Small and medium-sized enterprises: Hard to reach, data-poor but rich in creative potential as agents of change for decarbonisation

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Abstract

Small and medium-sized enterprises (SMEs) are the heart of the UK and EU economies and increasing attention is being paid to their environmental impact. In the UK and EU, the majority of organisations are SMEs (over 95%) employing the a high percentage of people and accounting for around half (43-53%) of greenhouse gas emissions by businesses. The SME sector is rich in diversity and challenges, often 'hard to reach' - both in terms of engagement and policy/practical interventions; and 'data poor' in terms of energy and environmental data available to analyse. 'SME' is a large catch-all term for various business organisations from corner shops, industrial units, factories, theatres and galleries. Even though SMEs face challenges due to their diversity, nature of their business operations and legal requirements, they are often characterised by a shared resource limitation compared to multi-national companies which, due to their size and scale, are often the focus of issues around social and environmental responsibility. As such SMEs are an under-researched sector in carbon management with questions remaining surrounding their environmental management and carbon performance, why they implement changes and the barriers to organisational change for decarbonisation.

This research investigates how environmental and carbon performance is managed by SMEs, their motivations, and barriers to implementing carbon management. The paper presents preliminary research findings developed in the context of an European Regional Development Fund (ERDF) Sustainability in Enterprise (SiE) project at Nottingham Trent University, UK, which aims to support SMEs in Nottingham to reduce carbon emissions by enhancing energy efficiency and reducing resource consumption. This research initially adopted a quantitative approach and a questionnaire survey was used to gather data from SMEs' managers. Findings show SMEs are in the early stages of their carbon management journey. Most SMEs do not measure and monitor carbon emissions for decarbonisation, even though many state having sustainability and environmental policies. SMEs show some evidence of implementing environmental and carbon management actions with targets, but these are sporadic and disconnected from their main organisational goals. Some of the barriers identified are the lack of knowledge & expertise and time & resources. Still, SMEs highlight that reputation, market position, and moral obligation can play a key role in starting their journey to take environmental action. This study contributes to mounting evidence that SMEs face challenges around in-house capacity, resources, access to support and data quality for carbon emissions measurement and management. As a result, the study offers recommendations including a policy recommendation based on Learning Energy Efficiency Network (LEEN) model.

Keywords: Carbon emissions, Carbon management, Decarbonisation, Small and medium-sized enterprises, Hard to reach

Introduction and Background

Increasing concern about the environment and climate change has forced organisations to reduce their environmental impact (Nulkar, 2014). Climate change poses major risks and opportunities for a wide range of companies and industries as well as society at large (Chandy et al., 2019). A major cause of the global problem and the key to its solution are business organisations that produce carbon emissions due to their business strategies and operations (Cadez et al., 2019). Small and medium-sized enterprises (SMEs) represent the dominant population of business organisations in both the United Kingdom (UK) and European Union (EU). Definitions of SMEs encompasses micro (less than 10 employees and an annual turnover under €2 million), small (less than 50 employees and an annual turnover under €10 million) and medium-sized (less than 250 employees and an annual

turnover under €50 million) businesses (Department for International Trade, 2020). In the EU, there are more than 20 million enterprises in the private sector, of which 99% are SMEs with a workforce of nearly 90 million people. There were approximately 6 million SMEs in the UK in 2020, which was over 99% of all businesses (Ward, 2021).

SMEs have a crucial role as an economic and social force in driving the changes required in the UK's transition to a net-zero economy (Baranova and Conway, 2017). Constantinos et al. (2010) estimate that SMEs contribute approximately 60%-70% to industrial pollution in Europe. It is estimated that smaller businesses collectively account for around half (43-53%) of greenhouse gas emissions by UK businesses (British Business Bank, 2021). The picture is much the same in Nottingham itself, albeit a higher proportion of manufacturing companies alongside wholesale and retail trade and automotive organisations. Thus, SMEs have a significant potential to influence and bring change towards the low carbon economy collectively. They also have an essential role in delivering UK and EU carbon emissions targets (net-zero by 2050). SMEs cannot ignore the potential impact of climate change and the related operational changes required in their core business activities (Hendrichs and Busch, 2012). Carbon management has been moving up the strategic agenda of organisations in the corporate world, albeit slowly (Mazhar et al., 2017). Besides contributing to the net zero goal, by embarking on the net zero journey, SMEs can significantly reduce costs, bring greater collaboration upstream and downstream, and boost reputation amongst customers and clients who might be increasingly concerned about carbon emissions and climate change (British Chambers of Commerce, 2022).

Previous studies have pursued understanding how business organisations are managing their carbon emissions through appropriate actions, including good practice corporate carbon management. However, further work is required to provide a strategic perspective to understand the role of business for a low carbon future (Busch and Schwarzkopf, 2013; Wade and Griffiths, 2020). Most environmental and carbon management studies have focused on large and carbon intensive business organisations (Cadez and Czerny, 2016; Conway, 2015). Whilst SMEs have been often left out of the scope of similar studies due to being perceived to have less significant impacts on the environment and society when compared to large multi-national companies, recent studies have started to address this. Jalo et al. (2021) also state that energy management practices in SMEs are underdeveloped and most of the energy efficiency and carbon reduction potential is left untapped. As far as policies are concerned, currently, policies still largely overlook SMEs in the UK and EU, particularly related to energy efficiency (Fawcett and Hampton, 2020). For example, Blundel and Hampton (2021) recently produced an evidence review of SMEs role in contribution to net-zero. Alongside noting the increased attention SMEs are getting with regards their environmental impact they explore the policy context surrounding them, which for now, mostly consists of local environmental legislation (pollution prevention for example), voluntary codes and participation in ISO standards such as 14001(Environmental Management) and 50001 (Energy Management). After providing a comprehensive review of the barriers and drivers (see Table 1), Blundel and Hampton (2021) present the evidence gaps.

