Reduced material cost
	Design for Transport and Distribution	Have you considered size, shape and volume of your products from a packaging and transport viewpoint? When specifying packaging do you consider embodied energy and water, production of VOCs or hazardous substances?	• Reduced CO_2 emissions and depletion of water resources • Reduced air pollution • Reduced transport use – less emission and wear and tear on infrastructure • Reduced potential for proliferation of hazardous substances in the Environment	• Reduced transport costs • Reduced packaging costs
	Design for Use (Including installation and maintenance)	When you design your products, do you think about their energy and/or water consumption when they are used? Do you consider the amount of consumables and any hazardous materials that may be released during use? Do you consider their longevity and ease of maintenance?	• Reduced demand on new material resources • Reduced CO_2 emissions • Reduced depletion of water resources • Reduced potential for proliferation of hazardous substances in the Environment	• Lower lifecycle costs for customer – increased profits from increased prices • Reduced maintenance costs • Good product image
	Design for End of Life	When you design your products, do you think about how easily they could be reused or dismantled and recycled? Do you consider any hazardous substances in the product that might be released during dismantling or recycling?	• Reduced use of land for landfill • Reduced demand on new material resources • Reduced CO_2 emissions • Reduced depletion of water resources	• Compliance with regulation • Reduced end of life costs

A point that we need to be aware of is the potential risk of shifting adverse environmental impacts from one lifecycle stage to another. For example, in countries where the climate is very mild and buildings require only minimal heating or cooling, the embodied energy in double glazed windows (material sourcing and manufacturing stages) can be more significant than the energy the windows save in reducing the heating and cooling requirement of the building (use stage). So in these circumstances double glazed windows are not environmentally beneficial. However in buildings with high heating and cooling demands, the energy savings the windows achieve justify their installation. Such possibilities need to be considered and a decision made on the best overall option before the design strategy can move forward.

We have already determined the hotspots for the timber-framed glazed window (figure 2) and we can now link these hotspots with the list of Design Focus areas as can be seen in Table 3 below.

Table 3. Hotspots and Design Focus Areas for hypothetical Timber-framed Glazed Window

Hotspots	Design Focus Area
Biodiversity and energy in sourcing of materials	Design for Material Sourcing
Energy used and waste created in manufacturing processes	Design for Manufacture
Energy efficiency, durability and maintenance of windows in use	Design for Use (Including installation and maintenance)
Recovery of materials for reuse or recycling during building demolition or refurbishment	Design for End of Life
Production of methane when landfilling timber	

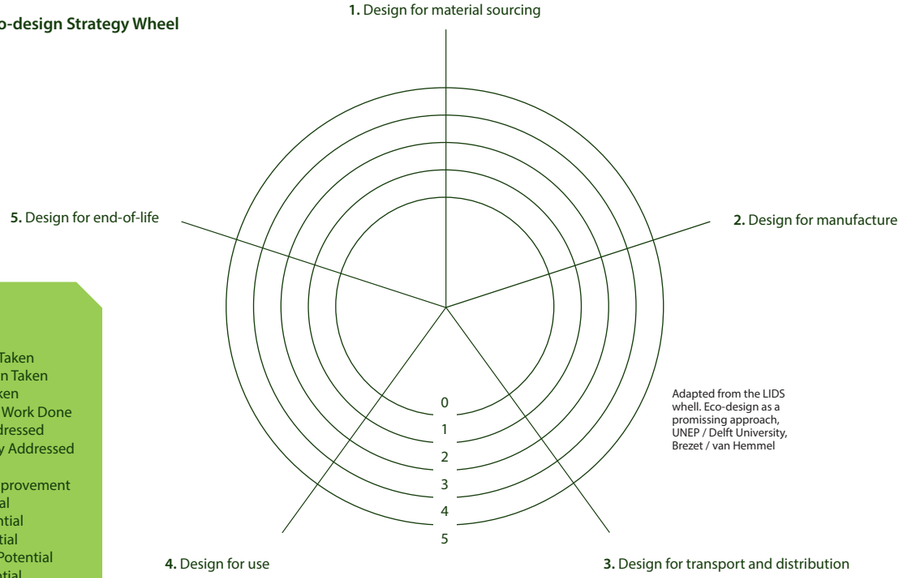
We now know which design focus areas to consider but we do not yet know which of these should be prioritised and which provides the greatest scope for improvement. We can think this through using the Eco-design Strategy Wheel described in the following section.

7.1

The Eco-design Strategy Wheel

We now have a better understanding of the product's significant impacts (or hotspots) and the design focus areas that can be addressed to reduce these impacts. However, we have not yet investigated the extent of the opportunity or scope to make design changes. This depends on two factors a) the current state ie, how much has already been done by the business to address the hotspots; and b) the potential for improvement, ie the options available to the company to make design changes to address the most significant impacts in the product or service lifecycle. The Eco-design Strategy Wheel in figure 3 (a blank template can be downloaded at http://www.ecodesign-een.eu/tool.asp?dt=Edecon&id=24) is a tool for identifying the scope for Eco-design.

Figure 3. The Eco-design Strategy Wheel



Key of scale

Current State
- **0** No Action Taken
- **1** Little Action Taken
- **2** Actions Taken
- **3** Significant Work Done
- **4** Mostly Addressed
- **5** Completely Addressed

Potential for Improvement
- **0** No Potential
- **1** Little Potential
- **2** Low Potential
- **3** Moderate Potential
- **4** High Potential
- **5** Very High Potential

Current State

When considering the current state, it may be found that Eco-design activity has already been undertaken for other reasons like cost-saving, for example reducing packaging or the product's weight to save on distribution costs. You need to identify the extent of this so you can estimate the remaining scope for improvement. Using your knowledge of the business and its products (this is best done in teams including representatives from management, marketing, purchasing, research and development) an estimate should be made, on a scale of 0 to 5 of the extent to which each focus area has already been addressed. The estimate is then marked on the appropriate spoke of the wheel, where 0 means that no action has been taken in this area and 5 means the focus area has already been completely addressed. By marking your estimate on each focus area of the wheel and joining the dots, a picture can be built up of the current state and which are the most productive areas for new design effort.

