A Review of the Sustainable Business Practices Services Industry

Maurizio Catulli

UHBS 2006:10

University of Hertfordshire
Business School
Hatfield
Herts
AL10 9AB
Email: m.catulli@herts.ac.uk
Telephone: + 44 (0) 707 281235

A Review of the Sustainable Business Practices Services Industry

Maurizio Catulli, University of Hertfordshire

ABSTRACT

This paper is concerned with the *Sustainable Business Practices (SBP) services industry*, also known as the *environmental goods and services industry*. To reduce their "environmental footprint", companies have looked for external help, and this has given rise to an industry with an estimated World market value of $484 billion in 1998. The problem in characterizing this industry is that it is very diverse, spanning numerous industrial classifications. Legislation, both national and EU, is set to play an important role to promote industry demand. Regulations need to be supported by a matching economic policy. This paper proposes a simplified segmentation model of the industry consisting of five broad segments: *Environmental engineering sector*; Waste *collection, disposal and processing sector*; Pollution *equipment sector*; Renewable *energy sector*; and *Services, Training and Consulting sector*.

The university sector has a unique role in the research and development of new sustainable processes, technologies and products, either through developing new technologies autonomously and then "spinning them off" by setting up new businesses or developing them in collaboration with businesses.

Costs are a constraint to the diffusion of renewable energy technologies; these are not competitive in respect to conventional technologies. Renewable energy sources need to 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. The sector is further hindered by weaknesses such as a poor ability to seek international opportunities, poor adaptability of their business strategies to changes in the market, lack of managerial skills and poor ability to attract and retain high level human resources.

This paper recommends that the Engineering and technological schools seek opportunities for collaboration with the private sector to jointly develop green technologies; Specialist environmental departments target the private sector for specialist training on best environmental practice; and the Business School seeks opportunities for collaborations with companies to support them in researching and exploiting international opportunities, as well as helping them to develop integrate offering of environmental services and business strategies by supplying these companies with management and strategic skills, and supporting them in attracting human resources.

Comments are invited and welcomed, and should be addressed to:

Maurizio Catulli, m.catulli@herts.ac.uk

Keywords: Sustainable Business Practices; Environmental Goods and Services Industry; Cleaner Technologies; Clean Energy; Environmental Impact; Resource Efficiency; Environmental Footprint; Recycling; Cradle to Cradle.

Introduction

This paper is concerned with the *Sustainable Business Practices (SBP) services industry*, also known as the *environmental goods and services industry*, 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). 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 the economic activity. Common products have for a while been known to produce harmful effects, for example the motor car produces harmful emissions from the exhaust; white goods such as fridges utilize CFC gases, which can damage the ozone layer; and the use of asbestos in various common use products has had very dangerous effects on people's health. More recently, the Stern Report (2006) and the increasing awareness generated by the media on the issue of global warming has 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 Linde, 1995; Stone and Wakefield, 2001; Maxwell and van der Vorst, 2002), although these claims have been disputed (Telle, 2006).

The SBP services industry is currently under researched. The purpose of this paper is to investigate the features of this growing industry, including its segmentation, capabilities and capacity of this industry in the context of the East of England. The main focus of this paper is 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 education sector.

Contribution to knowledge and rationale

As the sustainability agenda turns from relevant into urgent, businesses are increasingly demanding goods and services to support their implementation of

sustainable business practices. This has made the SBP services industry an increasingly important sector. The industry is strategically very important in delivering the changes necessary to address the issues identified, and this paper contributes to this agenda by mapping the industry and helping establish its capabilities and limitations. This will assist a redefinition of the industry by focusing on specific business oriented supply and therefore excluding consumer oriented provision, such as, for example, domestic waste collection. 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 will be therefore invaluable in assisting the reclassification of the industry and in aiding policy decisions on devising support interventions to this industry by the education sector. One of the aims is to identify specific gaps in the sector provision and capabilities in order to decide what support to target at this industry. This will add to current knowledge of the industry and point the University of Hertfordshire (UH) towards attractive opportunities in the sector as part of their *business facing agenda*. Additionally, the findings will also be useful as a competitive intelligence for the various initiatives UH is generating to support the sustainability agenda.

The SBP services industry

Encouraged 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, 2006). 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 $484 billion in 1998. This is complemented by the size of the market for carbon permits: €22.5Bn worth of allowances was traded in 2006 (The Economist, 2006). Specific market statistics for the UK are not available. A figure of £6.41 Bn pa in 2004 is arrived at aggregating the waste management market – including recycling – and the specific recycling of metals (Keynote, 2006). The available statistics for renewable energy are in tonnes of oil equivalent (toe) rather than in currency. This makes it difficult to estimate the real size of the industry.

The move towards renewable energy for example, although still very small, has created a market opportunity for small to medium scale technologies delivering renewable energies (Godfrey, 2006). The problem in characterizing this industry is that it is very diverse, spanning numerous industrial classifications, and including services and product technologies. It is also a sector in rapid structural change (OECD, 1999).