Table 1: Improving SME performance – the 'barriers' and 'drivers' perspective (Blundel & Hampton 2021)

Primary focus	***Common barriers***	***Common drivers***
Internal / intra-organisational -level	• Lack of awareness • Lack of specialist knowledge / technical skills • Limitations in absorptive capacity / organisational learning • Competing priorities / lack of time • Resource constraints • Access to capital • Short term tenancy agreements • Lack of strategic alignment	• Cost savings • Risk mitigation • Pro-environmental values • Reputation and image • Staff morale
External / inter-organisational level	• Lack of trusted brokers / intermediaries • Information deficit regarding opportunities • Principal-agent / split-incentive problem	• Compliance • Competitive advantage • New market opportunities • Corporate reputation • Public subsidy

Central to addressing these barriers is the need for more accurate data sets for decision-making, improved support mechanisms for SMEs, understanding the roles of values and how SMEs can have better access to networks (Constantinos et al., 2010). The authors noted a similar set of challenges as Blundel and Hampton (2021), but drew

a distinction between SMEs of over 50 employees with high energy consumption, the resources to tackle it, and the smaller low impact SMEs that pay little attention and have minimal resources. These organisations have been characterised by Janda et al. (2014) as 'data poor' in recognition of poor energy metering standards and processes.

The capacity to implement and monitor environmental and carbon aspects differ significantly compared to larger businesses (Fawcett and Hampton, 2020). The specific characteristics of SMEs, often characterised by restricted resources such as human and financial, explain in part their slower transition to implementing information management systems that enable them to measure, manage, and plan the transition to a low carbon economy. A study conducted in Derbyshire shows that most SMEs do not monitor or set targets for carbon management (Conway, 2015). For instance, Janda et al (2014) highlight the barriers often SMEs find in enhancing data collection as many SMEs do not have energy managers and have legacy meters. The legacy meters are a key barrier to collect energy data as they often are technologically obsolete, but in rented premises (often via leasing), the changes that SMEs can make to the premises to collect data or implement changes are limited. The tenant-landlord relationships can be particularly complex when the landlord is a public sector organisation such as a local government, which is often associated with restrictive resources. Also, often SMEs occupy premises in buildings that were not purposely created for their activities, which might lead to energy inefficiencies and incerased emissions. Thus, multiple barriers play a role in making SMEs 'data poor' businesses, including legal, organisational and technical (Janda et al, 2014). Therefore, Janda et al (2014) discuss the importance of a dedicated energy manager as an effective measure in addition to a smart meter. It is essential to measure and manage data, including interpreting results and implementing measures. Due to the size of some SMEs, this role might likely be occupied by an external consultant (Janda et al, 2014). Hampton (2019) suggests that business advisors are key in steering energy management practices, besides reflecting how energy management practices influence processes of knowledge production and organisational meaning-making. Conway (2015) discusses how SMEs make efforts in reducing carbon is related to internal stakeholders' values and when SMEs are pressured from the supply chain.

This paper aims to contribute to the evidence base by exploring a sample of Nottingham-based SMEs to understand the current state of carbon management, their motivations and barriers to implementing carbon management. The study will help understand where SMEs are at present and how they can improve in future by providing insights and recommendations to achieve low carbon transition and help meet the UK government's net-zero target. From policy perspective, the study has suggested developing 'carbon management network' in regions in the UK based on successful Learning Energy Efficiency Network (LEEN) model abroad. The study contributes to the emerging research agenda on environmental and carbon management in SMEs.

Research Method and Context

This is an ongoing research at Nottingham Trent University (NTU), Nottingham, UK. Nottingham is a relatively large city in the East Midlands with 330,000 inhabitants. It is part of the wider region of Greater Nottingham (see Figure 1) which is the focus of a European Regional Development Fund (ERDF) Sustainability in Enterprise (SiE) project at NTU. This research is conducted in the context of SiE project which helps SMEs in the Greater Nottingham area to progress towards net zero by providing free, practical support from specialists in sustainable business operations, building management, product design, and employee engagement. SMEs have to sign up to seek support provided they meet criteria. The project helps businesses understand their current carbon footprint and identify effective carbon management measures. Financial support is available to help companies to implement efforts to reduce carbon emissions. Carbon management workshop programme is offered to SME managers to build their in-house capacity and know-how to implement carbon management. The project offers consultancy work from academics, practitioners, and students from multi-disciplinary team at NTU. Student Sustainability Consultancy is also provided to SMEs by students from Nottingham Business School and the School of Architecture, Design and the Built Environment which is a unique part of the project in terms of knowledge exchange. SiE project has similar elements as the concept of LEEN networks for energy efficiency which was originally developed in Switzerland in 1987 (Köwener et al., 2014). Since then, the network concept was transferred and adapted to the German, Swedish and Austrian context. LEEN are designed to accelerate the take-up of energy efficiency measures by companies and networks are managed by local change agents such as business groups, trade bodies and banks with central government playing a key role (Mallaburn, 2018).

