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RESEARCH ARTICLE

Pathways to Sustainability of Small and Medium-Sized Companies in Resource-Intensive Industries: Exploratory Insights from a Multi-Level Perspective

Monika Bachinger[1*], **Madlen Schwing**[2], **Susanna Bloß**[2]

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Abstract

Small and medium-sized enterprises (SMEs) have the potential to play a central role in sustainability transition. Yet, their contributions remain insufficiently understood. Drawing on the Multi-Level Perspective (MLP) as an analytical lens, this paper uses an SME-oriented multi-level framework to explore how interviewees describe possible interactions between SME activities at the micro, meso, and macro levels. Building on thirteen qualitative interviews with stakeholders of three SMEs in the construction and waste management sectors in Germany, the exploratory study identifies three recurring interview-based patterns that may point to cross-level interactions: pioneering activities, which interviewees associated with attempts by SMEs to influence macro level standards; knowledge sharing in networks, which interviewees described as a way of extending expertise and outreach; and employee empowerment, which interviewees linked to micro level and meso level sustainability initiatives. Taken together, these accounts suggest plausible pathways through which sustainability-oriented practices may originate within firms and among employees, spread through networks, and, in some cases, inform broader standard-setting processes, without establishing causal effects or transferable mechanisms. They also point to macro level conditions that may enable or constrain wider change. The study offers exploratory, context-bound insight into how sustainability-related activities may interact across micro, meso, and macro levels, complementing transition narratives that focus primarily on large firms.

Keywords Sustainability Transition · Multi-Level Perspective · Construction · Waste Management · Qualitative Interviews

1. Introduction

Visions of a sustainable society have been extensively discussed in the literature on sustainability transition (Calisto Friant et al., 2024). Within these visions, firms are recognized as key actors. In particular, small and medium-sized enterprises (SMEs) represent potentially influential actors in advancing sustainability (Gennari, 2023; Organisation for Economic Co-operation and Development, 2023). Research on sustainability transition draws on multi-level conceptualizations, most prominently the Multi-Level Perspective (MLP), to explain transition processes. The frame is widely used to explain how incremental and radical changes co-evolve over time (Geels, 2002, 2005; Geels et al., 2017).

While the classical MLP focuses on structural change, recent research applies it to transformative practices of SMEs. At the micro level, attention shifts to firms' knowledge, capabilities, and organizational routines. The meso level highlights networks that facilitate cooperation and value-chain coordination. The macro level encompasses regulation, funding, standards, and governance. Thus, the MLP has evolved into a framework for

* Corresponding author: bachinger@hs-rottenburg.de
[1] University of Applied Forest Sciences, Schadenweilerhof, 72108 Rottenburg a.N, Germany.
[2] Catholic University Eichstaett-Ingolstadt, Pater-Philipp-Jeningen-Platz 2, 85072 Eichstaett, Germany.

understanding how SMEs may contribute to sustainability transitions (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025). This aligns with recent extensions of the MLP framework toward agency-driven perspectives (Geels, 2011, 2020).

The present paper conceptualizes SMEs' transition pathways as unfolding across micro, meso, and macro levels. While existing research has advanced the conceptual understanding of sustainability transitions, empirical insights into how transition processes are enacted remain limited, particularly at the interface between the firm's internal structures and its external environment (Schaltegger et al., 2022). This gap is especially relevant for SMEs, whose contributions to advancing sustainability remain insufficiently explored (Oduro & Haylemariam, 2026). Although recent studies conceptualize interactions between the levels, empirical evidence on how these interactions unfold in specific SMEs and through which pathways remains limited (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025).

Building on this gap, this study offers an exploratory refinement of the SME-oriented reinterpretation of the MLP. It examines how SMEs' transition pathways may operate across micro, meso, and macro levels, looking not only at level-specific factors but also at the interactions between the levels. The levels are treated as interrelated: the analysis examines how interviewees described organizational practices, networks, and policy conditions as influencing or constraining one another. This process-oriented refinement complements existing MLP reinterpretations (Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Gennari, 2023). The research questions are: How do interviewees describe sustainability-related activities in the selected SMEs in relation to the micro, meso, and macro levels? What possible interactions across these levels are suggested by the interview accounts?

The next section reviews relevant literature on multi-level approaches to SMEs in sustainability transition. This is followed by a description of the research methodology. Subsequently, the empirical findings are presented, highlighting the contributions of SMEs across micro, meso, and macro levels of sustainability transition, while emphasizing the interaction between the levels. The findings are discussed in relation to the existing literature, and their practical implications are considered. The paper concludes with recommendations and the study's limitations.

2. Literature Review

The classical MLP conceptualizes sustainability transitions as the outcome of interactions between three levels: niches, regimes, and landscapes (Geels, 2002, 2005; Geels et al., 2017). At the niche level, actors generate radical innovations and may, over time, challenge established systems. At the regime level, dominant technologies, rules, and practices constrain the pace of change. At the landscape level, broader macro-political, economic, and cultural developments exert external pressure on existing regimes. In this classical formulation, the MLP is a structural framework. It explains transition as an alignment of developments across the levels. The frame gives little attention to firm dynamics (Geels, 2002, 2005; Geels et al., 2017).

More current literature on multi-level perspectives in the context of SMEs preserves the three-level logic, but uses that logic in two ways. A first group remains close to the classical MLP and retains the three-level scaffold, while translating it into firm-level, network-level, and policy-level conditions (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Gossart & Özaygen, 2016). A second group extends the perspective by combining it with entrepreneurship, social practice theory, or governance perspectives (Ferreira et al., 2024; Salmenperä, 2023; van Uden et al., 2025). Across both groups, the multi-level perspective serves as a framework for explaining how SMEs foster sustainability transitions, as shown in Table 1.

