

A Meta-Analysis of UK SME Decarbonisation Survey Data

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Abstract

Small and medium-sized enterprises (SMEs) are essential to the UK's net-zero transition, yet survey evidence on their barriers, motivations and enabling conditions is fragmented and methodologically uneven. This study conducted a structured, category-based meta-analysis of UK SME decarbonisation surveys published between 2021 and 2025, synthesising findings from over twenty distinct instruments across government, finance, industry platforms, support bodies and private firms. Using a harmonised coding scheme (Finance, Capability, Information, Policy, Technology, Market, Values), the research extracted up to three top items per dimension from each survey, paired them with reported percentages, and applied sample-size weighting and group-normalisation to enable comparison over time and across institutions. Finance dominated reported barriers (26 of 60 coded entries), with Capability second (12), while Technology did not appear as a barrier. Motivators were led by Market (11 of 25) and Values (7), with Finance (4) and Policy (3) less frequent. Enablers were primarily Policy (13), then Information (6) and Technology (5), with Finance and Capability rare and Market/Values absent. Reported actions exceeded intended actions across categories; energy efficiency showed the largest gap (20 vs 6 mentions). Patterns varied by institutional sponsor, indicating framing effects alongside genuine heterogeneity. The analysis clarifies where evidence converges and where it is shaped by survey design, and recommends standardised question batteries, transparent sampling metadata, and coupling self-reports with verified indicators to strengthen decision-relevance.

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List of Abbreviations

SME Small and medium-sized enterprise iii
FSB Federation of Small Businesses 1
CSR corporate social responsibility 6
BSI British Standards Institution 6
PPN Procurement Policy Note 6
CRP Carbon Reduction Plan 6
CBAM Carbon Border Adjustment Mechanism 7
UK ETS UK Emissions Trading Scheme 7

1

Introduction

This section introduces the study's examination of fragmented survey evidence on how UK SMEs perceive and respond to decarbonisation. It motivates the need for a meta-analysis, sets out the aims and objectives, and outlines the approach used to produce the final synthesis.

1.1 | Motivation

SMEs are a vital and inevitable step in the UK's net zero transition. Of the 5.5 million businesses in the UK private sector, SMEs account for 99.8% of them, along with 60% of UK business employment and over half of business sector turnover [1]. While individually modest in energy use and emissions, their aggregate impact is substantial. As such, government targets for economy-wide decarbonisation cannot be met without meaningful SME engagement. Yet, this group has long been recognised as structurally constrained in its ability to adopt low-carbon practices. Compared to large firms, SMEs are more resource-limited, less likely to employ dedicated sustainability staff, and face tighter cash-flow and investment horizons. Furthermore, many operate in rented premises or fragmented supply chains where decarbonisation incentives are diluted.

In response, a growing body of survey research has sought to understand SME attitudes, capabilities and perceived barriers to decarbonisation. Since 2021 in particular, numerous institutions have released reports attempting to map SME sentiment and action readiness. These include UK government departments (e.g. Office for National Statistics [2]), development and commercial banks (e.g. British Business Bank [3], NatWest Group [4]), trade associations (e.g. Federation of Small Businesses (FSB) [5]), and third-sector partnerships (e.g. SME Climate Hub [6]). These surveys explore recurring themes like cost, awareness, regulation and customer pressure, but differ in framing, sampling and analytical depth. Individually, these reports are frequently cited in policy and practitioner settings to justify intervention design or highlight emerging trends; however, they are rarely read comparatively. The result is a fragmented evidence base with limited cross-survey synthesis. Some reports emphasise financial barriers as dominant [4], while others focus on lack of skills [7] or policy uncertainty [3]. In some surveys, the majority of SMEs express willingness to take action [8]; in others, apathy or scepticism dominate [2]. The variation may reflect genuine underlying heterogeneity, but it may also be shaped by differences in question design, sectoral mix, response bias or institutional framing.

While the barriers to SME decarbonisation have been catalogued extensively in qualitative studies [9], [10], the survey-based layer of evidence has not yet been subject to systematic review. This is a point of interest as policymakers often base programme design and communication strategies on these insights. If the underlying data are inconsistent, methodologically opaque, or skewed by self-selection, then policies risk being mistargeted or ineffective. More fundamentally, the divergence in survey findings risks obscuring the basic question: what do SMEs actually need in order to decarbonise? Surveys often report 'barriers' and 'motivators' without specifying how frequently each is mentioned, how the terms are defined, and whether responses refer to specific technologies (e.g. solar PV, heat pumps) or general concepts (e.g. 'going green'). Without consistent interpretation, the phrase 'SMEs need support' becomes difficult to act on. A bank, a trade body and a government agency might each interpret that need differently, resulting in misaligned instruments or overlapping schemes.

1.2 | Aims and Objectives

The primary aim of this research is to conduct a structured, category-based meta-analysis of UK SME survey data on decarbonisation, published in the UK between 2021 and 2025. It seeks to identify recurrent patterns, contradictions and omissions in the reporting of barriers, motivators, enablers and actions (actual and intended). It then structures these findings into a coherent and comparable evidence base.

To achieve this, the objectives are as follows. First, compile a structured evidence base of survey-based reports from relevant institutional sources, including government departments, financial institutions, trade associations and third-sector initiatives; Each source is to be reviewed against inclusion criteria and logged with methodological metadata. Second, extract the reported findings and categorise them within a harmonised framework, enabling cross-survey comparison regardless of differences in language and structure. Third, analyse the areas of convergence and divergence across the data set using descriptive frequency counts, weighted summaries and cross-institutional comparisons. Finally, synthesise the collated evidence into a structured results base to provide a foundation for interpretive discussion.

Through these aims and objectives, the study contributes in three ways. It clarifies the current state of SME perceptions and readiness, as reflected in the surveys that most influence UK policy debate; it introduces structure and comparability to a grey literature that is currently diffuse and selectively cited; and lastly, it generates a consolidated evidence base that can be interrogated in subsequent discussion to inform both academic understanding and practical policy design. This type of comparative, interpretive analysis has not yet been carried out at scale in the context of UK SME decarbonisation. Although academic studies have explored firm-level barriers, they have not focused on the surveys themselves; however, these data sets are now increasingly shaping programme design, from government-led schemes (e.g. net zero hubs, business advisory funding) to private finance products aimed at SMEs. As such, there is both an academic and practical case for the work attempted here. At the policy level, it helps

decision makers understand where gaps in SME support may arise due to under-represented voices or methodological blind spots in the survey record. At the research level, it contributes to understanding how evidence is produced, interpreted and operationalised in a complex, decentralised policy environment. SMEs will continue to be a central concern in UK climate strategy, making it necessary that the evidence used to design support mechanisms is as coherent and comparable as possible.

1.3 | Report Structure

The report is organised into six main sections, each designed to provide a comprehensive understanding of the steps taken to conduct this research.

- *Background and Literature Review* (section 2) surveys the existing evidence on SME decarbonisation. It discusses the unique characteristics of SMEs, the barriers and motivators that shape their behaviour, the methodological challenges of surveying this group, and identifies unresolved tensions and research gaps.
- *Methodology* (section 3) explains the research design and scope, details how survey sources were identified and selected, describes the structured process of data extraction and categorisation, and outlines the procedures used for weighting, normalisation and data analysis.
- *Results* (section 4) presents the empirical findings of the meta-analysis, including the distribution of barriers, motivators, enablers and actions across the evidence base. It also examines patterns over time and differences in emphasis between institutional groups.
- *Discussion* (section 5) interprets the findings, considering the implications of survey heterogeneity, institutional framing and methodological limitations. It explores what the results suggest about SME readiness and the robustness of the survey evidence used in policy debates.
- *Conclusion* (section 6) revisits the aims and objectives, summarises the key insights of the study, reflects on its limitations and outlines areas for future research.

2

Background and Literature Review

This section reviews the relevant literature used to form the basis of the investigation. It covers (i) barriers and motivators shaping SME decarbonisation, (ii) methodological challenges in surveying SMEs and (iii) unresolved tensions and research gaps.

2.1 | Decarbonising SMEs

While large corporations often dominate headlines on climate action, the decarbonisation of SMEs is equally necessary in achieving national and global net zero targets. In 2021, SMEs made up 44% of total UK non-household emissions, and 63% when their supply chains were accounted for [11]. This is a substantial share, yet decarbonising SMEs is far from straightforward. Unlike larger firms, they often lack the economies of scale, regulatory scrutiny and institutional support that can enable sustained low-carbon transitions. Therefore, understanding the unique circumstances that influence their behaviour is imperative.

2.1.1 | Resource constraints

A consistent finding across countries is that resource constraints are the dominant barrier to SME decarbonisation [12]. In the US, a survey[1] found that a majority of SMEs saw insufficient funding as the central barrier to adopting green practices [13]; in the UK, the FSB[1], found that 33% of SMEs were yet to take steps to reduce their energy usage, with 24% citing an uncertain return on investment, and 22% a lack of capital [14]. Beyond direct finances, SMEs often struggle with limited human and informational resources: shortages of time, skilled staff and technical knowledge are among commonly reported reasons for slow progress on sustainability [15]. Many SMEs operate on thin margins and focus on short-term survival, which can overshadow longer-term climate investments [16]. In developing countries, these challenges are exacerbated by weaker support systems - qualitative studies in Pakistan, for example, reveal that lack of government support and regulation, alongside low awareness, leads to especially low engagement in sustainability initiatives [12], [17]. Weak enforcement of environmental laws means many SMEs face little external pressure to change, reinforcing a cycle of inaction. It's here where government support makes the difference. By providing supportive policies such

[1]Survey/s included in data set.

as grants, tax incentives or technical assistance, they lower the barriers to action, ultimately shifting the cost-benefit balance in favour of investment.

2.1.2 | Heterogeneity

SMEs are not a homogeneous group, but range from sole traders and microenterprises to medium-sized firms, spanning every sector of the economy. Internationally, this distinction varies, with the European Commission [18] adopting the 250-employee threshold, while in the United States the Small Business Administration applies industry-specific criteria, in some cases extending the definition of a small business up to 1500 [19]. These definitions are then split further, with the UK and EU acknowledging micro, small and medium, all as separate categories (shown in Table 2.1).

	2021	2022	2023	2024
Micro (1 to 9)	1,162	1,187	1,177	1,161
Small (10 to 49)	211	217	223	220
Medium (50 to 249)	36	36	37	38
Large (250+)	8	8	8	8

Table 2.1: Estimated number of businesses (in thousands) in the UK private sector by employment size-band, 2021 to 2024 [1].

Naturally, these categories cover a wide range of budgets, capabilities and market influence, so medium-sized enterprises (with more employees and resources) tend to be much more involved in decarbonisation than micro- and small businesses [20]. In the UK, for example, most SMEs undertake at least some basic environmental initiatives, but the depth of engagement varies widely, and the smallest companies perceive far fewer benefits from climate action than larger SMEs do [21]. With medium-sized enterprises having the capacity for sustainability executives and similar dedicated roles, their voices are more loudly heard. This means the problems raised and solutions proposed do not always provide a true and equitable representation of SME wants and needs. As such, effective interventions must account for the diverse motivators and constraints among SMEs, from cash-strapped sole proprietors to more advanced medium enterprises. Research, and therefore policy that do not make sufficient distinction beyond the 'SME' must be received with caution.

2.1.3 | Internal drivers

Despite these barriers, the literature also identifies important motivators and drivers that can spur SME decarbonisation. Among the more universal internal drivers is the pursuit of cost savings and competitive advantage. Implementing energy efficiency, waste reduction and other eco-efficiency measures can yield tangible cost reductions at any scale, which, given the UK's energy price crisis which began in Autumn 2021 [22], has been increasingly recognised as a business benefit by SMEs [5]. Essentially, when SMEs perceive clear long-term financial payoffs, for example, lower energy bills or improved resource productivity, they are more inclined

to invest in sustainable practices [23]. This is especially true for medium-sized enterprises, which are likely to have more capacity to capitalise on such efficiency gains.

Market and reputational factors are another powerful motivator: SMEs are increasingly aware that 'going green' can enhance their brand image and appeal to eco-conscious customers [24], [25]. In an Ohio survey, internal values and the opportunity for a better public image were the top two drivers for SMEs to engage in green initiatives [13]. This development of corporate social responsibility (CSR) reflects a shift from sustainability as a peripheral activity to a core element of competitive advantage. CSR practices enable SMEs to strengthen legitimacy and stakeholder trust, while also differentiating themselves in competitive markets [26], [27]. Reputation-orientated initiatives allow companies to signal credibility to customers, investors and supply chain partners, making environmental performance an important dimension of market positioning [28]. Furthermore, this reputational drive often ties in with personal ethics. Owner–managers who have strong pro-environmental values or a sense of moral responsibility tend to proactively integrate sustainability in their business strategy. In annual surveys conducted by the SME Climate Hub[1] , where 'It's the right thing to do' repeatedly ranked as the highest motivator to take action [6], [7], [29], 46% have an emissions reduction plan in place and 82% will have one in place by the end of 2025 [6], despite it not being a mandated requirement for SMEs. These kinds of intrinsic motivations create a theme - when SME leaders and employees are personally committed to climate action, their companies often exceed regulatory compliance and innovate in carbon reduction, even without external legislative pressure [30].

2.1.4 | External pressures

Those not as personally committed may instead be motivated by external pressures. Proactive 'green demand' from customers has been shown to spur many SMEs to improve environmental practices to meet new market expectations. For example, according to a report by the British Standards Institution (BSI)[1], customer demand was the highest driver of Net Zero action for SMEs in 2025 [31]. Furthermore, consumer willingness to pay a premium for sustainable products is significant. PwC reports that in 2024 'Consumers are willing to spend an average of 9.7% more on sustainably produced or sourced goods, even as cost-of-living and inflationary concerns weigh' [32]. The commercial logic here presents an argument irrespective of personal values, as the frame of sustainability is shifted to competitive advantage. Beyond consumer pull, SMEs embedded in industry associations or local business networks often emulate the initiatives of their peers and benefit from knowledge spillovers that ease adoption [33].

Where voluntary pressures are insufficient, regulation comes into play. An example of note is public procurement in the UK, where explicit climate requirements have been laid out for contractors. Under Procurement Policy Note (PPN) 006 (previously PPN 06/21), bidders for most central government contracts worth £5 million+ a year must publish a Carbon Reduction

[1]Survey/s included in data set.

Plan (CRP) and commit to net zero by 2050 [34]. Whilst this only affects a small number of businesses, SMEs will eventually feel the pull as prime contractors and contracting authorities cascade these conditions through frameworks and sub-contracts. This can be seen in the health sector where the NHS Net Zero Supplier Roadmap [35] requires similar CRPs for all procurements, and in devolved administrations like the Welsh government with its own 'WPPN 06/01', which, while not identical, sustains similar expectations of suppliers [36]. Trade and carbon pricing reinforce this. The EU's Carbon Border Adjustment Mechanism (CBAM) moves from reporting to paid obligations on 1 January 2026 [37] and the UK CBAM starts a year later [38]; while SMEs rarely pay CBAM directly, they feel it through price and data requests for covered goods (iron and steel, aluminium, cement, fertilisers, electricity, hydrogen). On top of this, the UK Emissions Trading Scheme (UK ETS) [39] expands to domestic maritime in 2026 [40] and energy-from-waste more comprehensively from 2028 [41]. Not only does this reshape logistics and waste costs, it influences the social norms and standard business practices associated, pulling along businesses not explicitly involved.