Figure 1: The Greater Nottingham area

The paper presents findings from the initial baseline survey conducted at the beginning of the SiE project on the current environmental and carbon management practices. The research adopted a quantitative approach via an online survey using DocuSign and MS Forms. The survey was sent to all SMEs enrolled in the SiE project. SMEs enrolled in SiE have to complete a survey to establish a baseline before getting support (for example, consultancy). SME managers and directors were required to complete the survey who could provide insights on behalf of their business. The survey was carried out by means of structured questionnaires, which included closed and open questions. The survey included the main areas related to carbon management such as carbon/sustainability policies, carbon footprint measurement, carbon reduction targets, carbon management practices, drivers and barriers to change. After the support, SMEs will be completing an exit survey. The aim of this is to adopt an action research approach where SMEs are provided support for their low carbon transition after a baseline analysis. The quantitative survey approach was chosen to provide a consistent baseline, ease of analysis and a platform to develop a post-intervention qualitative study in SiE. The survey questionnaire was underpinned by literature (Mazhar, 2017) in line with the research aims. Data were collected from September to December 2021. The data entry and analysis were done in the software SNAP (Snap Surveys: Experience measurement platform for virtual research teams). The data were also exported to Excel spreadsheet for analysis. Data was pseudonymised to allow the confidentiality of SMEs in this study. Informed consent was gained from the SME participants whether their data can be anonymously used for academic research purposes in the baseline survey.

Survey Findings

A total of 57 Nottingham-based SMEs responded to the survey questionnaire. These SMEs belong to sectors with activities associated with manufacturing; arts, entertainment, and recreation; information and communication; real estate; construction; professional, scientific, and technical; wholesale and retail, repair of automotive; education; transport and storage; human health and social work and other services. All SMEs were from the Greater Nottingham area as per the requirements of the SiE project (see Figure 2). Figure 2 illustrates the distribution of SMEs according to the industry. Most SMEs analysed in this study belong to manufacturing, arts, entertainment and recreation, and other service sectors.

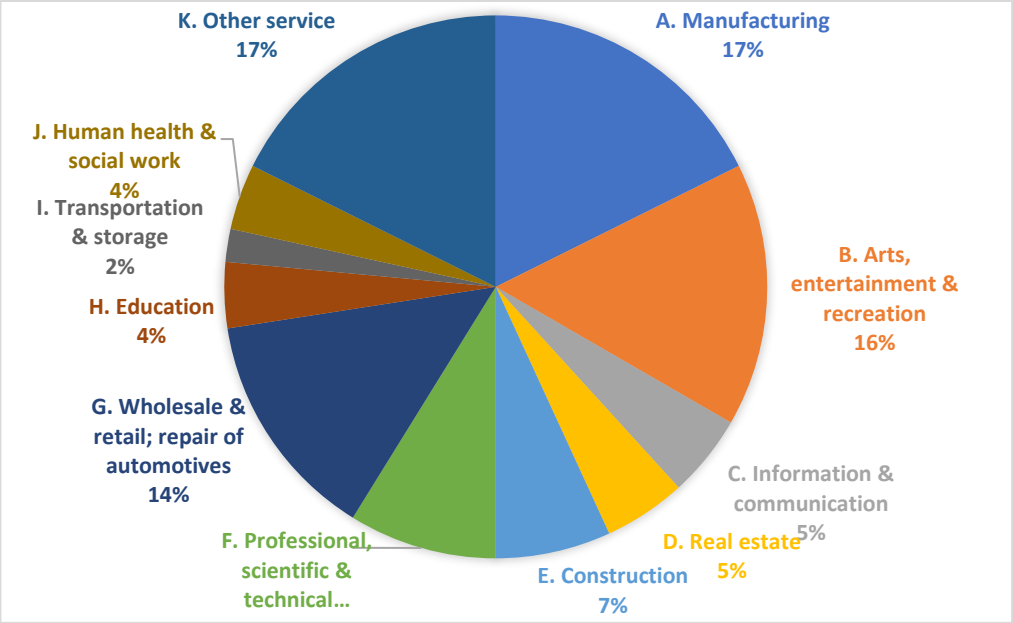

Figure 2. Distribution of SMEs analysed as per industry sector

The survey findings show that most SMEs analysed do not measure and monitor their carbon management performance, even though 61% of SMEs stated having sustainability or environmental policy for their business. Most SMEs (79%) do not measure their carbon emissions (carbon footprint) and 41% have not set a carbon reduction target yet. This may suggest that more SMEs have set a carbon reduction target than measuring their baseline carbon emissions. Carbon footprinting is the starting point for carbon management as it is not possible to manage if you cannot measure your emissions against a set baseline year which can then be used to track progress. The evidence of carbon management practices in Figure 3 suggests that most SMEs are still at an early stage in their transition to net-zero through carbon management, despite nearly 90% being aware of the potential risks and opportunities associated with carbon emissions.

