

Environmental Capability of SMEs: Capability Building towards a Low Carbon Economy

Abstract

The transition to a low carbon economy demands new strategies for maintaining competitiveness and benefiting from the 'green' growth. A study of the regional SMEs confirms that the main focus of the SMEs, when considering the sustainability and the carbon-reduction initiatives, is limited to a cost cutting. This paper argues for a broader remit of the sustainability initiatives at SMEs, including the environmental capability development in the areas of environmental management, access to green supply chains and eco-innovation. Such a growth-enabling and strategic approach at a firm and regional levels is vital for SMEs to take advantages presented by the green growth and the transition to a low carbon economy.

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Introduction

The low carbon economy (LCE) in the UK is significant and growing rapidly (CBI, 2015; DBIS, 2015). It is defined as the activities which generate products or services which themselves deliver low carbon outputs (DBIS, 2015). LCE is seen as one of the significant developments in the current policy and socio-economic landscape worldwide (DECC, 2008, 2011; 2013; DEFRA 2014, 2015; European Commission, 2010a, 2014; 2016; UN, 2015; UNEP, 2011; World Bank Group, 2016). Some scholars argue that the fundamental aims of a LCE are to achieve high energy efficiency, to use clean and renewable energy, and to pursue green GDP via technological innovation, while maintaining the same levels of energy security, electricity supply and economic growth (Muro, Rothwell & Saha, 2011). According to the Global Commission on the Economy and Climate (2014), tackling climate change is linked to sustainability transition, which has economic, technological as well as social dimension. Such a transition is seen as ‘the single greatest challenge of our generation’ (2014:7).

Much of the research and business literature about the shift towards a low carbon economy is focused on large companies and large scale change initiatives in cities, regions and whole countries (Rifkind, 2011; Whiteman et al., 2011; Uyarra et al., 2016). Much less is published on the practices, challenges and benefits for small and medium sized enterprises (Altham, 2007; Gadenne, Kennedy & McKeiver, 2009; Hillary, 2004). This is surprising given that small and medium sized enterprises (SMEs) represent the dominant form of business organisation globally. In Europe there were 21.2 million SMEs in the non-financial business sector in 2013, accounting for 99% of all enterprises in this sector, 67% of total employment and 58% of total value added generated (European Commission, 2014)¹. Globally, SMEs make up over 95% of the firms, account for approximately 50% of GDP and 60%-70% of total employment when both formal and informal SMEs are taken into account. It amounts up to 510 million SMEs, 310 of which are in the emerging markets (International Trade Centre, 2015). The present study, which analyses the data from 120 regional SMEs, explores the approach to suitability initiatives adopted by SMEs and develops recommendations to support SMEs’ significant role in the transition to a low carbon economy.

The Low Carbon Economy in the UK

In the UK, SMEs account for more than 90% of the low carbon sector in general (Carbon Trust, 2013b), with 11,550 businesses directly engaged in the low carbon economy across the UK in 2013. Nationally employment in the low carbon sector grew 12 per cent from 2010 to 2013, with a total of 460,600 people working in the low carbon economy supply chain. This represents approximately 1.5% of all UK jobs (Department for Business Innovation and Skills, 2015). The role of SMEs, by virtue of their prevalence and importance to local communities, is seen as significant to the transition to a low carbon economy, through the employees they engage, the business practices they carry out and their role in supply chains (Lee & Klassen, 2008; Powell, 2000; Williamson, Lynch-Wood, Ramsay, 2006).

¹ Small and medium-sized enterprises are defined by the European Union as businesses that have fewer than 250 employees and either a turnover of less than or equal to €50 million or a balance sheet total of less than or equal to € 43 million (European Commission, 2003).

The low carbon sector accounted for a third of the total economic growth in the UK during 2011-12 (CBI, 2012). Its turnover was estimated at £121.7 billion in 2013 with 45% of the turnover or \$ 56.4 billion generated in the waste processing, energy from waste and biomass sector (DBIS, 2015). The Gross Valued Added (GVA) of the low carbon economy has grown by 28.4%, turnover by 24.7% and employment within the low carbon economy grew by 12% during 2010-2013 (DBIS, 2015).

The Department for Business Innovation and Skills (DBIS, 2015) highlights the significance of the low carbon sector to the national economy:

- Businesses directly operating in the low carbon economy generated £70.8 bn sales in 2013. This grows to £121.7 bn when the supply chain is included. This means low carbon business turnover is more than double that of the UK's auto manufacturing industry.
- The direct low carbon economy generated £26.2 bn in GVA in 2013, which means it is about five times larger than aerospace; two and half times the size of Pharmaceuticals; almost twice as large as the Chemicals industry and equivalent to Food and Drink in GVA terms.

The transition towards a low carbon economy is identified as a key UK Government priority (Climate Change Act, 2008). The UK Government set targets to reduce carbon emissions by 20% by 2015, and by 80% lower than the 1990 baseline by 2050 (Climate Change Act, 2008). The UK Government's Plan for Growth (HM Treasury, 2013) states its clear commitment to support investments into low carbon technologies and employment opportunities in the low carbon sector. These aims are in line with the European Commission 'low-carbon economy' roadmap (European Commission, 2010a, 2010b, 2012, 2016) and wider ambitions across Europe.