Under the European Commission, the Corporate Sustainability Reporting Directive requires the first wave of large companies to report for fiscal year 2024 (published in 2025), driving structured information requests into supply chains [42]. However, to reduce burden on smaller suppliers, the Commission adopted the 'Voluntary Sustainability Reporting Standard for non-listed SME' in July 2025, expressly to help non-listed SMEs respond to buyers and banks with a short, consistent template [43]. In parallel, the Corporate Sustainability Due Diligence Directive entered into force in July 2024, pushing larger customers to seek clearer environmental and human-rights assurances from their suppliers [44]. This again does not directly regulate most SMEs, but by standardising what big customers will ask for and reducing the barrier to accommodate those requests, they create indirect compliance channels exerting natural business case pressures on SMEs. This 'compliance-by-proxy' dynamic is likely to intensify as CBAM becomes payable (EU 2026; UK 2027), UK ETS expands and further policy measures seep their way in. Yet, the simplification moves in Brussels and standardised templates [43] show a counter-trend towards burden reduction without abandoning the direction of travel. Here, the key question is not whether external pressure exists, but how its form and sequencing shape SME behaviour - who decarbonises, who delays, and who complies symbolically because the bar is high, but support is thin.

2.2 | Methodological Challenges in Surveying SMEs

Understanding SMEs' climate actions via surveys is fraught with methodological difficulties. The evidence base is fragmented, not only because of the inherent diversity (heterogeneity) of SMEs, but also due to variations in how surveys are framed, sampled and reported in different studies. This has been acknowledged in the literature, with Hampton et al. highlighting 'ample international evidence identifying barriers' but with 'piecemeal' data that varies in sectoral and geographical focus, ultimately hampering direct comparisons and synthesis [45].

2.2.1 | Question framing

One major issue is the inconsistent framing of survey questions and definitions. 'Decarbonisation' can mean different things in different surveys – some explicitly ask about climate change mitigation efforts (e.g. cutting carbon emissions, adopting renewables), while others frame questions around energy efficiency, cost savings, or general environmental practices. How the issue is framed can significantly influence responses. Many SMEs do not readily identify their actions under the banner of 'climate change' or 'net-zero' if those terms feel abstract or politically charged; however, they may report a number of ongoing measures if prompted in terms of energy cost reduction, waste reduction or resource efficiency, which they see as core business concerns. For example, the British Business Bank frames its questions to SMEs[1] 'in terms of "carbon" [footprints and reductions], for ease of understanding', aiding comprehension for small businesses that might otherwise be unclear about what climate action entails [46]. Such framing differences mean that one survey could find low engagement on 'climate change' by SMEs, while another finds high uptake of 'energy-saving actions,' even if both are essentially measuring similar activities.

2.2.2 | Sampling variation

SME surveys rarely use truly random samples of all businesses; instead, they often draw on membership lists, particular sectors or voluntary respondents, thereby introducing bias. Studies focused on engaged populations, for instance surveys of firms that have signed up to sustainability networks (like the SME Climate Hub [47]) are going to report a rosier picture of SME climate action since these firms are self-selected as greener. In contrast, broader national surveys might show much lower levels of action or awareness, as they capture the 'silent majority' of SMEs not actively involved in environmental initiatives. This can be seen in the Office for National Statistics 'business action on net zero' survey, where 'action is not being prevented' and 'not sure' were the top two responses when asked about actions and intentions to reduce carbon emissions [2]. Geographic and sectoral sampling frames also have an impact. Surveys in sectors such as manufacturing are much more likely to report uptake of decarbonisation measures, as energy and emissions are material to those businesses, compared to surveys dominated by service-sector micro-enterprises [5], [48].

Internationally, most academic surveys have been conducted in Europe and developed Asia, with relatively fewer studies in other regions [15]. This skews the literature toward contexts where policy and public awareness may be higher, potentially overestimating global SME engagement. However, even within Europe the evidence varies. In the DHL Sustainability Survey[1], when asked how important sustainability was to their business, respondents from the Netherlands said 'extremely important' more than twice as often as those from Germany (35% vs 17%) [49], reflecting the differences in regulatory and cultural environments. Furthermore, the reporting of results can also be inconsistent. Some studies aggregate data in ways

[1]Survey/s included in data set.

that obscure important details, such as combining all 'environmental actions' into one metric or reporting only the percentage of firms doing at least one green activity. This can inflate perceptions of engagement; an SME that has only implemented recycling might be counted as 'taking climate action' in some reports while other surveys might set a higher bar, like having a formal carbon target or an emissions inventory, ultimately leading to much lower reported engagement. This can result in incomparable, confusing and misleading data. Differences in time-frame and survey year add to the complexity. SME climate engagement has likely improved from 2021 to 2025 as net-zero discourse and energy prices intensified [50], thus surveys from early 2021 may not be directly comparable to those in 2024.

2.2.3 | Response rate and bias

Survey response rates in SMEs today are strongly determined by methodological design. A recent meta-analysis covering more than 1,000 online surveys reports an average response rate of 44% [51], however, busy SME owners are less likely to take the time to complete questionnaires, especially on topics such as climate change that they may not view as immediate priorities. Those who do respond might disproportionately be businesses that are already interested or active in sustainability, skewing results upward. However, non-response can also bias results in the other direction. In some cases, surveys attract a disproportionate share of firms that are struggling and wish to articulate barriers, meaning the evidence may overstate obstacles rather than progress. Researchers have experimented with different ways to mitigate these effects, like offering monetary incentives [52], but participation is still likely to skew towards particular groups. The risk is that each data set captures a slice of the SME population that is motivated to respond for different reasons, leaving uncertainty about how representative the findings are of the wider business base.

This, in turn, makes it difficult to generalise findings. The heterogeneity of SMEs discussed earlier compounds the issue: a given survey's results can heavily depend on its sample mix of firm sizes, sectors and attitudes. For instance, if a survey sample inadvertently includes more medium-sized firms, it will likely report a higher incidence of climate initiatives since these firms have a greater capacity to do so [53]. Thus, variations in sampling can lead to seemingly contradictory conclusions across studies. One survey might say that 'the majority of SMEs are taking climate action', while another concludes 'most SMEs are not engaging', and both can be accurate given their specific samples and definitions.

2.3 | Unresolved Tensions and Research Gaps

Despite progress, certain debates remain open. One concerns the voluntariness versus regulation question; how far can we rely on the 'business case' and intrinsic motivation to drive SME decarbonisation, or must policy tightly mandate and enforce action [54], [55]? Another tension is the performance impact of sustainability for SMEs. Some studies (generally adopting a

resource-based view) argue that developing green capabilities enhances SME competitiveness and innovation in the long run [56]. However, many SME remain concerned about the immediate hit to profitability, and empirical findings on financial performance are mixed rather than universally positive [57]. There is also an equity dimension. Will pushing SMEs to decarbonise through regulations or market pressure disproportionately burden the smallest and least resourced firms? How can support be targeted so that 'family' businesses are not left behind in the green transition? These questions are only partially addressed in current research.

In conclusion, the academic literature provides a multifaceted understanding of how SMEs perceive and respond to decarbonisation, while acknowledging significant fragmentation and unanswered questions. Barriers like finance, knowledge and institutional voids are pervasive, yet many SMEs are finding ways to overcome them through internal drive or external support. Methodologically, the need for careful synthesis to navigate the inconsistent data is clear. As such, this background and literature review sets the stage for an analysis of recent (2021–2025) SME survey data with an informed lens, ensuring that a meta-analysis can integrate findings, account for biases and ultimately contribute to closing the evidence gap. This research is timely and, as the OECD puts it, there is 'no net zero without SMEs' [58]. Addressing climate change without the full engagement of SMEs is impossible, and improving our understanding of how to mobilise this sector is an urgent research and policy priority.

3

Methodology

This section provides the theoretical and methodological underpinnings that have allowed the research to take shape. It explores the techniques used, the challenges encountered, and the solutions that both carried the experimentation forward and enabled a deeper understanding of the research itself.

3.1 | Research Design

This research adopts a structured, category-based meta-analysis of UK SME survey data on decarbonisation. The aim is to compare and integrate findings from multiple surveys in order to identify consistent patterns and divergences in reported barriers, motivators, enablers and actions relating to SME decarbonisation.

3.1.1 | Methodological choice

Several methodological options were considered. Conducting primary research (e.g. interviews or new survey work) was rejected due to resource limitations and the challenge of achieving a representative SME sample within the time frame. A systematic literature review of academic sources would have provided theoretical grounding, but would have excluded the rich grey literature produced by financial institutions, government and industry bodies that has become central to SME climate policy debates. A formal meta-analysis involving large, pooled statistical estimates was also considered but deemed unsuitable due to the significant variation in survey design, sampling strategies, question phrasing across sources and ultimately a lack of data volume. These differences made statistical aggregation inappropriate, particularly where underlying populations, survey logic or definitions of 'SME' diverged.

Against this backdrop, a structured, category-based meta-analysis was selected as the most appropriate approach. Meta-analyses are generally more common in medical research due to the high variability in clinical study designs, populations and outcomes however, this heterogeneity is mirrored in the SME context [59]. In this case, a meta-analysis framework enables meaningful comparison across surveys that vary in depth, structure, and methodological rigour, without relying on assumptions of statistical compatibility that the data cannot support. Rather than being limited by the lack of raw response data or standardised instruments, the methodology takes advantage of this, allowing the innate differences in emphasis, framing

and sample to be treated as nuances to interpret, rather than issues or obstacles with the data. In doing so, the method supports the identification of broad patterns in how SMEs perceive and respond to decarbonisation challenges, while also drawing attention to inconsistencies and blind spots in the current evidence landscape. It should avoid false precision while still allowing for grounded generalisation - this makes it well-suited to a policy space where robust, high-quality data remains limited but strategic insight is urgently needed.

3.1.2 | Scope and inclusion criteria

The unit of analysis in this dissertation is the survey. Eligible surveys had to meet the following conditions:

1. The target population was SMEs, defined in accordance with UK government criteria as firms with fewer than 250 employees [1]. Surveys using slightly wider thresholds (e.g. <500 employees) were included if results were clearly marked as SME-specific or widely cited in UK policy debates.

2. The survey reported empirical data on at least one of the following: barriers to decarbonisation, motivations for action, or forms of support/enabling conditions.

3. The survey was UK-focused, or reported and differentiated a substantial UK subsample within a wider European or global data set.

4. The survey was conducted between 2021 and mid-2025, a period aligned with the UK government's net zero commitments and the growing prevalence of SME climate surveys.

Surveys were excluded if they lacked sufficient methodological transparency (e.g. no sample size reported), focused solely on environmental themes unrelated to decarbonisation (e.g. biodiversity, plastics), or if their focus was narrower than the scope of this research. For example, an FSB study on helping small businesses during the energy crisis was not included in the main data set, as its narrow focus on energy consumption risked skewing the findings away from broader decarbonisation practices [60]. However, such studies were retained for contextual discussion in the literature review. Annual waves of the same survey (e.g. the British Business Bank's SME Finance Survey [3]) were included but coded separately, with clear metadata, so that they could be treated either individually or comparatively depending on the analytical requirement. Where multiple documents reported on the same survey (e.g. a summary infographic and a full technical report), only the most detailed version was included to avoid duplication.

3.2 | Source Identification

Before searching for data, five categories of organisations were identified to ensure that a broad and representative mix of sponsors and institutions were included. This reduced the risk of institutional bias and allowed for a more guided approach to finding data. The categories are shown in Table 3.1.

Table 3.1: Classification of survey publishers by institutional group.

Group	Description
Financial institutions	Includes banks such as NatWest and HSBC, which increasingly commission surveys of SMEs to understand risk exposure, financing demand and sustainability commitments.
Government (public sector)	Includes surveys sponsored or commissioned by government departments or public agencies such as the ONS and the UK Business Climate Hub (backed by DESNZ).
Industry platforms	Includes trade associations and membership bodies. Organisations such as the FSB and Small Business Britain often survey their members to represent sectoral positions in policy discussions.
Support and standards initiatives	Includes partnerships or third-sector organisations such as the SME Climate Hub and BSI that generate survey evidence to guide programme design and encourage SME engagement.
Businesses (private sector)	Includes large companies such as Sage, Biffa, and DHL that conduct surveys either as part of corporate responsibility initiatives or to build thought leadership in sustainability.

Based on these categories, sources were then identified through three channels. First, a systematic scan of major institutions known to publish SME-related climate material was conducted, covering each of the five categories. Second, targeted searches were conducted with combinations of terms such as 'SME decarbonisation survey UK', 'small business net zero report', and 'SME climate barriers survey'. Lastly, reference chaining was used - citations within survey reports often pointed to earlier or parallel studies, which were then retrieved. This process yielded a final data set of surveys that was well balanced as well as appropriate for analysis.

3.3 | Data Extraction

3.3.1 | Variables captured

To ensure consistency across sources and study replicability, a structured data extraction template was applied to each survey. This enabled surveys with diverse framing and methodologies to be systematically compared within a common analytical framework. The extraction focused on both descriptive metadata and content-specific responses related to SME decarbonisation. Core content fields included the top barriers, motivators, enablers and actions reported by SMEs, along with indicators of intent and planned future measures. These were chosen because of their frequency in the literature, relevance to policy and behavioural frameworks, and consistent appearance across the majority of surveys, all of which enabling strong cross-study comparison.

Data in these categories was only collected if an associated percentage was present in order to enable quantitative comparison. Separate categories captured broader engagement indicators, such as whether firms had a net zero strategy or calculated their emissions. Additional contextual notes, including regional or sectoral differences and survey-specific caveats, were also recorded to support interpretation. A full summary of data categories captured during extraction is shown in Table 3.2.

3.3.2 | Interpreting and harmonising survey framings

Heterogeneity across surveys was not limited to their structure or metadata, but extended into the conceptual framing of questions and response categories. As such, a critical part of the extraction process involved making interpretive decisions about how differently worded items could be meaningfully grouped for comparative purposes. Surveys varied in how they presented the drivers and consequences of SME action. For example, while some might ask directly about 'motivators' or 'reasons for decarbonisation', others frame the same issue in terms of perceived 'benefits' or 'opportunities' associated with sustainable practices. In this research, such responses were interpreted as functionally equivalent and recorded under the common category of motivators, provided they clearly indicated a factor that influenced SME behaviour towards action. Likewise, where surveys reported 'barriers to energy efficiency' or 'reasons for inaction', these were treated as barriers to decarbonisation if the context was sufficiently broad or aligned with the intent of the study. Where uncertainty existed, items were flagged for review and only included when interpretation could be clearly justified. This interpretive mapping enabled the inclusion of a wider set of surveys while maintaining conceptual clarity. However, it also introduced a degree of subjectivity, which is acknowledged and addressed through transparent categorisation rules (see Section 3.4) and the consistent application of the structured extraction template. In essence, the heterogeneity presented in this context was analytical and required close reading, contextual judgment of subjective constraints, and manual alignment of framings to the given categories.