Figure 3 shows that only a minority (less than 20%) of the SMEs effectively have procedures to manage carbon emissions reduction. Results show that most SMEs analysed (i) do not have effective procedures and knowledge/information for calculating an accurate carbon footprint, (ii) do not effectively manage carbon emissions nor successfully implement carbon reduction projects as planned, (iii) do not effectively track and review progress towards carbon management target, (iv) do not integrate carbon management into the procurement process and it is also not central to core business activities and decision making, (v) do not communicate carbon reduction targets, strategies and performance to all relevant stakeholders, (vi) do not have carbon reduction behavioural change, and awareness-raising programmes for staff, and (vii) are unable to manage the conflicts between carbon management and core business activities/growth. All these are key characteristics of carbon management process and therefore, Nottingham-based SMEs need to improve in these areas to embed carbon managemrnt in their business.

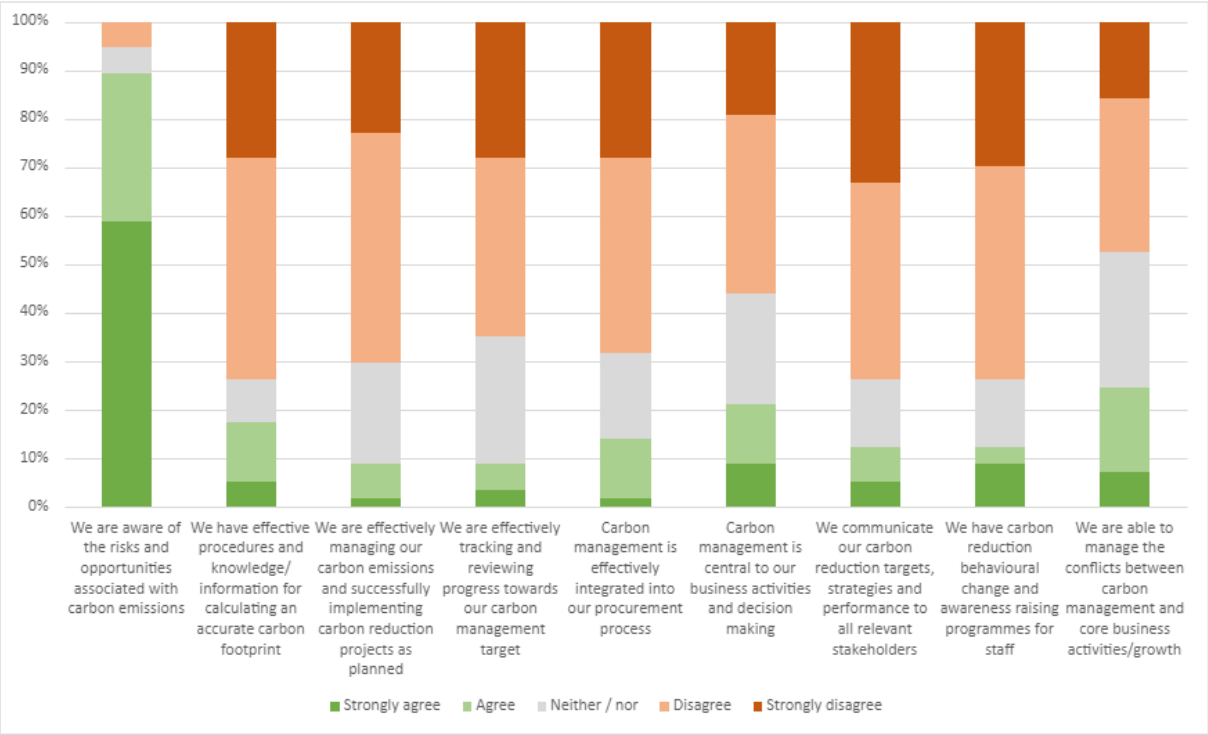

Figure 3. SMEs' stages in their carbon management journey

Findings highlight the significant scale of the challenge for SMEs in Nottingham attempting to establish carbon management systems to contribute to city's carbon neutral target by 2028 and seek support from funded projects such as SiE as they strive towards net zero by 2050. A lot of this is to do with resources, knowledge and capacity to deliver carbon management. Locally, Nottingham is racing to be the UK's first carbon neutral city. Transport, housing and energy use all being transformed in bid to hit net zero emissions by 2028. SMEs in Nottingham are key part of this net zero journey. However, SMEs need to get level of maturity in terms of carbon management to help make this net zero transition.

Among the barriers to improving environmental and carbon management performance, most SMEs highlighted the lack of knowledge and expertise and lack of time and resources (see Figure 4). Some SMEs also referred to the lack of capital funding, policy or strategy and lack of data collection, monitoring or management systems to allow carbon footprinting analysis. The barriers have played a paramount role particularly during Covid-19 when SMEs' core focus has been their survival due to significant business disruption/closure and financial constraints. Staff resistance to behavioural change and the fact that carbon management is not a priority are not perceived as barriers to improving the carbon management in business. This may suggest that SMEs are now willing to act on their carbon emissions and managers are receptive to low carbon and sustainable change. SMEs engaging with the SiE project and seeking support is a sign for this as they need help to bring change in their business.