The reinterpretation of the MLP is useful but has also received criticism. Recent studies often use its three levels mainly to discuss level-specific barriers, drivers, and success factors, with limited analysis of cross-level interaction (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025). This improves empirical usability but may weaken the classical model's focus on the alignment of micro, meso, and macro dynamics (Geels, 2005). Moreover, newer studies treat level boundaries as fluid, which captures empirical complexity but has been criticized as complicating comparison across studies (Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Gennari, 2023; Gossart & Özaygen, 2016).

It is therefore useful to define what each level comprises in an SME-oriented reinterpretation of the MLP. The micro level is understood as the intra-firm domain of knowledge, learning, and capability formation (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025; van Uden et al., 2025). It is the place

where firms translate sustainable practices into organizational routines (Ahmadov, Durst, Gerstlberger, & Kraut, 2025; van Uden et al., 2025). The meso level is conceptualized as the network level shaped by suppliers, customers, associations, and collaborative infrastructures (Ahmadov et al., 2025; Bellandi & Stark, 2025; Bumpus & Neville, 2020; Kundurpi et al., 2021), which enable collaborative problem-solving across the value chain (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Gossart & Özaygen, 2016). The macro level is understood as the political-institutional environment (Ahmadov et al., 2025; Salmenperä, 2023), which can be influenced by policy entrepreneurs (Acebillo-Baqué et al., 2025; Veleva, 2021), but is also shaped by formal rules, financial incentives, and standards (Ahmadov et al., 2025; Salmenperä, 2023).

The present study, thus, does not equate the micro, meso, and macro levels with the classical niche, regime, and landscape levels. Instead, it uses them as an SME-oriented analytical reinterpretation of the MLP. The correspondence between both concepts is partial: the micro level refers primarily to intra-firm practices, the meso level to networks and value-chain relations, and the macro level to institutional and market conditions.

Table 1. SME-oriented reinterpretation of the Structural MLP as the exploratory study's conceptual basis

Level	Classical MLP Emphasis	SME-oriented Reinterpretation
Micro	Niche innovation	Knowledge, skills, routines, organizational culture, internal leadership (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Gossart & Özaygen, 2016; van Uden et al., 2025)
Meso	Regime structures	Supplier relations, intermediaries, collaboration, value-chain coordination (Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Bellandi & Stark, 2025; Kundurpi et al., 2021; Salmenperä, 2023)
Macro	Landscape pressure	Regulation, funding, governance (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Kaplan & Kula, 2023)

The interaction between micro, meso, and macro levels has already been examined in the literature. Ahmadov, Durst, Gerstlberger, and Kraut (2025) developed a conceptual multi-level model in which SME transitions depend on internal capabilities, leadership, employee engagement, stakeholder relationships, networks, regulation, and institutional support. The model shows how micro level capabilities can shape cooperation and knowledge exchange beyond the firm. However, because the study is based on a systematic literature review and conceptual synthesis only, these cross-level relationships are not empirically tested. Instead, Ahmadov et al. (2025) worked empirically on the development of a multi-level frame of SME transition practices through interviews with twelve manufacturing SMEs. Their findings highlight feedback loops in which micro level decisions influence meso level collaboration, while meso and macro level conditions shape firms' activities. The study, however, is limited by its small and context-specific sample and its exclusive reliance on interviews with executive managers, leaving employee-driven processes underexplored. Ahmadov, Durst, Gerstlberger, and Kraut (2025), therefore, conclude that "future research should focus on a comprehensive exploration and examination of the intricate interactions between meso, micro, and macro levels" (p. 311).

Taken together, these studies conceptualize cross-level interactions and propose possible feedback loops, but they do not fully explain how such interactions unfold and through which potential pathway activities might be translated across levels. The present study contributes to addressing this gap by exploring pathways that might connect SMEs' sustainability activities across the micro, meso, and macro levels. This process-oriented refinement complements existing SME-oriented reinterpretations of the MLP frame.

3. Methods

The study adopts a qualitative design. Empirical data were collected through 13 semi-structured interviews conducted in three family-owned SMEs operating in the construction and waste management sectors (see sample description in Table 2). The cases were selected using a purposive sampling approach to identify information-rich SMEs with established sustainability practices. The selection, however, was not based on

prior evidence or an assumption that the firms displayed the specific cross-level pathways discussed in this paper. Rather, these patterns were developed during the analysis of the interview accounts. Nevertheless, because all three firms were selected for their sustainability orientation, the study cannot establish how common these patterns are among SMEs generally or whether they also occur in less sustainability-oriented firms.

The construction and waste management sectors seemed particularly well suited for examining SMEs' contributions to the sustainability transition due to their high resource intensity. The construction sector is a major driver of material consumption, land use, and energy demand, and is therefore central to resource efficiency (European Commission, 2020). Waste management and recycling, in turn, play a key role in closing material loops (Ghisellini et al., 2016).