Table 3.2: Data categories captured during structured survey extraction.

Data Category	Description
Metadata	Source title, year of publication, commissioning organisation, geographic scope, SME definition, sample size, SME breakdown, survey mode (online, telephone, in-person), survey period and sector coverage.
Barriers	Top three barriers reported by SMEs that are preventing them from acting. Expressed as a title and a percentage.
Motivators	Top three factors reported by SMEs that motivate them / would make them want to act. Expressed as a title and a percentage.
Enablers	Top three supportive policies, financial instruments or conditions that SMEs indicated would help them act. Expressed as a title and a percentage.
Actions	Top three measures that SMEs reported as already taken (e.g. energy efficiency upgrades, waste reduction). Expressed as a title and a percentage.
Intent/Priority to Act	Whether SMEs reported an intent or priority to act on sustainability. Expressed as a percentage.
Intended Actions	Top three measures SMEs reported planning to take or prioritising within a defined future period (typically 12 months). Expressed as a title and a percentage.
Net Zero Engagement Indicators	A set of quantitative indicators used to reflect SME engagement with net zero, including existence of a net zero strategy, development of a strategy in progress, reported emissions reductions and whether emissions are measured or calculated. Expressed as a percentage.
Special Notes	Sectoral or regional differences, and interpretive caveats noted during data collection.

3.3.3 | Inputting extracted data

To ensure efficient processing of the data later on, a standardised naming convention was also applied at this stage. Each extracted item was assigned a structured column name indicating both its type and position (e.g. 'Barrier 1', 'Motivator 2 Percentage', 'Action 3 Category'). This ensured that related categorical and numeric response fields could be automatically paired and processed without ambiguity. By imposing this naming structure at the point of extraction, the later stages of analysis could be automated with confidence, avoiding the need for manual column identification or inconsistent mappings.

3.4 | Categorisation

To facilitate synthesis across surveys with varied question structures and terminology, all extracted items related to barriers, motivators, enablers, actions, and intended actions were categorised using a consistent coding schema. This classification was developed iteratively during the data extraction process and drew on common themes found across the evidence base. Initially, a singular schema that encompassed all barriers, motivators, enablers, actions and intended actions was attempted; however, this was found to be analytically limiting, as it failed to distinguish between the factors that influence behaviour and the behaviours themselves. Separating them into two schemas reduced ambiguity and enabled better supported comparative analysis across surveys.

3.4.1 | Barriers, motivators and enablers

Regarding barriers, motivators and enablers, the coding framework was based on seven overarching categories: Finance, Capability, Information, Policy, Technology, Market and Values. These categories were chosen for their conceptual clarity and empirical significance in the data set, enabling consistent coding of survey responses regardless of phrasing. For example, 'access to finance' and 'lack of capital' would both be coded under Finance, while 'difficulty in reducing emissions' and 'lack of time' would be classified under Capability. Table 3.3 provides definitions and examples for each category as applied during extraction.

3.4.2 | Actions and intended actions

Actions and intended actions were categorised into six standard types based on their nature and operational focus. These categories allowed for the varying responses, in this case operational measures, to be grouped consistently. Table 3.4 provides definitions and illustrative examples.

3.5 | Data Processing

Following extraction and categorisation, the structured survey data was processed using a custom Python (version 3.12.11) script designed to generate visualisations of results. The codebase was built using pandas for data manipulation (version 2.3.1), matplotlib for plotting (version 3.10.5) and numpy for array operations (version 2.3.2). All outputs were generated from the evidence base, stored in an Excel spreadsheet containing the fully extracted data set.

3.5.1 | Frequency and variation

Initial figures were generated using raw frequency counts of reported categories across all included surveys. Up to three entries were recorded per survey per dimension (barriers, mo-

Table 3.3: Coding schema for barriers, motivators and enablers.

Category	**Explanation**	**Example**
Finance	Monetary factors that influence action, including costs, affordability, access to funding and return on investment.	'Current economic conditions' (barrier) / 'Lower cost to their energy bill' (motivator).
Capability	The organisation's skills, expertise and operational capacity to implement decarbonisation measures.	'Difficulty in reducing emissions outside of own operations' (barrier) / 'Training programmes' (enabler).
Information	Awareness, understanding and access to reliable data, advice or guidance on decarbonisation.	'Lack of clarity on sustainability metrics' (barrier) / 'Advice on best options for my business' (enabler).
Policy	Influence of laws, regulations and government programmes, including both compliance obligations and supportive policies.	'Lack of supportive policies or government incentives' (barrier) / 'Enabling environment and coherent policy frameworks that incentivise and support action by SMEs' (enabler).
Technology	Availability, suitability and ease of integrating low-carbon technologies into operations.	'Help buying and using technology effectively to help to reduce our environmental impact' (enabler) / 'Sustainable delivery options' (enabler).
Market	Customer demand, competitive pressure or supply chain requirements driving or hindering decarbonisation.	'Assuming customers unwilling to pay for more sustainable products' (barrier) / 'Appealing to environmentally conscious customers' (motivator).
Values	Ethical drivers, brand positioning and leadership vision motivating sustainability actions.	'Addressing climate change' (motivator) / 'Appealing to environmentally conscious customers' (motivator).

Table 3.4: Coding schema for actions and intended actions.

Category	Definition	Example Actions
Energy Efficiency	Actions to reduce energy consumption in operations through more efficient equipment, processes or building upgrades.	LED lighting upgrades, insulation, HVAC optimisation, energy management systems.
Renewable Energy	Adoption or procurement of energy from renewable sources.	Installing solar PV, switching to a green electricity tariff, biomass boilers.
Process Improvements	Optimising production or service delivery methods to reduce environmental impact.	Lean manufacturing, low-carbon product redesign, water efficiency upgrades.
Waste Reduction	Minimising waste and maximising reuse, recycling and resource recovery.	Implementing recycling systems, product take-back schemes, material reuse programmes.
Behavioural Change	Influencing staff behaviour and organisational culture towards sustainability.	Employee training, energy-saving campaigns, sustainability champions.
Supply Chain Engagement	Working with suppliers, customers or partners to reduce environmental impacts beyond direct operations.	Sustainable procurement policies, supplier audits, joint emissions reduction projects.

tivators, enablers, actions taken and actions intended), and these were tallied to produce unweighted totals. Each count corresponds to a unique mention of a given category in a distinct survey. These totals were visualised in bar charts to highlight which categories appeared most frequently across the evidence base. For surveys that provided response proportions, box plots were also used to depict interquartile ranges and medians over time, thereby illustrating between-survey variation. While this measure risks treating all surveys equally regardless of sample size, it provides a useful benchmark of theme visibility across the evidence base. Furthermore, weighted and normalised surveys were later implemented to mitigate this.

3.5.2 | Weighting of responses

To ensure that individual survey entries were not treated as equivalent regardless of scale, responses were weighted by the size of the underlying sample. Where survey i reported a percentage share $p_{i,c}$ of respondents identifying category c (e.g. finance as a barrier) and a total sample size n_i, a weighted count was constructed as:

$$w_{i,c} = p_{i,c} \times n_i$$

These values were aggregated across all surveys in a given year, and then normalised by the sum of contributing sample sizes to produce a weighted proportion:

$$\hat{P}_{y,c} = \frac{\sum_{i \in y} p_{i,c}\, n_i}{\sum_{i \in y} n_i}$$

where $\hat{P}_{y,c}$ denotes the weighted proportion of SMEs reporting category c in year y. This procedure effectively scales each survey's contribution by the number of businesses it represents, improving comparability between large-scale national instruments and smaller association-led polls. For example, if a 2023 national survey of $n = 1{,}000$ SMEs, reported a 40% response rate for finance as a barrier, and a sectoral survey of $n = 100$ reported 60%, the weighted share is calculated as:

$$\hat{P}_{2023,\text{finance}} = \frac{(0.40 \times 1000) + (0.60 \times 100)}{1000 + 100} = 0.418$$

or 41.8%. This contrasts with a simple unweighted average, which would have given equal weight to both surveys and reported 50%. Weighting therefore mitigates distortions from small-N surveys, though, as discussed in Section 5.1.3, it cannot eliminate underlying heterogeneity in survey design and framing.

3.5.3 | Normalising for institutional imbalances

To compare how different institutional groups emphasised barriers, motivators or enablers, frequency counts were normalised within each group. This procedure accounts for the fact that some groups (e.g. financial institutions) contributed more distinct surveys than others, which would otherwise inflate their absolute counts. For each group g and category c, the raw count $f_{g,c}$ was divided by the total number of mentions across all categories within that group, T_g, to yield a normalised share:

$$h_{g,c} = \frac{f_{g,c}}{T_g}$$

where $h_{g,c}$ denotes the proportion of category c mentions relative to all coded items reported by group g. The resulting matrix of $h_{g,c}$ values forms the basis for the heat maps presented in Section 4, with each column summing to unity.

As an illustration, suppose industry platforms mentioned three categories: finance (12), capability (8) and policy (20). The normalised proportions are computed as:

$$h_{\text{industry,finance}} = \frac{12}{12+8+20} = 0.30, \quad h_{\text{industry,capability}} = \frac{8}{40} = 0.20, \quad h_{\text{industry,policy}} = \frac{20}{40} = 0.50$$

This ensures that comparisons across groups reflect their relative emphases rather than the raw volume of responses, thereby controlling for unequal survey representation between institutional actors.

4

Results

The results in this section directly address the aims and objectives of this study, which sought to synthesise survey evidence on how UK SMEs perceive and respond to decarbonisation. By structuring disparate survey findings into a harmonised data set, the section builds a more coherent picture of SME readiness for net zero. Results are presented in a sequence of structured analyses. Each section is supported by figures designed to capture both aggregate patterns and underlying variation. The sections are:

- *Overview of Evidence Base* (section 4.1) summarises the composition of the data set, including coverage by institution type and survey year.
- *Barriers* (section 4.2) identifies the most frequently cited obstacles to SME decarbonisation, and presents their relative prevalence, variation over time and spread across institutions.
- *Motivators* (section 4.3) shows the drivers of SME action, focusing on their distribution, volatility and the contrasting emphases between values-based and market-driven influences.
- *Enablers* (section 4.4) presents the supportive conditions most often reported, such as policy and technology, and shows how they evolve across the 2021–2025 period.
- *Actions, Intended Actions and Broader Evidence* (section 4.5) compares what SME report having already undertaken with what they prioritise for the future, and evaluates the relative weight of barriers, motivators and enablers across the survey record.

4.1 | Overview of Evidence Base

The data set assembled for analysis covers more than twenty distinct surveys conducted between 2021 and 2025, with a summary of these shown in Table 4.1. As shown in Fig. 4.1, survey sponsorship spans government departments, financial institutions, industry platforms, third-sector initiatives and private businesses. Support & standards and financial institutions account for the majority of surveys, reflecting their strong interest in SME readiness for Net Zero, while industry and private contributions are more selective. Government / public sector have the fewest responses. The temporal coverage is relatively even across the period, enabling examination of evolving SME sentiment as the UK approaches its 2030 interim targets.

Table 4.1: Summary of surveys included in the evidence base.

Title	Year	Lead / Publisher
NatWest Sustainable Business Tracker Q1 2023	2023	NatWest Group / S&P Global
Business Finance Survey	2025	British Business Bank / Ipsos
SME Finance Survey	2024	British Business Bank
SME Finance Survey	2023	British Business Bank
Smaller business and the transition to net zero	2021	British Business Bank
From Now to Net Zero	2023	Lloyds Bank
Up to 4 million small businesses have no plans...	2022	Lloyds Bank
UK business action on net zero and historical...	2021	Office for National Statistics
2024 UK Net Zero Business Census	2024	UK Business Climate Hub
New Growth	2025	FSB / Zurich UK
Accelerating Progress	2021	FSB
Small Business, Green Growth	2024	Small Business Britain / BT
Sustainability Meets Growth: A Roadmap for...	2025	WEF / Schneider Electric
Mobilizing Small Businesses to Net Zero	2025	SME Climate Hub
Mobilizing Small Businesses to Net Zero	2024	SME Climate Hub
Small Business Climate Action	2023	SME Climate Hub
BSI Net Zero Barometer Report 2025	2025	BSI
SMALL BUSINESS SUSTAINABILITY: Insights...	2022	Small Business Britain
Sustainability matters: DHL Express' Global Sur...	2024	DHL
Circularity Survey Results	2024	Biffa
The Climate Impact of SMEs	2022	Sage

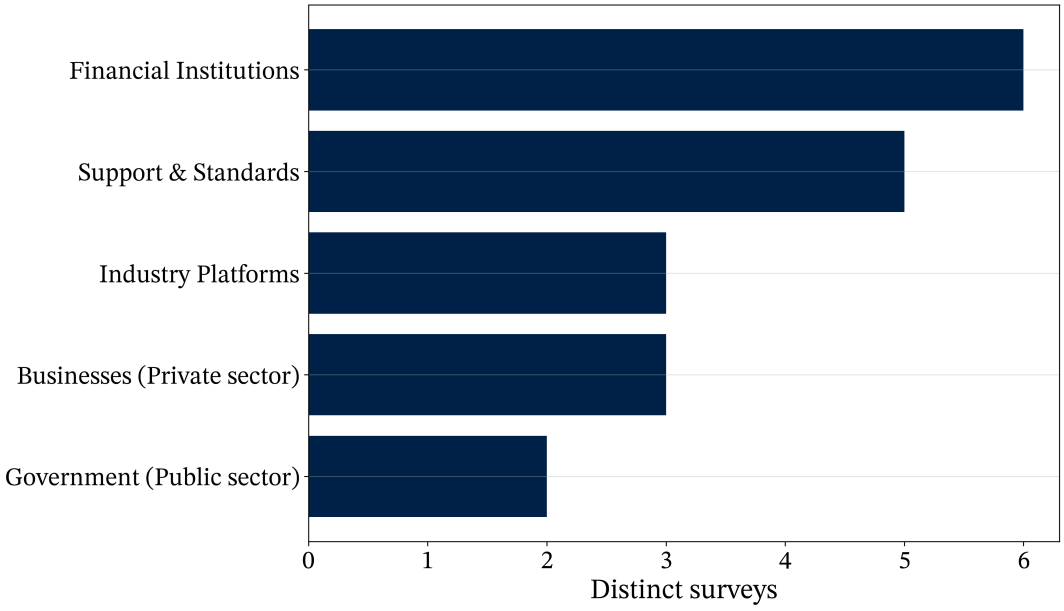


Figure 4.1: Distribution of surveys by institutional group.

4.2 | Barriers

Barriers to SME decarbonisation were the most consistently captured dimension across the evidence base. Fig. 4.2 shows the overall distribution of barrier categories, with finance emerging as the dominant constraint. Of the 60 recorded barrier entries, 26 related to financial obstacles, more than double the next largest category (capability, 12 entries). Information, policy, market and values barriers were each reported less frequently, while technology barriers do not appear at all.