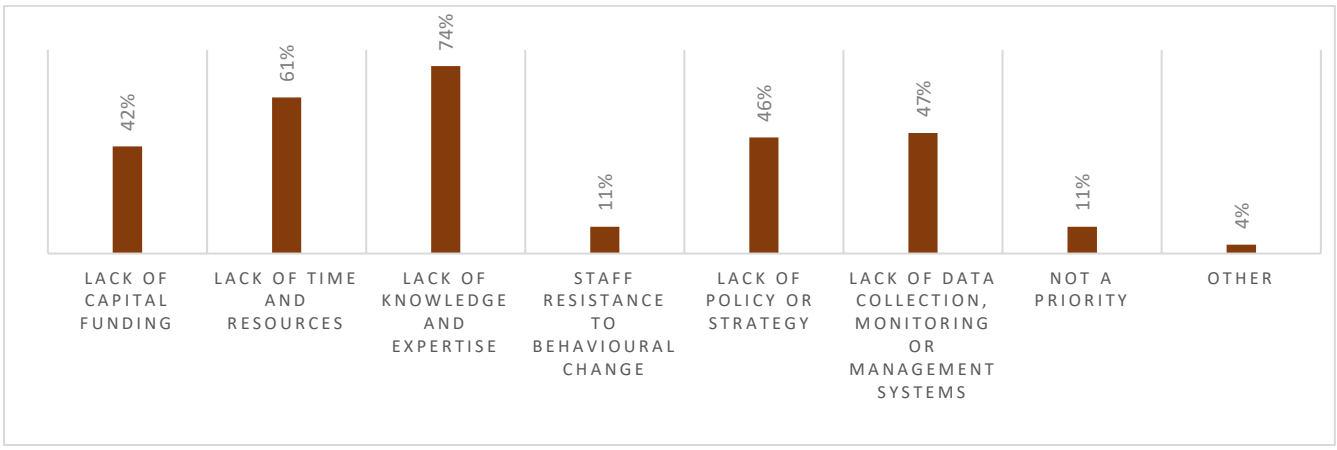

Figure 4. Barriers to improving environmental and carbon performance

A small number of the SMEs analysed in this study show some efforts to manage their environmental and carbon performance. Only five SMEs stated having a carbon management action plan or strategy, which addresses multiple areas of carbon emissions impacts as illustrated in Figure 5, including business travel, procurement, supply chain, and waste. Surprisingly, the five SMEs are micro and small enterprises (associated with less than forty-nine employees). These five SMEs belong to only three sectors: (i) arts, entertainment, and recreation, (ii) transportation and storage, and (iii) other services. This may indicate that there are pockets of good practice but carbon management needs to scale up. Although SMEs are developing and implementing actions in various areas of carbon emissions presented in Figure 5, there is a lack of a systematic and more formal approach to carbon management process within the business. For example, majority (79%) SMEs do not measure carbon footprint of their activities in Figure 5, but they are tacking these areas to reduce emissions. There is a need for SMEs to understand their direct (Scope 1) and indirect (Scope 2 and Scope 3) impacts in terms of carbon emissions to measure and subsequently reduce them.

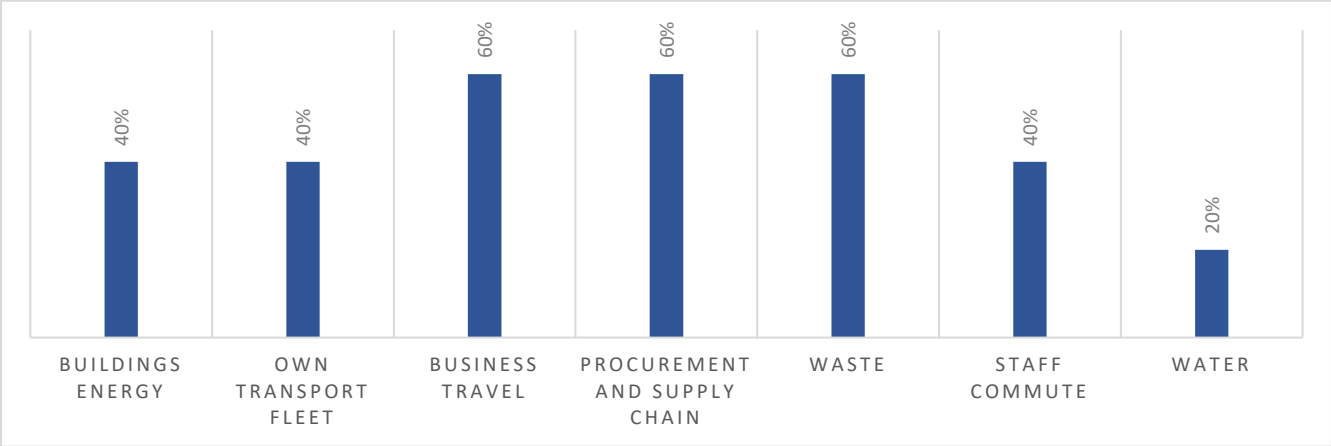

Figure 5. Areas developed in the carbon management plan

Despite a small number of SMEs making efforts towards improving their environmental and carbon management performance, all recognise the significance of taking environmental action. However, there appears to be disconnect between how SMEs perceive the increasing importance of carbon management and how they implement the process in terms of action. Figure 6 depicts SMEs' primary motivations or drivers for taking environmental action and reduce carbon emissions. The majority of SMEs stated that reputation, market position, and moral obligation play a key role in taking environmental action. Cost savings, compliance with government laws and regulations, and meeting clients or suppliers' needs also appear as essential motivations or drivers, even though not the most important. Staff recruitment and retention seems to be less perceived as a motivation for environmental action for SMEs.