Table 2. Profile of SMEs and Sample Description

Industry	Company Size (no. of employees / turnover in mill. €, estimates)	Business Type	Sample Description
Construction (Roofing)	20 / 3.3	Private, small enterprise, family-run operation	Managing Director, Customers (2), Business Partner
Construction	50 / 30.0	Private, medium-sized enterprise, family-run operation	Managing Director, Management Assistant, Employees (2)
Waste Management	85 / 34.4	Private, medium-sized enterprise, family-run operation, part of larger group	Managing Director, Business Partners (2), Employees (2)

The companies are located in the Ingolstadt region, Germany. The Ingolstadt region constitutes a fitting context, since it is marked by a high degree of industrialization, leading to substantial material flows and high demands in the field of waste management. At the same time, Ingolstadt and its surrounding area have experienced strong economic growth over decades, resulting in intensive construction activity. This dynamic has contributed to rising resource prices and increasing pressure on firms in the construction sector to address resource efficiency, circular economy practices, and land-use sufficiency (Bavarian State Office for Statistics, 2024).

To capture multiple perspectives, interviewees were selected across different stakeholder groups. Respondents were selected based on two main criteria: a high degree of familiarity with the company and its internal processes, and substantial familiarity with the topic of sustainability, ensuring that participants were able to provide informed and relevant insights into the companies' sustainability-related practices. Respondents came from both the management and the operational level. In addition, customers and business partners were interviewed. In greater detail, the sample consisted of three management representatives, five employees, three business partners, and two customers. Eight interviews were conducted in the construction companies, and five interviews were conducted in the waste management company.

The interviews were conducted between August 2024 and April 2025, mostly by teams of two interviewers. They lasted between 30 and 60 minutes. They were conducted using a semi-structured interview guideline (Patton, 2015). The guide comprised five thematic sections, covering questions on how the companies perceive their role in the sustainability transition, their sustainability-related activities and impacts, relevant influencing factors and framework conditions, as well as potential barriers to change. All interviews were conducted in German, audio-recorded, and transcribed verbatim. The transcripts were analyzed in German. The findings were translated into English.

The study was designed around a deliberately focused interview sample, prioritizing the diversity of perspectives from management, employees, customers, and business partners over maximizing the number of interviews. The transcripts show considerable thematic overlap, suggesting that further interviews were unlikely to yield substantially new insights. However, formal saturation was neither assessed nor an objective of this exploratory study. The interviews provide a case-bounded basis for describing interviewees' accounts and for developing tentative interpretations of possible cross-level interactions. The findings should be interpreted in light of this scope and not as evidence that such patterns are typical of SMEs generally.

The interview transcripts were subjected to a qualitative content analysis. A qualitative approach was considered appropriate because the SME-oriented reinterpretation of the MLP frame has only rarely been empirically applied (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025), and even less frequently to firms operating in the two industries. An exploratory approach was therefore deemed suitable to examine how interviewees described SMEs' sustainability-related activities and their possible connections across the micro, meso, and macro levels. The design was not intended to test causal effects.

Methodologically, the analysis followed the principles of qualitative content analysis as proposed by Mayring (2015) and Kuckartz and Rädiker (2023). This approach is characterized by a systematic, rule-guided, and iterative process of analysis. Following transcription, the material was reviewed to achieve familiarity with the data. The material was then segmented into meaning units and coded using a structured coding framework. The complete coding framework is presented in Figure 1. The levels of the SME-oriented reinterpretation of the MLP frame served as the deductive main categories, while additional subcategories emerged from the material through the coding process. The transcripts were coded in two rounds to ensure that relevant text passages were analyzed using the same coding framework. The assignment of codes to categories followed rules. Each category was conceptually defined and illustrated with an example code (see Table 3).