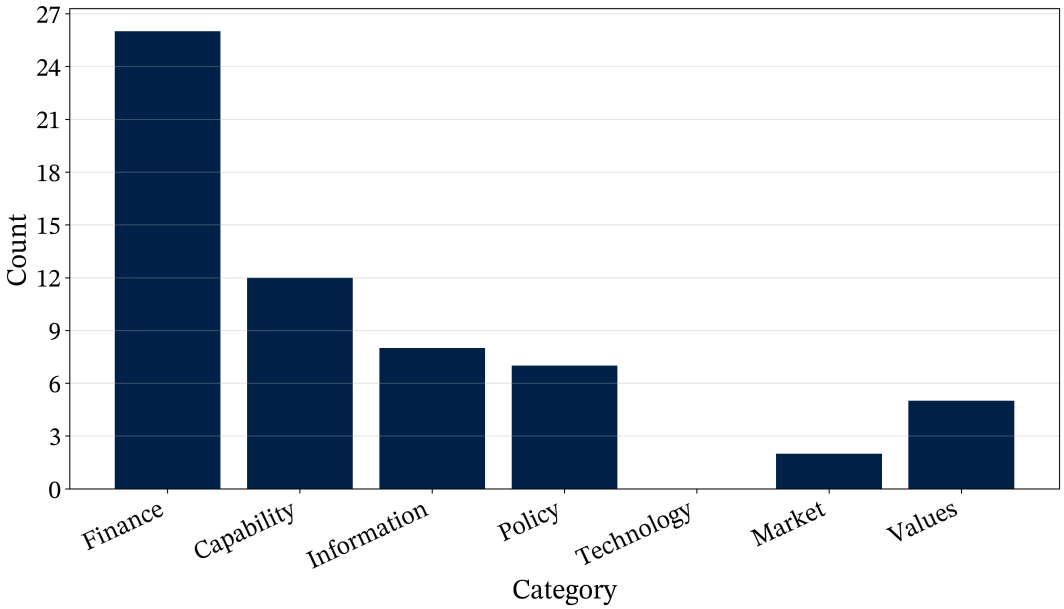


Figure 4.2: Frequency of barrier categories across surveys.

Stacked bar charts by year (Fig. 4.3) present the proportion of respondents, weighted by sample size, who reported each barrier category. The figure shows a gradual increase in reported barriers over time, with the total weighted score rising from under 1.0 to over 2.0. Finance is the most consistently reported barrier across all years, maintaining a dominant share throughout. Capability also features prominently across the time series, peaking in 2023 and 2024. Policy emerges more strongly in the latter years, becoming a significant contributor in both 2024 and 2025, whereas it was largely absent in earlier years; this is also true for market barriers. Information barriers remain modest but stable. Values are more sporadic but consistent in representation when they do appear. Technology barriers do not feature.

Finance barriers not only dominate in frequency, but also show marked variability across surveys. Fig. 4.4 shows the dispersion of finance-related barriers across surveys by year. Median values rise from around 30% in 2021 to over 60% in 2023, before moderating to around 50% in later years. The ranges are consistently high, particularly between 2022 and 2024. Individual entries in 2023 range from below 40% to nearly 70%.

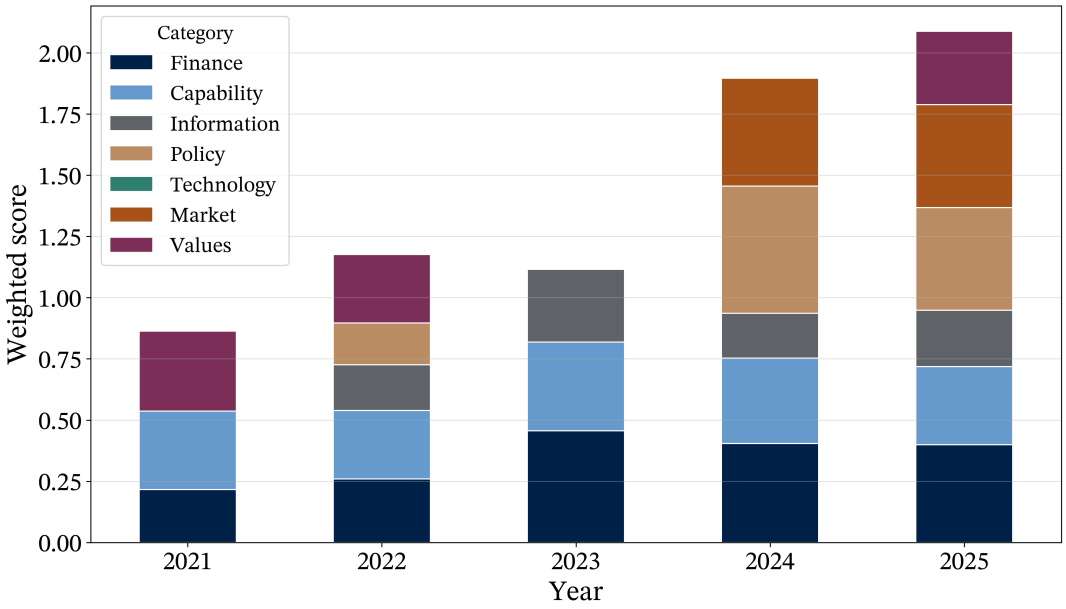


Figure 4.3: Reported barriers over time (weighted, stacked).

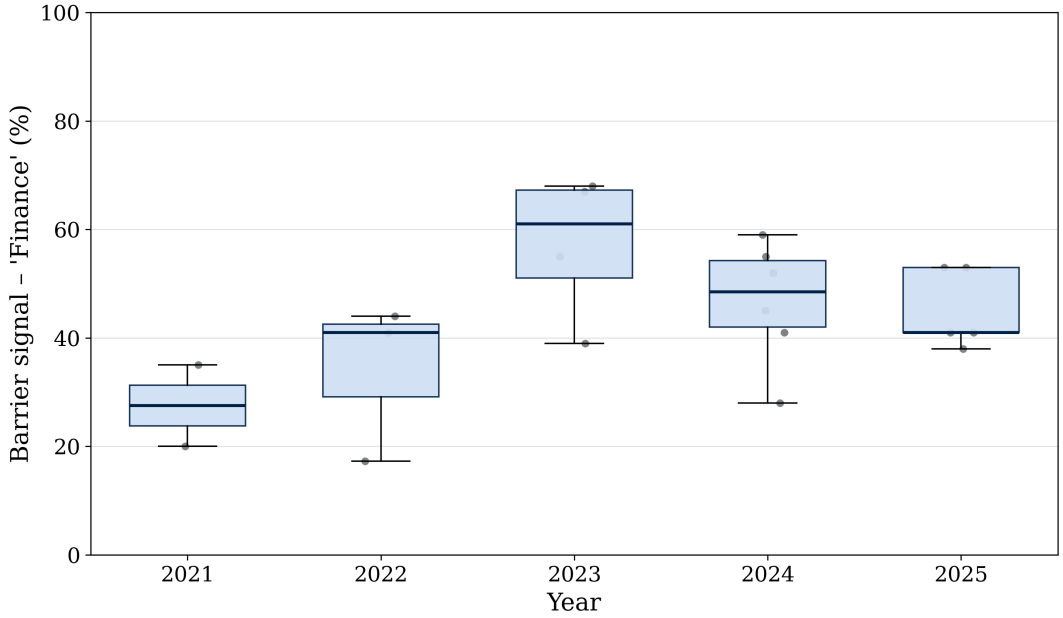


Figure 4.4: Variation in finance-related barriers across surveys.

Fig. 4.5 presents the box plot for capability-related barriers. These show lower and more stable medians than their finance-related counterparts, generally in the 30–40% range. The relatively modest weighting may reflect the fact that capability constraints (e.g. lack of internal knowledge) are often perceived as longer-term or structural issues, rather than acute, high-priority barriers. In contrast, financial pressures such as energy price volatility or capital access tend to spike during periods of macroeconomic stress. The subdued prominence of capability barriers may therefore be partially explained by the inflationary and cost-of-living crisis during this period [22], which likely shifted SME concern towards more immediate financial survival rather than internal capacity-building. Nonetheless, the notable spread of responses in 2023 and 2024, where interquartile ranges span 20–25 percentage points, suggests that for some firms, capability remains a significant constraint, potentially linked to labour shortages or the difficulty of accessing advice tailored to SME needs. Fig. 4.6 presents the distribution of bar-

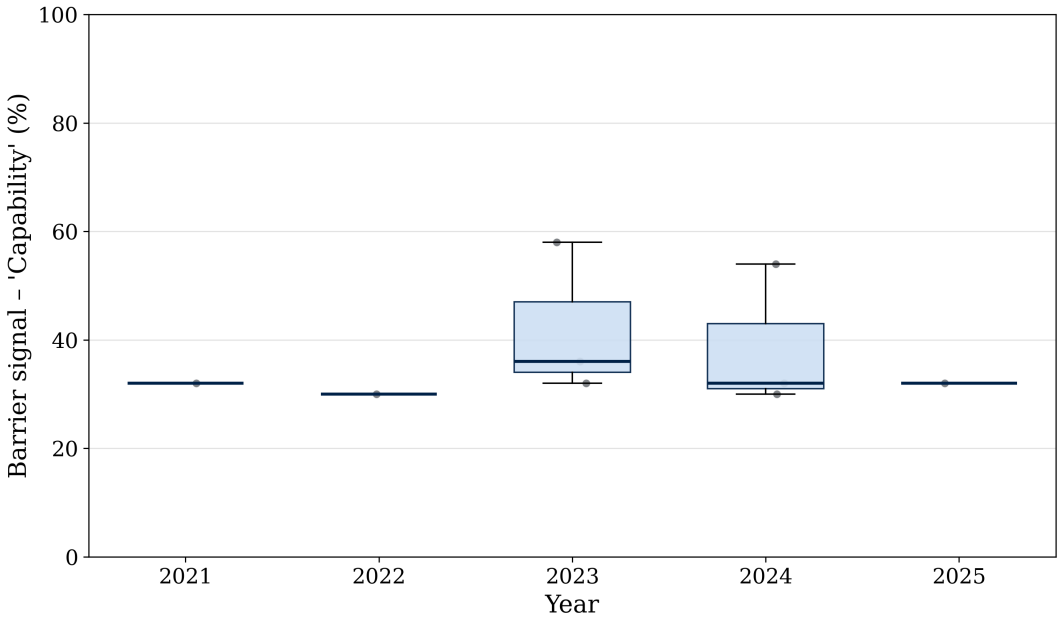


Figure 4.5: Variation in capability-related barriers across surveys.

riers reported by institutional group, normalised to account for differences in the distribution of survey types. Finance emerges as the most consistently reported barrier across all groups, representing one-third to one-half of cases depending on the institution. Capability barriers appear most prominently in industry platform and support organisation surveys, while information is more commonly emphasised by businesses. Policy barriers are present across all groups other than industry platforms, however they are at relatively lower proportions, with public sector surveys citing them more frequently than others. This is similar for values-related barriers. Market barriers occur minimally and only in private sector surveys, and technology barriers do not show at all. Overall, there is a fairly even balance between the variation of categories reported and the type of institutions reporting them.

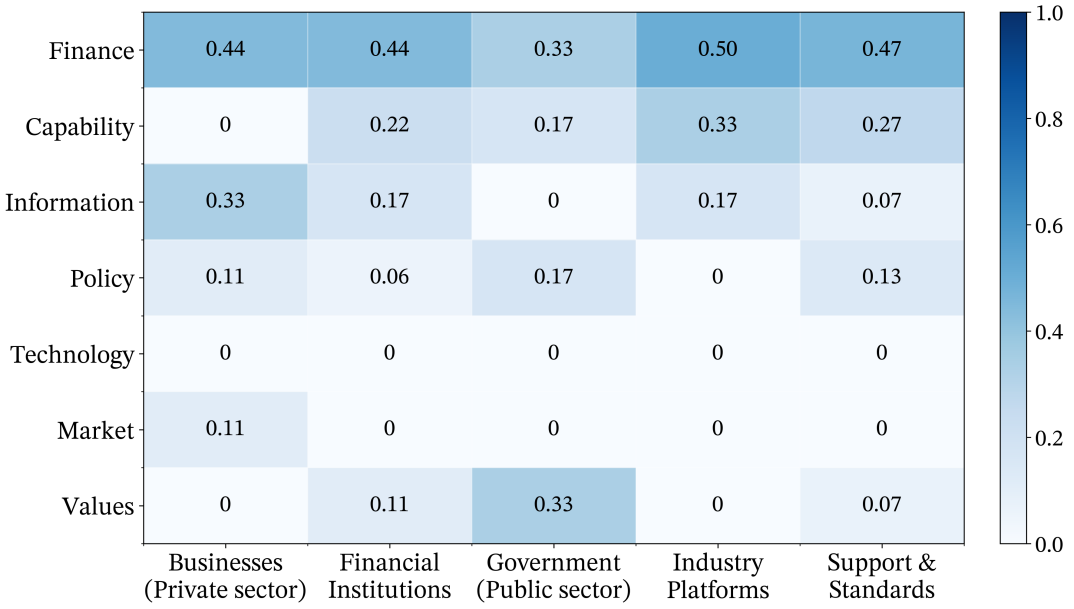


Figure 4.6: Barriers reported by institutional group (normalised).

4.3 | Motivators

Motivators are most frequently reported (Fig. 4.7) in relation to market dynamics and values. Of the 25 motivator entries coded across the evidence base, 11 related to market pressures such as customer demand or competitive positioning, and 7 related to values, including reputation, ethics or employee expectations. Financial and policy-based motivators appear less frequently with 4 and 3 entries respectively, and capability, information and technology not at all. This distribution contrasts sharply with barriers, where finance dominates.

Fig. 4.8 shows the distribution of reported motivators over time, weighted by the number of respondents per survey and adjusted to the percentage of respondents selecting each category. Overall motivational reporting increased between 2021 and 2024, peaking at a total weighted score of around 1.5 before declining slightly in 2025. Values-based motivators feature strongly throughout and dominate the responses in 2024. Market motivators also play a consistent role across the time series, with a notable increase in 2023. Finance emerges from 2023 onwards as a recurrent motivator, reaching similar levels to Market. Policy motivators are non existent in early years but do appear in 2025, while Technology, Information and Capability remain absent across the period.

Values-related motivators display wide variation across surveys and years (Fig. 4.9). In 2021 and 2024, reported values signals were relatively strong and consistent (around 45% and 73% respectively), whereas in 2022 the recorded level was very low (17%). In 2023, values motivators spanned a broad range, with survey results distributed between 33% and 72%, showing divergence in how strongly reputational or ethical concerns were emphasised. In 2025, signals narrowed again but at a more moderate level (27%).

