GREENING BUSINESSES: UPDATE ON THE ENVIRONMENTAL GOODS AND SERVICES INDUSTRY IN THE UK

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Abstract

This paper proposes that policy makers and the Higher Education (HE) sector have a special duty to support the *Environmental Goods and Services (EGS) industry.* The EGS industry's market value was estimated at $550 billion in 2001. Legislation plays an important role in promoting industry demand. The HE sector has a unique role in the research and development of new sustainable processes, technologies and products, either through developing these autonomously or in collaboration with businesses. Costs hinder the diffusion of renewable energy technologies. Renewable energy sources need to be made viable by the government's introduction of taxation and carbon tariffs. The sector is hindered by several weaknesses, such as poor ability to seek international opportunities, poor adaptability of their business strategies, lack of managerial, marketing and ICT skills and a poor ability to attract and retain high level human resources. This paper recommends that HE institutions and policy makers support the EGS industry to help the sector to overcome these limitations.

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Keywords: Environmental Goods and Services; Environmental Goods and Services Industry; EGS industry; Cleaner Technologies; Clean Energy; Environmental Impact; Resource Efficiency; Environmental Footprint; Recycling; Cradle to Cradle

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Introduction

This paper investigates the *Environmental Goods and Services* (EGS) sector, reviews existing research and maps the performance gaps and weaknesses of this sector. Ultimately the paper suggests ways the Higher Education (HE) sector and local governments can support the growth and development of this important industry. The paper suggests that there are considerable opportunities for the HE sector to support the industry with education, consultancy and training services, and even to enter collaboration agreements with operators in the sector. Indeed it is suggested here that the HE sector and policymakers have a duty to support this industry, for example with targeted service provision of incentives, because of its importance as a growing industry and because of its role in providing goods and services that might help fight global warming. The research is also a pilot project to inform the performance of wider scale projects. The project is set in the context of the East of England, as this region has a strong EGS cluster, and it focuses on the private sector industry as developer of new "cleaner" technologies, as it "will be the main driver for these new technologies" (Stern, 2006, p.360). The private sector may therefore represent a better opportunity than the public sector as a target market for support services supplied by the HE sector.

Plenty of research has been carried out on the *EGS* industry, for example numerous OECD studies are available (1999, 2002 and 2004). Other studies include Diener and Terkla's (2000); Mansfield and Thomas's (2005), to mention but a few. This research identified the size, structure, trends and constraints to growth of this industry. However, little research, apart from Diener and Terkla's (2000) study focuses on the micro characteristics of this industry, in particular its capabilities, performance gaps, direct constraints to growth and needs for support. This information is very important both for policy makers and the HE sector, as this industry has an important role to play both in terms of contribution to wealth creation and economic growth and of its contribution to the research and design of new technologies, processes and business models to reduce the impact of business and consumption activities on the environment, for example global warming. The research builds on Diener and Terkla's (2000) study, and on a previous paper by the author (2008).

Contribution to knowledge and rationale

Under the pressure of environmental legislation and regulation, international standards, social pressures and changes in lifestyle, and stimulated by incentives, technological developments and public investment (OECD, 2002), businesses are increasingly demanding goods and services to support their implementation of sustainable business practices. This has made the *EGS* industry an increasingly important sector. The industry is strategically very important in delivering the changes necessary to address environmental issues, and this paper contributes to this agenda by mapping and helping establish the capabilities and limitations of the industry in the East of England, so that relevant organizations, such as HE organizations, GOs and NGOs can aim relevant support at the sector. This exercise is difficult as the industry is very diverse and expected to go through rapid structural change, including the introduction of totally new activities (OECD, 1999). The study proposes some direction for policy decisions on support interventions to this industry by the HE sector, as well as suggesting more avenues for research. One of the aims is to identify specific gaps in the sector provision and capabilities in order to decide what specific support this industry needs. This will add to the current knowledge of the industry and point HE establishments towards attractive opportunities in the sector, in order to support the sustainability agenda.

The EGS industry - Overview

The EGS sector is defined by the Organization for Economic Cooperation and Development (OECD, 1999) as the set of "activities which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use" (OECD, 1999, p.9). The European Commission defined the industry (1994) as "including firms producing goods and services capable of measuring, preventing, limiting or correcting environmental damage such as the pollution of water, soil, as well as waste and noise-related problems. They include technologies where pollution and raw material use is being minimised." Diener and Terkla (2000 P. 305) define the industry as the sector of activities "associated with compliance with environmental regulations, environmental assessment, analysis and protection; pollution control, waste management, and remediation of contaminated property; the provision and delivery of the environmental resources of water, recovered materials, and clean energy"; and the technologies and activities to deliver "energy and resource efficiency, higher productivity, and sustainable economic growth (enabling pollution prevention)".

Demand for environmental technologies, defined as the technologies that provide improvements in environmental quality (Ramakrishnan, 2004) has always been significant, stimulated by widespread concern about the environmental impact of economic activity. Many products of common use have long been known to produce negative environmental externalities in production, for example the motor car produces harmful exhaust emissions; white goods such as fridges utilize CFC gases which can damage the ozone layer; and the use of asbestos in various common products has had very negative effects on people's health. The Stern Report (2006), and the increasing awareness generated by the media on the issue of global warming, have generated greater interest in sustainable business practices in the business sector. Part of this interest is due to claims by academics and practitioners that being green generates competitive advantage (Porter and van der Linde, 1995; Stone and Wakefield, 2001; Maxwell and van der Vorst, 2002), although these claims have been disputed (Telle, 2006).