This paper concentrates on cleaner technologies and other services aimed at the business sector, and updates the industry's definition to include new environmental services, such as the provision of technologies to renew and recycle products and resources, and advice, education and training services. The definition excludes the provision of goods and services supplied to the consumer sector.

The SBP services sector attracts considerable human resources, directly or indirectly employed by the industry, and generates specific professional competences (Diener and Terkla, 2000; Godfrey, 2006). 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). There are important exceptions, e.g. some of the waste management companies are very large, international players such as *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). Size is important in waste management in particular because of the need to achieve economies of scale. 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). The industry is also driven by other sectors, for example energy consumption, transport, economic activity, etc. and therefore affected by the state of demand in these sectors.

Main Industry Trends

The waste management and recycling industry is a mature industry, as major materials have been recycled for a while. 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. The waste management sector is only a segment of the SBP services industry. 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). Furthermore, the 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 universities and other research organizations. A very important trend is the coming to fruition 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) features strategies to produce "cradle to cradle", closed loop processes, 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 trend, "precipitated" by the adoption of ISO14001 is the management of supply chains for the achievement of the same. In terms of energy, hydropower seems an important growth area, with prospect revenues of $160Bn pa (Koch, 2002), and opportunities for small scale projects. Developing countries seem set to become an important market for any renewable energy project (Ibid). 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

After the initial fast growth period of the environmental goods and services industry, the industry's growth rate seemed to have slowed down and become a quite stable industry, with signs of consolidation (OECD, 1999; Diener and Terkla, 2000). Recently a renewed urgency has been given to this agenda by scientific consensus on the gravity of environmental problems such as global warming. This consensus has been amplified by media and by various government commissioned reports, such as the Stern Report (2006). This in turn puts social pressures on businesses to comply with environmental standards. The SBP services industry is driven and influenced by various factors that shape the demand for its services and goods. The driving factors include 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 again. 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), and stated that renewable sources of energy will need to be developed (Keynote, 2006). 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) and the End-of- Life Vehicles directive will all stimulate demand for recycling services. 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. The ability of increasing resource efficiency and recycled content will be supported by organizations such as NISP and IRR cited above.

Industry Segmentation

The OECD (1999) offers a comprehensive approach to the segmentation of the SBP services industry, summarized in Fig.2. The sector is divided into three main groups: the "pollution management" group; the "cleaner technologies and product groups" and the "resource management" group. These three groups are divided in three sectors of activities; these are "production of equipment and specific materials", "provision of services" and "construction and installation of facilities". A third level lists all the specific environmental activities, for example air pollution control, wastewater management, solid waste management, etc. (OECD, 1999). Diener and Terkla (2000) segment the environmental services industry into three main sectors, *the environmental engineering and consulting sector*, including environmental engineering, construction, remediation and consulting; the *waste collection and disposal sector*, which includes solid and hazardous waste and recycling services, and the *pollution equipment sector*, including monitoring instruments, information systems, and equipment for pollution prevention, control and remediation equipment. In reality the author feels that to these, other sectors of activity need to be added, for example the renewable energy sector, which competes against fossil fuel generated energy, and is segmented in sectors in competition between each other, such as wind power, solar cells, which have

gone through three generations of technologies, solar tubes, another type of technology utilizing solar power. Geothermal technology is still in its infancy, as is wave technology (utilising the energy generated by waves along coastlines). Other technologies do not generate energy, but help preserve it, vacuum tubes are an example. Energy storage technologies are also very important to compensate the transient nature of some of the above technologies. To this sector we need to add other "specialist" sectors such as the training services sector and specialist advice, for example the marketing consulting sector aims at advising on how companies should position themselves in respect of the sustainability issue. In this paper, we propose a segmentation strategy that refers both to Diener and Terkla's (2000) segmentation and the categories proposed by Ecodirectory (http://www.ecodirectory.org/default.aspx), a government backed organization funded by Envirolink UK, the East of England Development Agency (EEDA) and ExDRA. The categories used by this organization are summarized in Fig. 1.

Table 1. SBP services categories - Ecodirectory

Type of Service
Air pollution control
Cleaner technology & processes
Contaminated land remediation
Energy management
Environmental monitoring / instrumentation
Environmental services
Marine pollution control
Natural environment management
Natural environment science
Noise & Vibration control
Renewable energy
Renewable materials
Waste management
Water and wastewater treatment
Consultancy & advice
Training
Other

Source: Ecodirectory

Table 2. SBP services categories – OECD

Main groups	Activities
Pollution management group	Air pollution control
	Waste water management
Production of equipment and specific materials for,	Solid waste management
	Remediation and clean up of soil,
	Noise and vibration abatement
Provision of services for,	Environmental monitoring analysis and
	Environmental R&D
Construction and installation for	Environmental contracting and

	Analytical services. Data collection,
	Education, training and information
	Other
Cleaner technologies and products Production of equipment, technology, specific materials or services for	Cleaner/resource efficient technologies and processes
	Cleaner / resource efficient products
Resource Management group Production of equipment, technology, specific materials or services for	Indoor air pollution control
	Water supply
	Recycled materials
	Renewable energy plant
	Heat/energy saving and
	Sustainable agriculture and fisheries
	Sustainable forestry
	Natural risk management
	Eco-tourism
	Other

Source: OECD, 1999

For pragmatic reasons, and taking into consideration all three above exemplified models, the Author proposes a simplified segmentation model 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.