A recent Carbon Trust Report forecasts that global low carbon exports will be worth more than £1 trillion, cumulatively up to 2020 (Carbon Trust, 2013b). In the same timeframe, the UK has a credible opportunity to triple its exports from £12 billion in 2012-13 to around £30 billion, and double its share of the global low carbon export market from around 5% to 10% (similar to the UK's share of the global pharmaceuticals industry) (Carbon Trust, 2013b). As the low carbon sector grows, businesses are seizing the opportunities to contribute to the sector, as well as to strengthen their competitiveness either by cost reduction due to resource efficiencies or by discovering new markets that are demanding low carbon goods and services.

SMEs and sustainability initiatives

Cost saving through more efficient use of materials and energy efficiency is seen as compelling enablers for SMEs to engage in sustainability initiatives (Klewitz, Zeyen, & Hansen, 2012; Triguero, Moreno-Mondejar, & Davia, 2013). Scholarly literature consistently reports that lack of resources such as time, money, technical skills and organisational capacity hold back SME 'eco-innovation' (European Commission, 2010b; Perry & Towers, 2009; Triguero et al., 2013). Gibb (2000) and Jenkins (2004) argue that attempts to engage SMEs in sustainability initiatives have failed due to the lack of understanding of smaller business needs alongside the weak policy setting and implementation with regulators such as the UK

Environment Agency (EA) claiming that SMEs are unresponsive to environmental regulations (EA, 2009).

SMEs are reported to be lagging behind larger companies in adopting sustainability related improvements. According to a survey of over 1000 SMEs by Lloyds Banking Group (Lloyds Commercial Banking, 2013), a quarter of SMEs cite sustainable practices as one of their top priorities in the coming years. However, a study by the Association of Certified Chartered Accountants (ACCA, 2012) showed that only 29% of SMEs had introduced any measures to save energy or raw materials compared with 46% of large enterprises and only 4% had comprehensive energy efficiency systems in place compared with 19% of large enterprises. Whilst SMEs represent a significant share of the low carbon economy and are key players in the sustainability transition, they also represent a potentially significant level of inertia given the challenges they face in prioritising the de-carbonisation efforts.

Environmental Capability

Considerable research has been undertaken to explore the role of firm-specific capabilities in the pursuit of competitive advantage. The vast majority of existing research considers internal sources such as skills and routines (Nelson and Winter, 1982) as the main sources for capability building in organisations. External sources have also been explored to an extent, including consideration of the role of formal and informal relationships with other firms (Gulati, Norhia & Zaheer, 2000); the degree of network density that affects the capability building of the firm (Coleman, 1990; Burt, 1992; McEvily & Zaheer, 1999; Ahuja, 2000); and the effects of different types of network ties on capability acquisition by individual members and through interactions with each other (McEvily & Marcus, 2005; Mahmood, Zhu & Zajac, 2011).

A firm's environmental capabilities are capabilities that allow a firm to reduce its ecological footprint (Baranova & Meadows, 2017). As a part of a firm's strategic capabilities, they are significant for the success of the firm's environmental strategies (Rugman & Verbeke, 1998; Klassen & Whybark, 1999; Aragon-Correa & Sharma, 2003; Buysse & Verbeke, 2003). These capabilities include, for instance, environmental management skills and routines, product/service design with a focus on sustainability, waste management, resource efficiency skills and practices and others that focus on the reduction of the ecological footprint of the firm. It is noted that the concept of ecological footprint (Hart, 1995) is defined sufficiently broadly to include the impact of the firm's activities in supporting a reduction in the ecological footprint of the firm's key stakeholders such as its suppliers and customers.

The existing literature on capability building is dominated by studies which emphasise capabilities as being internally generated, with heterogeneity primarily arising from imperfections in factor markets (Barney, 1986), distinct organisational skills and routines (Nelson & Winter, 1982), causal ambiguity and uncertain imitability (Dierickx & Cool, 1989) and deliberate investment in learning and making improvements (Zollo & Winter, 2002). In this study it is argued that, while an internal focus on capability-building is critical, it has to be inclusive of the external perspective on capability building (Gulati, Norhia and Zaheer, 2000). This includes capability development through becoming a part of the green supply

chains, as well as broader networks, which support decarbonisation efforts and broader sustainability initiatives.

Research approach and methods

The study was part of the preliminary data gathering in support of a collaborative bid led by the University of Derby with Derby City and County Councils for the European Regional Development Funding (ERDF) for a 3-years project to support regional SMEs in becoming more energy efficient. This study set out to explore what sustainability initiatives SMEs in the D2N2 (Derby, Derbyshire, Nottingham, Nottinghamshire) Local Enterprise Partnership (LEP) region were undertaking and their awareness of regional support available for reducing carbon footprint. As part of the study, a survey was launched using SurveyMonkey functionality at the beginning of September 2015 and was open for four weeks.

The survey was promoted via the social media channels of Derby Business School (University of Derby), Derby City and Derbyshire County Councils, the regional Chamber of Commerce and several Cleantech and green business networks linked through the D2N2 LEP Low Carbon Hub. It is estimated the survey was sent to between 5,000-8,000 businesses in the D2N2 LEP region. 120 questionnaires were returned; giving a response rate of between 1.5- 2%. This level of response is not uncommon for web-based surveys of this nature (Archer, 2008). The survey response data was analysed per question and in relation to the type of the SMEs surveyed, for instance per sector/industry where a SME operates and/or per SME size. The data was analysed using the SurveyMonkey and Excel (Microsoft Office 10) functionality.