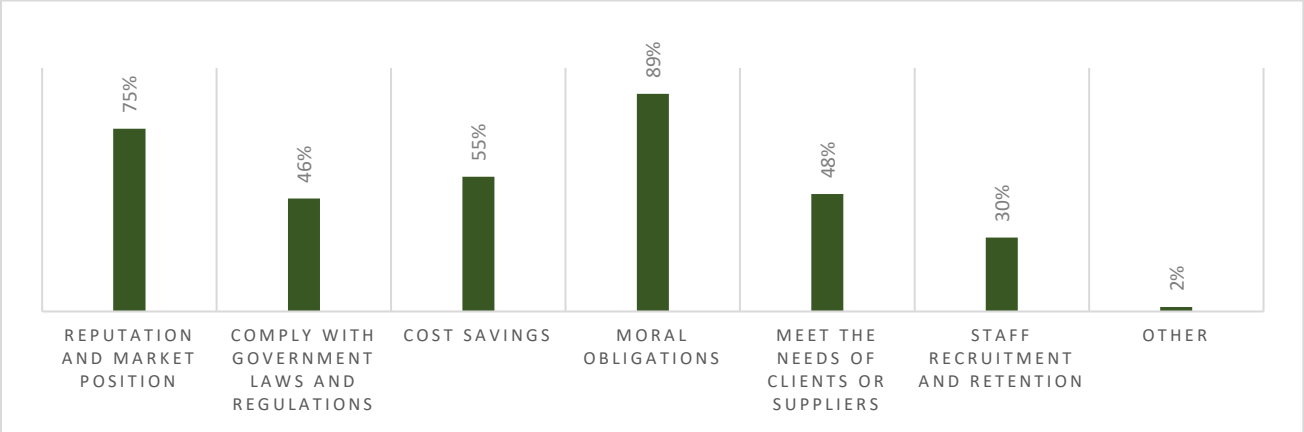

Figure 6. Primary motivations for taking environmental action

Discussion

This paper shows that only a small number of SMEs manage environmental and carbon management performance effectively. Even though the majority have a sustainability or environmental policy, no specific activities or an action plan is related to the policy in a systematic way. Thus, it is unclear how the policy or strategy is implemented

and assessed in terms of its achievement, suggesting environmental-related actions are initiatives disconnected from the SMEs' main business activities. These results corroborate previous findings highlighting that most SMEs do not monitor or set targets for carbon management (e.g., Conway 2015). Findings show that SMEs are aware of the risks and opportunities associated with increasing carbon emissions, but no effective actions are in place. This could be due to a range of barriers as shown in Figure 4. Similar to this research, previous studies have highlighted that most SMEs are at an early stage in their transition to net zero (e.g., British Business Bank, 2021). We identify two factors as playing a key role as barriers to measuring and managing environmental and carbon performance: a lack of knowledge and in-house expertise and time & resources, as found by Blundel and Hampton (2021). SMEs may not have energy and sustainability department and teams managing emissions as many of the large business organisations do. This is due to their small size and lack of finance to afford staff dedicated to energy and carbon. Covid-19 has not helped and made carbon management as a second thought. In current times, many SMEs are fighting for their survival after a huge disruption. Therefore, carbon management seems to be an after-thought for them unless a business sees a tangible business case and relevance. The findings align with previous research studies where resource constraints and a lack of relevance to the business were identified as the most common barriers to low carbon engagement (Conway, 2015). SiE project aims to fill the gap of lack of resources to support the measurement of carbon emissions by calculating the carbon footprint of SMEs and the monitoring of emissions.

However, a challenge lies when it comes to measuring carbon emissions which is a lack of data or incomplete/missing data in SMEs. This shows that SMEs can be 'data poor' and there is an opportunity for SMEs to manage the data effectively enabling carbon footprinting and carbon management. With regards to the implementation, SMEs are associated with fewer resources than bigger organisations, including financial and human. In large business organisations, there are Sustainability and/or Environmental Managers responsible for reducing carbon emissions. There is budget for capital project to deliver carbon management. In contrast, this is not the case in SMEs due to financial and human resource constraints and size of the business. Often employees are responsible for multiple tasks in SMEs, which makes it difficult to implement actions that are not mandatory by regulations or are not in line with the cultural identity, image or business model. Although carbon management related support exists in various parts of the UK including Nottingham, reflections from the local SiE project indicate that SME managers often find it hard to engage with support. Also, they tend to only be able to focus on one developmental area at a time due to the limited resources and this will be quite often around a short-term priority. Due to their size and substantial impact, SMEs can have significant potential to act as change agents for decarbonisation. However, our study shows that they are at an early stage in measuring and monitoring carbon emissions and implementing measures for their carbon emissions reduction. SMEs represent the dominant population of businesses globally and are an essential part responsible for carbon emissions. Thus, they must not be associated with 'hard to reach' or 'data poor' organisations as without measuring and monitoring, they will fail to implement carbon management in strategic decision-making. Due to resource constraints and competing priorities, SMEs can be seen as 'hard to reach' when it comes to engaging with the net zero journey. There are 9280 enterprises in Nottingham based on number of employees (Cartwright et al., 2021). While SiE project is aiming to support 244 SMEs in Greater Nottingham SUDS area, there is still huge population of SMEs which need to be engaged and supported to be on pathway to low carbon business.