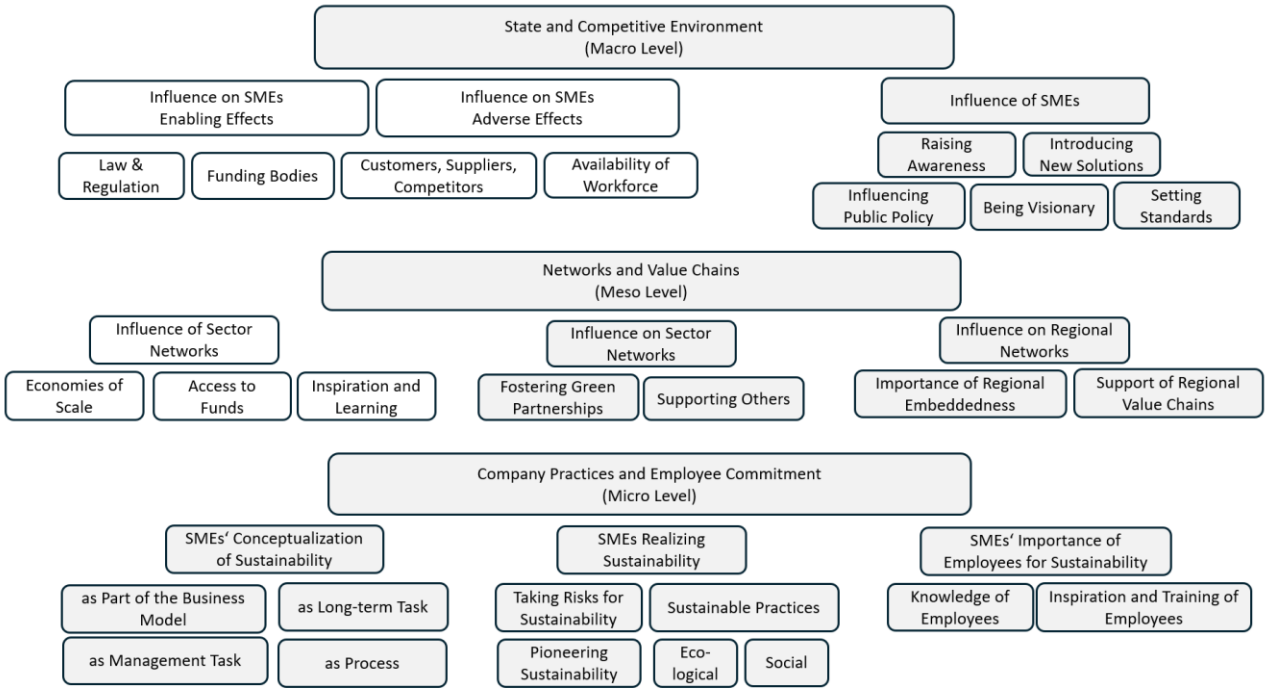


Figure 1. Coding Framework for Qualitative Content Analysis: categories capturing interview accounts of SMEs' reported influence across the micro, meso, and macro levels are shaded grey; categories capturing reported influences on SMEs at these levels have a white background.

Data analysis was conducted by one researcher using MAXQDA 26 (VERBI Software, 2026). The coding framework was developed and discussed with a second researcher. Ambiguous cases and uncertainties concerning the assignment of passages to codes were reviewed jointly to support a consistent application of the coding scheme. The coded material was systematically compared within and across interviews to trace reported cross-level interactions of SMEs. This was done by examining how interviewees described one level as enabling, constraining, or reframing another. The analysis examined reported interactions in both directions: bottom-up processes and top-down processes. The coding frame contains respective categories (see Figure 1) for example the category "Influence of SMEs on State and Competitive Environment" as well as the category "Influence of State and Competitive Environment on SMEs" (enabling effects or adverse effects). To develop an exploratory synthesis, coded passages relating to these reported interactions were then compared to identify recurring patterns in the actors, activities, and connections described across levels. The resulting three pathways are analytical interpretations of the interview material, not causal mechanisms. The pathways are presented as plausible, context-specific cross-level interactions that merit further investigation. In the

following, results on each analytical level (macro, meso, and micro) are reported, before the exploratory cross-level pathways are presented as ways interviewees' accounts connected activities across levels.

Table 3. Codebook for Qualitative Data Analysis: Categories, Definitions and Example Codes

Category	Definition	Example Code	Number of Codes
State and Competitive Environment (Macro)			
Influence on SMEs - Adverse Effects	Statements describing potential state or competitive environments' constraints on sustainability efforts.	"As in many areas, the price, rather than the sustainability of the product, is often the key deciding factor for the end customer" (C4:129-131).	46
Influence on SMEs - Enabling Effects	Statements describing potential state or competitive environments' positive influence on sustainability efforts.	"I think management is always influenced by competitors, business partners, suppliers, and other stakeholders" (C2:176-177).	36
Influence of SMEs	Statements describing patterns through which companies may shape the competitive environment and regulatory frameworks.	"Faced with this idea or challenge, we went to the state agency" (W3:498-499).	84
Networks and Value Chains (Meso)			
Influence of Sector Networks	Statements indicating how networks may support sustainability actions and describing the types of support they may provide.	"But yes, I would say that he draws his knowledge and many of his ideas from his network" (W3:351-352).	34
Influence on Sector Networks	Statements on the SMEs' contributions to developing or strengthening networks that may promote sustainability, including value chain networks	"But, well, how should I put it, we do pay attention to that. We wouldn't choose a supplier if we knew they didn't comply with social standards" (C3:57-58).	20
Influence on Regional Networks	Statements on the SMEs' potential contribution to the development of their location or region as part of their business activities.	"I mean, I always need suppliers to provide me with the materials or products I require. So, of course, it's always beneficial to source those suppliers locally whenever possible" (R2:485-487).	20
Company and Employees (Micro)			
SMEs' Conceptualization of Sustainability	Statements describing how sustainability is understood by interviewees, including its key principles as well as whether sustainability is viewed as an intrinsic goal.	"In the long term, and I know it's an ambitious goal, I would like to see a truly circular economy, a genuine circular economy. That would be one thing. And I simply believe that… well, I don't think there is any alternative" (R4:460-463).	74
SMEs Realizing Sustainability	Statements describing sustainability practices implemented within the SMEs, and reasons why such practices are absent, limited, or not fully implemented.	"I get the impression that sustainability is still evolving at [SME]. Setting yourself a goal is one thing; actually putting it into practice is another" (R1:205-206).	201
SMEs' Importance of Employees for Sustainability	Statements on the importance of employees' knowledge, skills, motivation, and training for implementing and advancing sustainability.	"Of course, the knowledge of our employees plays a crucial role" (C1:147-148).	48

4. Results

The analysis of the thirteen interviews yielded 563 codes, which were attributed to nine categories. These categories were clustered according to the three analytical levels of the SME-oriented reinterpretation of the MLP framework: micro, meso, and macro. At the micro level, three categories were identified: SMEs' conceptualization of sustainability, SMEs realizing sustainability, and SMEs' importance of employees for realizing sustainability. Together, these categories comprise 323 codes. The meso level consists of three categories capturing the influence of sector networks on SMEs and vice versa, as well as the influence of SMEs

on regional networks. To these categories, 74 codes were assigned. At the macro level, three categories were identified: influence of the state and the competitive environment on SMEs (adverse effects), influence of the state and the competitive environment on SMEs (enabling effects), and influence of SMEs on the state and the competitive environment. All three categories together account for 166 codes (see Table 3). Each category on the three levels comprised several lower-level subcategories, which are shown in Figure 1. For example, the macro level category "influence of SMEs on the state and the competitive environment" comprises five subcategories: Raising Awareness, Introducing New Solutions, Influencing Public Policy, Being Visionary and Setting Standards. Similarly, Figure 1 presents the respective subcategories for each of the remaining categories. The codes of each subcategory were paraphrased and summarized, resulting in a set of overarching themes that provided the basis for an exploratory interpretation of possible pathways. Sources of information from the interviews are cited in parentheses throughout the following sections, using the company identifier (W = waste management SME, R = roofing SME, C = construction SME), the interview number, and the line number of the relevant passage in the transcripts.