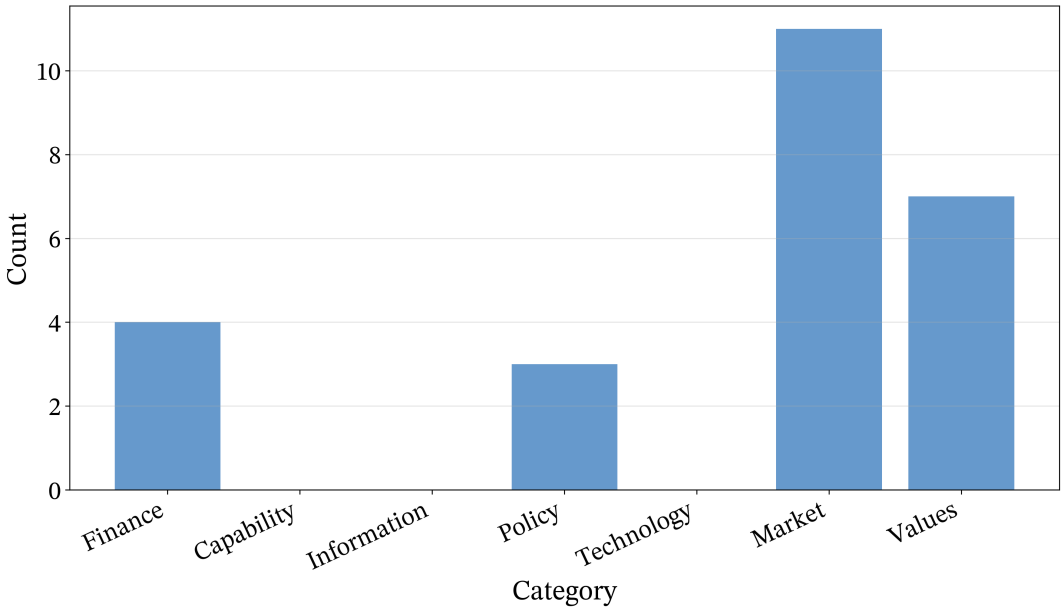


Figure 4.7: Frequency of motivator categories across surveys.

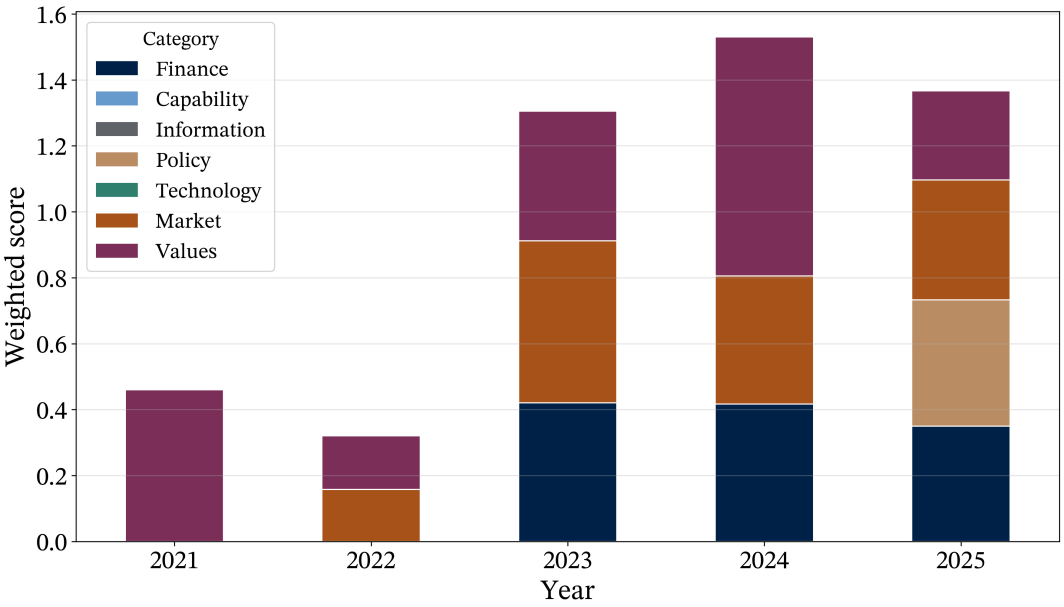


Figure 4.8: Reported motivators over time (weighted, stacked).

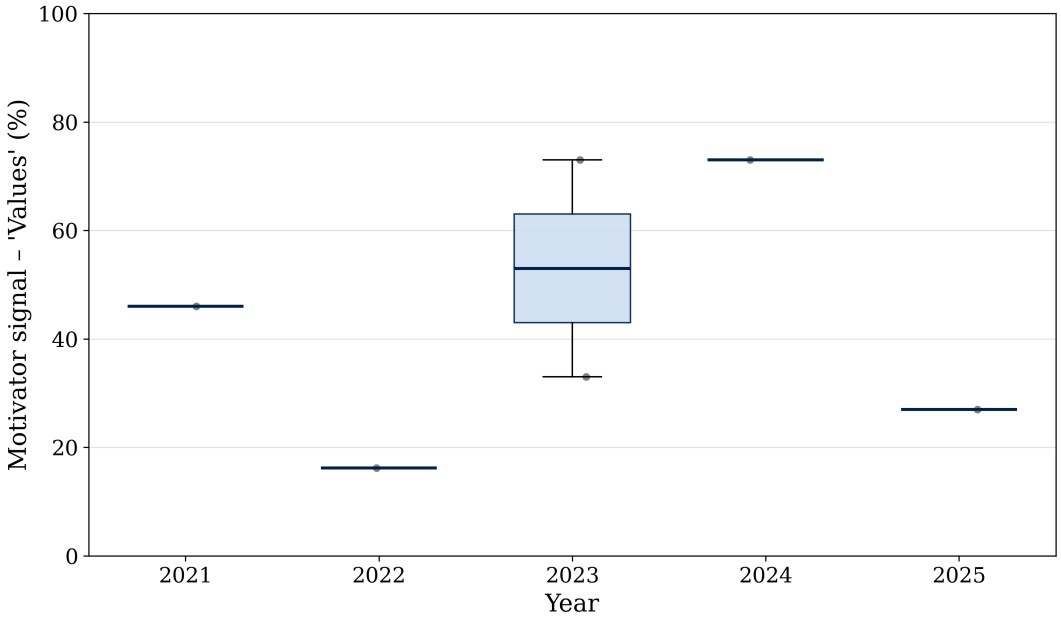


Figure 4.9: Variation in values-based motivators across surveys.

Market motivators also exhibit marked variation (Fig. 4.10). In 2022 the reported level was minimal (16%), yet by 2023 surveys consistently recorded stronger signals, clustered between 50–65%. The distribution narrowed slightly in 2024, with values concentrated between 37% and 49%, but widened again in 2025, where responses ranged from 20% to 61%.

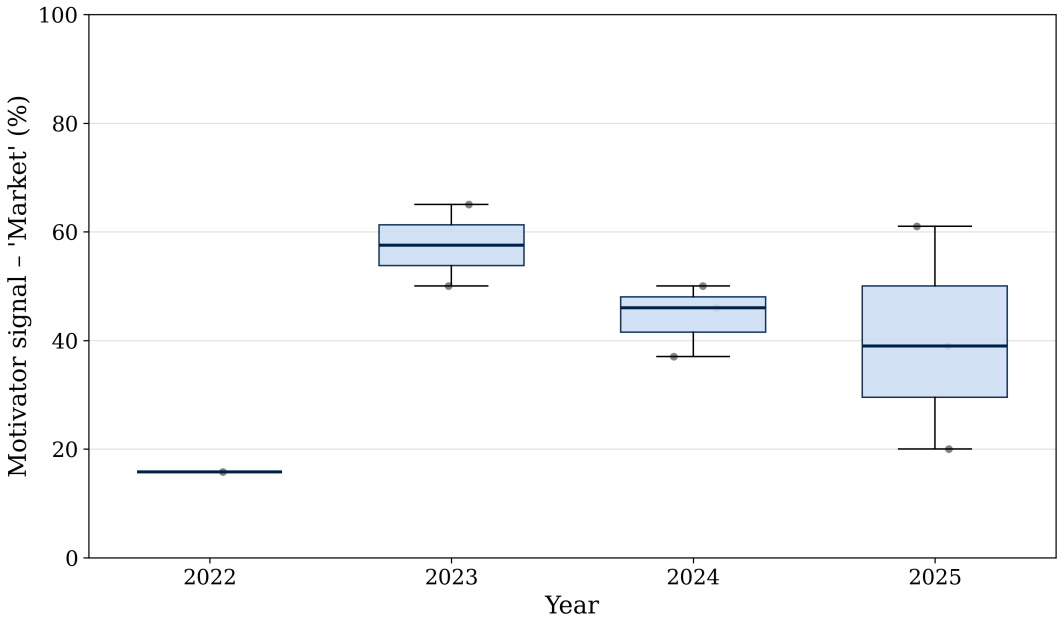


Figure 4.10: Variation in market-related motivators across surveys.

Fig. 4.11 shows the normalised distribution of motivators reported by institutional group. Market-related motivators are most commonly emphasised, particularly in industry platform surveys, where they are the only response type, and in private-sector and financial institution surveys, where they account for around half and 43% of motivators respectively. Values-based motivators are also frequently reported, cited as the only response type in government surveys and as half of private-sector responses. By contrast, policy and finance motivators appear only sporadically, and capability, information and technology are entirely absent from motivator reporting across the evidence base. Unlike barriers, motivators have a less gradual spread across categories.

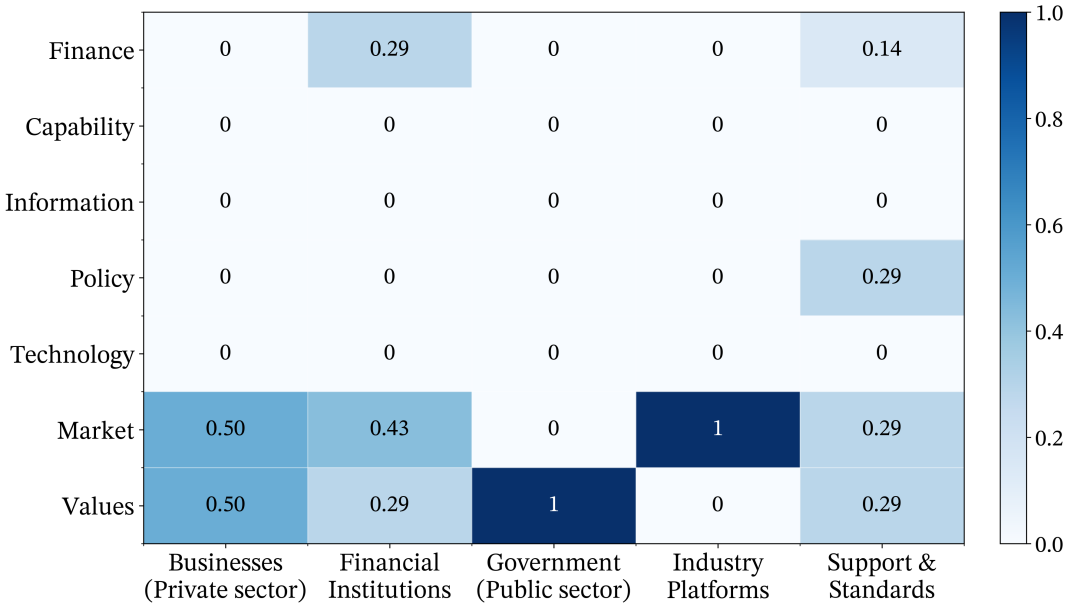


Figure 4.11: Motivators reported by institutional group (normalised).

4.4 | Enablers

The overall distribution of enablers is shown in Fig. 4.12. Policy is the most frequently reported enabler, cited in 13 instances across the evidence base. This is more than double the next most common categories, information (6) and technology (5), which nonetheless feature regularly as supporting conditions for SME decarbonisation. Finance and capability are only infrequently mentioned, each appearing twice, while market and values-related enablers are absent from the data set.

Fig. 4.13 displays the weighted distribution of reported enablers by year, again taking into account both sample size and the percentage of respondents selecting each category. Overall reporting of enablers fluctuates across the time period, with peaks in 2021 and 2024 and a notable dip in 2022. Policy and Information emerge as the most consistently cited enablers. Policy

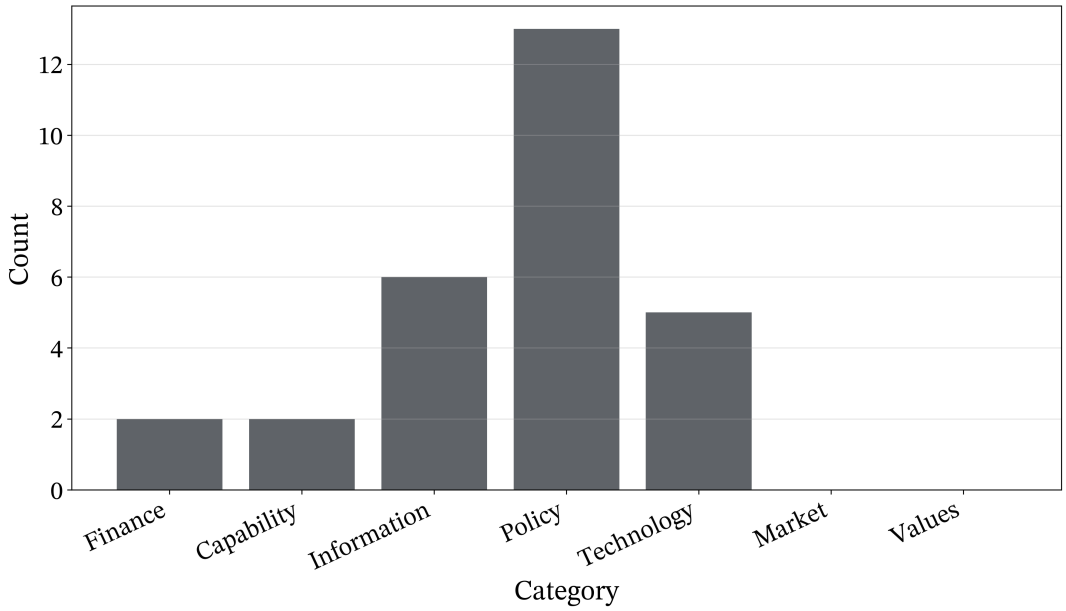


Figure 4.12: Frequency of enabler categories across surveys.

dominates in 2021, 2024, and 2025, accounting for the largest share in those years. Information appears steadily throughout. Finance features prominently in 2021 and 2023 but are less visible in later years. Capability enablers appear only in 2024 and technology enablers appear in 2022 and 2024, while Market and Values are absent across the full time series. This distribution suggests a persistent institutional framing of enablers, with softer organisational capacities and external demand-side signals receiving comparatively little attention.