The absence of specific carbon management policies for SMEs undermines their potential as agents of change for decarbonisation. Their voluntary initiatives are, at present, disconnected from a formal approach that would allow the implementation of a robust strategy integrated into their business model and development of activities, including carbon management. Most SMEs recognise a moral obligation for taking environmental action, even though only a minority have actions related to carbon management. They also believe more actions can be driven by reputation, market position, and cost savings. Mallaburn (2018) call external drivers such as reputation and risk as strategically important or 'salient', and that salience is strongly influenced by external drivers. The current lack of regulations might play a key role in the absence of carbon and environmental management processes in SMEs. Currently, only bigger organisations are required to account for environmental-related aspects. For example, Streamlined Energy and Carbon Reporting (SECR) which requires obligated companies to report on their energy consumption and carbon emissions within their financial reporting for Companies House. This regulation applies to companies (those whose shares are listed on the stock exchange) and large UK companies with over 250 employees or annual turnover of more than £36m or an annual balance sheet of over £18m (HM Government, 2019). Therefore, the study suggests carbon management related policy instrument such as LEEN for SMEs which is be explored by UK policymakers. This is in line with Fawcett and Hampton (2020) who argue SMEs have been ignored when it comes to energy and carbon related policies in the UK and EU.

Conclusion and Recommendations

This research has investigated how environmental and carbon performance is managed by SMEs, their motivations, and barriers to implementing carbon management. It provides insights to understand where SMEs are and where they need to go in the future to achieve low carbon transition and help meet the UK government's net-zero climate goals. From a theoretical perspective, the paper contributes to knowledge in this area by investigating decarbonisation efforts in SMEs, an important but under-developed topic with a few exceptions. We focus on carbon management in SMEs that have been under-researched, except for some studies showing their environmental or green proactivity in different contexts. The research provides insights into how environmental and carbon performance is managed by Nottingham based SMEs as part of their decarbonisation efforts, their motivations, and barriers to change. Practically, SME managers can develop appropriate strategies and actions based on the findings, and lessons can be learnt to achieve a carbon zero future. In addition, the study offers policy lessons to help address barriers to change and provide support mechanism for SMEs for the effective implementation of carbon management across sectors.

Many SMEs in Nottingham have started their carbon management journey which needs maturity. There are good practice examples across sectors. However, environmental and carbon management are still seen as an add-on to business activities which might indicate reducing environmental impacts is not in line with core business activities. At present, SMEs do not have a formal systematic approach to manage environmental and carbon impacts. As far as recommendations arising from the study are concerned, SMEs need to develop their in-house capacity and their managers need to gain technical knowledge, skills, and competencies around carbon management. SMEs can make use of available support from universities and through projects such as SiE in Nottingham. Similar projects exist in other cities too. SMEs need to engage with local partners such as universities as knowledge hubs and make use of existing support ecosystem. More recently, a lot of free resources are emerging to support SMEs, for example, SME Climate hub by the Department for Business, Energy and Industrial Strategy (BEIS). There are various good practice examples from which SMEs can learn and replicate as part of normal business practices. Local networks and ecosystems are also engaging SMEs on net zero agenda due to its urgency, for example, local government, growth hubs and various other local business forums. SME managers can benefit from trainings and courses to develop their 'know-how' which might enable them to measure and manage their business carbon emissions. Secondly, access to finance is part of the solution to drive more action. Many organisations can help small business on their path to net zero. Some provide grants, matching funds, and interest-free loans both locally and nationally. Notably, 11% of UK smaller businesses have already accessed external finance to support net zero actions (British Business Bank, 2021). However, finance is an area which can be streamlined for SMEs with easy access to generate wider impact. In terms of advice and support, Hampton (2018) states that significant public funds are invested in low carbon advisors to support SMEs to reduce carbon emissions on a regional basis. Therefore, business advisors in growth hubs can mainstream carbon management in their discussions with businesses and signpost SMEs towards support and resources to build their capacity.

As a policy instrument for SMEs, the study recommends the UK government to replicate and test the LEEN model. Various successful pilot networks have been delivered in Europe to drive energy and carbon reductions as an ultimate agreement (Jalo et al., 2021; Mallaburn, 2018; Paramonova and Thollander, 2016). This approach can be adopted in regions to address barriers to carbon management and engage hard to reach SMEs. The network process consists of three phases: 1) acquisition which involves initial establishment of the network, 2) review which involves a complete technical evaluation of energy and carbon saving potentials and a calculation of the profitability of measures and 3) network including capacity building and sharing experiences with monitoring and communication of the results. Through developing a network, there is exchange of practical experience and the possibility of utilising synergies across the network which makes the LEEN successful (Köwener et al., 2014).

Future research should address the organisational change process that leads SMEs behaving differently as they are all under the same regulatory framework. The industry might play a role as multiple initiatives are developed in different sectors, which might influence the implementation of environmental actions and effective carbon management. Cross-sector SME analysis can be carried out through segmentation to draw upon similarities and differences as well as lessons learnt. At the same time, cultural identity and image might also play a key role as key internal stakeholders might align their values into the business organisation. These are the avenues future research can explore.

References

Baranova, P. and Conway, E., 2017. Transition to a Low-Carbon Economy: An SME Perspective. In The Low Carbon Economy (pp. 87-115). Palgrave Macmillan, Cham.