Findings

The sample characteristics of the 120 SMEs responded to the survey are as follows: 51% of the SMEs in the sample are micro businesses employing less than 10 employees, 36% are small firms (10-50 employees), 9% are medium sized enterprises with 4 (of the 120) respondents representing large enterprises. The largest proportion of the firms (25%) operates in the high-tech manufacturing and engineering sector. Other industries had the following representation: 20% of the firms work in construction and housing; 13% in IT and creative industries; 12% in retail; 10 % in hospitality and tourism; 7% in health and wellbeing and management services and consultancy; with transport and logistics, food and drink and low carbon goods and services each reflecting 6% of the respondents to the survey. The analysis of the survey data provides insights into the following areas:

Energy efficiency projects

The vast majority of SMEs surveyed, 78%, said they had already invested in some form of energy efficiency projects over the previous two years; although the majority of investments were described as small (25%) with only 14% of SMEs making 'substantial' investment in energy (or resources) efficiencies. 36% of the firms surveyed stated that there was 'some' potential for further energy cost savings in the business, 23% of SMEs indicated that such potential is 'significant', with 8% considering the potential as 'substantial'. It is interesting to note that around 30% of the SMEs surveyed had not invested at all in any form of Environmental Management Systems (EMS) or accreditation (EMA) over the previous two

years; with some 26% of the SMEs making ‘some’ investment; and 20% defining their investment in these areas as ‘small’.

Barriers to improvements in energy efficiency

The major barriers to improving energy efficiency were identified as:

- lack of funding and finance;
- the initial costs of efficiency measures being too high;
- lack of clear advice from the Government and other bodies;
- lack of specialist expertise/capacity to undertake the measures and finally;
- perception that the ROI for energy efficiency initiatives was not high enough for the key decision-makers.

The data confirms that for many SMEs, efforts to reduce carbon emissions seem expensive in terms of time, staff allocation and the necessary accreditations. Environmental/carbon accreditations are often seen as time consuming to obtain, maintain and renew. Many SMEs and micro businesses still consider low carbon initiatives and accreditations as ‘nice to have, but not critical’ to business success or survival.

The data also suggests that many SMEs still require support in developing the ‘business case’ for low-carbon interventions, including help with investment options, return on investment and value added options. Assistance in attracting external funding as well as project management expertise could, therefore, have a significant impact on SMEs’ confidence towards low carbon, eco-innovation and energy-efficiency projects.

Areas of environmental capability

As part of the survey, SMEs were asked to indicate the type of capability they require to become more energy or resource efficient. The table below provides a breakdown of the survey responses.

Table 1: SME’s demand for capability building towards energy and resource efficiency

Areas of capability building	Response, %
Accessing funding and finance	49
Energy and materials efficiency	47
Waste management	44
Designing new low carbon products and services	24
Leadership for sustainability	18
Environmental management	16
Procurement and purchasing	16
Strategic planning	13

Accessing / building the right networks	12
Research and development	12
Supply chain management	10

Source: D2EE ERDF project survey, September 2015

The capability associated with ‘accessing funding and finance’ attracted the highest interest (49%), closely followed by ‘energy and materials efficiency’ (47%) and ‘waste management’ (44%). ‘Design for low carbon product and services’ category attracted substantial attention (24%); ‘leadership for sustainability’ (18%) with ‘environmental management’ and procurement and purchasing both attracting the same interest with 16%, with ‘strategic planning’ (13%) and ‘accessing and building the right networks’ (12%) not far behind.

When considering these responses by sector, the ‘accessing funding and finance’ category attracted attention from the majority of sectors attracting 29% of responses. SMEs from construction and housing, and retail sectors had the highest representation in this category, indicating that access to funding and finance was the most important category of capabilities to support their sustainability initiatives. The second largest capability category, attracting 27% of the responses across the sectors studied, was ‘energy and materials efficiency’. Half of all SMEs surveyed operating in high-tech manufacture and engineering in the region indicated that such capability was critical to them; at the same time only 18% of SMEs from the same sector stated that the ‘access to finance’ was important to them. 42% of SMEs operating in IT and Creative industries and 34% of SMEs in construction and housing indicated that ‘energy and energy efficiency’ was the key environmental capability for them to develop.

‘Waste management’ was another category of environmental capability that attracted the most attention from the regional SMEs surveyed, which is consistent with earlier studies (Ilomaki and Melanen, 2001). 28% of SMEs responses indicated that skills and competences in waste management were significant to their sustainability efforts. 75% of SMEs operating in food and drink, 64% in retail and 60% in low carbon goods and services sectors indicated that this capability was of interest for development in these sectorial contexts.