Spurred on by factors such as legislation, taxation and public opinion, Businesses have started to offer new "green" products to the market, sometimes with good intentions, sometimes in exploitative ways (Peattie and Crane, 2005). The establishment of international standards such as the ISO14001 environmental management standard has raised the stakes by creating a clear distinction between businesses that can demonstrate commitment to environmental management and those who cannot. To reduce their "environmental footprint", companies have looked for external help (Diener and Terkla, 2000) and this has given rise to a significant, diverse and developed industry (ibid), with an estimated World market value of $550 billion in 2001, up from $484 billion in 1998 (Kennett and Steenblik, 2005). This market was expected to reach a value of $620Bn by 2005 (ibid). This is complemented by the size of the market for carbon permits: €22.5Bn worth of allowances was traded in 2006 (The Economist, 2006). The market size for the UK was just above £25Bn in the UK in 2004, up from £16Bn in 2001, while the market size for the East of England was £7.2Bn in 2004 (Mansfield and Thomas, 2005). The waste sector alone is worth £14.6Bn for the UK. The EGS sector attracts considerable human resources, directly or indirectly employed by the industry, and generates specific professional competences (Diener and Terkla, 2000; Godfrey, 2006). Around 400,000 people are employed by the industry in the UK, of which 48,000 circa in the East of England, and it is composed of circa 17,000 companies, of which 2,139 in the East of England, on a par with the aerospace and defence sectors (Mansfield and Thomas, 2005). At least 80% of the industry appears to be made up of SMEs, with a considerable number of start-up companies (Diener and Terkla, 2000). The average turnover per company for the UK is £1.4M, while in the East of England region this is nearly £3.4M, second only to the South East of England region where this average is over £3.8M. There are important exceptions, e.g. some of the waste management companies are very large, international players such as *Veolia Environmental Services*, a £5Bn operation with 82,700 employees in the UK alone (www.veolia.co.uk/); *Onyx Environmental Group Plc*, part of *Vivendi Environment's* £16Bn operation, *SITA Holdings UK*, part of *SITA* of France and employing 7,000 people in the UK alone, and *Bramble Industries Plc*, a merger of *GKN Plc* and *Cleanaway* (Keynote, 2006 a). The technology based firms are complemented by ancillary firms, e.g. financial services, insurance, accounting and

law firms, in addition to training and educational institutions, that specialize in serving this industry. One of the features of this sector is the connection of some segments of the industry with the public services sector, for example waste management, refuse collection, recycling etc. are delivered by companies that are contracted out to environmental services by local authorities (Keynote, 2006 a,c). Around one half of the investment in the field comes from government, although the business sector has been increasing expenditure in EGS (OECD, 2002). The industry is also driven by other sectors, for example energy consumption, transport, economic activity, etc. and therefore is affected by the state of demand in these sectors.

The sector is in rapid growth: an estimate of the rate of growth in 2000 was about 8% pa (OECD, 2002), but other estimates are far higher, up to 20% pa (Mansfield and Thomas, 2005). New firms and technologies appear over time to fuel this growth (Ibid). In 2006, the sector was estimated to grow by 45% by 2010 (Selwyn and Leverett, 2006). The UK Centre for Economic and Environmental Development forecasts growth to £34Bn by 2010, and £46Bn by 2015 in the UK (ibid). World market size is expected to grow to $688Bn by 2010 and $800Bn by 2015 respectively (ibid). Some industry experts interviewed by the author commented that the credit crunch and a possible recession in the years 2008 and 2009 could perhaps call for more conservative estimates.

Segmentation and profiling of the sector

The problem in characterizing this industry is that it is very diverse, spanning numerous industrial classifications, and including services and product technologies across sectors such as engineering, construction and many other industry sectors, so it is difficult to define a clear boundary (OECD, 1999; Mansfield and Thomas, 2005) and there is no consensus on its definition (OECD, 2002; Kennett and Steenblik, 2005). It is also a sector in rapid structural change (OECD, 1999), and finely segmented (Catulli, XXXX). Detailed segmentation approaches have been offered by the OECD (1999) and Diener and Terkla (2000). This paper adopts a simplified segmentation approach based on the above and consisting of five broad segments:

- *Environmental engineering sector*, which includes environmental engineering, construction, remediation and cleaner technology and processes, contaminated land remediation and other;
- *Waste collection, disposal and processing sector*, which includes solid and hazardous waste management, recycling services, renewable materials and other;
- *Pollution equipment sector*, including monitoring instruments, information systems, and equipment for pollution prevention, control and remediation equipment, environmental monitoring and instrumentation, marine pollution control, noise & vibration control, and other;
- *Renewable energy sector*, which include renewable energy technologies, and energy management and other;
- *Services, Training and Consulting sector*, which includes environmental services, natural environment management, consultancy & advice and training and other.

Main Industry Trends

Some sectors of the EGS industry were defined as mature by the OECD in 1999; however from a low rate of growth through the 1990s (OECD, 1999; Diener and Terkla, 2000), a renewed impetus has been given to this growth by scientific consensus on the gravity of environmental problems such as global warming. This means that the sector is poised to continue its recent growth spurt. Industry growth is driven by increase of expenditure in EGS by the private business sector (OECD, 2002); not only to comply with regulation but also to gain economic benefits, e.g. to reduce use of resources and waste.

The emphasis of the industry has thus far been to "clean the mess" created by industrial processes, i.e. a remedial effort rather than a redesign of the processes to prevent the damage. This industry is expected to go through rapid structural change, including concentration and privatization (OECD, 1999). New technologies are expected to move the emphasis from remedial "end of pipe" clean up activities, which concentrate on individual industrial processes, to preventative models which are orientated to design whole industrial systems, where industrial processes are designed to achieve closed loop, "cradle to cradle" features (OECD, 1999; Diener and Terkla, 2000). One of the technologies forecasted to grow, for example, is that of air pollution control technologies, including products, systems and services to reduce and eliminate polluting gases and particulates. From an economic policy context, by "internalising" externalities via taxation, or assigning property rights etc. the incentive is provided to eliminate the externalities at the first instance.

The EGS sector has been urged by governments and environmental agencies to design products and services that integrate environmental management with other business strategies that contribute to core businesses (OECD, 1999; Diener and Terkla, 2000; Gutberlet, 2000). All these pressures are stimulating considerable research and investment in new technologies to "design waste out" of products and processes, with the participation of HE organizations. The industry is becoming increasingly globalized. Differences in environmental regulations from country to country and the small size and specialization of some of the operators have thus far limited the development of global trade (OECD, 2002). The adoption of common standards, as well as privatization and de-regulation of utilities in many countries is expanding international markets. This means that many international opportunities are now available to EGS companies, in areas such as the East European countries, East and South East Asian countries, Italy and other South Europe countries (OECD, 2002), Brazil and other Latin American countries and some African countries (Kennett and Steenblik, 2005). These markets are expected to grow due to increasing public environmental awareness and legislation.