For example, a team looking at Design for Transport and Distribution of roof tiles found that product weight had previously been reduced to cut the financial costs of transportation. In this instance the team might decide to score current state as 2, indicating that actions have been taken but a number of options have yet to be considered.

Consideration of the key design questions in Table 2 and the more detailed Eco-design options checklist (downloadable at http://www.ecodesign-een.eu/tool.asp?dt=Edecon&id=30) can help to clarify the current state.

Potential for improvement

We now consider possible design improvements in each focus area. Working around the wheel through each focus area and using for reference the Eco-design options checklist an estimate is made of the feasibility of implementing the design options. Again, the scale is from 0 to 5, with 0 indicating that there are no potential options for improvement (ie not relevant or completely outside of the business's control),and 5 indicating a very high potential for improvement with many options feasible. Joining up the dots gives a second picture of where it is believed there are feasible design options for improvement.

Comparison of the current state and potential for improvement allows design teams to identify the best opportunities for improvement, i.e. those areas where little has been already done but much can be feasibly achieved. The larger the gap between the two lines, the greater the opportunity. Addressing these areas then becomes the basis for the design plan or strategy.

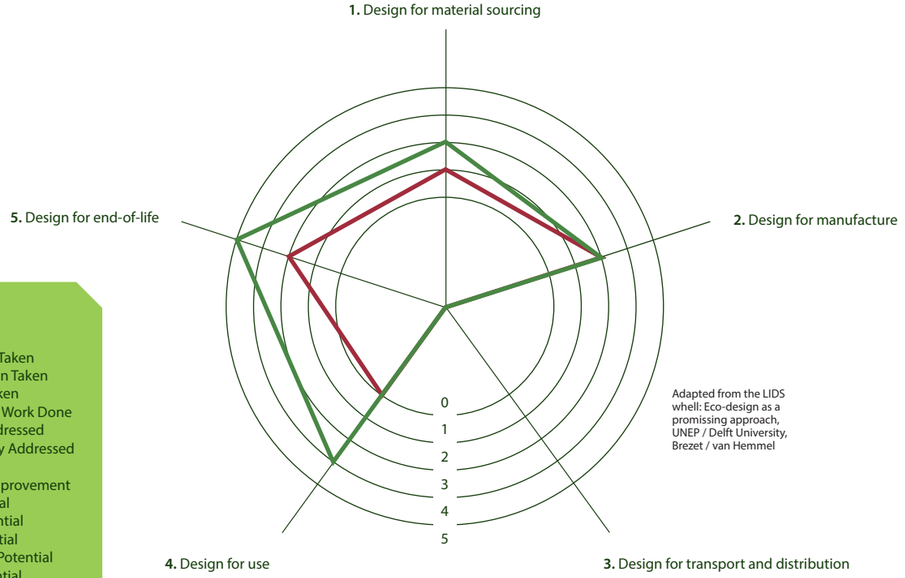
For example, the roof tile design team, believes that there is further scope to reduce the product weight by considering alternative materials. Also new lighter pallet systems can be introduced that will use an increased amount of recycled material, reduce weight and as a consequence cut energy consumption in distribution. In this instance the team might score the potential for improvement as 4.

7.2 Using the Eco-design Strategy Wheel

- Windows example

In figure 2 the LIT tool was used to document the significant environmental impacts throughout the lifecycle of a hypothetical wooden-framed glazed window and in table 3, the hotspots and design focus areas are indicated.

Figure 4. Strategy Wheel Showing Focus Areas and Scope for Improvement for the Window example



Key of scale

Current State
- **0** No Action Taken
- **1** Little Action Taken
- **2** Actions Taken
- **3** Significant Work Done
- **4** Mostly Addressed
- **5** Completely Addressed

Potential for Improvement
- **0** No Potential
- **1** Little Potential
- **2** Low Potential
- **3** Moderate Potential
- **4** High Potential
- **5** Very High Potential

In figure 4, the red line indicates the current state or extent to which the design has already been optimised i.e. the start line. (This is purely for illustrative purposes and is not meant to be a definitive indication of the environmental performance of any actual window products). The green line shows those focus areas where the window manufacturer believes (for the sake of this example) that there is scope for employing the relevant design options. The wheel shows two focus areas, 'Design for end of life' and 'Design for use' where there is the greatest scope for improvement. These all link to the hotspots of high energy consumption, high emissions of CO_2 and generation of non-recoverable waste and if successfully addressed will lead to environmental performance improvements. (Note that the focus area for Transport and Distribution shows zero on the scale because it was deemed insignificant at the assesment stage).

The result of the exercise is the identification of the priority focus areas and related options for design improvement that will make up an environmental improvement strategy for the product or services in question. In the case of our example for windows, these could be:

Design for Use
Increase Energy efficiency, durability and ease of maintenance of windows in use.

Design for End of Life
Increase recovery of materials for reuse or recycling during building demolition or refurbishment.

Each option for improvement will then need to be considered further to determine how to carry out this strategy and to establish design goals and objectives for each improvement area. The proposed activities will then need to be assessed for desirability, cost, conflicts and constraints before the final Eco-design specification. A key consideration in setting objectives is agreeing indicators to measure progress. Guidance on indicators is given in section 7.3.

ACTION:

We suggest that you complete an Eco-Strategy Wheel for one of your products – a blank template can be downloaded at http://www.ecodesign-een.eu/tool.asp?dt=Edecon&id=24

7.3 Indicators

As with any business activity, the actions undertaken through Eco-design should be measurable so that any targets to reduce environmental impact can be tracked internally and also communicated to customers and other stakeholders, if required. In essence targets should be Specific, Measurable, Attainable, Relevant, and Timed (SMART).

The calculation of embodied carbon and water for products is technically demanding. There are plans in place at EU level to develop standardized methodologies for product environmental footprints but these are still very complex. For SMEs less complex indicators can be useful in understanding and measuring progress. Some examples for consideration are given below. Indicators often enable the measurement of impacts on a per unit or weight of product basis.