4.1. Macro Level Findings: Interview Accounts of the Regulatory and Competitive Environment

At the level of the state and the competitive environment, interview accounts describe the researched SMEs as sometimes seeking to shape standards, while also being affected by government influence and market conditions. The following section examines both dimensions.

Interviewees describe instances in which the researched SMEs sought to influence public policy, including by pursuing regulatory change. The waste management SME's initiative for getting an alternative fuel approved provides an example of this. Faced with a fuel not yet approved, the firm pursued the regulatory authorization: "faced with this idea or challenge, we went to the state agency" (W3:498–499). Another interview account describes efforts to influence a decision behind the introduction of additional household waste bins: "it was possible to convince politicians that this was reasonable to ask of citizens" (W3:188).

Interviewees also describe efforts by SMEs to raise customers' awareness of sustainability. An employee of the waste management SME considers customer education central: "a very important issue is sensitizing customers to see their waste through different eyes" (W2:103–104). This extends to direct advice, described as advising customers "holistically" (W5:36), while a roofing SME customer confirms that the SME "can convince customers bit by bit" (R3:177). The construction SME takes this further and explains that it follows the mission: "to make everyone a little more aware that there is something they can do" (C2:139–140).

Interviewees further report examples of SMEs introducing new solutions and engaging with standard-setting. One SME's engagement with a large customer led to a company-wide standardization of resource-efficient production processes (W3:382). The same company "developed its own patents and its own technologies very early on" (W4:39–40) and could help its customers with specific knowledge to become more resource-efficient. This account suggests that the firm's specialized expertise may have informed practices beyond its own organizational boundaries, including within larger corporations. The roofing SME is also described as seeking to influence standard-setting further up its own supply chain, with its suppliers: "you can confront them with demands that they use packaging that is largely free of plastic film" (R2:389–393).

Interview accounts also situate these reported efforts within external conditions, including banks, whose cheaper credit for sustainable investments "won some internal supporters for the sustainability agenda" (W5:474–475); customers and competitors, since rising expectations are "a quite decisive driver" (C1:166–167); and the state, whose pressure is decisive "because otherwise nobody would do anything" (C3:157–158). The same factors may run in the opposite direction. Customers "still insist that primary raw materials be used" (W3:682–687) despite recycled material offering the same functionality. State bureaucracy and a skills shortage may compound this (C1:241; W3:697–700). The accounts also include limits to perceived influence: "to be quite honest, we don't have that much influence" (C3:50–51).

4.2. Meso Level Findings: Interview Accounts of Sustainable Networks and Value Chains

At the meso level, a distinction can be made between sectoral and regional networks. This section first examines how sectoral networks may be influenced by the SMEs in this study and, conversely, how these

networks may influence them. It then turns to regional networks, considering how interviewees describe the researched SMEs' participation in and support for sustainability-related activity in their regions.

Interview accounts describe the researched SMEs as participating in and, in some instances, initiating sector networks. The waste management SME, for example, played a leading role in establishing an interregional waste management network. As an employee puts it: "So, we initiate it ourselves whenever we come across a network issue that interests us and we feel like being part of it" (W2:238–239). Such networks are described as helping participants translate sustainability commitments into practice: in a network of the roofing SME, partners regularly ask each other "how many of your goals have you actually achieved? Show us," so that "we still keep controlling one another" (R4:113–117). Furthermore, the motive for the waste management SME to initiate networks was to share knowledge: "that these standards and these companies could share the knowledge" (W3:303–305).

Knowledge sharing is described as a prominent function attributed to networking in the interviews: "Networks are there so that … people can exchange ideas and experiences" (W3:324–325). Beyond that, one employee points to economies of scale. In his words, networks exist "so that ... you can join forces and become more powerful or stronger in competition with the large corporations" (W3:326–328). Networks furthermore may open access to funding, "through ties to universities and applied research institutes" (W3:581–582). Finally, networks may be a source of inspiration: "without that input, we probably would not be where we stand today" (W5:221–224).

Interviewees also describe learning within value chains and efforts by the researched SMEs to shape supplier relationships. They are described as practicing long-lasting, values-based supplier partnerships: "we work with our suppliers for many, many years, often for decades" (C3:29–30). The roofing SME screens suppliers through audits: "we would not work with anyone" (R2:417–424). In selecting partners, sustainability is described as a relevant criterion by interviewees: "We wouldn't choose a supplier if we knew they didn't comply with social standards" (C3:57–58). However, other criteria, like costs, exist as well, and may weigh more (R2:363–367). Ultimately, value chain activities are described as resting on the conviction that sustainability needs commitment: "What's important is that … we simply can't implement [sustainability] on our own … we naturally depend on partnerships" (W2:280–282).