There has been an increase in the rate of success of initiatives to "spin off" the intellectual property, in the form of technologies and patents, from universities and other research institutions into the commercial sector (Rutherford and Fulop, 2006). Life Cycle Assessment (LCA), for example, is the assessment of the environmental impact of a product in the different stages of its life cycle (Herdrickson et al, 2005). LCA features strategies to produce "cradle to cradle", closed loop processes designed to maximize the recovery and reuse of resources (Hawken et al, 1999), and sustainable approaches to product (service) design and manufacture, but maintains focus on these products' and services' performance to achieve customer satisfaction (Nuij, 2001; Maxwell and van der Vorst, 2002). Another area of development, "precipitated" by the adoption of ISO14001 is the management of supply chains for the achievement of sustainable provisioning and supply chains. Developing countries are set to become important markets for renewable energy projects (Koch, 2002). Education and training are sectors of activity that are set to grow, as both consumers and companies' employees need to be made aware of the ecological impact both of production and consumption (Gutberlet, 2000) and this may interest both the private and the public sector. The demand for environmental management systems (EMS) supported by information systems is likely to increase significantly, for example in the transport industry (Rondinelli and Berry, 2000). This opens opportunities for consulting services. Some of these services, such as energy audits, are supplied by industrial sector associations or utilities, but there is already evidence that the private sector, e.g. engineering firms, are more effective (Schleich, 2004). Finally, a disturbing trend consists of the rise of new specialized and organized eco-crime activities, including for example illegal hazardous waste trafficking (Massari and Monzini, 2004).

Driving Factors

The EGS industry is driven and influenced by various factors that shape the demand for its services and goods. The driving factors include consumer demand, fuelled by a consensus on the gravity of environmental problems, amplified by media and by various government commissioned papers, such as the Stern Report (2006). This in turn puts social pressures on businesses to comply with environmental standards, governments' environmental policies implemented by taxation and penalties

(the "polluter pays" principle), regulatory agencies, the action of pressure groups, customers' requirements, employees and public opinion. These industry drivers can prompt the rate of growth of this industry to accelerate further. The action of these driving factors is counterbalanced by the development costs of new technologies, which are more expensive than conventional technologies as economies of scale have not yet reduced the costs. Governments are expected to establish policies that stimulate the industry of generation of carbon neutral energy (Godfrey, 2006). These government policies include financial support in the form of grants to develop new technologies and the setting up of bodies that help shape the behaviour of businesses in researching and adopting these new technologies. Other forms of government intervention include targets, taxation and enforced regulation. In the UK for example the government set up specific recycling and composting targets – as opposed to other techniques to deal with waste such as landfill and incinerating (Keynote, 2006 a), and stated that renewable sources of energy will need to be developed (Keynote, 2006 b). However, the UK support for the EGS industry has been questioned, as grants provided to support domestic installation of solar panels and wind turbines, already administered in a very confusing way, have been slashed (The Guardian, 2007).

Legislation, both national and EU, is set to play an important role to promote industry demand. For example, the EU directive 94/62 EC will stimulate demand for biodegradable, recyclable packaging (Catulli, 2007); The EU Waste Water Treatment directive (Keynote, 2006 a) and the End-of- Life Vehicles directive will all stimulate demand for recycling services. In the UK and the EU, trends are driven by UK and EU legislation and regulation. A good example is the *Waste Electrical and Electronic Equipment* (WEEE) directive, which sets out the responsibility of manufacturers of said equipment for its recovery and recycling after the life cycle of the product. "Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge" (http://ec.europa.eu/environment/waste/weee/index_en.htm). This development created opportunities for new ventures to be formed, such as *Wastepack, Weee Care Plc*. *PCDisposals Ltd*. and *Valpack Ltd*. amongst others. In the automotive market BMW was notable for being the first to introduce (in fact, anticipate) the EU Directive on End of Life disposal and recycling, in the form of the End of Life Charter (bbc.co.uk, 2006). This piece of legislation will no doubt induce a new "growth spurt" in the EGS industry. This legislation also drives technology and research: "In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (…) and brominated flame retardants (…) in new electrical and electronic equipment put on the market from 1 July 2006" (http://ec.europa.eu/environment/waste/weee/index_en.htm). This opens the door to business (and Universities) to invest in the development of alternative materials.

Regulations need to be supported by a matching economic policy. Renewable energy sources will be made viable by the government's introduction of taxation and carbon tariffs, which will put the burden of the damage carbon does on the polluters (Duncan, 2007). If governments keep enforcing these economic measures big businesses will drive the industry further by creating demand for cleaner technologies. Further, economic incentives, such as subsidies, play a part in driving the market (OECD, 2002).

Constraints to the growth of the EGS sector

Generally EGSs are constrained in their expansion by various factors, including the size and recent set up of some of the operators. For example, costs are a constraint to the diffusion of renewable energy technologies; these technologies are not competitive in respect to conventional technologies, especially because of their development costs (Keynote, 2006 b). This means that the success of these technologies in gaining market share depends on their costs and prices falling, which in turn depends on achieving economies of scale- a "catch 22" situation. These limitations can represent an opportunity for suppliers to this industry, for example, for the development of technologies to reduce these costs (Keynote, 2004, 2006 b). Many other factors contribute to constrain the further development of this market, first of all a degree of uncertainty on what regulation and legislation will be introduced by governments, and the absence of universal technical standards – although these are

being adopted. This uncertainty not only makes difficult for the EGS company managers to make decisions on investments, it also discourages investors from supporting the sector, and therefore makes it difficult for some EGS companies to raise finance. This is exacerbated by the fact that many of the operators in the industry are small, specialist companies (OECD, 2002).
The importance of the public sector as a receptor of EGS, often equal to 50% or more of the market value – means that operators need to be conversant with public procurement procedures. This factor also hinders international trade, as some governments tend to "buy local" (Ibid). There is also the dependence on the sector on technical innovation, which is often difficult to manage for smaller companies as is the acquisition of the necessary technical knowledge (Ibid). The industry has not been very proactive in trying to infuence or shape this regulation and legislation (ibid).
The recycling industry has constraints of its own. Some of the "image" problems that restricted the success of recycled products in some product categories, e.g. high technology, would probably not be a problem today. However, companies involved in recycling and supplying recycled or reused products face problems such as irregularity of supply (i.e. out of stock positions when a buyer requires a recycled product and this is not available) and, especially in after consumer recycling, labour intensiveness and high costs of disassembling products, sorting materials and stocking them (Vadde et al, 2007). Finally there is the cost of the recycling process itself, often requiring advanced technologies (e.g. as in the recycling of carbon fibre). This means that recycled products in some cases need to be priced at a premium, which can be difficult to accept by prospective buyers.