The author considers the above segmentation strategy as provisional, and one of the items on his research agenda is a further refinement of this segmentation approach.

The Public and not for profit sector

The environmental agenda was promoted initially by the not-for profit sector and Non Governmental Organizations (NGOs), such as for example *Friends of the Earth* and *Greenpeace*. Initially the relationship between these organizations and business, especially big business, was one of conflict. Recently though, as businesses gained awareness of the problem and its implications, the relationship has become one of collaboration (Deri, 2003; Esty and Winston, 2006). Companies started to develop strategies of seeking the support of these NGOs (ibid). The types of collaboration include advice and consultancy to businesses, and sponsorship to promote the sponsors' "environmentally friendly" image. Governments in various countries have sought to influence business behaviour in various ways, and these include various forms of support. This has given rise to a host of government backed or autonomous not for profit organizations which perform various roles. Businesses associate together to lobby governments, but also to join forces for researching new technologies and processes, which is essential to achieve results (Schmidt, 2001). Organizations that are linked to business and the professions include, for example, The *Chartered Institute of Waste Management* (CIWM), which promotes knowledge of, and training and education on, waste management; *The Environmental Services Association* (ESA), which includes the sector's operators and also supply training in order to raise standards; and *The Institute of Environmental Management and Assessment* (IEMA) which also aims at promoting best practice. The university 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 universities, and then "spun off" by setting up new businesses to exploit the intellectual property (Ramakrishnan, 2004; Rutherford and Fulop, 2006), or developed in collaboration between universities and businesses (Maxwell and Van der Vorst, 2003; Ramakrishnan, 2004). New technologies and processes such as renewable energies are also developed in collaboration between universities and utilities (Godfrey, 2006). There are numerous government and non-government organizations that support progress on the sustainability agenda as well as 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/) and the International Resources and Recycling Institute (IRRI, http://www.recycling-institute.info/) facilitate the interaction and collaboration between businesses and businesses and universities, as well as promoting research on environmental practices . In the UK, local authorities take responsibility for supplying some environmental services, such as for example waste disposal, collection and management, domestic waste collection, and street cleaning. These activities are normally

contracted out to specialized operators (Keynote, 2006). Overall, this sector and its competence are therefore heavily supported by government organizations and NGOS

Gaps in provision and general weaknesses

Generally SBP services 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). 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. Furthermore some of these technologies, for example solar power, are already very standardized (Diener and Terkla, 2000), which makes it difficult for any of the suppliers to differentiate themselves from other businesses. 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). 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). 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 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.

In many cases of start-up companies originated by the spin-off of technologies researched in universities 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 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). 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 by 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 examples 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. Universities have for a while been investing time and resources in collaborating with this industry, currently on the technical side (Maxwell and Van der Vorst, 2003; Ramakrishnan, 2004; Rutherford and Fulop, 2006). In general, some of the weaknesses of the industry have been addressed by the specific supply of business services by the government and education sector.

A Note on Methods

As this paper concentrates on researching a specific industry, methods will rely somewhat on industry statistics sourced from market reports. A semi-structured questionnaire will be designed and administered on the telephone to a cross-section of the SBP services industry in the EEDA region. The context of the EEDA region has been selected for pragmatic reasons and because it lies within the area of intervention of the university of Hertfordshire. This questionnaire will be followed by a more qualitative research approach and involve in depth interviews with the management of 10 identified case companies.
The limitations of the methods chosen are in the regional character of the sample targeted and the limited number of respondents. Because of this, any results will be only indicative and will require further research on a larger scale for validation.

Conclusions and recommendations for sector support by universities

It is evident that the SBP Services Industry is a major growth industry and it is strategically important so that it has attracted the attention and support of governments, the OECD, universities and other bodies. The sector is diverse and well developed in terms of the size of the economic activity, and its diversity makes it very arduous to research. However, it appears that the industry has

numerous knowledge and competence gaps. 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 university sector, and in particular UH, faces a major opportunity in supporting this sector, and it is recommended that:

- The Engineering and technological schools seek opportunities for collaboration with the private 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;
- Business School seeks opportunities for collaborations with companies to support them in researching and exploiting international opportunities, as well as help them 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.

The next stage of the research is to build on the preliminary evaluation based on desk research by designing a survey of the supply side in the relevant region so to further investigate the needs of this industry and establish communication links with operators.

References

Anon, (2006), "Everybody is green now", *The Economist*, June 2007

Catulli (2007), "What's Your Marketing Footprint?" *The Marketer*, No1, January 2007

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

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

www.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

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

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

Key Note, (2006) *Waste Management*, Key Note Report

Key Note, (2006) *Renewable Energy*, Key Note Report

Key Note, (2006), *Local Government Services*, Key Note Report

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

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

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 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 and Berry (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

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