Example Indicators

- Weight or volume of the unit product (or number of units that can be packed into transport vehicle)
- Number of materials specified with low VOC emissions in manufacture or use
- Percentage by weight of unit product of recycled materials or materials that can be recycled
- Consumption of energy in manufacture of unit product
- Water consumption in manufacture of unit product or the provision of a service
- Percentage by weight of materials used that are wasted in manufacture
- Percentage by weight of waste material that can be reused
- Volume of waste produced or recyclate used in the provision of a service
- Distance travelled and energy consumed in the provision of a service

8 Sources of further information and support

8.1 European Drivers of Eco-design in Construction Products and Services

European Directives & Regulations

Eco-design of Energy Related Products Directive (2009/125/EC)
This Directive provides a framework which allows setting minimum environmental performance requirements for dozens of product groups. Its main focus is on energy performance in use, whether that is the energy the product uses or the impact the product has on energy use where it is installed. The Directive covers:

- **Energy-using products** (EUPs): products which use, generate, transfer or measure energy including consumer goods such as boilers, computers, TVs, washing machines, light bulbs and industrial products such as transformers, industrial fans, industrial furnaces.
- **Energy related products** (ERPs): products which do not necessarily use energy, but have an impact on energy such as windows, insulation material or bathroom devices (e.g. shower heads, taps).

The mandatory product requirements may be:

- **Specific requirements**, which set limit values, such as maximum energy consumption or minimum quantities of recycled material, or
- **Generic requirements**, which do not set limit values but may require, for example, that a product is "energy efficient" or "recyclable" or may entail information requirements, such as best practices to use and maintain the product in order to minimise its environmental impact or a lifecycle analysis of the product in order to identify alternative design options and solutions for improvement.

http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm
http://ec.europa.eu/energy/efficiency/ecodesign/eco_design_en.htm
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005L0032:EN:NOT

EU Construction Products Regulation (305/2011)
The objective of the Construction Product Regulation is to ensure reliable information on the performance of construction products. This is achieved by providing a "common technical language", offering uniform assessment methods of the performance of construction products.

The Regulation makes it mandatory for manufacturers to apply CE marking to any of their products which are covered by a harmonised European standard (hEN)or European Technical Assessment (ETA) and aims to break down technical barriers to trade with a system of harmonised technical specifications.

The CPR requires that seven basic requirements should be satisfied by all construction works:

1. mechanical resistance and stability
2. safety in case of fire
3. hygiene, health and the environment
4. safety and accessibility in use
5. protection against noise
6. energy economy and heat retention
7. sustainable use of natural resources

The CPR has been directly applicable in all countries of the European Union without further transposition since 1st July 2013.
http://ec.europa.eu/enterprise/sectors/construction/legislation/
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011R0305:EN:NOT

Energy Performance of Buildings Directive (Directive 2010/31/EU)
This Directive aims to promote the energy performance of buildings. It requires Member States to adopt a methodology for calculating the energy performance of buildings and set minimum requirements for energy performance. New buildings must comply with these requirements while existing buildings must have their energy performance upgraded to satisfy the minimum requirements when undergoing major renovation. The objective is to ensure that all new buildings shall be nearly zero-energy consumption buildings by 31 December 2020 (31 Dec 2018 for new buildings occupied and owned by public authorities).

The Directive requires buildings to have an Energy Performance Certificate which includes information on the energy performance of a building and recommendations for improvements. For buildings where a total floor area of over 500 m^2 is occupied by a public authority and buildings with a total floor area of over 500 m^2 which are frequently visited by the public, the energy performance certificate must be displayed in a prominent place and be clearly visible (this threshold shall be lowered to 250 m^2 on 9 July 2015).

Member States are responsible for putting in place a system of regular inspections of heating and air-conditioning systems in buildings by qualified personnel to ensure optimal performance

On 20 June 2013, the Commission published a study on "Energy performance certificates in buildings and their impact on transaction prices and rents in selected EU countries". The study shows a positive impact of the Energy Performance Certificate under the Energy Performance of Buildings Directive (Directive 2010/31/EU) on sales and rental prices indicating that better energy efficiency is rewarded in the market.
http://europa.eu/legislation_summaries/internal_market/single_market_for_goods/construction/en0021_en.htm
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0031:EN:NOT

Energy Efficiency Directive (Directive 2010/31/EU)
On 25 October 2012, the EU adopted the Directive 2012/27/EU on energy efficiency which establishes a common framework of measures for the promotion of energy efficiency to step up Member States' efforts to use energy more efficiently at all stages of the energy chain – from the transformation of energy and its distribution to its final consumption. Measures include the legal obligation to establish energy efficiency obligations schemes or policy measures which will drive energy efficiency improvements in households, industries and transport sectors. Other measures include an exemplary role to be played by the public sector and a right for consumers to know how much energy they consume.

The main changes the directive brings to existing legislation are:

- Energy companies are requested to reduce energy sales by 1.5% every year among their customers. This can be achieved via improved heating systems, fitting double-glazed windows or insulating roofs.
- The public sector is required to renovate 3% of buildings "owned and occupied" by the central government in each country. Buildings need to have a useful area larger than 500 m2 in order to be covered by this requirement (lowered to 250 m2 as of July 2015).
- EU countries are requested to draw up a roadmap to make the entire buildings sector more energy efficient by 2050 (commercial, public and private households included).
- Energy audits and management plans are required for large companies, with cost-benefit analyses for the deployment of combined heat and power generation (CHP) and public procurement.

http://ec.europa.eu/energy/efficiency/eed/eed_en.htm
http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2012:315:SOM:EN:HTML

Renewable Energy Directive
The EU aims to get 20% of its energy from renewable sources by 2020. Renewables include wind, solar, hydro-electric and tidal power as well as geothermal energy and biomass. More renewable energy will enable the EU to cut greenhouse emissions and make it less dependent on imported energy. And boosting the renewables industry will encourage technological innovation and employment in Europe.

This Directive establishes a common framework for the promotion of energy from renewable sources. It sets mandatory national targets for the overall share of energy from renewable sources and requires Member States to adopt a national renewable energy action plan and introduce measures to ensure that the target it hit.