Gaps in provision and general weaknesses

In addition to the above constraints, the development of the industry is also hindered by some reported structural weaknesses. One reported weakness of the sector is a poor ability to seek international opportunities, which is a problem as these are very attractive (Diener and Terkla, 2000; Keynote, 2006 b). Industry players also find it difficult to adapt their business strategy to changes in the market (Diener and Terkla, 2000). For example, it appears that the sector has not as yet implemented the required shift in emphasis from cleanup to pollution prevention which the OECD (1999) and Diener and Terkla (2000) advocate. These limitations may be a consequence of the small size of many of the operators in these segments, for example those involved in the recycling of metals, where the majority of the operators are SMEs. They may not have the skills and resources to invest in the technical developments necessary for the above mentioned change of emphasis or in international trade activities, or the ability to attract funding, both because of their small size and because of the high level of uncertainty and dependence on regulatory frameworks beyond their control (OECD, 2002). Their small size also prevents them from achieving the economies of scale necessary to address the costs issues explained above.

In many cases of start-up companies originated by the spin-off of technologies researched in HE establishments the "inventors" of these technologies, when starting to run the company concerned, lack the necessary managerial skills to succeed (Rutherford and Fulop, 2006). This in turn prevents these companies taking advantage of important opportunities, such as that represented by The East of Europe and East and South East Asian countries, Italy and other South Europe countries (OECD, 2002), Brazil and other Latin American countries and some African countries and China for both recycled metals and renewable energy sources (Keynote, 2004; Godfrey, 2006). In addition UK based companies face intense competition from international operators (Keynote, 2004). Another reported weakness is the sector's poor ability to attract and retain high level human resources to the industry (Diener and Terkla, 2000). In the UK the waste management industry finds it difficult to attract and retain capable people, especially young people (Keynote 2006 a). The need for products and services that integrate environmental management with overall business strategies suggested by Diener and Terkla (2000) may put under resourced operators under pressure to quickly acquire additional competence and skills.

How are these weaknesses addressed at present?

Some effort has been made by the incumbent operators to identify new growth niches and geographical markets (Diener and Terkla, 2000). However, these new technologies need support from

the government. In Australia for example, the Government and the renewable energy industry have set up an objective of achieving "a sustainable and internationally competitive renewable energy industry which has annual sales of $4Bn" (Godfrey, 2006, P. 98). The sector is also supported in the rest of the World, and in the UK public sector organizations and NGOs support this industry, for example grants are available to the development of new technologies and products from various regional, national as well as EU sources. Organizations such as NISP (see above) facilitate collaborations between business sector operators, and between these and the University sector. HE establishments have for a while been investing time and resources in collaborating with this industry, especially on the technical side (Maxwell and Van der Vorst, 2003; Ramakrishnan, 2004; Rutherford and Fulop, 2006). Government policies worked on two fronts to support the EGS supply side: stimulating the demand side through environmental regulations and standards, economic incentives and taxation; and directly promoting the supply side by promoting the industry with support of environmental R &D, financial support , export incentives, etc. (OECD, 2002). In general, some of the weaknesses of the industry have been addressed by the specific supply of business services by the government and HE sector. From an initially conflictual relationship (Catulli, XXXX), business now sees the not-for profit sector and Non Governmental Organizations (NGOs), such as for example *Friends of the Earth* and *Greenpeace,* as a source of help (Deri, 2003; Esty and Winston, 2006; Catulli, XXXX). The types of collaboration include advice and consultancy to businesses, and sponsorship to promote the sponsors' "environmentally friendly" image. Governments assist the sector with various forms of support. For example in some case they assist businesses researching new technologies and processes (Schmidt, 2001). There are numerous government organizations that support research and implementation of best practice by business, e.g. the *Department for Environment, Food and Rural Affairs* (DEFRA, http://www.defra.gov.uk/), and the *Environment Agency,* (http://www.environment-agency.gov.uk/) are responsible for the implementation of most of the legislation and regulations in matters of environment; government backed organizations such as the *National Industrial Symbiosis Program* (NISP, http://www.nisp.org.uk/) facilitate the interaction and collaboration between businesses and businesses and universities, as well as promoting research on environmental practices. Many non government organizations assist businesses with training, advice and other support, such as for example The *Chartered Institute of Waste Management* (CIWM); *The Environmental Services Association* (ESA); and *The Institute of Environmental Management and Assessment* (IEMA). The HE sector has a unique role in the research and development of new sustainable processes, technologies and products. These new technologies are either developed autonomously by HE institutions, and then "spun off" by setting up new businesses to exploit the intellectual property (Ramakrishnan, 2004; Rutherford and Fulop, 2006), or developed in collaboration with businesses (Maxwell and Van der Vorst, 2003; Ramakrishnan, 2004; Godfrey, 2006).

Notes on Methodology

The study included a range of objectives to be achieved by means of a survey, these included:

1. Industry sectors of expertise of companies in the EGS sector, in other words, industries they served. This question is particularly relevant when considering the driving factors and trends of this industry, in particular legislation and regulation which are sector specific, for example the above mentioned WEEE directive aimed at the electric and electronic equipment manufacturers sector and the end of life directive aimed at the car industry;
2. Perceived industry drivers;
3. Weaknesses of the industry as perceived by its management;
4. Industry managers' opinion on future prospects for the sector;
5. To what extent government support and incentives, e.g. grants, influence the market.

A survey was conducted on EGS companies based in the East of England. The sample interviewed was made up of 32 companies, and these were administered a semi-structured questionnaire. This

questionnaire focused on the characteristics of the companies in the sample and their perceived strengths and weaknesses

On Line search

This consisted of web research, in particular the database of EGS East of England companies was sourced from an on – line directory (Ecodirectory); some information on companies, GOs and NGOs has been sourced from these organizations' web sites.

Primary Research

This consisted of administering a telephone semi-structured interview to a sample of EGS managers. Telephone questionnaires have been administered to a sample of 32 respondents from a frame of 103 companies in the database. The questionnaire included a mix of quantitative and qualitative questions. The sampling frame was obtained by sourcing a list of companies based in the East of England from *Ecodirectory* (http://www.ecodirectory.org.uk/), a resource funded by *Envirolink UK*, the *East of England Development Agency* and *ExDRA*. In order to be registered on this database, which is accessible on line, a company must elect to register with it – registration is free, and the total database includes over 2,000 companies.