Another interesting aspect of the survey data analysis highlighted a link between the demands for environmental capabilities and the SME’s size. This relationship has been explored earlier in the studies of firm’s size and attitudes towards CSR (Lepoutre and Heene, 2006). Our analysis indicated that for micro (less than 10 employees) and small (10-50 employees) enterprises the capabilities that attracted the most attention are: ‘access to finding and finance’ (45% of micro and small enterprise responses), ‘energy and material efficiency’ (37%) and ‘waste management’ (35%). But for the regional medium sized enterprises (51-250 employees), the picture is different. 73% of medium sized enterprises that took part in the survey considered ‘leadership of sustainability’ as an important area for development. The following capabilities: ‘design for new low carbon products and services’, ‘energy and materials efficiency’, ‘strategic planning’ and ‘waste management’ attracted the same number of responses, at 36%, in this group of businesses that took part in the survey. This picture is

indicative of the shifting priorities as businesses grow: for micro and small businesses – the priorities often lie in achieving short term priorities often measured in financial terms i.e. positive cash flow, payback on investments, reinvestments in growths. As businesses become more established, as in case of medium enterprises, these priorities shift towards a longer term horizon. Thus, capabilities in leadership, strategic planning and design for products and services attract more attention as the business confidence grows.

As a result of the survey data analysis and the literature reviewed on SMEs' role in the transition to a low carbon economy, the following areas become important for the development of SMEs' environmental capabilities.

Access to funding and finance

The access to finance and funding is seen by the SMEs as a major area where they require capability development. This is not surprising, as the lack of finance and the ability to attract funds from the external sources is seen as one of the major limiting factors preventing SMEs to engage in sustainability initiatives (Lewis & Cassell, 2010; Perry & Towers, 2009; Torugsa *et al.*, 2012). The ability to attract the external funds is high on the agenda of the regional SMEs, which indicates that SMEs often struggle to develop a business case for sustainability (Moor & Manring, 2009). Thus, developing a strategic view of sustainability initiatives, which consider not only cost cutting, as a main short-term gain of the green investment, but longer-term benefits contributing to business growth and support towards the shift to a LCE, are important factors in SMEs' pursuit of funding and finance to support sustainability and energy efficiency efforts.

Traditionally, low carbon initiatives are viewed as means of reducing costs through improved energy efficiency and resources utilisation. Although this approach could contribute significantly to ensuring cost efficiencies in various organisational contexts, it could limit the opportunities presented to organisations by the green growth. There is a danger of overlooking broader green/sustainability strategies in organisations at the expense of the carbon reduction strategies. The regulatory environment in the UK and Europe provides a clear driver to businesses to minimize their carbon footprint and reduce GHG emissions, which in itself reflects a broader strategic imperative to achieve higher levels of resource efficiency. The other imperative – development of the low carbon goods, processes, services and sustainable business models– is as critical as the resources efficiencies due to its potential contributions to the UK economic growth and global competitiveness. Such a growth-enabling approach provides a more balanced answer to supporting the transition to a low carbon economy.

Greening of the regional supply chains

A large number of SMEs are part of the vast supply chains and networks at a regional, national and supranational level. Development of the sustainable sourcing approaches and effective carbon management across supply chains is vital. Recent studies confirm (Gimenez & Sierra, 2013; Lee & Klassen, 2008; Foerstl *et al.*, 2010) that being a part of the supply chain that encourages sustainable sourcing and conduct has a positive impact on sustainability orientation of the supply chain participants. Lee and Klassen (2008) found, in a

case study of SMEs, that a combination of evaluation and collaboration provides synergies that help suppliers build their organisational capabilities that enable them to improve their environmental performance and that of their customers (i.e., the buying firms). In a similar vein, Reuter *et al.* (2010) confirmed that a combination of assessment and collaboration strategies generates the greatest effect for the greening of supply chains.

Often, firms assess their individual environmental impact using the firm itself as the 'system boundary' in which the assessment is made and then focusing on the physical processes within the 'system boundary'/firm to reduce the impact (Berners-Lee *et al.* 2011, Finnveden *et al.* 2009, Huang *et al.* 2009, Pennington *et al.* 2004). Although this approach is valid, it might not yield significant results in carbon reduction as many carbon footprinting models consider only direct emissions (known as Scope 1) and those deriving from the purchase of energy (Scope 2). Since more than 75% of emissions in a supply chain are elsewhere in the chain, leaving out a consideration of these Scope 3 emissions can lead to a suboptimal view (Berners-Lee *et al.* 2011, Finnveden *et al.* 2009) and shift the emissions problem elsewhere in the chain (Huang *et al.* 2009). This is where sustainable supply chain management practices such as joint ordering, delivery frequency optimisation and batch sizing to reduce fuel consumption in delivery vehicles across the supply chain can be helpful (Benjaafar *et al.* 2013). This may counter against some of the philosophies used in lean manufacturing and just-in-time deliveries, which require small, but frequent shipments and thus may appear to reduce the cost of inventory holding to the end manufacturer, actually add carbon to the supply chain and therefore indirectly increase costs in the long run (Benjaafar *et al.* 2013).

Eco-innovation

Green innovation is seen as a critical factor in supporting the transition to a low carbon economy (Department for Business, Innovation and Skills 2015; LCICG 2014; The Scottish Government 2010). Support for 'green' innovation is heavily featured on the agenda of key regional players, including LEP and Chamber of Commerce, as well as at the national level through the Low Carbon Innovation Co-ordination Group (LCICG, 2014) and the network of Energy Research Partnerships (ERPs).

SMEs have a significant potential to develop innovative solutions for green products and services as well as sustainable business products. Innovation in these areas could provide a source for differentiation alongside the cost savings, which could be achieved through adaptation of the low carbon strategies. Capability building for low carbon innovation is an emergent area of business activity, where both public and private sectors are supporting investment in low carbon technologies. For SMEs to succeed in this arena, they need to be supported in terms of finance and leadership for eco-innovation, which requires a long-term perspective, tolerance of failure and risk-taking. A combination of differentiation and cost effectiveness could contribute towards sustainable competitive advantage (Lynch, 2011), thus positively affecting the business continuity of an SME.