Member States must ensure that the renewable energy makes up at least 10% of energy consumption in transport by 2020.

http://ec.europa.eu/energy/renewables/index_en.htm
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF

8.2 UK Drivers of Eco-design in Construction Products and Services

Legislation

2008 Climate Change Act
UK Government has set an ambitious and legally binding target to reduce national greenhouse gas emissions by at least 80% by 2050 with an intermediate target of a 34% reduction by 2020 (against a 1990 baseline). The operation of buildings currently accounts for nearly half of the UK's greenhouse gas emissions and therefore significant improvement in new and existing building performance is required if these targets are to be met.
http://www.legislation.gov.uk/ukpga/2008/27/contents

Site Waste Management Plans Regulations 2008
All construction projects over £300,000 in England must have a site waste management plan (SWMP) which details how you handle your construction waste and follow the law on managing waste. These regulations are under review for repeal.
http://www.legislation.gov.uk/uksi/2008/314/made

EU Construction Product Regulation 305/2011
The objective of the Construction Product Regulation is to ensure reliable information on the performance of construction products. The CPR is directly applicable in all countries of the European Union without further transposition from 1st July 2013. It revises and expands the basic requirements set out in the original 'Directive'. Most changes will be connected with the new Basic Requirement No 7 'Sustainable use of natural resources'.
http://www.planningportal.gov.uk/buildingregulations/buildingpolicyandlegislation/tabs

Policy

UK Government Strategy for Sustainable Construction
The Strategy4 for Sustainable Construction will help to deliver the aims set out in the UK's Sustainable Development Strategy5. It is a joint industry and Government initiative, and is intended to promote leadership and behavioural change, as well as delivering substantial benefits to both the construction industry and the wider economy.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15370/strategy-for-sustainable-construction.pdf

UK Government Carbon Plan
Low Carbon Buildings: By 2050, all buildings will need to have an emissions footprint close to zero. Buildings will need to become better insulated, use more energy-efficient products and obtain their heating from low carbon sources.
https://www.gov.uk/government/publications/the-carbon-plan-reducing-greenhouse-gas-emissions--2

UK Low Carbon Industrial Strategy
By 2050, the Government expects industry to have delivered its fair share of emissions cuts, achieving reductions of up to 70% from 2009 levels. All new non-domestic buildings should be zero carbon from 2019, with the public sector leading the way from 2018.
http://www.berr.gov.uk/files/file52002.pdf

UK Government Strategy for Sustainable Construction
Includes a target to reduce Construction, Demolition & Excavation waste to landfill by 50% by 2012 compared to 2008 levels
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15370/strategy-for-sustainable-construction.pdf

UK Government Electricity Demand Reduction Project
In November 2012 Government ran a consultation looking at a range of options for reducing electricity demand. Following the consultation Government has tabled amendments to the Energy Bill so that a financial incentive to encourage permanent reductions in electricity demand could be delivered through the Capacity Market.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66562/7076-electricity-demand-reduction-consultation-summary-.pdf

The Code for Sustainable Homes
The code for sustainable homes (CSH) is the national standard for the sustainable design and construction of new homes. It aims to reduce carbon emissions and promote higher standards of sustainable design above the current minimum standards set out by the UK's Building Regulations.
https://www.gov.uk/government/policies/improving-the-energy-efficiency-of-buildings-and-using-planning-to-protect-the-environment/supporting-pages/code-for-sustainable-homes

BREEAM
BREEAM sets the standard for best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building's environmental performance. It encourages designers, clients and others to think about low carbon and low impact design, minimising the energy demands created by a building before considering energy efficiency and low carbon technologies.
http://www.breeam.org/about.jsp?id=66

Energy Performance Certificates & Display Energy Certificates
Energy Performance Certificates (EPCs) provide information about a property's energy use and typical energy costs as well as recommendations about how to reduce energy use and save money. They are required whenever a property is built, sold or rented . Larger public buildings over 500m^2 must display a Display Energy Certificate (DEC) - https://www.gov.uk/government/policies/improving-the-energy-efficiency-of-buildings-and-using-planning-to-protect-the-environment/supporting-pages/energy-performance-of-buildings
https://www.gov.uk/buy-sell-your-home/energy-performance-certificates

Climate Change Levy
Climate change levy (CCL) encourages businesses to reduce their energy consumption or use energy from renewable sources. It's a tax on:
Electricity, gas and solid fuels - like coal, lignite, coke and petroleum
http://www.hmrc.gov.uk/climate-change-levy/

Landfill Tax
Landfill Tax is a tax on the disposal of waste. It aims to encourage waste producers to produce less waste. The standard rate of Landfill Tax at April 2012 was £64 per tonne for non-hazardous (and non-inert) wastes rising by £8 per tonne each year until at least 2014. A lower rate of £2.50 per tonne applies to inactive (or inert) waste.
http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_ShowContent&id=HMCE_CL_001206&propertyType=document

Aggregates Levy
The Aggregates Levy was introduced in 2002 to reduce demand for primary aggregates and to encourage the use of recycled and secondary aggregates. The levy in 2012 was £2.00 per tonne of primary aggregates.
http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_InfoGuides&propertyType=document&id=HMCE_CL_001169#P4_40

8.3 Additional sources of information

General

Embodied impacts of construction products, Construction Products Association
The purpose of this guide is to improve understanding across the construction industry of the embodied impacts of construction products.
http://www.constructionproducts.org.uk/fileadmin/client/cpa/documents/Sustainability/Embodied_Impacts_brochure_small_V9.pdf

Sustainable construction, Building Research Establishment (BRE)
A guide to simple ways to make it happen
http://www.bre.co.uk/filelibrary/rpts/sustainable_construction_simpleways_to_make_it_happen.pdf

GreenSpec
GreenSpec is a team led by practicing architects and specifiers which promotes 'green' building products, materials, and construction techniques, with the aim to help reduce the overall environmental impact of the buildings.
http://www.greenspec.co.uk/

Sustainable Build
Focus on having experts create the high quality information
http://www.sustainablebuild.co.uk/

Sustainable Construction Checklist
This checklist has been developed to help the construction industry improve in terms of its sustainability with regard to planning, design, the construction process and the finished product.
http://www.constructingexcellence.org.uk/zones/sustainabilityzone/checklist.jsp