Rationale and limitations

The choice of telephone interviewing was made to allow a survey of a larger sample than originally envisaged and at the same time reduce costs. The author believes that because the respondents are business managers and not consumers, the responses are representative. However, there are considerable limitations in the study, in particular:

- The respondents were all recruited from an Association (Ecodirectory) directory – this exclude companies that are not members of that association;
- The respondents are all based in the East of England, this may not be representative of the wider market;
- The sample size, 32 is too small to draw final conclusions.

Findings and discussion

The companies surveyed were predominantly SMEs, which reflects the observed characteristics of the industry. The average turnover of the companies is £22M circa, and the average number of employees is 97. A summary of company's characteristics is shown in table 4 and 5.

Table 1 - Company Size: Turnover

Turnover ££	f	%
<£100K	3	9
£100K - £250K	2	6
£250K - £500K	1	3
£500K - £1M	6	19
£1M - £5M	4	13
£5M - £10M	3	9
£10M - £25M	2	6
£50M - £100M	1	3
>100M	1	3
Not Known	9	28
Total	32	100

Base: 32 Managers of EGS Companies in East of England

Table 2 - Company Size: Number of employees

Size (employees)	f	%
1 -10	13	41
11 - 50	10	31
51 - 100	3	9
101 - 500	3	9
501 - 1000	2	6
>1000	1	3
Total	**32**	100

Base: 32 Managers of EGS Companies in East of England

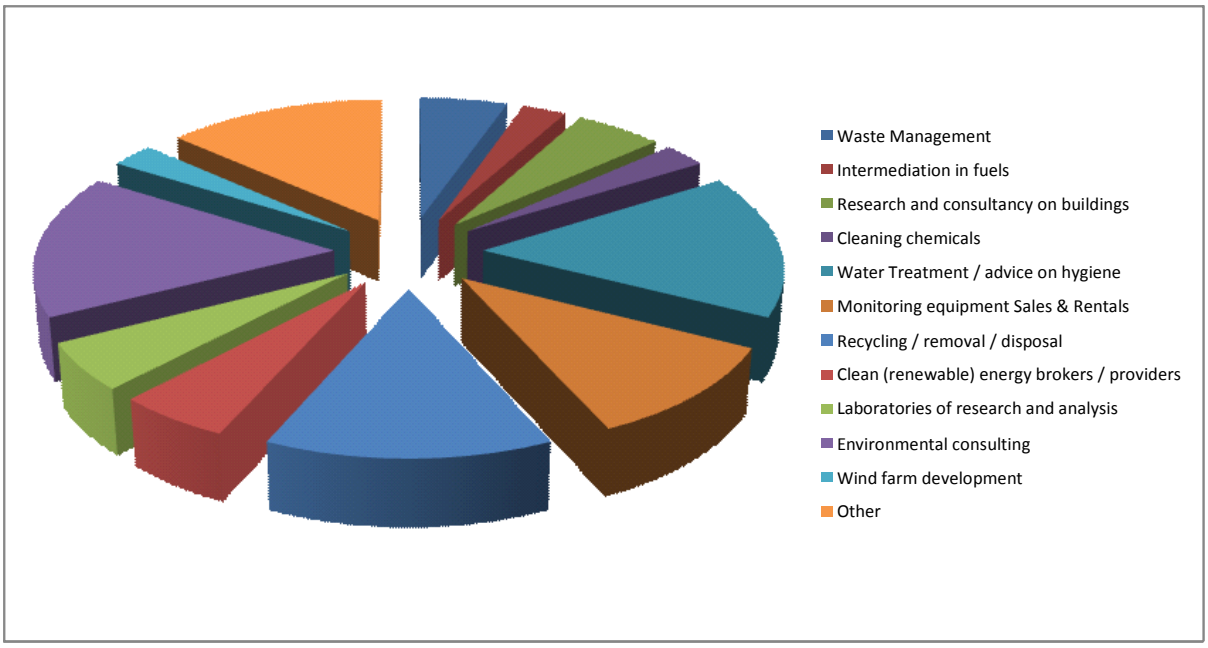
The analysis of the sample reveals a very diverse sector. Table 3 summarizes the typologies of companies in our sample. The total adds up to more than 100% due to some companies being in more than one sector.

Table 3 – Typology of EGS sector companies

Typology	f	%
Waste Management	2	6
Intermediation in fuels	1	3
Research and consultancy on buildings	2	6
Cleaning chemicals	1	3
Water Treatment / advice on hygiene	6	19
Monitoring equipment Sales & Rentals	4	13
Recycling / removal / disposal	5	16
Clean (renewable) energy brokers / providers	2	6
Laboratories of research and analysis	2	6
Environmental consulting	6	19
Wind farm development	1	3
Other	5	16
Total	37	106.25

Base: 32 Managers of EGS Companies East of England - % adds more than 100 because of companies being in more than one sector

Fig. 1 - Typology of EGS sector companies



Base: 32 Managers of EGS Companies in East of England

The mix of companies broadly resembles the segmentation that has been described above.

Industry Sectors of Expertise

The results seem to suggest that the companies in the sector supply a variety of business sectors, so it would appear most sectors of industry are supported. A summary of sectors of specialization is shown in table 4.

Table 4 - Target Sectors of Expertise

Target sectors of expertise	Number of companies targeting sector
All industry	7
Manufacturing	3
Automotive	1
Aerospace	1
Commercial sector	3
Local authorities	8
Construction, property and other relative to built environment	6
Transport	1
Public and Private Utilities	4
Government e.g. Defra	3
Hotel, leisure and hospitality industry	4
Health care	1
Oil and gas industry	1
Pharmaceutical and bio-tech	2
Semiconductors, electric and electronic equipment	2
Banking and finance	2
Information technology, telecommunications and media broadcasting	1