Sustainable Business Models

SMEs need to be open to the creation and redesign of existing business models, which encompass sustainability. This proposition requires a deep understanding of value chain dynamics as well as customer needs and behaviours. Furthermore, SMEs need to keep abreast

of developments in technology, design, and infrastructure which are creating the space for new solutions to emerge. They need to engage proactively in creating platforms for collaboration and open innovation with suppliers, customers and other partners (e.g. designers and software companies). Such efforts would inevitably require leadership ambition, strategic foresight and the capacity for capability building to encourage innovation, market development and growth through collaborative strategies.

Many big companies have started to use technology in the development of sustainable business models: for instance, BT, a telecommunications services company, is working with suppliers to develop products and services designed for ‘circularity’, while also aligning its revenue model with a ‘net positive’ enablement of carbon reduction (Carbon Trust, 2013a). A nationwide retailer, [Kingfisher](#), is developing closed-loop hardware products, as well as service-focused propositions for customers undertaking big ‘do-it-yourself’ (DIY) projects (Kingfisher, 2016). These examples show that, if done correctly, more value can be delivered while cutting waste and material resource requirements.

The trend of combining product-service propositions to deliver more sustainable solutions represent a strategic shift for SMEs as they need to develop their competences to match demands for sustainable product and service solutions. As these models develop they will create opportunities for a number of ‘enabling’ industries where SMEs have a significant presence. These include ICT (telematics, tracking and ‘smart’ infrastructure), logistics (for reverse logistics of used products, collection/distribution of asset-sharing models), and financial services (insuring and financing leased assets) (Smith-Gillespie, 2013). Sustainable business models present opportunities for new solutions in organisational design and infrastructure. SMEs could take a lead in developing such bespoke solutions and in crafting new and unexplored ‘niches’ for competitive success taking advantage of their flexibility and close proximity to the customer base.

Leadership and leadership development for sustainable business

Support and active engagement of staff in sustainability initiatives are critical to ensuring the success of any company’s green strategy. Sustainability needs to be positioned at the heart of the organisational strategy and viewed as critical to behavioural change at individual and organisational level. For SMEs, it is often challenging to encourage employees to ‘do one more task on the list’ in addition to their contractual roles and responsibilities. As SMEs struggle for resources, their staff work to full capacity with little time for ‘other’ tasks and duties; so encouraging people to become environmental champions (Taylor et al, 2012) in initiating and supporting green practices, for example, is often viewed as a real challenge.

The study confirms the criticality of the senior management’s commitment and ‘hands-on’ approach to working with employees across organisations and beyond to provide support and stewardship for sustainability. There is a growing body of literature exploring the nature and the role of sustainability leadership (Boiral et al, 2008; Egri and Frost, 2000; Metcalf and Benn, 2013; Wolfgramm et al, 2015). In the context of SMEs, leadership agendas are often focused around familiar business priorities, with sustainability leadership often seen as secondary; although these are increasingly becoming interchangeable terms which are strongly associated with the success of sustainable business strategies.

Greater University-Business Co-operation

The present research has shown that even in a highly regarded LEP such as D2N2 the exchange of knowledge and information about low carbon and sustainability practices between SMEs and the local support agencies can be weak. This is where Universities might bolster their role to strengthen the leadership capacity for sustainability at a regional level. HEFCE's Sustainable Development Framework (HEFCE, 2014) outlines the important role that universities can play in supporting sustainable development principles. Part of this role is to enable researchers and stakeholders in business, policy and civil society to develop and share new methodologies, data, conceptual frameworks, skills and practices to support acceleration of a low carbon economy. For SMEs, such an orientation presents opportunities to develop collaborative projects with universities in order to support eco-innovation and business growth, as well as to create partnerships which could advance debates about the role of SMEs in regional economies and their contribution towards the green growth.

Conclusion and Recommendations

The present study asserts that SMEs are significant contributors to the shift towards a low carbon economy; that many are optimistic about the new opportunities presented by the green growth; and that many are engaged in becoming more resource and energy efficient as well as more sustainable. However, a high proportion of SMEs remain unaware of the support, guidance and funding that will facilitate their environmental strategies.

The survey results indicate that whilst the majority of the SMEs surveyed have adopted quite rudimentary steps to reduce their carbon footprint, a significant minority have developed more innovative approaches to their own carbon management, including alternative power generation. Like various other studies, the main impediments to engagement were seen as a lack of time and money, a lack of relevance to the business (due to the micro-size of some of the respondents) and a lack of knowledge about the alternatives. Very few respondents actively measured or set targets for their carbon output, which is an area where SMEs could be better supported.

The majority of SMEs surveyed indicated that their main needs are access to funding and finance, followed by capabilities in energy and material efficiency and waste management. It is argued that attracting finance to support sustainability efforts often requires strong leadership and a strategic perspective on how these investments can, not only reduce costs in the short term but, aid long-term business growth aspirations. There are variations in the demand for environmental capabilities across the sectors studied, as well as variations that relate to the size of an enterprise. Thus, development of a business case for green investment needs to consider how SMEs can take advantage of the opportunities presented by the green growth more strategically and to include development of the environmental capabilities that go beyond aspirations to cut energy bills. Such an approach is vital so that the regional SMEs are fit to grow and compete successfully whilst supporting the transition to a low carbon economy.