Sustainable Construction, Environment Agency
Provides advice on sustainable construction.
http://www.environment-agency.gov.uk/business/sectors/136252.aspx

Construction Carbon Calculator, Environment Agency
A tool to assist with assessing and reducing the carbon footprint of construction projects
https://publications.environment-agency.gov.uk/skeleton/publications/SearchResults.aspx?name=GEHO0712BWTW-E-X

Sustainable Construction in Cambridgeshire
A Good Practice Guide
http://www.cambridgeshirehorizons.co.uk/documents/publications/useful_guides/sustainable_construction.pdf

Materials

Business Case for Resource Efficiency in Construction
http://www.wrap.org.uk/content/business-case-resource-efficiency-construction

Resource Efficient Construction, Eco Innovation Observatory
Describes the role of eco-innovation for the construction sector in Europe
http://www.eco-innovation.eu/images/stories/Reports/eio_thematic_report_resource_efficient_construction_2011.pdf

Green Guide to Specification
The Code for Sustainable Homes and BREEAM use the Green Guide to Specification to assess the environmental impacts of construction materials and products.
http://www.bre.co.uk/greenguide/podpage.jsp?id=2126

Guidance on resource efficient construction
http://www.wrap.org.uk/content/resource-efficient-construction

Materials and waste in construction products
http://www.wrap.org.uk/content/construction-products-materials-and-waste

Standards of good practice in waste and resource management for the Construction, Demolition & Excavation sector
http://www.wrap.org.uk/category/sector/construction

Specifying and using recycled and secondary aggregates.
http://aggregain.wrap.org.uk/

Choosing Construction Products
A Guide to the recycled content of mainstream construction products.
http://www.wrap.org.uk/sites/files/wrap/Const%20Product%20Guide%20Version%204.1.pdf

Resource efficiency through Building Information Modelling – Information Note
http://www.wrap.org.uk/sites/files/wrap/Resource%20efficiency%20through%20BIM%20-%20information%20note%20Revised.pdf

Resource efficiency through Building Information Modelling – A Guide for BIM Managers
http://www.wrap.org.uk/sites/files/wrap/Resource%20efficiency%20through%20BIM%20-%20a%20Guide%20for%20BIM%20Managers.pdf

Responsible Sourcing of Construction Products, BRE
Describes the BRE Global framework standard for the Responsible Sourcing of Construction Products.
http://www.bre.co.uk/page.jsp?id=1514

Sustainable Green Building
Provides general guidance on specifying sustainable construction materials
http://www.calrecycle.ca.gov/greenbuilding/materials/

A Guide to Understanding the Embodied Impacts of Construction Products,
The purpose of this guide is to improve understanding across the construction industry of the environmental impacts of construction products.
http://www.constructionproducts.org.uk/fileadmin/client/cpa/documents/Sustainability/Embodied_Impacts_brochure_small_V9.pdf

Forest Stewardship Council
FSC works to improve forest management worldwide, and through certification creates an incentive for forest owners and managers to follow best social and environmental practices.
https://ic.fsc.org/

PEFC
An international non-profit, non-governmental organization dedicated to promoting sustainable forest management
http://www.pefc.org/

Green Guide to Composites
This guide has been created to allow the composites industry to understand the environmental and social impacts of different composite materials and manufacturing processes.
http://www.netcomposites.com/green-guide/download-guide

Energy

Green Business Directory
Find your ideal energy efficient equipment and renewable energy technology supplier from the directory of Carbon Trust accredited businesses
http://www.carbontrust.com/resources/tools/green-business-directory

Guide to Carbon Footprinting.
Carbon foot-printing or embodied carbon assessment is increasingly being used within the construction industry to inform building design and product selection. Although this is currently on a voluntary basis, it is likely that some form of regulation, possibly via Part L of the Building Regulations, will be introduced in the future.
http://www.carbontrust.com/resources/guides/carbon-footprinting-and-reporting/carbon-footprinting

Energy efficient lighting guide
http://www.carbontrust.com/resources/guides/energy-efficiency/lighting)

Heating, ventilation and air conditioning (HVAC)
http://www.carbontrust.com/resources/guides/energy-efficiency/heating,-ventilation-and-air-conditioning-(hvac)

Building energy efficiency, improving building fabric
http://www.carbontrust.com/resources/guides/energy-efficiency/buildings-energy-efficiency

Low Carbon Buildings
http://www.carbontrust.com/resources/guides/energy-efficiency/low-carbon-buildings-design-and-construction

Renwable Energy & combined heat & Power (CHP)
http://www.carbontrust.com/resources/guides/renewable-energy-technologies/renewable-energy-and-combined-heat-and-power-(chp)

Biomass heating tools & guidance
http://www.carbontrust.com/resources/guides/renewable-energy-technologies/biomass-heating-tools-and-guidance

Building a lower carbon construction industry
http://www.carbontrust.com/news/2012/02/building-a-lower-carbon-construction-industry-(1)

Business case for improving energy efficiency during construction
http://www.wrap.org.uk/content/business-case-improving-energy-efficiency-during-construction-1

Carbon: Reducing the footprint of the construction process
http://www.strategicforum.org.uk/pdf/06CarbonReducingFootprint.pdf

The Performance Gap
http://www.greenconstructionboard.org/images/stories/pdfs/performance-gap/2013-03-04%20Closing%20the%20Gap_Final%20Report_ISSUE.pdf

Information on energy and construction can be found at
http://www.bre.co.uk/greenguide/podpage.jsp?id=2126

Building Regulations Approved documents Approved Document L (Conservation of fuel and power)
Provides practical guidance on ways of complying with the energy efficiency requirements of the Building Regulations.