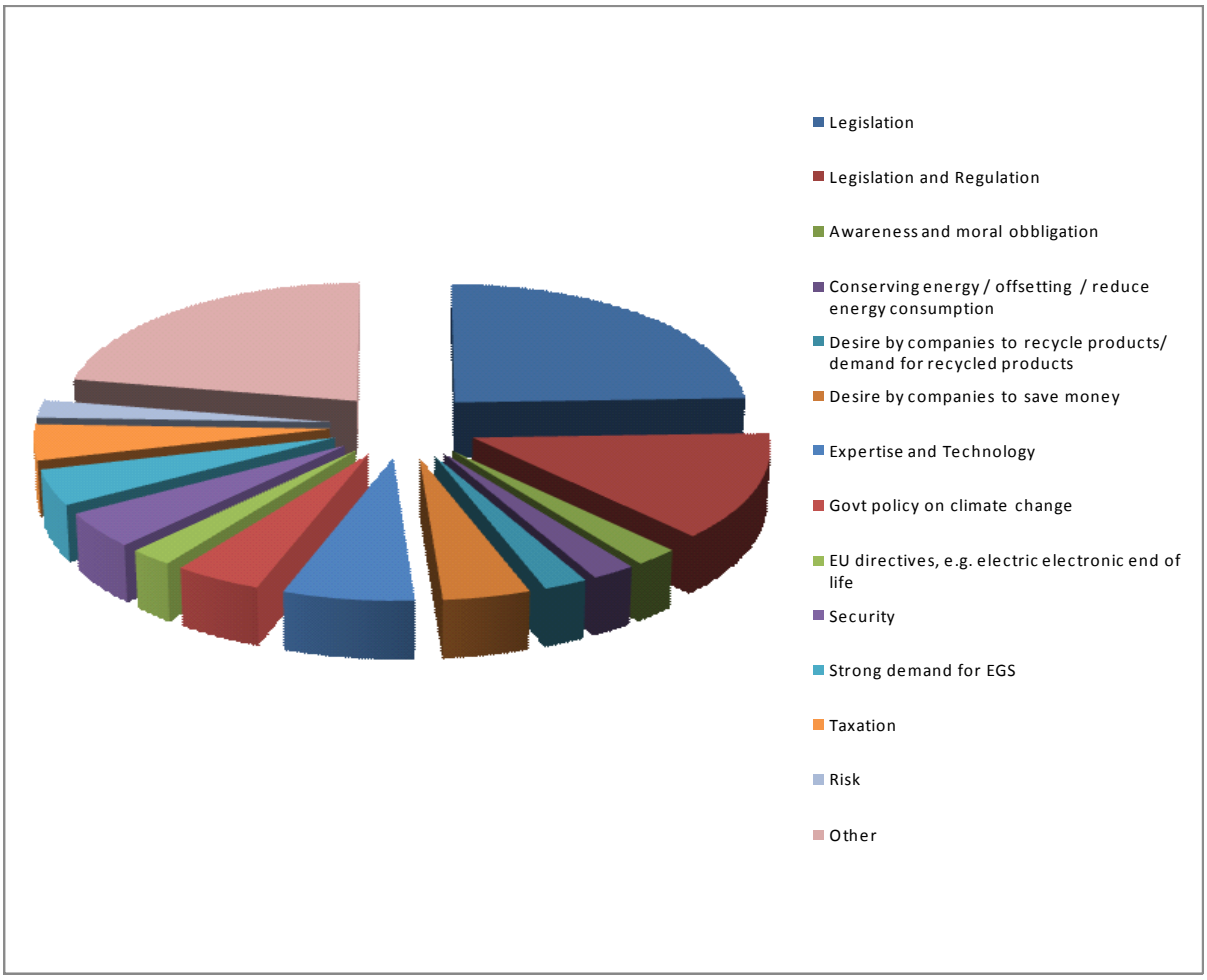
Academic	1
Grocery, food manufacturing	2

Base: 32 Managers of EGS Companies in East of England - % adds more than 100 because of companies being in more than one sector

Perceived Industry Drivers

Our sample's responses suggest that 44% of company managers believe that legislation is the main driver of the EGS sector. The second most cited driver is legislation and regulation combined (where regulation includes voluntary industry regulation as well as compliance with international standards). According to Mike Beard, Corporate Affairs Advisor for Wastepack Ltd., a company supplying packaging management and recycling services, growth in many sectors of the EGS sector occurs in spurts, driven by new pieces of UK/EU regulation as they are introduced. According to Mr. Beard these drivers are extremely powerful because they set liability for both manufacturers and retailers of products in respect both of their products *and* packaging, so that a demand has been created for suppliers which are able to take this responsibility, and associated risk and liability, from their clients. Our primary research seems therefore to confirm the importance of legislation as a market driver. The results are summarized in Fig. 4,below. The findings seem to confirm what identified by existing research as far as the main drivers are concerned. Security and risk are new suggested drivers, as well as awareness and moral obligation felt by managers, which is connected with the needs of preserving the reputation capital of a business.
The "other" category includes such factors as quality, price, trust, experience, reliability, reputation and customer needs – these are common drivers in all industries.

Figure 2 – EGS sectors drivers



Base: 32 Managers of EGS Companies in Hertfordshire

Performance Gaps

The findings from the survey confirm the perceived industry weaknesses identified by previous studies, in particular by Diener and Terkla (2000). In addition to these, our study identified some more perceived performance gaps. The most significant new performance gap identified is in *marketing* and associated activities, such as *market research* and *sales strategy*. This need has been expressed by 15 of the respondents, which is nearly 50% of the sample. The second relevant gap is information technology (IT). These general performance gaps are summarized in Table 5 and Figure 3 below. A limitation to be acknowledged in these findings is that SMEs may not have access to the marketing funds and facilities of larger business organisations not in the survey, however it has been noted above that the sector is largely composed by SMEs.

Table 5 – Perceived weaknesses

Performance gap – want improvement in / support with…	**Frequencies**	**%**
International business performance	13	41

Strategic capability	9	28
Management Competence	8	25
Ability to attract high value HRM	13	41

Base: 32 Managers of EGS Companies in East of England- % adds up to more than 100 due to some companies quoting more than one performance gap

Table 5 summarises the response to a set of questions designed to validate the suggestions from existing research, in particular that by Diener and Terkla (2000), who suggested the performance gaps above.