As for the regional support towards the strengthening of SMEs' sustainability efforts - a much more integrated and collaborative approach is required that recognises the bespoke requirements of smaller businesses. It is proposed that local government, corporate

businesses, a range of national and regional NGOs as well as higher education institutions (HEIs) should play a much more pro-active role in forming SMEs' support networks, partnerships and supply chain collaborations to accelerate the shift to a more sustainable local economy.

References

- ACCA (2012) Embedding sustainability in SMEs. London. Accessed 09.12.16 <http://www.accaglobal.com/content/dam/acca/global/PDF-technical/small-business/pol-tp-es-is-v1.pdf>.
- Ahuja, G. (2000) 'Collaboration networks, structural holes, and innovation: a longitudinal study'. *Administrative Science Quarterly*, 45(3): 425-455.
- Altham, W. (2007) 'Benchmarking to trigger cleaner production in small businesses: dry-cleaning case study'. *Journal of Clean Production* 15 (8-9):798-813.
- Archer, T. M. (2008) Response rates to expect from web-based surveys and what to do about it. Accessed 09.12.16 www.joe.org/joe/2008june/rb3.php.
- Baranova, P. and Meadows, M. (2017) 'Engaging with environmental stakeholders: routes to building environmental capabilities in the context of the low carbon economy'. *Business Ethics: European Review*, 18th of January 2017, DOI: 10.1111/beer.12141.
- Benjaafar, S., Li, Y. and Daskin, M. (2013) 'Carbon footprint and the management of supply chains: Insights from simple models'. *IEEE Transactions on Automation Science and Engineering* 10, no. 1: 99-116.
- Berners-Lee, M., Howard, D.C., Moss, J., Kaivanto, K. and Scott, W.A. (2011) 'Greenhouse gas footprinting for small businesses—The use of input–output data', *Science of the Total Environment* 409, no. 5: 883-891.
- Boiral, O., Cayer, M. and Baron, C.M. (2008) 'The action logics of environmental leadership: a developmental perspective'. *Journal of Business Ethics*, 85: 479-499.
- Burt, R.S. (1992). *Structural Holes: The Social Structure of Competition*. Harvard University Press: Cambridge, MA.
- Buyse, K. and Verbeke, A. (2003) 'Proactive Environmental Strategies: A Stakeholder Management Perspective', *Strategic Management Journal*, 24(5): 453-470.
- Carbon Trust. (2013a) *Carbon Trust endorses BT's new good carbon abonnement technology*. Accessed January 25, 2017 <https://www.carbontrust.com/news/2013/06/carbon-trust-endorses-bt-net-good-carbon-abatement-methodology>.
- Carbon Trust (2013b) *Low Carbon Entrepreneurs: The new engines of growth*, The Carbon Trust and Shell, 2013.
- Coleman, J.S. (1990) *Foundations of Social Theory*. Belknap: Cambridge, MA.
- Confederation of Business Industries (CBI) (2012) The colour of growth: Maximising the potential of green business. Accessed 09.12.16 http://www.cbi.org.uk/media/1552876/energy_climatechangerpt_web.pdf.
- CBI (2015) Business Issues: SMEs. Accessed 10.07.15 <http://www.cbi.org.uk/business-issues/smes/>.
- D2N2 (2014) D2N2 Economic Regional Strategy, Derby, Derbyshire, Nottingham and Nottinghamshire Local Enterprise Partnership. Accessed 24.07.15 <http://www.d2n2lep.org/Growth/D2N2-Growth-Deal>.
- Department for Business Innovation and Skills (DBIS) (2013). Low Carbon Goods and Services (LCEGS). Report for 2011/12. London.
- DBIS (2015) Low Carbon Economy: size and performance. Accessed 06.12.16. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416240/bis-15-206-size-and-performance-of-uk-low-carbon-economy.pdf.