Water

Conserving Water in Your Business
Top tips from the Environment Agency on saving water in an office/business
http://www.environment-agency.gov.uk/business/topics/water/32070.aspx

10 Simple Tips to save water on your construction site
http://www.strategicforum.org.uk/HowToBrochure.pdf

Saving water in Business & Industry
Advice on developing a water management plan.
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geh00406bknl-e-e.pdf

Save Water on Your Construction Site
Guidance from the Green Construction Board
http://www.greenconstructionboard.org/otherdocs/HowToBrochure.pdf

Auditing of Water Use on Construction Sites – Phase I & II
Identifies High priority areas on a typical construction site.
http://www.wrap.org.uk/sites/files/wrap/Auditing%20of%20water%20use%20on%20construction%20sites%20-%20Phase%201%20and%202.pdf

Water-efficient buildings – good practice for new build projects
This guide will help you to set clear requirements for water efficiency when procuring design and construction services for new build and major refurbishment projects.
http://www.wrap.org.uk/sites/files/wrap/2010%2012%2023%20Water%20efficiency%20requirements%20new%20build%20overview.pdf

Water-efficient buildings – good practice for existing buildings
This guide will help you to set clear requirements for water efficiency when procuring facilities and estates management services for existing buildings.
http://www.wrap.org.uk/sites/files/wrap/2010%2012%2023%20Water%20efficiency%20requirements%20FM%20overview.pdf

General information on water conservation
www.waterwise.org.uk

Water Efficiency Labelling Scheme
The Water Efficiency Labelling Scheme allows you to compare products on water efficiency.
http://www.water-efficiencylabel.org.uk/home.asp.

Water conserving products and behaviours
http://www.waterwise.org.uk/

Water efficiency in construction
http://www.wrap.org.uk/content/water-efficiency-construction-0

Waste

Designing out waste
http://www.wrap.org.uk/content/designing-out-waste-1

Implementing designing out waste
http://www.wrap.org.uk/content/implementing-designing-out-waste-0

Designing out waste tool for buildings
http://www.wrap.org.uk/content/designing-out-waste-tool-buildings

Rethink Waste: resource efficiency for manufacturers
http://www.wrap.org.uk/content/rethink-waste-resource-efficiency-manufacturers

Packaging and recyclability guidance
http://www.wrap.org.uk/content/packaging-and-recyclability-guidance

Materials and waste in construction products
http://www.wrap.org.uk/content/construction-products-materials-and-waste

Standards of good practice in waste and resource management for the Construction, Demolition & Excavation sector
http://www.wrap.org.uk/category/sector/construction

Five Steps to Reduce Waste
IGD is a charity act positively on nutrition, skills, sustainability and employment in the food and consumer goods industry
http://www.igd.com/our-expertise/Supply-chain/Sustainable-supply-chains/2661/Supply-Chain-Waste-Prevention-Guide-from-factory-in-gate-to-till/Five-to-Drive-to-Prevent-Waste/Supply-Chain-Waste-Prevention-Guide-Five-to-Drive-to-Prevent-Waste/

Supply Chain Waste Prevention Guide
http://www.igd.com/Documents/Online%20Guides/Supply%20chain/Supply%20Chain%20Waste%20Prevention/Collaborative%20Waste%20Prevention%20Toolkit.pdf

Designing out waste in the steel industry
http://www.steelconstruction.info/Construction_and_demolition_waste#Designing_out_waste

Waste Management
Despite working to minimise your waste it is inevitable that you will have some waste to dispose of. This guide focuses on waste management and aims to help you maximise revenues & reduce costs.
http://www.igd.com/our-expertise/Supply-chain/Sustainable-supply-chains/2661/Supply-Chain-Waste-Prevention-Guide-from-factory-in-gate-to-till/Waste-Management/Supply-Chain-Waste-Prevention-Guide-Waste-Management/

Pollution to air, land and water

Pollution Prevention Guidance
http://www.environment-agency.gov.uk/business/topics/pollution/32252.aspx

Pollution Prevention – Good Practice Guide
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_7481_364b76.pdf

Guide to Avoid Pollution and Comply with the Law
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/LIT_1404_8bdf51.pdf

Works and Maintenance in or Near Water
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho1107bnkg-e-e.pdf

Safe Oil storage in above ground tanks
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0811bucr-e-e.pdf

Safe Storage in Drums and Intermediate Bulk Containers
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0511btpg-e-e.pdf

Safe Storage and Disposal of Used Oils
https://publications.environment-agency.gov.uk/skeleton/publications/ViewPublication.aspx?id=b1d39f58-f7d1-417f-a55f-1e41e3a4ce6e

Vehicle Washing & Cleaning
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0307bmdx-e-e.pdf

Pollution Incident Response Planning
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0309bpna-e-e.pdf

Dealing with Spills
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0411btez-e-e.pdf

Preventing Pollution at Construction and Demolition sites
http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/pmho0412bwfe-e-e.pdf

Social

Considerate Constructors Scheme
The Code of Considerate Practice commits those sites and companies registered with the Scheme to enhance their appearance, respect the community, protect the environment, secure everyone's safety and care for the workforce.
http://www.ccscheme.org.uk/

Preventing Noise from Construction Sites
http://www.netregs.org.uk/library_of_topics/nuisances/noise_from_construction_sites.aspx

BES 6001
The BRE standard BES 6001 has been published to enable construction product manufacturers to ensure and then prove that their products have been made with constituent materials that have been responsibly sourced.
http://www.bsigroup.co.uk/en-GB/bes-6001-responsible-sourcing-of-construction-products/

SA8000
http://www.sa-intl.org/index.cfm?fuseaction=Page.ViewPage&pageId=937

Protection of occupants, neighbours and environment
http://www.eurofins.com/product-testing-services/information/compliance-with-law/european-directives-and-laws/construction-products/voc-emissions-under-cpr.aspx

Indoor air quality impact on Health
http://www.bre.co.uk/page.jsp?id=720

The Impact of Paint of Health
http://www.greenspec.co.uk/paint.php#voc

Preventing Accidents at Work
https://osha.europa.eu/en/publications/magazine/4/

Sun Protection – Advice for Employers of Outside Workers
http://www.hse.gov.uk/pubns/indg337.pdf

Preventing Contact Dermatitis at Work
http://www.hse.gov.uk/pubns/indg233.htm

Case Study – The Truth About Imported Sandstone
http://www.marshalls.co.uk/sustainability/publications/pdfs/indian_sandstone.pdf

Mining, Communities and the Environment
http://www.nodirtygold.org/pubs/DirtyMetals.pdf

Product Design

Electrical product design
http://www.wrap.org.uk/content/electrical-product-design

Sustainable Product Design
The Centre for Sustainable Design
Various resources and publications related to sustainable/eco-design and innovation
www.cfsd.org.uk

8.4 Sources of Funding and Grant Support

Green Deal
The Green Deal is UK government policy, it was launched by the Department of Energy and Climate Change in 2012 to permit loans for energy saving measures for properties in Great Britain.
https://www.gov.uk/green-deal-energy-saving-measures/how-the-green-deal-works

Enhanced Capital Allowances
Enhanced Capital Allowances (ECAs) let businesses that invest in certain energy-saving equipment write off the total cost of the equipment against their taxable profit as a 100% first-year capital allowance.