Some interviewees describe network participation as valuable even when direct returns were not expected. According to a business partner, the waste management SME supports networks "without seeing a direct benefit or direct profit for the company" (W4:51). Especially in a regional context, the SMEs studied are described as considering the support of networks to be part of their social responsibility. Interviewees highlight a sense of regional belonging and reciprocal responsibility: conceiving themselves as part of a region, from which they receive support, they feel a responsibility to give something back, or as an employee puts it: "Yes, they always give something back to the region. I think that … this is part of how they define themselves" (W3:221–224). Part of this regional embeddedness may be that the SMEs favor regional suppliers. The construction SME sources regionally, calling supply from abroad "an absolute no-go" (C2:39–40). One interviewee also describes how local ties may support the spread of practices through imitation: "if one of them does it, then the others follow along—simply because people know each other" (W4:233–234).

4.3. Micro Level Findings: Interview Accounts of Sustainability Practices and Employees

The interview accounts offer several ways of understanding how the researched SMEs conceptualize and pursue sustainability. This section begins by exploring how SMEs in this study understand sustainability. It then analyzes the activities they undertake to implement sustainability, considering both practices and the underlying attitudes. Particular emphasis is placed on the role of employees.

Sustainability is understood in several ways. Interviewees frame it as a process that develops over the years (R4:377–379). For some, sustainability is an integral part of their business model (W1:45–47). Others regard it more as a management task (W5:329–334). One frames it as risk management: "sustainability is always risk management, because it is first of all about avoiding harm" (W1:264–265). A commonality is that sustainability is thought of as a long-term concept (C4:82–85). As a business partner of the waste management SME puts it, one "doesn't just look at what benefits it in three months, but does things that may only pay off in five or ten years" (W4:300–302).

Interviewees link this long-term view to company practices: the construction SME reinvests all profits in the company, pursuing "a healthy company size with healthy, long-term growth" (C4:174–176). The same SME is willing to take risks when investing in sustainability: "It is something of a guiding principle for us: always having the courage to move forward and being willing to invest accordingly" (C2:151–152). Interviewees also describe examples of pioneering activity in the researched SMEs. For example, one was "the first to publish a sustainability report" (W5:182), another developed "a new kind of concrete," "playing a pioneering role" in a sector "not exactly known for innovation" (C2:77–83).

Interviewees emphasize employees' role in sustainability-related activity. A business partner of the waste management SME recalls being surprised that the push for sustainability "actually came from the employees" (W5:342). Such initiative seems to have been actively enabled, with employees given room to pursue their own projects. The interviews indicate that the SMEs invest in training: "We regularly attend training courses … so that we stay up to date" (C4:98–100). The waste management SME underscores that employees' capabilities are at the core of realizing sustainability (W2:195). The roofing SME built its sustainability goals through an employee workshop "so that we don't just do something, but take everyone along" (R4:172–176). However, sustainability does not always appear to be self-sustaining; as a member of the management board at the waste management SME notes, constant persuasion was necessary: "then my job ... is to bring the colleagues along" (W1:156).

Interviewees also describe limits to the researched SMEs' sustainability efforts. The most basic appears to be habit: "unfortunately, in practical life, these firms have their entrenched ways of doing things, " as one customer puts it (R3:182–188). Profitability may add a structural limit: "in the end, of course, we also have to earn money" (W1:210–211). Public support may be unreliable too: one SME was refused a grant because its equipment was still "not old enough" (R3:404). Lastly, implementation sometimes may lag behind management intention, as a customer states: "what happens below only happens if it's ordered from above" (R1:30).

4.4. Exploratory Synthesis: Possible Cross-Level Pathways in the Interview Accounts

Across the interviews, three recurring patterns were interpreted as possible cross-level pathways in the cases studied: pioneering activities with institutional and market actors, network-based knowledge sharing, and employee empowerment. These are exploratory interpretations of reported patterns, not established causal mechanisms.

The first proposed pathway concerns accounts of pioneering activity and proactive engagement with institutional and market actors. Interview accounts portray proactive engagement as one way in which the firms sought to respond to macro level barriers rather than wait for them to be resolved. For example, instead of waiting for the slow bureaucracy to catch up with an alternative fuel for garbage trucks, the waste management SME took the case directly to the responsible authorities (W3:504). This behavior is consistent with the proactive orientation described by a member of the roofing SME's management board, who emphasized the importance of acting "now, while we still have the possibility to shape things," rather than waiting "until it is so bad that we no longer have any other option" (R4:531–535).

The second proposed pathway concerns interviewees' accounts of knowledge sharing across firms. An employee of the waste management SME describes his role as "the bridge to what the waste management firm knows, what the customer might not know" (W3:662–664). The firm also reports maintaining regular contact with regional networks, through which other firms approached it for information and support (W2:119–120). Interviewees described these networks as channels for sharing sustainability-related knowledge and connecting firms with broader institutional resources. Trade associations, for example, were described as helping to place sustainability "on the political agenda" (C4:153).

The third proposed pathway concerns the role interviewees attribute to employees in developing and maintaining sustainability practices. The interviewees in this study describe entrenched routines as a persistent barrier to change (C3:190–191). In accounts of employee empowerment, however, employees are described as a potential source of initiative. An employee of the waste management SME observed that "by now it's clearly the employees" who drive the agenda, because "anyone with an idea is heard here, and nobody talks it down" (W2:194–195). Employees are described as contributing their experience-based knowledge to sustainability-related activities (C4:240–243). This is consistent with statements from the construction SME's

management board, which describe employee knowledge as crucial (C1:147–148) and referred to employees as “the foundation” of the company’s activities (C4:238–239). Employee initiative may even extend beyond the company. An employee of the construction SME describes training sessions with suppliers as part of his activities (C3:150–152).