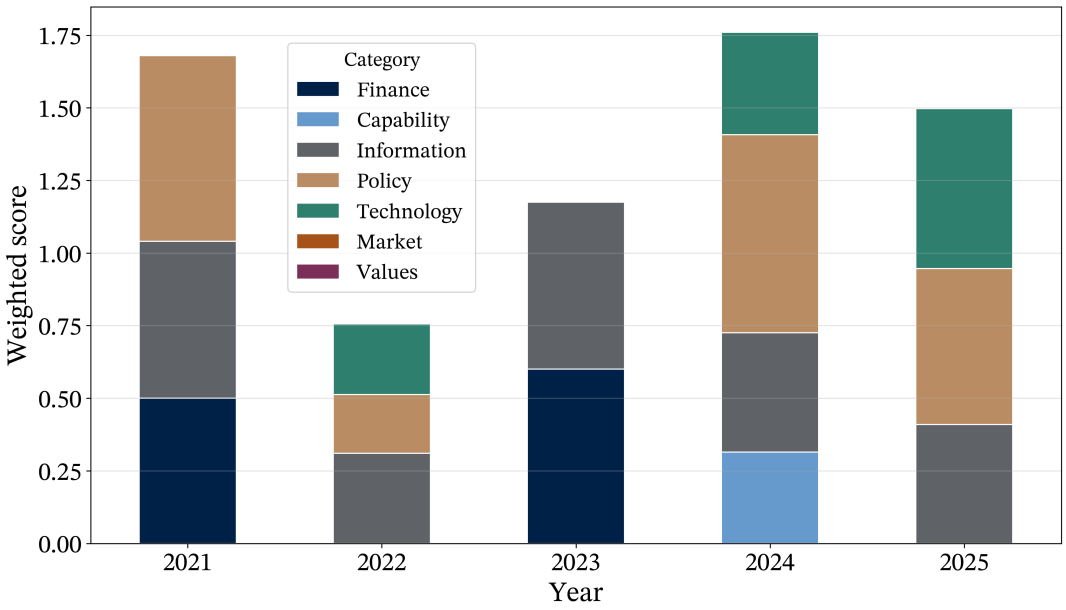


Figure 4.13: Reported enablers over time (weighted, stacked).

Fig. 4.14 presents the distribution of policy-related enabler signals over time. In 2021 and 2022 the data are limited to single reported values at around 64% and 20% respectively. Data in 2023 are non existent however from 2024, more variation is visible: in 2024, the central values cluster around 60–70%, though one survey reports a lower figure near 40%. In 2025 the results narrow again to a consistent band between 60% and 65%. Overall, the figure shows that policy-related enablers are reported across surveys with moderate to high weighting in most years, but with a few isolated lower responses.

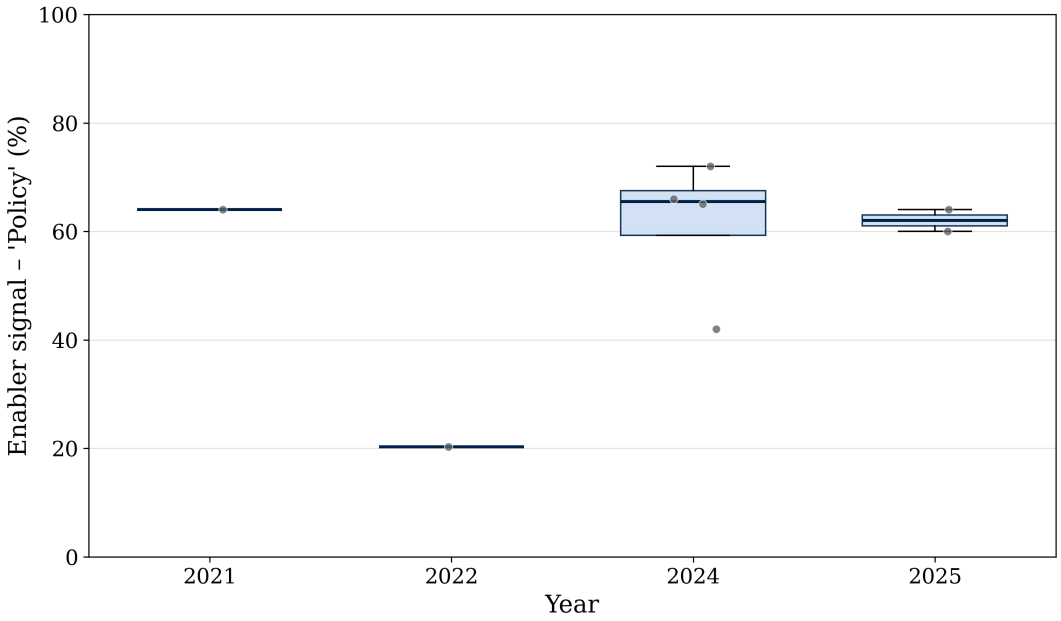


Figure 4.14: Variation in policy-related enablers across surveys.

Fig. 4.15 shows the distribution of technology-related enabler signals between 2022 and 2025. In 2022, only a single survey reported on this category, with a value of around 25%. 2023 had no data entries, however in 2024, multiple surveys provide a wider spread of results, ranging from approximately 34% to 52%, with the median near 40%. In 2025, reporting narrows again to a single value of around 55%. Overall, references to technology as an enabler appear only intermittently across years, with moderate weighting where reported.

Fig. 4.16 shows the normalised distribution of enablers reported by institutional group. Policy dominates across all institutional types, making up all responses in government surveys, two-thirds in industry platform surveys, and one-third in financial institution and support body surveys. Information appears more variably, cited in around one-third of private-sector, financial institution and support body surveys. Technology emerges here as an enabler rather than a barrier and is referenced exclusively by private-sector surveys (43%) and occasionally by support bodies (17%). Finance features only in financial institution surveys (33%) and support bodies (17%), while capability, market and values are absent from enabler reporting.

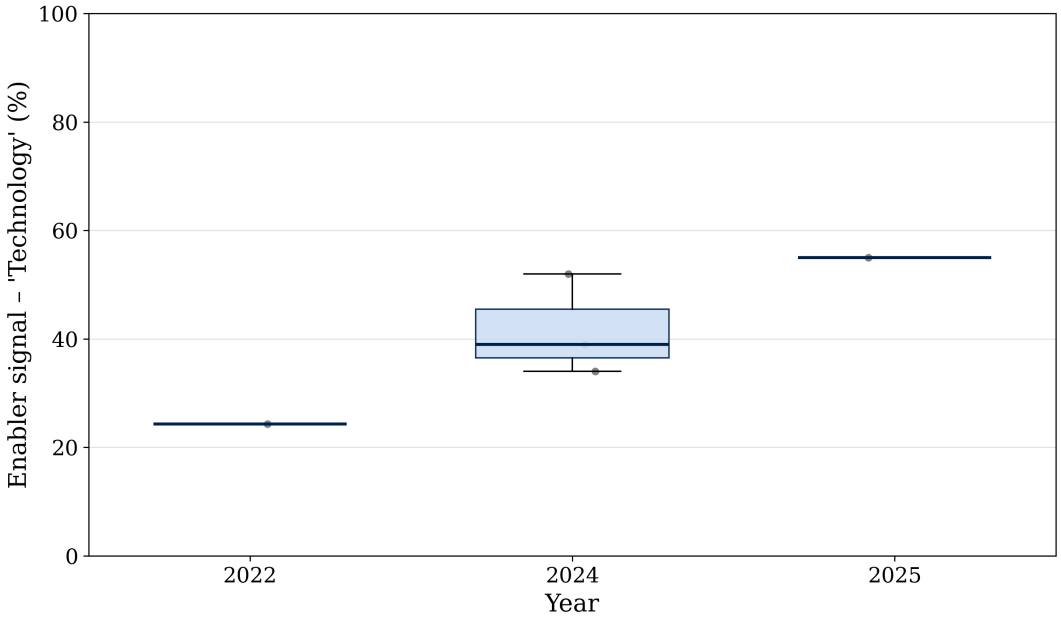


Figure 4.15: Variation in technology-related enablers across surveys.

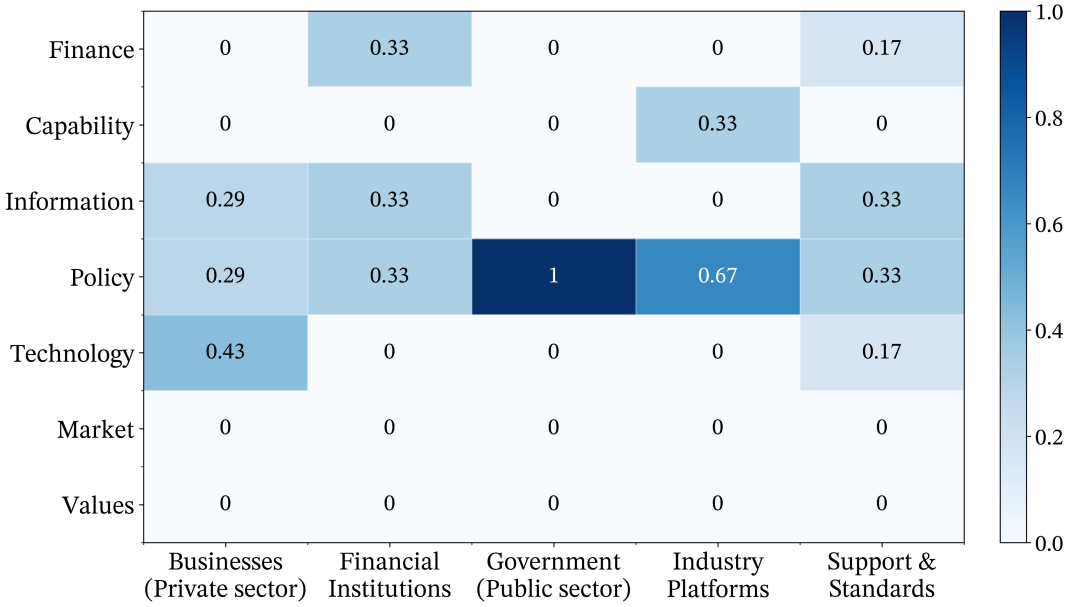


Figure 4.16: Enablers reported by institutional group (normalised).

4.5 | Actions, Intended Actions and Broader Evidence

Fig. 4.17 compares the frequency of actions SMEs report already having undertaken against those they intend to pursue. Across all categories, actual actions are greater than or equal to intended ones. Energy efficiency dominates both groups, but the gap is notable with 20 mentions for actual versus 6 for intended. Waste reduction and behavioural change also show higher frequencies of actual than intended actions (7 vs 2 and 7 vs 5, respectively). Renewable energy and process improvements are more balanced, with actual and intended actions reported at similar low levels (2–3 mentions each). Supply chain engagement remains rare in both cases, with only one mention each.

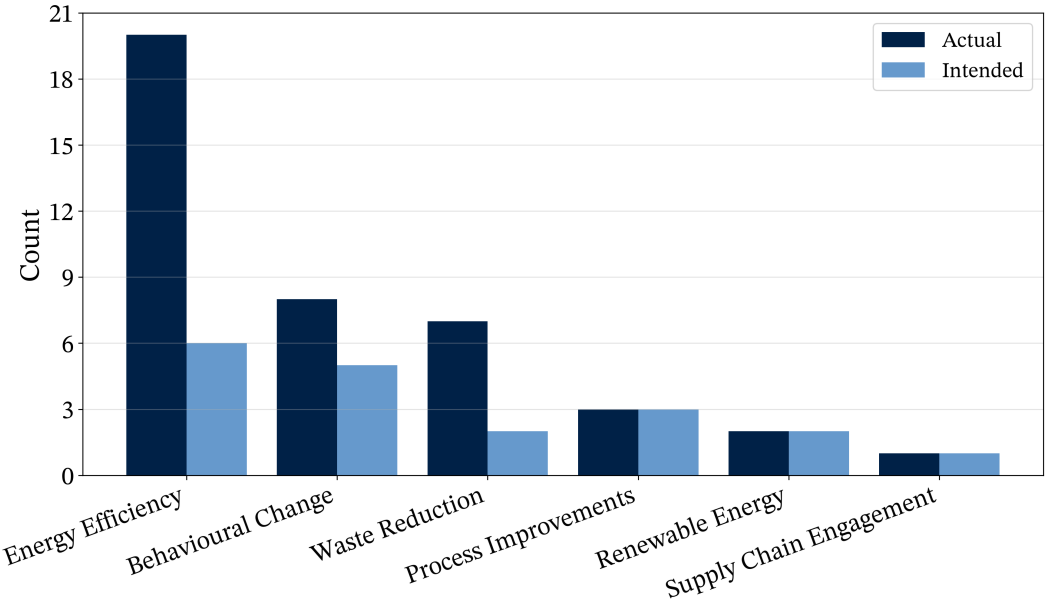


Figure 4.17: Reported actions versus intended actions.

Fig. 4.18 presents the weighted progression of actions taken by SMEs between 2021 and 2025, adjusted for sample size and response share. Across the period, overall reporting remains relatively stable, with total weighted scores clustering between 1.45 and 2.2 annually. Waste reduction emerges as the most consistently reported action, occupying a large segment in every year. Energy efficiency also features prominently, with a steady increase from 2021 to 2024 before falling slightly in 2025. Process improvements are significant in the earlier years but diminish after 2022. Behavioural change on the other hand appears in 2023 and stays strong from there onwards. Renewable energy actions fluctuate, with supply chain engagement featuring once in 2022. The data suggests a strong and sustained focus on cost-saving and internally manageable measures (waste, energy), with more complex or externally dependent strategies such as supply chain engagement and renewables less consistently adopted.

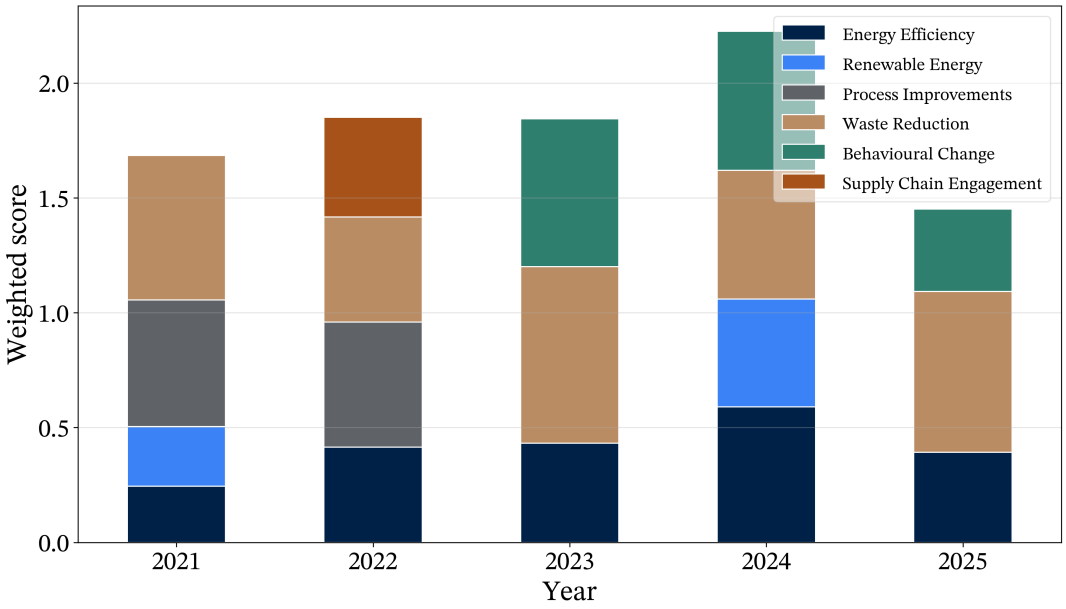


Figure 4.18: Reported actions taken over time (weighted, stacked).