Feed In Tariffs
The Feed-In Tariffs are a new Government-backed measure to make it worth your while to produce renewable electricity. There are three separate ways that the Tariffs help you make money from generating your own energy:

- A payment for all the electricity you produce, even if you use it yourself
- Additional bonus payments for electricity you export into the grid
- A reduction on your standard electricity bill, from using energy you produce yourself

More information on Feed in Tariffs can be found at
http://www.fitariffs.co.uk/eligible/

The Renewable Heat Incentive
The Renewable Heat Incentive is a new Government-backed measure being introduced in 2011 to make it worth your while to produce renewable heat. The Renewable Heat Incentive allows you to:-

- Earn a fixed income for every kilowatt hour of heat you produce.
- Save on your energy bill, as many renewable systems produce all the heat you need.

More information can be found at http://www.rhincentive.co.uk/, however, the Renewable Heat Incentive is still being designed, so all the details described on the website are provisional and may change.

Decent Homes
This is a £1 billion government scheme designed to bring thousands of sub-standard council homes up to a decent standard. This includes work to save energy and reduce carbon emissions. This will increase local spend through orders to tradesmen and suppliers in the area.
https://www.gov.uk/government/policies/improving-the-rented-housing-sector--2/supporting-pages/decent-homes-refurbishing-social-housing

Sustainable Development Fund
The Sustainable Development Fund (SDF) provides grants to individuals, businesses, local authorities and community groups to fund sustainable new business ideas and community projects in our National Parks, including the New Forest and South Downs.
http://www.ydmt.org/programme-details-sustainable-development-fund-sdf-14618

South East Sustainability Loan Fund, the FSE Group
The South East Sustainability Loan Fund provides debt funding on a matched basis to companies that are developing or selling a product or service that looks to reduce carbon emissions in the South East of England. Loans from this Fund must be matched against a publicly funded debt fund ("Primary Loan Fund

8.5 Support Associations

Waste and Resources Action Programme (WRAP)
Helps organisations to recycle more and waste less. They have numerous publications to help improve resource efficiency in the construction
http://www.wrap.org.uk/

The Carbon Trust
Provide expert advice, footprinting and technology services to help business, governments and organisations worldwide cut carbon emissions and costs.
http://www.carbontrust.com/

Sustainable Construction iNet
Are a provider of funding, expertise and advice to Small and Medium Enterprises (SMEs) specialising in the area of innovation in sustainable construction
http://www.construction-inet.org.uk/

Construction Products Association
The Association acts as a single voice to promote and campaign for the construction product manufacturers and suppliers in support of the industry.
http://www.constructionproducts.org.uk/sustainability/sustainability/

The Green Construction Board
Government and industry are working collaboratively through the "Green Construction Board" (GCB) to drive forward the actions set out in the Low Carbon Construction Action Plan
http://www.greenconstructionboard.org/

Sustnav
Provide not-for-profit sustainability services including delivering workshops/training and providing sustainability assessments
http://sustnavmodules.org.uk/

Sharing best practice through the Carbon Trust SME Network
http://www.carbontrust.com/resources/tools/sme-carbon-network

Solar Trade Association
STA is a not-for-profit trade association representing manufacturers, distributers, developers and installers across the solar power and solar heating industry.
http://www.solar-trade.org.uk/

Renewable Energy Association
REA is a not-for-profit trade association, representing British renewable energy producers and promoting the use of renewable energy in the UK
http://www.r-e-a.net/

Register of Low Carbon Consultants
The Chartered institution of Building Services Engineers provides a list of consultants certified by CIBSE to be competent to minimise energy use and carbon emissions from buildings both in design and operation.
http://www.cibseenergycentre.co.uk/energy-certificates/cibse-low-carbon-consultants.html

The Centre for Sustainable Energy
Help people and organisations from the public, private and voluntary sectors meet the twin challenges of rising energy costs and climate change
http://www.cse.org.uk/about-us

Regen SW
Regen SW is a leading centre of sustainable energy expertise and pioneering project delivery. They enable business, local authorities, community groups and other organisations to deliver renewable energy and energy efficiency.
http://www.regensw.co.uk/

Constructing Excellence
An organisation charged with driving the change agenda in construction. They exist to improve industry performance in order to produce a better built environment.
http://www.constructingexcellence.org.uk/

8.6 How to Commission an Eco-design Project

1. Developing the design brief

This is a key element to ensure that you get the most out of your Eco-design project. You will have already decided which area you are going to address by using the tools provided in this guidebook – now you may need to find, brief and select a design agency or consultant to deliver this work. Even if you are going to deliver the project in house it is recommended that you still develop a design brief as this will help you manage the process internally.

By providing the following information you will provide a good picture of your requirements that should allow a design agency / consultancy to understand and respond to your requirements. You may not need to address all of these – so be selective!

Company background
Give a brief overview of your business and what it does for customers

Business rationale
Describe the business challenge you are facing that has brought about this project.
What is/are the commercial reason(s) for considering this project?
How will it serve the company's ambitions/vision?

Project overview
Brief project statement - What do you want the designer to do?

Business objectives and expected outcomes
What return are you looking for from the expenditure?
Can you quantify what you are trying to achieve, this may include:
- new/safeguarded sales
- increased market share
- increased turnover
- increased market awareness
- new skills and processes
- increased efficiencies
- new/safeguarded jobs
- improve profit margins
- attract new and/or different types of customers
- retain existing customers/prevent them going elsewhere
- increase customers
- help to reposition the company in the market
- improve the profile of the company

Measures
How have your existing products and services performed in the past?
What results are you expecting from this project?
How are you going to measure the outcome of this project?
Over what timescale are you going to measure it?