Taken together, the interview accounts suggest possible connections among sustainability-related activities at the different analytical levels of the SME-oriented reinterpretation of the MLP (see Table 4). With pioneering activities, the researched firms were reported to respond proactively to macro level barriers; their employees were reported to contribute knowledge and initiative to the development of sustainability practices within the firms on a micro level; in some accounts, employee initiative extended beyond the firm, for example through training activities with suppliers; in turn, interviewees described networks as channels through which firms sought to extend their reach and communicate their experience to institutional actors. These reported connections may be context-dependent and specific to the SMEs studied. Accordingly, the patterns reported here should be treated as plausible, context-bound interpretations that warrant further investigation, rather than as evidence of causal mechanisms or generalizable findings.

The findings, furthermore, need to be read in light of limiting factors. Interviewees described customer expectations and bureaucratic requirements as constraints on what firms, employees, and networks could achieve. Customer expectations, for example, may override the SMEs’ sustainability preferences (W5:568–569; C3:195–197). Bureaucracy may become a barrier to sustainability (W3:697–700). On the other hand, potential macro level drivers, such as favorable bank conditions or state support, may not automatically translate into organizational change: one manager noted that “occasional voices” within the company still claim that sustainability “just costs money” (W1:175–176). The potential benefit of a lower interest rate may therefore depend on whether firms can absorb the associated short-term costs as reflected in the statement that “everything that costs more first has to be earned, even if it pays off in the long run” (R3:163–164).

Table 4. Possible pathways across micro, meso, and macro levels

Pathway	Level(s) connected	Underlying logic	Illustrative examples
Pioneering activities	Micro ↔ Macro	Acting as though a future state were already in place lets firms bypass, rather than wait out, macro level barriers; macro level power can still limit or reverse this.	Micro → Macro: waste management SME sought direct regulatory approval for an alternative fuel (W3:504); standard-setting with a large customer (W3:382); "now, while we still have the possibility to shape things" (R4:531-535). Macro → Micro (enabling): cheaper bank credit "won some internal supporters" (W5:474-475); state pressure as decisive driver (C3:157-158). Macro → Micro (constraining): customers "still insist that primary raw materials be used" (W3:682-687); subsidy withdrawal absorbed by the firm (R3:404-405).
Knowledge-sharing networks	Micro ↔ Meso → Macro	Knowledge-sharing networks may multiply SMEs’ expertise and outreach, enabling them to influence macro level settings.	Micro → Meso: SME initiating a sector network (W2:238-239); acting as "the bridge to what the waste management firm knows" (W3:662-664); staying "constantly in touch with regional networks" (W2:119-120) Meso → Micro: network inspiration ("without that input, we probably would not be where we stand today" W5:221-224). Meso → Macro: trade associations placing sustainability "on the political agenda" (C4:153).
Employee empowerment	Micro ↔ Micro → Meso	Empowerment of employees may make them a source of initiative and changing routines within the firm on a micro level and in networks on a meso level.	Micro ↔ Micro: leadership persuading colleagues on an ongoing basis, "then my job is … to bring the colleagues along" (W1:156); peer-level openness, "anyone with an idea is heard here, and nobody talks it down" (W2:194-195). Employees as drivers: "the employees are the foundation … without our employees, none of it would work" (C4:238-239). Micro → Meso: An employee of the construction SME describes running "training sessions with our suppliers" which is a networking activity that grows out of intra-firm initiative (C3:150-152).

5. Discussion

5.1. Reported Cross-Level Pathways in SME Accounts

The interview accounts suggest that SMEs may contribute to sustainability transition through activities associated with the micro, meso, and macro levels, and point to possible connections among organizational practices, network activities and engagement with political actors. More specifically, interviewees described instances in which SME activities at the micro level appeared to extend beyond the individual firm: pioneering activities were described as engaging with institutional actors. This is consistent with research that frames sustainable entrepreneurs as political actors who may influence stakeholders and create momentum for policy change (Veleva, 2021). It also resonates with research on policy entrepreneurship in collaborative sustainability governance, although this literature focuses primarily on public-sector actors rather than firms (Acebillo-Baqué et al., 2025).

The interviews also offer examples of networks that may serve as intermediary structures between firms and political actors. Trade associations were described as placing sustainability on the political agenda. Interviewees described SMEs in this study as contributing to the establishment of a network that served as a channel to regional political bodies. This finding is consistent with Kundurpi et al.'s (2021) characterization of intermediaries as boundary spanners that connect SMEs with governments and sustainability-related actors. Networks have also long been studied as places for knowledge exchange, including in relation to the diffusion of sustainable practices (Ahmadov, Durst, Gerstlberger, & Kraut, 2025; Kundurpi et al., 2021). In the cases examined, interview accounts suggest that knowledge exchange could involve joint interpretation and adaptation, as well as discussion of possible actions. The cases also include interview accounts of companies sharing practical experiences with their networks. Interviewees described these networks as settings in which sustainability-related practices could be coordinated.

The findings also highlight employee initiative in interviewees' accounts of sustainability-related change within firms and, in some instances, activity extending across organizational boundaries. Previous research highlights the role of employee training, continuous learning, and internal stakeholder involvement in implementing sustainability practices (Ahmadov, Durst, Gerstlberger, & Kraut, 2025). The present accounts add employee initiative as a theme that may complement these emphases. In the cases examined, interviewees described bottom-up activity alongside management decisions; however, this does not imply that sustainability generally develops through a bottom-up process.