Fig. 4.19 illustrates a the same time series methodology as before but for intended actions. The highest volume of intended actions occurs in 2023, with weighted scores dropping significantly in 2024 and again in 2025 - noticeably there is no data at all for 2022. Process improvements are the most consistent intended action, featuring significantly in three of the four years and renewable energy showed promise in 2021 and 2023 but without continuation. Waste reduction shows moderate uptake in 2023 and 2024 but declines thereafter, with supply chain engagement only appearing in 2021. Energy efficiency, despite being widely implemented in practice (Fig. 4.18), ranks lower in intention metrics, particularly in the early years, suggesting it may be considered 'already done' by many respondents. The shift from high-intention years (2023) to more modest planning in 2024–2025 could reflect changing priorities or declining momentum in SME climate ambition.

Fig. 4.20 shows a comparative distribution of barriers, motivators and enablers as reported across the full evidence base. Finance is the most frequently cited barrier, appearing in 26 instances, and is also referenced occasionally as a motivator (4) and an enabler (2). Capability is reported almost exclusively as a barrier (12), with very few mentions elsewhere. Information appears primarily as a barrier (8), though it is also noted in a number of enabler references (6). Policy is more evenly distributed, reported 7 times as a barrier, 3 times as a motivator and 13 times as an enabler, making it the most prominent enabler category overall. Technology is absent from the barrier and motivator sets but appears 5 times as an enabler. Market and values, by contrast, are concentrated within motivators, with 11 and 7 mentions respectively, and feature only sparsely in the barrier category.

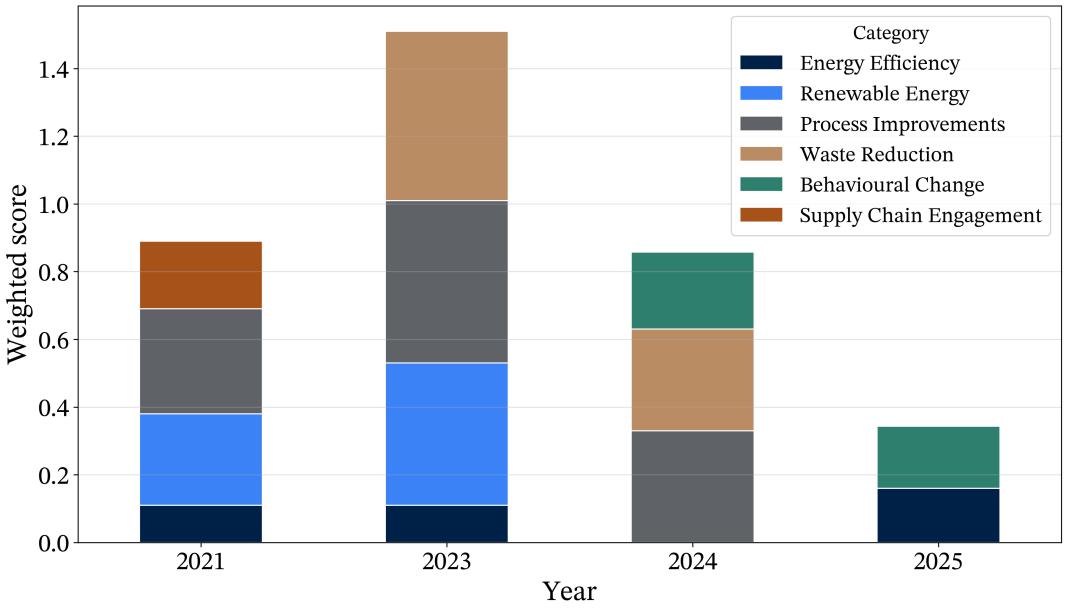


Figure 4.19: Reported intended actions over time (weighted, stacked)

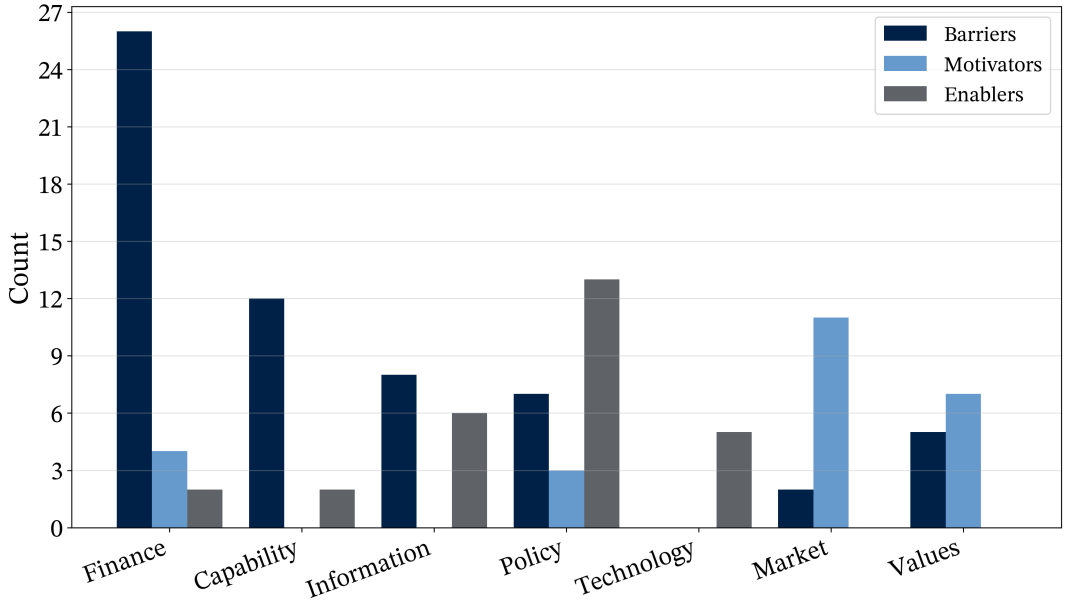


Figure 4.20: Relative frequency of barriers, motivators and enablers across surveys.

5

Discussion

5.1 | Challenges in Interpreting SME Survey Data

5.1.1 | Heterogeneity

Clearly the most fundamental issue with the study lies in the heterogeneity of the underlying evidence base. The data set brings together surveys that differ widely in scope, methodology and representativeness. Some are designed and fielded by national institutions with large, carefully weighted samples, while others are small-scale polls conducted by trade associations or advocacy groups. Bringing these into a single synthesis inevitably blends evidence of unequal robustness. In some cases, a barrier such as finance is documented in surveys with several thousand respondents, while in others, it is drawn from samples numbering only a few hundred. This disparity complicates interpretation: frequency counts cannot be taken as a straightforward measure of relevance across the SME population, but instead reflect a mix of well-substantiated and more anecdotal evidence.

Yet, it is precisely this heterogeneity from which the value of a meta-analysis is derived. By treating each survey as a unit of analysis, this study helps to offset the skew introduced by any single data set, reducing the dominance of particular institutional framings and enabling a more balanced synthesis. Whilst the methodological choice does not remove the underlying imbalance, it allows divergent sources to be compared on more equal terms, providing a clearer picture than any individual survey could achieve in isolation.

5.1.2 | Self-reporting bias

A further limitation concerns the reliance on self-reported data. By their nature, self-reporting surveys capture what SMEs say about their own perceptions rather than independently verified behaviour. This opens up a gap between reported intention and actual practice. For instance, a firm might indicate that high costs are the central barrier, but this could partly reflect the relevance of finance in public discourse, rather than the most binding constraint in day-to-day operations. Similarly, the reporting of 'intended' actions may be shaped as much by what respondents believe to be socially desirable answers as by genuine commitment. This is especially relevant in the decarbonisation context, where reputational considerations and

increasing public attention make it more likely that SMEs overstate ambition and understate inaction.

The problem is compounded by uneven response dynamics. Time-poor business owners may skip questions, respond superficially, or not engage at all, while those with strong opinions, positive or negative, are more likely to participate. This introduces the risk of skew, whereby the survey record reflects a vocal minority rather than the median SME experience. Similarly, an SME owner is unlikely to self-report a lack of knowledge, be it for the Dunning-Kruger effect [61] or simply their own hubris; why say you 'don't know what to do' when you can tick a box shifting the blame to the 'current economic conditions' or similar [62]? While the synthesis in this dissertation helps to offset individual survey biases by pooling multiple sources, it cannot fully correct for the structural issues of self-reporting and participation bias. The findings should therefore be read as indicative of how SMEs articulate their position on decarbonisation, rather than a direct window into their lived behaviour.

5.1.3 | Time series and weighting

The time series plots naturally give the impression of changing sentiments and response fluctuation: barriers remain consistently finance-dominated with only modest shifts in emphasis (Fig. 4.3), motivators peak before declining (Fig. 4.7) and enablers appear sporadically before policy support becomes more prominent in the later years (Fig. 4.13). However, it must be considered that these trajectories are driven as much by changes in the survey base as by genuine shifts in SME sentiment. Certain years are dominated by large, finance-centred surveys (e.g. the British Business Bank 'Finance Markets Report' series [3]), with others containing more trade association or third-sector contributions. The trend is therefore partly a representation of institutional sequencing as opposed to a robust measure of longitudinal change. This raises two points. First, attempts to treat these surveys as a continuous series, risk overstating temporal coherence. The evidence base is patchy, and SMEs sampled in 2021 are not directly comparable to those sampled in 2024, given different methodologies and institutional framings. Second, the fact that few consistent longitudinal instruments exist highlights a fundamental weakness in SME decarbonisation evidence: policymakers are relying on a rotating patchwork of surveys rather than a stable panel. The result is that apparent trends may mislead, suggesting volatility where in fact there is inconsistency in measurement.

The use of weighting in this study also requires caution. Category counts were weighted by reported percentages and by sample size, meaning that surveys with larger respondent bases or more detailed outputs exert proportionally greater influence. While this improves comparability between sources of different sizes, it inevitably introduces distortions and highlights the persistent issue of heterogeneity. Survey percentages are not always derived from equally rigorous bases, with the underlying populations, sampling logic and error margins differing substantially. Furthermore, the weighting approach assumes that reported percentages are commensurable across surveys, which is rarely the case given differences in the way questions

are framed. This is particularly so with regards to response options and the treatment of 'don't know' or non-responses. Lastly, the method implicitly privileges surveys with more detailed percentage reporting, while those with broader categorical output contribute less, even if they are influential in policymaking circles. The weighted figures are still useful indicators of relative emphasis, but should not be treated as precise measures of SME sentiment. They allow patterns to be visualised and compared, but do not resolve the underlying heterogeneity of the data.

5.1.4 | Categorisation and coding decisions

The process of categorising and coding survey findings into barriers, motivators, enablers and actions was necessary to make the comparisons possible, but it also introduced interpretive limitations. Imposing a common framework inevitably flattens nuances in how individual surveys present their findings. For example, the British Business Bank framing 'access to external finance' [63] as a barrier is not fully equivalent to the FSB highlighting 'return on investment too long,' [5] yet both were coded under 'Finance.' Similarly, 'enhance the reputation of my business' and 'customer demand' were placed into distinct categories (values and market, respectively), even though in practice they may overlap. These choices reflect reasoned judgement, but they are nonetheless subjective. Moreover, a particular difficulty arose where factors could reasonably fall into multiple categories depending on framing. Tax incentives exemplify this challenge. When presented in policy terms as government support mechanisms, they were classified as enablers, since they constitute external conditions that lower barriers to action. In other surveys, tax breaks appeared instead as motivators, reflecting how SMEs may interpret them as direct financial gains alongside cost savings or customer demand. The same instrument therefore functioned both as enabling infrastructure and as a motivational driver, depending on perspective. In these cases, coding decisions required the imposition of a single label, but this risks flattening nuance and under-representing the multifaceted way SMEs experience such interventions. As such, tax incentives ended up featuring within the data under both categories. This brings to light the artificiality of strict category boundaries - the framework ensures comparability across surveys, but at the cost of obscuring overlaps and interactions that may be crucial in making sense of decision-making dynamics.

In the future, alternative approaches could mitigate some of these constraints. For example, adopting inductive coding grounded in the survey texts themselves, rather than fitting responses into pre-defined categories, would allow more organic patterns to emerge, albeit at the cost of comparability. Similarly, using multiple coders and calculating inter-rater reliability could provide a check against individual bias; such a process was beyond the scope of this project. Acknowledging these trade-offs highlights that the present analysis privileges comparability over granularity, a methodological decision that necessarily shapes the results.

5.2 | Interpreting Barriers, Motivators and Enablers

5.2.1 | Institutional framing

Despite the limitations of the research, there are still a number of interesting observations. Firstly, the synthesis demonstrates that financial and, to a lesser extent, capability barriers dominate SME survey reporting, with other categories appearing far less frequently (Fig. 4.2). At first glance this confirms what the literature generally concludes: resource scarcity shapes the extent of SME engagement. However, it should be considered that the weight placed on finance may also reflect institutional biases rather than the lived reality of SMEs. Banks and other financial institutions are structurally inclined to frame obstacles in financial terms, because these map most directly onto the levers they themselves can provide - loans, grants and subsidies. Surveys run by trade bodies or independent research groups on the other hand, are more likely to foreground softer factors like awareness, skills or organisational values. The data therefore risks over-representing the barriers that commissioning institutions are predisposed to measure. Similarly, the relative absence of technology, values and market barriers (Fig. 4.6) should not simply be interpreted as evidence of their irrelevance. Rather, it exposes the narrowness of survey framing - few surveys asked SMEs to reflect explicitly on cultural or technological impediments. The 'findings' of this synthesis therefore say as much about what surveys choose not to measure as what they do. This uneven coverage complicates the claims of representativeness, as although financial barriers appear numerically dominant, their relevance may be inflated by design, intentionally or not.

A similar pattern can also be seen on the motivator side. Market pull and reputational values are more frequently cited than regulatory or financial incentives (Fig. 4.7), but the result depends on who asked the question. Although financial institutions and support bodies do show responses in this category, they account for a smaller share of the evidence base; government surveys cite only values as motivators, while industry platforms dominate in market-related motivators. This indicates that the emphasis observed is not a neutral snapshot of SME motivation, but a filtered product of those institutional priorities. Enablers, meanwhile, exhibit even greater unevenness in reporting. Policy dominates as the most visible enabler, particularly in government- and industry-led surveys (Fig. 4.16), while technology and information feature more sporadically and exclusively through private-sector or support organisations. By contrast, finance and capability, arguably the most fundamental preconditions for SME action, are cited only rarely. It must be considered that the unevenness seen here is due to a structural bias. The enablers that institutions can most easily claim responsibility for (policy measures, information campaigns) are foregrounded, while those that are politically or financially costly (capital access, staff capacity) are downplayed or neglected. The resulting effect is a skewed evidence base in which 'enablers' appear to exist, but largely in forms that align with institutional mandates rather than SME realities. This is exacerbated by the coding decision to subsume arguably finance-related incentives under the 'policy' category (limitation highlighted in section 5.1.4): of the 13 policy enablers recorded, 10 were financial in nature (e.g. 'tax incentives',

'business rate discounts', 'government grants'). While this categorisation is defensible given the context of reporting and the type of enabling mechanism with which they exist under, it nonetheless risks creating the impression that 'policy' is the dominant lever when in reality, many responses speak directly to financial barriers. Policymakers relying on this distribution risk mistaking partial coverage for a comprehensive picture, overemphasising levers already within their control while the more challenging support gaps, particularly those rooted in finance and capability, remain obscured by the way enablers are categorised and reported.