Scope of work
What specifically do you want the designers to create?
Is there an existing brand/identity that you want to work with?

Special considerations
Are there any special requirements, issues or constraints that need to be considered for this project?

Competition
Who is the current competition?
Who might be your competitors in the future?

Customers
Who are your existing customers?
Who will you be targeting in the future?
What do you know about your target audience?

Routes to market
What are your current routes to market?
Which have been successful and which less so?
What might they be in the future?

Market trends
What market trends are affecting your business now and in the future?

Budgets
How much are you budgeting to spend on this particular project?

Project management
Who will be responsible for managing the project day-to-day?
Who has overall responsibility for executive decision-making?
Who should the designers refer to in the absence of the decision maker?

Timescales
When should the project start and when should it end?
Is there a specific deadline?
How often do you want/need to meet in the interim?

2. Setting the Project Budget

You will need to have a budget in mind for your project brief – your Design Mentor will be able to give you an idea of how many days work a particular project will entail and Design Agency / Consultancy charges range from £300 per day to above £1000 per day.
We would suggest that you budget in the range of £400 to £600 per day

3. Choosing the Design Agency / Consultant

We suggest that you identify at least three design agencies / consultancies to quote for your project. Your Design Mentor can help you identify suppliers if you have no local contacts – or if you require specialist support.

You should send the design brief to each chosen supplier and invite them to present a 'credentials pitch' (or indeed you could visit their premises which will give you further information about them). A credentials pitch is where the agency has read your brief and shows you relevant past work they have completed for other clients. You cannot expect them to do free creative work in response to your brief – they need to understand the full scope/breadth of what you need before they commence this stage.

At the credentials pitch you could use the following framework to assess the relative performance of each supplier – once you have chosen your prime supplier you then ask for a full proposal and quote, ensuring that this still matches your brief and expectations.

Design agency review criteria

	Criteria	Agency 1	Agency 2	Agency 3	Notes
1	**Understanding** Has the agency done any relevant research?				
2	**Preparation** Has the agency read and understood the design brief? Have they prepared relevant questions or highlighted specific areas? Have they done that bit extra such as understanding your competitors?				
3	**Ideas and creativity** Has the agency provided an opinion on your brand / products / services as they stand today? Do you like any of their ideas for other clients? How fresh and original are the ideas they have had for other clients? Is there enough breadth and variation in their portfolio?				
4	**Process** Has the agency explained how they would approach your project if selected? Have they demonstrated a clear process to their approach? Do you understand what the output of each stage of the design project will be? How thorough will the first stage be?				
5	**Experience** Does the agency have the relevant experience to undertake your project? Do they understand your market / industry?				
6	**Return on investment** Has the agency demonstrated the before and after their involvement with other clients? Have they demonstrated the returns they achieved for other clients they have worked with?				
7	**Resources** Does the agency have the necessary resources to implement your project? Can they support the development of your vision and strategy as required?				
8	**Drive and desire** Does the agency seem like they want to work with you? How interested are they in undertaking your project – do they really want the work? Will your project be a priority?				
9	**People and personality** Can you see yourselves working with them? Do they fit with your business approach and culture? Do you trust them?				
10	**Price** Can you afford and /or justify the investment with this company?				
11	**Instinct** What is your overall feel?				
	Totals				

8.7 Enterprise Europe Network

EISC ltd are part of the Enterprise Europe Network, the biggest business support network in the world. With 600 offices across over 50 countries, we assist Small and Medium Sized Enterprises (SMEs) with growth in and around Europe.
Our services are partly financed by the European Commission and are for most of them free to SMEs

We can help you:

- Find funding: we have a comprehensive database of UK and EU funding and will try to match your requirements with what is currently available.
- Find partners: whether it is to find distributors or agents, or whether you want to find new products and services to work with, working with our colleagues we will put you in contact with interesting companies all over Europe.
- Find contracts: if you are interested in supplying the public sector, we can help you understand the process through our workshops as well as alert you about interesting contracts that are being issued.
- Get information about legislation: if you are a bit unclear about which texts are applicable to your business when trading around Europe, we will try to help.
- Get information about various EU markets: We have people in every region in Europe and can help you understand the specificities of their local markets.

For Further Support from the Enterprise Europe Network and the Edecon Programme, please contact:-

European Information Service centre Ltd
Tel: +44 (0)23 8020 6162
Email: info@eiscltd.eu

9

Glossary

Carbon Dioxide (CO_2) is emitted from the combustion of fossil-fuels, like coal and oil to release energy. Its concentration in the earth's atmosphere is increasing through man's activities which is accelerating global warming and contributing to climate change

Eco-design is the integration of environmental considerations into product and service design and development that aims to improve performance throughout a product or service lifecycle

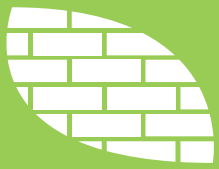
Product Lifecycle relates to the journey that a product takes from the sourcing of raw materials, through manufacture, distribution and use to its end of life. If the product is disposed of at end of life the lifecycle can be described as 'cradle to grave' or 'cradle to cradle' in more resource efficient systems when the product is reused or recycled at end of life.cradle to cradle' if it is reused or recycled at end of life

Product Service Systems (PSS) are business models that aim to provide a novel combination of products and services to fulfill specific customer demands. Value is created more through service provision and less by material products. Therefore, material efficiency and energy efficiency in the system are increased

Volatile Organic Compounds (VOCs) are a wide range of organic chemicals that evaporate from liquids or solid forms at or around normal room temperature. Formaldehyde, a VOC used in paints and other building materials can cause headaches and nausea during and following application if the indoor environment is not adequately ventilated.

"Through Eco-design, small businesses can make a big difference in the construction industry"

Alan Powell, Managing Director, HPW Architecture



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Business Support on Your Doorstep

The Centre for Sustainable Design®

An initiative of the University for the Creative Arts