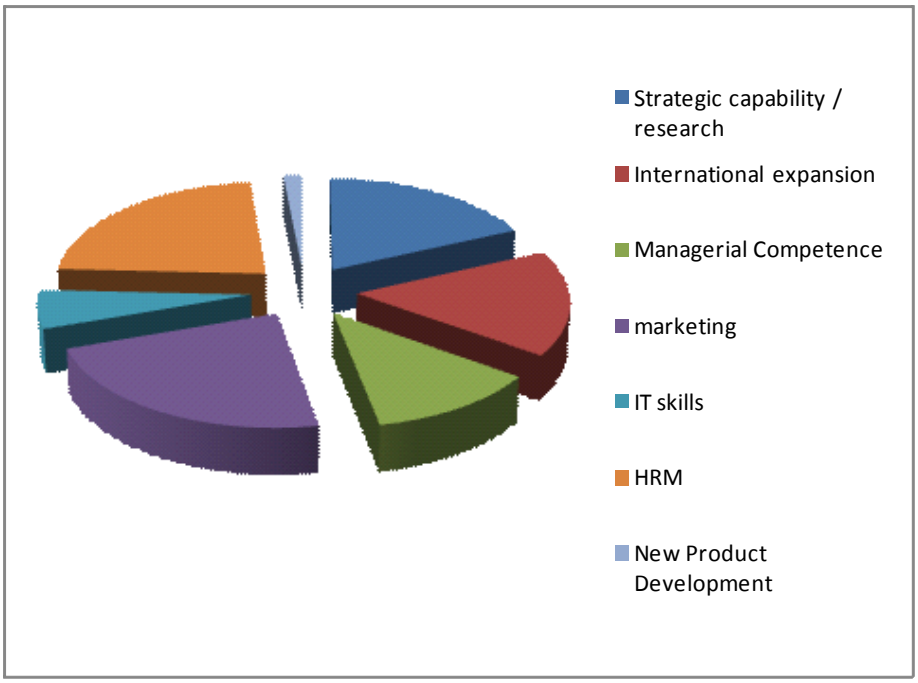
Table 6 – General areas for improvement

General areas for improvement	f	%
Strategic capability / research	12	38
International expansion	11	34
Managerial Competence	8	25
marketing	15	47
IT skills	4	13
HRM	15	47
New Product Development	1	3
Total	53	206

Base: 32 Managers of EGS Companies in East of England - % adds up to more than 100 due to some companies citing more than1 perceived weaknesses

Table 6 summarises the responses to a question designed to probe what other weaknesses the managers perceived their company to suffer from in addition to these performance areas identified by Diener and Terkla (2000). It is suggested that marketing and IT skills are significant areas of performance previous research appears to have overlooked – or perhaps the discrepancy is due to the different research context; for example Diener and Terkla's study was conducted in the USA. Several companies expressed rather specific needs. *STATS* Limited for example, a consultancy company part of the RDS group said "We need to improve at spotting opportunities", explaining their need is for improving marketing research and analysis. *Aqualog Ltd*. explained that they "would like to work faster in terms of market penetration, e.g. we would like to find agents for Germany, France and Holland", and *Detek Systems Ltd.* would like "new breaks in international markets". *Applied Ionics Ltd.* declared they need "faster turnaround; responsiveness to orders and inquiries", suggesting some areas of improvement in their sales operations. On the issue of attracting high value human resources, *Cambridge Recycling Services Ltd.* said "We are not very successful in this task; we want to find better ways to target possible candidates more cost-effectively". *Tri Tec Environmental Services Ltd.* also suggests they have difficulties with HRM, as they find it "Difficult. We find it very expensive, and we would like to reduce costs of recruiting", while *STATS Ltd.* complained about the supply of good graduates by Universities: "It is a difficult fix, we feel we have been let down by the education sector".

Fig. 3 - General areas for improvement



Base: 32 Managers of EGS Companies in Hertfordshire

The size of the segments in fig. 3 is proportional to the number of companies which have a stated need of improvement in that management function.

Future Prospects for the sector

There it is a consensus amongst the respondents that the industry is growing at a fast rate and has been doing so in the last 5 years. Estimates for this growth vary among respondents possibly depending on the sector they are in: the estimated rates of growth vary between 5% and 20%. Future outlook is upbeat, most respondents believe the market will continue its growth, with two respondents explaining this growth is due to buyers becoming more responsive to their marketing communication activities and growing concerns on sustainability; two other respondents believe that the growth rate is subject to the introduction of legislation and the impact of the introduction of international standards, e.g. ISO14001. Two respondents in the energy sector are sceptical of the international development of their business due to the heavy regulation of their market.

Influence of government policy

Our last objective concerned the influence of government intervention. 12 respondents (37%) claim GOs and NGOs support or act as brokers in the connection with potential buyers. These include *Business Link, Chambers of Commerce, NISP, EEDA* and Trade Associations. As far as incentives and subsidies are concerned, only 4 companies out of 32 (circa 12%) cited these as important. One respondent cited research grants while 3 others claimed that their clients look for subsidies when they buy their products. These 3 companies are respectively an environmental management company, an energy adviser and broker and a water treatment and testing company. The fourth company, which benefits from research funding, is a research and consultancy company.

Conclusions and recommendations for sector support

The EGS Industry is a major growth industry and it is strategically important so that it has attracted the attention and support of governments, the OECD, HE establishments and other bodies. The sector is diverse and well developed in terms of size of the economic activity, and its diversity makes it very arduous to research. For this reason, it is recommended that HE organizations research the sector

further to better define its features and needs. Our findings confirm the general weaknesses identified by Diener and Terkla (2000). In addition, we identified several additional perceived gaps:

- Marketing and market research
- Information Communication Technology;
- General managerial competence;
- New Product development.

These gaps may constrain the sector in its growth, and, more importantly, in its timely development of suitable technologies that can support energy and resource efficiency. The research also seems to suggest that this sector represents a major opportunity for the Higher Education sector especially in consideration of the growth of education and training services within the EGS sector, which could unlock opportunities for the HE sector to deliver both training and education to the wider business community and students, and collaborate with EGS companies to deliver training and consultancy projects and education.

It is recommended that:

- Local Government Agencies, Authorities and Non Government Organizations (NGO) devise support packages for the industry including, for example, financial incentives, advice, training and other support to address the weaknesses identified in the sector;
- Business Schools seek opportunities for collaboration with companies in the EGS sector to support them with:
    - Tailored business courses, in particular programmes such as MBAs and Master degrees in Management, Marketing and HRM. The sector can be approached to enrol employees on these courses and fill the gaps in performance identified by the research, which include strategic capabilities, international trade skills, general managerial competence, marketing, ICT and HRM skills;
    - Approach companies in the sector to offer commercial collaborations including for example *Knowledge Transfer Partnerships (KTPs)*, to support these organizations to redesign their strategies, research and exploiting international opportunities, improve their marketing and HRM processes and activities and build their ICT skills.
    - Collaborate with companies in the sector to develop integrate offering of environmental services and business strategies by supplying these companies with management and strategic skills, as well as supporting them in attracting human resources;
- Engineering and technological schools seek opportunities for collaboration with companies in the EGS sector to complement their technical skills in order to jointly develop green technologies;
- Specialist environmental departments target the private sector for specialist training on best environmental practice.