- Department for Energy and Climate Change (DECC) (2008) *The Climate Change Act*, (c27) Act of the Parliament of the United Kingdom, 26 of November 2008.
- DECC (2011) *Planning Our Electric Future: A White Paper for Secure, Affordable and Low-Carbon Electricity*.
- DECC (2013) *Going for Green Growth: the case for ambitious and immediate EU low carbon action*, 28th of October 2013.
- Department for Environment, Food & Rural Affairs (DEFRA) (2014) *Policy: sustainable development*. available at <https://www.gov.uk/government/policies/making-sustainable-development-a-part-of-all-government-policy-and-operations>. accessed 15.05.16.
- DEFRA (2015) *Reducing the UK's greenhouse gas emissions by 80% by 2050*. Policy paper. Accessed 23.02.17. <https://www.gov.uk/government/publications/2010-to-2015-government-policy-greenhouse-gas-emissions/2010-to-2015-government-policy-greenhouse-gas-emissions>.
- Egri, C. and Herman, S. (2000) 'Leadership in North American environmental sector: Values, leadership styles and contexts of environmental leaders and their organizations'. *Academy of Management Journal*, 43(4): 571-604.
- Environmental Agency (2009) *Understanding and Improving SMEs compliance*. Accessed 23.02.17
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291208/scho1209brpv-e-e.pdf.
- European Commission (2003) COMMISSION RECOMMENDATION of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. Official Journal of the European Union, (2003/361/EC)
- European Commission. (2010a) *Europe 2020 strategy, EU policy initiative*. Accessed 11.05.16. <http://ec.europa.eu/energy/en/energy-strategy/2020-energy-strategy>.
- European Commission (2010b) *Removing barriers to eco-innovation SMEs*. Accessed 12.11.16. https://ec.europa.eu/environment/ecoap/about-eco-innovation/business-fundings/eu/495_en
- European Commission (2012) *Energy Efficiency Directive*, Official Journal of the European Union. Accessed 02.07.16 <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>.
- European Commission (2014) *A partial and fragile recovery: annual report of European SMEs*. Accessed 10.07.15 http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/files/supporting-documents/2014/annual-report-smes-2014_en.pdf.
- European Commission. 2016. *Climate Action*. Accessed 11.05.16. http://ec.europa.eu/clima/policies/strategies/2050/index_en.htm
- Figge, F. and Hahn, T. (2012) 'Is green and profitable sustainable? Assessing the trade-off between economic and environmental aspects'. *International Journal of Production Economics* 140(1): 92–102.
- Finnveden, G., Hauschild, M.Z., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D. and Suh, S. (2009) 'Recent developments in life cycle assessment'. *Journal of Environmental Management*, 91(1), pp.1-21.
- Foerstl, K., Reuter, C., Hartmann, E. and Blome, C. (2010) 'Managing supplier sustainability risks in a dynamically changing environment – sustainable supplier management in the chemical industry'. *Journal of Purchasing and Supply Management*, 16(2):118-130.

- Gadenne, D., Kennedy, J. and McKeiver, C. (2009) *An Empirical Study of Environmental Awareness and Practices in SMEs*. Springer Science and Business Media B.V.
- Gibb, A. (2000) 'SME policy, academic research and the growth of ignorance, mythical concepts, myth, assumptions, rituals and confusions'. *International Small Business Journal* 18(3): 13–35.
- Gimenez, C. and Sierra, V. (2013) 'Sustainable supply chains: governance mechanisms to greening supplier'. *Journal of Business Ethics* 116: 189-203.
- Global Commission on the Economy and Climate (2014) Better Growth, Better Climate: The New Climate Economy Report. Accessed 09.12.16. <http://www.worldbank.org/content/dam/Worldbank/document/WEurope/2014/IMF-global-commission-economy-climate.pdf>.
- Gulati, R., Nohria, N., & Zaheer, A. (2000) 'Strategic Networks', *Strategic Management Journal*, 21(3), 203-215.
- Hart, S. (1995) 'A Natural-Resource-Based View of the Firm'. *Academy of Management Review*, 20:4, 986-1014.
- Higher Education Funding Council for England (HEFCE) (2014) HEFCE's Sustainable Development Framework. Accessed 24.07.15 <http://www.hefce.ac.uk/workprovide/Framework/>.
- Hillary, R. (2004) 'Environmental management systems and the smaller enterprise'. *Journal of Cleaner Production* 12: 561-569.
- H.M Treasury (2011) Plan for Growth (Vol. March 2011). London UK: UK Government HM Treasury Department of Business Innovation and Skills.
- Huang, Y.A., Weber, C.L. and Matthews, H.S. (2009) 'Categorization of scope 3 emissions for streamlined enterprise carbon footprinting'. (2009): 8509-8515
- Ilomaki, M., and Melanen, M. (2001) 'Waste minimisation in small and medium-sized enterprises – do environmental management systems help?' *Journal of Cleaner Production* 9: 209-217.
- International Trade Centre (2015) SME Competitive Outlook 2015. Connect, Compete and change for inclusive growth. Executive summary, accessed 18.12.17. <http://www.intracen.org/uploadedFiles/intracenorg/Content/Publications/2015SMECompOutlookEXSumm.pdf>
- Jenkins, H. (2004) 'A critique of conventional CSR theory: an SME perspective. How can small and medium enterprises embrace corporate social responsibility?' *Journal of General Management* 29(4): 37-57.
- Kingfisher (2016) *This is Personal*. Sustainability Report 2015-2016. Assessed January 25, 2017 http://www.kingfisher.com/sustainability/files/reports/cr_report_2016/2016_Sustainability_Report.pdf
- Klewitz, J., Zeyen, A., and Hansen, E. G. (2012) 'Intermediaries driving eco-innovation in SMEs: a qualitative investigation'. *European Journal of Innovation Management* 15(4): 442–467.
- Lee, S. and Klassen, R.D. (2008) 'Drivers and enablers that foster environmental management capabilities in small- and medium-sized suppliers in supply chains'. *Production and Operations Management* 17(6): 573-586.
- Lepoutre, J., and Heene, A. (2006) 'Investigating the impact of firm size on small business social responsibility: A critical review'. *Journal of Business Ethics*, 67:257-273.
- Leveson-Gower, H. and Lonsdale, J. (2009) *Understanding and Improving SME compliance*. Bristol.
- Lewis, K. and Cassells, S. (2010) 'Barriers and drivers for environmental practice uptake in SMEs: A New Zealand Perspective'. *International Journal of Business Studies*- special edition.
- Lloyds Banking Group (2013) One in four small businesses say sustainability is a top priority for 2014. Press Release. Accessed 09.12.16. <http://www.lloydsbankinggroup.com/media/press-releases/2013-press-releases/lloyds-bank/one-in-four-british-small-businesses-say-sustainability-is-a-top-priority-for-2014/>.