5.2.2 | The prevalence of 'finance'

Finance dominates the results, cited more frequently than any other barrier in surveys and years (Fig. 4.2, Fig. 4.3), and (as revealed in section 5.2) is the underlying backbone of the policy dominance as an enabler. On one hand, this reflects a clear and intuitive truth: SMEs operate on tight margins, often without the capital buffers available to larger firms, making upfront investment in new technologies or processes a natural constraint. However, it also raises questions regarding whether this finding represents an authentic hierarchy of obstacles, or whether it reflects the way surveys are designed and how SMEs themselves interpret the questions posed. Financial barriers (and enablers via policy) may in fact be the easiest for both survey designers and respondents to articulate. It is straightforward to frame a question around cost or expense, and equally straightforward for a respondent to attribute inaction to insufficient funds (section 5.1.2). By contrast, barriers such as limited knowledge, time or organisational capacity are harder to capture in a tick-box survey and may be less readily volunteered by respondents. In this sense, the prominence of finance might partly be a methodological effect: the topic that is easiest to ask about and easiest to claim becomes the topic most frequently reported.

There is also a behavioural dimension to consider. To say that something is 'too expensive' may operate as a convenient shorthand for a range of more complex obstacles, such as uncertainty about returns, risk aversion or competing business priorities. Without probing further, surveys risk conflating these distinct dynamics under a generic financial label. As a result, the evidence base may overstate the role of finance while underplaying other structural constraints. One possible methodological advance would be to test the robustness of financial claims by pairing barrier questions with diagnostic follow-ups. For example, asking SMEs not only whether cost is a barrier, but also whether they have investigated financing options, applied for grants or compared the lifecycle costs of alternative technologies. This approach would allow finance to be distinguished as a genuine factor, rather than a default explanation.

5.3 | Implications for Policy and Practice

The weaknesses identified in this study have immediate implications for the way SME surveys are commissioned, designed and interpreted. Policymakers rely heavily on this evidence to shape schemes and judge progress; unless measurement improves, programme design risks

continuing to be guided by the impacts of framing and sampling rather than SME realities. The following sets out practical steps intended for survey commissioners and official statistics bodies, grounded in the challenges and interpretive issues evidenced above.

5.3.1 | The need for standardisation and validated scales

An immediate and obvious blind spot in the current evidence base lies in the absence of standardised measures. Each institution, be it a government department, financial body or trade association, designs its own instrument, usually with reference to its organisational priorities. As noted in section 5.2.1, this produces survey data that is as much a reflection of institutional framing as it is of SME reality. The result is an evidential landscape where 'finance' might mean external lending in one survey, high upfront cost in another and delayed return on investment in a third. When synthesised, these can become flattened into a single category but in doing so, nuance is lost and very different barriers are rendered indistinguishable. Furthermore, rarely is it clear whether figures derive from respondents selecting predefined options or from qualitative responses later reclassified by researchers. In either case, the evidential basis is obscured, leaving readers unable to assess how robustly categories were constructed. There are two consequences to this. Firstly, it undermines comparability across surveys and over time. Apparent shifts in barriers or motivators may reflect nothing more than a change in wording or categorisation between instruments. Second, it gives excessive interpretive power to those conducting synthesis; coding decisions become determinative of the pattern that emerges. This compromises transparency and leaves space for researcher subjectivity to shape findings.

An optimal design would therefore move towards a validated scale for SME barriers and motivations, borrowing from practices in psychology and behavioural sciences. In those fields, concepts such as resilience, motivation or risk perception are not measured ad hoc, but through carefully developed and tested instruments, designed to capture latent constructs with consistency and reliability [64]. A similar approach in the SME decarbonisation field would mean developing a fixed set of items, much like the categories used in this study, tested across multiple contexts to ensure construct validity. Each item would have standard wording and response options, ensuring that 'finance' means the same thing in each survey. The presence of such a scale would fundamentally alter the evidence base. It would allow comparisons across surveys without collapsing distinct concepts; it would enable longitudinal analysis that genuinely reflects change in SME sentiment rather than changes in survey design; and it would reduce reliance on researcher judgement in coding. Commissioners could still include institution-specific modules, but the existence of a validated core would provide a stable backbone, ensuring that synthesis across sources reflects underlying dynamics rather than methodological noise. The absence of such a scale is therefore not just a methodological limitation but a structural blind spot - without it, SME survey evidence will continue to reproduce institutional framings, foregoing the potential to deliver genuine, robust insight.

5.3.2 | Transparency in sampling and respondent characteristics

Another blind spot in the current evidence base lies not in what SMEs say, but in what we know about who is speaking. Many surveys omit essential metadata: the breakdown of firm sizes and sectors in the sample, the geographic coverage, response rates and, importantly, the job title or role of the respondent. This omission is not trivial. SMEs are an extremely heterogeneous population (sections 2.1.2 and 5.1.1): a three-person café in rural Wales and a 200-employee engineering firm in Birmingham both qualify as SMEs, yet their decarbonisation challenges are profoundly different. Without transparent disclosure, surveys risk being interpreted as representative of the 'SME population', when in practice they reflect only a narrow subset. The resultant issues mirror and exacerbate those in section 5.3.1 as comparability between surveys is further undermined. Interpretation becomes a guessing game, and weighting schemes cannot properly account for biases in coverage. Additionally, a lack of transparency obscures intra-firm dynamics. Responses from finance directors might emphasise capital constraints, while owner-managers might stress time scarcity or capability; yet without knowing who answered, these differences are flattened into a generic 'SME voice'. An optimal design would therefore require a minimum metadata standard to accompany all SME surveys, ideally applied to each individual question. At a baseline, this should include:

- Sample size and response rate.
- Firm size distribution (micro, small, medium).
- Sectoral composition.
- Regional coverage.
- Role of respondent within the firm.

Such a standard would not only improve the interpretability of individual surveys but also enable reliable secondary analysis. Meta-analyses could weight responses according to sector or size representation, or test whether finance is disproportionately cited by larger SMEs as opposed to micro-firms citing capability or awareness. Publishing response rates would add a further layer of clarity, indicating whether results reflect a broad cross-section of firms or are skewed by participation bias. In practice, the most time-poor businesses are often least likely to respond (section 5.1.2), meaning that surveys may over-represent firms that are either more engaged in sustainability or hold stronger views. If this study were repeated in five years, this single change of consistently published metadata would most improve the analysis. It would transform surveys from opaque snapshots into data sets whose representativeness and biases can be critically evaluated. Currently, the absence of this information is a blind spot that leaves policymakers and analysts building inferences on an uncertain foundation - without knowing who the respondent is, we cannot credibly claim to know what 'SMEs' think.

5.3.3 | Coupling self-report with verified indicators

A final blind spot is that SME surveys almost universally rely on self-report, with no linkage to independently verifiable data. As discussed in section 5.1.2, this introduces well-known biases: respondents may overstate ambition to align with social norms, or understate plans in periods of economic uncertainty. Surveys are therefore more accurate in telling us what SMEs *say* rather than what they actually *do*. While valuable for gauging perceptions, this reliance on unverified self-report limits the ability of policymakers to judge actual progress. Some surveys attempt to address this through follow-up interviews, which can provide richer qualitative insight, but these too are self-reported and thus remain subject to the same risks of bias, framing effects and selective recall. From a policy and practise perspective, this has two effects. It allows socially desirable answers to inflate the apparent prevalence of 'green intentions,' especially in reputation-sensitive domains. Secondly, it makes it impossible to calibrate responses against behaviour: when a firm cites 'finance' as the key barrier, we cannot tell whether it has explored grant opportunities, sought quotes, or simply defaulted to cost as an easy explanation. In both cases, survey results risk overstating or mischaracterising SME realities. An optimal design would therefore move toward coupling self-report surveys with verifiable indicators of action. These need not be intrusive or burdensome, and several options already exist.

- Administrative linkages, such as grant uptake or participation in government schemes.
- Market-based records, for instance anonymised installer invoices or equipment registration data.
- Energy consumption proxies, such as standardised energy intensity bands drawn from meter data.
- Emerging automated reporting systems, such as Project Perseus [65], which seek to streamline SME emissions reporting.

Even partial linkage, for example, on an opt-in basis, would create a reference subset against which the wider self-report survey can be calibrated. This would allow analysts to test the reliability of self-reported claims, identify systematic biases and adjust interpretation accordingly. Importantly, such links would also enable policymakers to distinguish between SMEs who are constrained by finance despite having explored options, and those who invoke finance as a default response without further engagement. It should be emphasised that the point is not to replace surveys with administrative data, but to create a hybrid evidence base where self-reported perceptions are cross-checked against observable, quantitive indicators of behaviour. Surveys capture attitudes, values and perceived barriers (all factors invisible to administrative data), but without some external anchor, their credibility is limited. In five years, if mechanisms such as automated carbon reporting become widespread, a study of this kind could focus directly on analysing the substantive needs of SMEs, rather than first contending with the evidential limitations of how that information is gathered.

6

Conclusion

6.1 | Revisiting the Aims and Objectives

The overarching aim of this dissertation was to conduct a structured, category-based meta-analysis of UK SME survey evidence on decarbonisation, identifying recurrent patterns, contradictions and omissions, and assembling these into a coherent and comparable evidence base. This was supported by four objectives: to compile surveys meeting set inclusion criteria; to extract and categorise responses into barriers, motivators, enablers, and actions; to analyse cross-survey patterns and divergences; and to synthesise these findings into a critical account of the evidence base.

This aim has been achieved. More than twenty surveys, spanning government, financial institutions, trade associations and third-sector organisations, were collated and coded into a common framework. The method enabled comparison across highly heterogeneous instruments and revealed regularities that no single survey could provide. At the same time, it has exposed the methodological weaknesses of the underlying evidence, demonstrating that while surveys offer insight into SME perceptions, they cannot be treated as a reliable map of behaviour. The objectives of collation, extraction, analysis and synthesis were each met in practice, and together they have delivered both a consolidated picture of SME survey evidence and a critique of its limitations.

6.2 | Key Findings

Three substantive findings stand out. Firstly, finance dominates the evidence base, consistently cited as the leading barrier across institutions and years, and reappearing indirectly through policy enablers that are financial in nature (e.g. grants, tax relief). This dominance reflects genuine SME resource constraints, but the analysis has shown it is also amplified by survey design. Financial obstacles are the easiest to ask about, the easiest to report and often serve as a shorthand for more complex issues such as uncertainty, risk aversion or lack of capability. On top of this, the synthesis shows that survey evidence is heavily shaped by institutional framing. Financial and capability barriers dominate reporting, but their prominence is partly a reflection of the priorities of banks and financial institutions, while trade bodies and support organisations tend to emphasise softer factors such as awareness and skills. Motivators and enablers display

similar patterns: market and values drivers are most visible where industry and government lead the questioning, and policy support is foregrounded as an enabler largely because it maps onto levers that institutions can readily provide. As a result, the survey record risks overstating finance and policy while under-representing technology, values and capability, producing a skewed evidence base that reflects institutional mandates as much as SME realities. Lastly, the research has shown that from a methodological perspective, survey evidence is useful but not sufficient. Heterogeneity between surveys means that robust, weighted national data sets and small convenience polls are blended in the same record. Reliance on self-report introduces social desirability and pessimism biases that cannot be corrected by weighting alone. Apparent time-series trends are often the result of which institutions issued surveys in a given year rather than genuine shifts in SME sentiment, and coding decisions flatten nuances in how responses are expressed. The conclusion is that survey data indicates how SMEs articulate their circumstances but cannot, in its current form, serve as a direct measure of action or readiness. This is precisely where a meta-analysis adds value: only by viewing surveys together can the patterns, biases and gaps be made visible.

6.3 | Critique and Limitations of Proposed Solutions

The dissertation has proposed three main avenues for improvement: the development of a validated core question set, the publication of minimum metadata standards and the coupling of survey responses to verifiable indicators (such as grant uptake or automated emissions reporting). Each proposal directly addresses a structural weakness identified in the research, but each also carries limitations. Developing a validated scale requires cross-institutional cooperation and extensive pilot testing, both of which are resource-intensive and politically challenging. Metadata transparency, while straightforward in principle, may encounter institutional resistance where disclosure of sampling weaknesses risks reputational cost. Hybridising self-report with verified indicators faces both privacy challenges and uneven data availability across sectors. Therefore, these proposals are best viewed not as immediate fixes, but as directional improvements. Each addresses a structural weakness in the evidence base, but their implementation would require institutional buy-in, funding and governance structures that are not guaranteed. The critique here is that reform must balance methodological rigour with feasibility; without such pragmatism, recommendations risk remaining aspirational.

6.4 | Future Work

Future research should align with the proposed solutions and focus on building an evidence base that is not only larger but also more reliable. The first priority is to pilot a validated core survey module, tested for reliability, to eventually be adopted by all commissioners. This would allow genuine comparability across time and institutions, while leaving space for bespoke modules. There is also scope for methodological experimentation. Coding and weight-

ing decisions in this study highlight the interpretive power of the researcher; future work should test alternative approaches such as inductive coding, multiple-rater validation, or sensitivity analyses to explore how conclusions vary under different assumptions. These exercises would help identify which findings are robust and which are resultant of methodological differences. A further priority is triangulation with other forms of evidence. Linking survey synthesis with administrative records, sectoral emissions data, or energy-use statistics, even in a partial or anonymised form, would allow researchers to test whether reported circumstances align with observed behaviours. This would move the field beyond perceptions alone and provide a stronger empirical base. Finally, future work should expand into international comparison. The meta-analysis framework developed here could be applied to surveys from other countries, allowing cross-national testing of whether finance universally dominates or whether different institutional contexts produce different constellations of barriers and motivators. Such research would distinguish UK-specific features from broader structural dynamics of SME decarbonisation. Together, these directions emphasise not simply increasing the volume of evidence, but improving the rigour and breadth of analysis. In doing so, future research can build a more credible knowledge base, capable of better supporting academic understanding and policy design.

6.5 | Final Remarks

This dissertation has shown that while SME survey evidence offers valuable insights, it is also partial, uneven and institutionally shaped. By assembling and analysing more than 20 surveys within a common framework, the research has provided both a consolidated picture of what is known and a critical account of how that knowledge is produced. The analysis highlights the danger of taking survey findings at face value: finance appears to dominate, but this is as much a product of survey design and institutional priorities as of SME realities.

The contribution of this work lies in clarifying those dynamics, making visible both convergences across the evidence base and the blind spots that persist. Its proposals for validated instruments, transparent metadata and hybrid forms of evidence are not immediate fixes, but practical directions for strengthening the field, ultimately to achieve national climate targets. More broadly, the study underscores that advancing SME decarbonisation requires not only policy and financial support, but also more credible forms of evidence. Robust evidence is itself an enabler: without it, neither researchers nor policymakers can design interventions that respond to the true diversity of SME circumstances.

In closing, this dissertation does not claim to resolve the complexities of SME decarbonisation, but it does provide a clearer lens through which they can be understood. By bringing structure to a fragmented record, it lays foundations on which future research, policy and practice can build.

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