Blundell, R. and Hampton, S. 2021. How Can SMEs Contribute to Net Zero?: An Evidence Review. SOTA Review No. 51 July. Available online at: https://www.enterpriseresearch.ac.uk/wp-content/uploads/2021/07/No51-How-Can-SMEs-Contribute-to-Net-Zero-BlundelHampton-2.pdf [Accessed: 25 February 2022]

British Business Bank, 2021, Smaller businesses and the transition to net zero, Available online at: https://www.british-business-bank.co.uk/wp-content/uploads/2021/10/J0026_Net_Zero_Report_AW.pdf [Accessed: 20 October 2021]

British Chambers of Commerce, 2022, Available online at: https://www.britishchambers.org.uk/news/2021/09/net-zero-and-smes-how-you-can-act-now [Accessed: 21 January 2022]

Busch, T. and Schwarzkopf, J., 2013. Carbon management strategies–a quest for corporate competitiveness. Progress in Industrial Ecology, an International Journal, 8(1-2), pp.4-29.

Constantinos C., Yding S., Sørensen, Bjørn P., Larsen, Alexopoulou S. 2010 SMEs and the environment in the European Union, PLANET SA and Danish Technological Institute, Published by European Commission, DG Enterprise and Industry.

Cadez, S., Czerny, A. and Letmathe, P., 2019. Stakeholder pressures and corporate climate change mitigation strategies. Business Strategy and the Environment, 28(1), pp.1-14.

Chandy, R., Dowell, G., Mayer, C., Plambeck, E., Serafeim, G., Toffel, M., Toktay, B. and Weber, E., 2019. Management science—special issue on business and climate change. Management Science, 65(7), pp.3447-3448.

Cadez, S. and Czerny, A., 2016. Climate change mitigation strategies in carbon-intensive firms. Journal of Cleaner Production, 112, pp.4132-4143.

Conway, E., 2015. Engaging small and medium-sized enterprises (SMEs) in the low carbon agenda. Energy, Sustainability and Society, 5(1), pp.1-9.

Cartwright, E., T. Luong and Al. Orazgani, 2021. 'Small and Medium Enterprises (SMEs) in Derby, Leicester and Nottingham'. IAESV EMEDR Data Brief 21-01.

Department for International Trade, 2020. Small and medium-sized enterprises action plan, Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/961722/SME-Action-Plan.pdf [Accessed: 20 January 2022]

Fawcett, T., Hampton, S. 2020. Why & how energy efficiency policy should address SMEs. Energy Policy, 140, p. 111337.

Hampton, S. 2019. Making sense of energy management practice: reflections on providing low carbon support to three SMEs in the UK. Energy Efficiency,12, 1473-1490.

Hampton, S., 2018. 'It's the soft stuff that's hard': Investigating the role played by low carbon small-and medium-sized enterprise advisors in sustainability transitions. Local Economy, 33(4), pp.384-404.

Hendrichs, H. and Busch, T., 2012. Carbon management as a strategic challenge for SMEs. Greenhouse gas measurement and management, 2(1), pp.61-72.

HM Government, 2019, Environmental Reporting Guidelines: Including streamlined energy and carbon

Reporting guidance, Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850130/Env-reporting-guidance_inc_SECR_31March.pdf [Accessed: 27 February 2022]

Jalo, N., Johansson, I., Kanchiralla, F.M. and Thollander, P., 2021. Do energy efficiency networks help reduce barriers to energy efficiency?-A case study of a regional Swedish policy program for industrial SMEs. Renewable and Sustainable Energy Reviews, 151, p.111579.

Janda, K.B., Bottrill, C., Layberry, R. 2014. Learning from the "data poor": energy management in understudied organisations. Journal of Property Investment & Finance, 32(4), 2014. pp. 424-442.

Köwener, D., Nabitz, L., Mielicke, U. and Idrissova, F., 2014. Learning energy efficiency networks for companies–saving potentials, realization and dissemination, Proceedings of the European Council for an Energy Efficient Economy (ECEEE) Industrial Summer Study 2014, pp.91-100.

Mazhar, M.U., Bull, R. and Lemon, M., 2017. Critical success factors for embedding carbon management in organisations: lessons from the UK higher education sector. Carbon Management, 8(5-6), pp.379-392.

Mazhar, M., 2017. Strategic Carbon Management within the UK Higher Education Sector, Unpublished PhD Thesis, De Montfort University, UK.

Mallaburn, P., 2018. Principles of successful non-residential energy efficiency policy, Proceedings of the European Council for an Energy Efficient Economy (ECEEE) Industrial Summer Study 2018, pp.15-22.

Nulkar, G., 2014. SMEs and environmental performance–A framework for green business strategies. Procedia-Social and Behavioral Sciences, 133, pp.130-140.

Paramonova, S. and Thollander, P., 2016. Energy-efficiency networks for SMEs: Learning from the Swedish experience. Renewable and Sustainable Energy Reviews, 65, pp.295-307.

Wade, B. and Griffiths, A., 2020. Examining Best Practice Carbon Management within Australian organisations: cases from contrasting sectors. Australasian Journal of Environmental Management, 27(2), pp.156-172.

Ward, 2021, Business Statistics – Briefing Paper, Available online at: https://researchbriefings.files.parliament.uk/documents/SN06152/SN06152.pdf [Accessed: 21 October 2021]