- Low Carbon Innovation Co-ordination Group (LCICG) (2014) LCICG Strategic Framework. Accessed 24.07.15
http://www.lowcarboninnovation.co.uk/working_together/strategic_framework/overview/
- Lynch, R. (2011) *Strategic Management*, Sixth Edition, Pearson Education Limited, Harlow, UK.
- Mahmood, I.P., Zhu, H. & Zajac E.J. (2011) 'Where can capabilities come from? Network ties and capability acquisition in business groups'. *Strategic Management Journal*, 32: 820-848.
- McEvily B. & Marcus, A. (2005) 'Embedded ties and the acquisition of competitive capabilities'. *Strategic Management Journal*, 26(11): 1033-1055.
- McEvily B. & Zaheer, A. (1999) 'Bridging ties: a source of firm heterogeneity in competitive capabilities'. *Strategic Management Journal*, 20(12): 1133-1156.
- Metcalf, L. and Benn, S. (2013) 'Sustainability Leadership: an evolution of leadership ability'. *Journal of Business Ethics*, 112: 369-384.
- Moor S.B and Manring S.L. (2009) 'Strategy development in small and medium sized enterprises for sustainability and increased value creation'. *Journal of Cleaner Production*, 17: 276-282.
- Muro, M., Rothwell, J. and Saha, D. (2011) Sizing the Clean Economy: A national and Regional Green Jobs Assessment, Bookings Institution, Accessed 09.12.16 <https://trid.trb.org/view.aspx?id=1119256>.
- Nelson R. and Winter, S. (1982). *An Evolutionary Theory of Economic Change*. Harvard University Press: Cambridge, MA.
- Perry, P. and Towers, N. (2009) 'Determining the antecedents for a strategy of corporate social responsibility by small and medium sized enterprises in the UK fashion apparel industry'. *Journal of Retail Conservation* 16(5): 377-385.
- Powell, A. (2000) Greening the supply chain: are formal environmental management systems appropriate for the needs of small and medium-sized enterprises? In R. Hillary (Ed), *Small and medium-sized enterprises and environment: Business imperatives* (pp.233-243). Sheffield, UK: Greenleaf.
- Reuter, C., Foerstl, K., Hartmann, E. and Blome, C. (2010) 'Sustainable global supplier management: The role of dynamic capabilities in achieving competitive advantage'. *Journal of Supply Chain Management* 46(2): 45-63.
- Rifkin, J (2011) *The Third Industrial Revolution*. New York, Palgrave MacMillan.
- Smith-Gillespie, A. (2013) Business model innovation and strategies for sustainable growth, Carbon Trust, Accessed on July 14, 2015 <http://www.carbontrust.com/news/2013/11/business-model-innovation-and-strategies-for-sustainable-growth/>
- Taylor, A., Cocklin, Ch. and Brown, R. (2012) 'Fostering environmental champions: A process to build their capacity to drive change'. *Journal of Environmental Management*, 98: 84-97.
- The Scottish Government (2010) *A low carbon economic strategy for Scotland: Scotland- a low carbon society*, The Scottish Government, Edinburgh, 2010.
- Torugsa, N., O'Donohue, W. and Hecker, R. (2012) 'Capabilities, Proactive CSR and Financial Performance in SMEs: Empirical Evidence from an Australian Manufacturing Industry Sector'. *Journal of Business Ethics* 109(4): 483-500.
- Triguero, A., Moreno-Mondejar, L., Davia M.A. (2013) 'Drivers of Different types of eco-innovation in European SMEs'. *Ecological Economy* 92: 25-33.
- United Nations (2015) *Transforming our World: The 2030 Agenda for Sustainable Development*. United Nations 2015, accessed 5.01.17
<https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>.
- United Nations Environmental Programme (2011) *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, accessed 23.02.17
https://web.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/field/image/green_economyreport_final_dec2011.pdf,

- Uyarra, E., Shapira, P. and Harding, A. (2016) 'Low carbon innovation and enterprise growth in the UK: Challenges of a place-blind policy mix'. *Technological Forecasting and Social Change*, 103, 264–272. doi:10.1016/j.techfore.2015.10.008.
- Williamson, D., Lynch-Wood, G. and Ramsay, J. (2006) *Drivers of Environmental Behaviour in Manufacturing SMEs and the Implications for CSR*. Springer Science and Business Media B.V.
- Whiteman, G., de Vos, D. R., Chapin, F. S., Yli-Pelkonen, V., Niemela, J., and Forbes, B. C. (2011) 'Business Strategies and transition to low-carbon cities', *Business Strategy and the Environment*. 20 (4): 251-p265.
- Wolfgramm, R., Flynn-Coleman, S. and Conroy, D. (2015)' Dynamic Interactions of Agency in Leadership (DIAL): an integrative framework for analysing agency in sustainability leadership'. *Journal of Business Ethics* 126: 649-662.
- World Bank Group (2016} A greener path to competitiveness:-policies for climate action in industries-and products. Working Paper. Accessed 09.12.16:
<http://documents.worldbank.org/curated/en/835691472028683380/A-greener-path-to-competitiveness-policies-for-climate-action-in-industries-and-products>.