Recommendations for future research

This study was a small scale project which is certainly effective as a pilot to suggest further directions for research, however, it is recommended that the study is repeated with a bigger sample, on a wider regional context.

More qualitative information on this sector is needed, so it is recommended that further research is conducted with a small sample utilising qualitative methodologies such as in depth interviews, in order to gain a deeper understanding of this important sector, in particular a better feel for what the future prospects of the market are and to what extent the companies in the EGS industry can benefit from government support and incentives.

References

bbc.co.uk (2006), Newsfeed

Catulli (XXXX), “"A review of the environmental goods and services sector in the United Kingdom", Int J. Environment and Sustainable Development, Vol. X, No Y, pp. XXX-XXX

www.defra.gov.uk/ (Accessed 1 March 2007)

Deri, C. (2003), “Make alliances, not war, with external crusading stakeholders”, *Strategy & Leadership*, V.31, No. 5, pp.26-33

Diener, B.J. and Terkla, D. (2000), “The Environmental Industry in Massachusetts: From Rapid Growth to Maturity”, *Corporate Environmental Strategy*, V 7 No 3 pp. 304-313

Duncan, E (2007),”Cleaning Up”, *The Economist*, June 2007

ec.europa.eu/environment/waste/weee/index_en.htm (Accessed 1/04/08)

ecodirectory.org/default.aspx (Accessed 1/06/07)

The Economist, (2006), “Everybody is green now”, *The Economist*, June 2007

environment-agency.gov.uk/ (Accessed 1 March)

Esty, D.C. and Winston, A.S. (2006), *Green to Gold – How smart companies use environmental strategy to innovate, create value, and build competitive advantage*, Yale University Press

Godfrey, R.B. (2006), “Renewable energy technologies in Australia: research, status and prospects”, *Energy & Environment*, V17, N.1

Hendrickson, C.T., Lave, L.B, and Matthews, H.S. (2005), *Environmental Life Cycle Assessment of Goods and Services: An Input-Output Approach*, Resources for The Future Press

The Guardian, “Green means slow to this government”, *The Guardian*, August 6 2007

Gutberlet (2000), “Sustainability: a new paradigm for industrial production”, *International Journal of Sustainability in Higher Education*, V1 N3, pp. 225-236

Hawken, P.;Lovins, A.B. and Lovins, L.H. (1999), *Natural Capitalism*, Earthscan Publications, London

Kennett, M. and Steenblik, R. (2005), Environmental Goods and Service A Synthesis of Country studies, OECD Trade and Environment Working Paper No 2005-03

Key Note, (2004) *Metal Recycling*, Key Note Paper

Key Note, (2006 a) *Waste Management*, Key Note Paper

Key Note, (2006 b) *Renewable Energy*, Key Note Paper

Key Note, (2006 c), *Local Government Services*, Key Note Paper

Koch, F.H. (2002), "Hydropower-the politics of water and energy: introduction and overview", *Energy Policy*, N.30 pp. 1207-1213

Mansfield, T. and Thomas, D. (2005), Mapping the UK Environmental Goods and Services Sector, Domestic Sponsorship Team, Environmental Industries Unit, DTI / Defra

Massari, M. and Monzini, P. (2004), "Dirty Business in Italy: A Case-study of Illegal Trafficking in Hazardous Waste", *Global Crime*, V6, No ¾, pp. 285-304

Maxwell, D. and van der Vorst, R. (2002), "Developing sustainable products and services", *Journal of Cleaner Production*, 11 pp. 883-895

http://www.nisp.org.uk/ (Accessed 1 March 2007)

Nuij, R. (2001, "Eco-innovation: Helped or hindered by Integrated Product Policy", *The Journal of Sustainable Product Design*, N.1, pp. 49-51

OECD, (1999), *The Environmental Goods and Services Industry*, OECD, Eurostat 1999

OECD, (2002), *The Global Environmental Goods and Services Industry*, published on line, http://www.oecd.org/dataoecd/11/10/2090577.pdf, Accessed 10 April 2008

Peattie, K. and Crane, A. (2005), Green marketing: legend, myth, farce or prophesy?", *Qualitative Market Research: An International Journal*, Vol 8, No 4

Porter, M. and van der Linde, C. (1995),"Towards a New Conception of Environment – Competitiveness relationship", *Journal of Economic Perspectives*, 4, pp 97-119

Ramakrishnan, S. (2004), "An industrial ecology framework to assist transferring environmental technologies" *International Journal of Technology Transfer and Commercialization*, V.3 No 2, pp. 147-165

http://www.recycling-institute.info/ (Accessed 1 March 2007)

Rondinelli, D. and Berry, M. (2000), "Multimodal Transportation, Logistics, and the Environment: Managing Interactions in a Global Economy", *European Management Journal*, V18 No 4, pp 398-410

Rutherford, L. M. and Fulop, L. (2006), "Commercialization of university-based biotechnology research and internal performance issues for spin-offs", *International Journal of Technology Transfer and commercialisation*, V. 5, n.1/2, pp. 123-139

Schleich, J. (2004), "Do energy audits help reduce barriers to energy efficiency? An empirical analysis for Germany", *International Journal of Energy Technology and Policy*, V2 No 3, pp. 226- 239

Schmidt, W.P. (2001), "Strategies for Environmentally Sustainable Products and Services", *Corporate Environmental Strategy*, V.8, N.2, pp. 118-125

Selwyn, J and Leverett, B (2006), *Emerging Markets In the Environmental Industries Sector*, UK CEED White Paper

Stern, N. (2006), The *Stern Review: The Economics of Climate Change, www.hm-treasury.gov.uk/* (Accessed 16 Dec 2006)

Stone, G.W. and Wakefield, K.L. (2001),"Eco-Orientation: An Extension of Market Orientation in an Environmental Context", *Journal of Marketing Theory and Practice*, V.8, I 3, 21-32

Telle, Kjetil (2006), "'It pays to be Green' - A Premature Conclusion?", *Environmental and Resource Economics*, 35 pp. 195-220

Vadde, S., Kamarthi, S. and Gupta, S.M. (2007), "Optimal pricing of reusable and recyclable components under alternative product acquisition mechanisms", *International Journal of Production Research*,Vol. 45, Nos. 18–19, 15 September–1 October 2007, 4621–4652