Taken together, the accounts point to possible cross-level connections. They suggest that the analytical levels in the SME-oriented reinterpretation of the MLP may be linked through processes of translation, feedback, and interaction in these cases. Given the exploratory design and the small, purposively selected sample of three SMEs, this interpretation is context-dependent and should not be treated as representative of SMEs generally. The findings do not establish causal effects. Accordingly, this study uses the term "pathways" to refer to recurring, interview-based patterns that may link the analytical levels; it does not claim to identify causal mechanisms.

5.2. Theoretical Contributions and Future Research

The study offers an exploratory contribution to the literature, with findings that may nuance existing accounts in three areas. The literature predominantly conceptualizes the macro level as an external enabling or constraining environment shaping SMEs' sustainability activities (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025). This emphasis is not absolute: Gossart and Özaygen (2016) show that firms, industry associations and consortia can influence standards, funding priorities and regulatory conditions. In the cases examined here, interviewees described ways in which SMEs, directly and through networks, sought to contribute to policy agendas and competitive conditions. These accounts provide case-based examples; they do not show that such influence is typical across SMEs.

A second divergence concerns the role assigned to employees in sustainability transition. Ahmadov et al. (2025) place particular emphasis on top-management support and strategic commitment as drivers of circular-economy implementation; notably, their empirical evidence is based on interviews with executive managers holding decision-making power. The present study draws on perspectives from managers, employees,

customers, and business partners and therefore highlights interview accounts of employee initiative as a possible source of change alongside top-down leadership.

Third, Ahmadov et al. (2025) describe feedback loops across levels: micro level decisions influence meso level collaboration, while meso level dynamics can affect macro level alignment with sustainability goals. The present cases add examples of three interview-based patterns (pioneering activities, inter-firm knowledge sharing, employee initiative) that may help explain how SMEs respond to barriers such as bureaucracy, and, in some cases, identify opportunities for action. These patterns are exploratory and should not be read as established causal mechanisms.

The study's central contribution is to treat the three levels as analytically distinct while examining how interview accounts may connect them. Pioneering activities were described in relation to market and institutional conditions, while networks were described as connecting firm-level experience to collaboration and, in some cases, wider political processes. Employee empowerment, while concentrated within the firm, may provide organizational conditions relevant to activities extending outward. The cases therefore suggest that SME sustainability transitions may involve connections among activities at different levels, rather than activity at only one level. This offers a tentative, case-based refinement of existing multi-level conceptualizations of SME contributions to the sustainability transition (Ahmadov et al., 2025; Ahmadov, Durst, Gerstlberger, & Kraut, 2025).

The theoretical novelty of this study, therefore, lies in the refinement of the existing SME-oriented reinterpretation of the MLP. Rather than treating micro, meso, and macro levels as categories for classifying drivers and barriers, the analysis uses interview accounts to trace three possible pathways through which activities may extend across levels. These pathways differ in how the accounts link organizational practices, networks, and institutional contexts. Their reach appears conditional on contextual constraints. The findings therefore offer a process-oriented way of examining SME contributions within an MLP-informed framework, without establishing causal effects or claiming a generalizable transition model.

At the same time, the findings raise questions. At the micro level, further research is needed to examine how employee initiative can be institutionalized beyond the flexible organizational cultures associated with SMEs. At the meso level, interview accounts suggest that networks may support knowledge exchange, actor coordination, and efforts to influence policy agendas. This raises questions about the governance conditions under which knowledge networks may move from collective learning to influencing public policy. At the macro level, further research is needed to examine how SMEs sustain transition efforts when institutional support for their claims remains limited.

6. Management Implications

Given the exploratory nature of the study, the following implications should be understood as tentative and context-specific. They relate primarily to the sustainability-oriented SMEs examined here, including family-owned firms in the construction and waste management sectors, rather than to SMEs in general. First, the cases suggest that close employee relationships, open communication, and opportunities for participation may help translate sustainability aspirations into operational practice. Relatively flat hierarchies may create conditions for employee initiative, learning, and the consolidation of sustainability-oriented routines.

Second, interview accounts from the cases suggest that supplier relationships and regional networks may support a sustainability translation process. In the cases examined, knowledge exchange with suppliers, ongoing contact in regional networks, and collaborative problem-solving appeared to help connect internal sustainability efforts with broader organizational contexts. These practices may facilitate the diffusion of sustainability, although their relevance beyond the cases requires further investigation.

Third, the cases suggest that proactive engagement with institutional actors may be beneficial under certain conditions. However, directly approaching regulators should not be regarded as a universally applicable recommendation, since SMEs differ in their capacity, expertise, and available resources. Where direct engagement is not feasible, trade associations, intermediaries, and regional networks may provide alternative channels through which SMEs can communicate practical experience and contribute to broader sustainability discussions.

7. Conclusion

This paper explores how SMEs in resource-intensive industries might contribute to the sustainability transition. Drawing on an SME-oriented reinterpretation of the MLP framework and on qualitative data from three SMEs in the construction and waste management sectors, the study develops an exploratory interpretation of three interview-based pathways that may connect activities across the micro, meso, and macro levels: acting as sustainability pioneers, disseminating sustainability-related knowledge, and enabling employees to support sustainability.

The first pathway concerns interview accounts of pioneering action, in which firms were described as taking a proactive orientation, responding proactively to bureaucratic barriers and not awaiting their resolution. The second pathway concerns inter-firm networks, which interviewees described as possible settings for the diffusion of sustainability-related knowledge and access to resources and influence. The third pathway concerns employee empowerment: interviewees described staff as a source of initiative, sometimes beyond firm boundaries. These accounts suggest possible cross-level interactions, but do not establish causal effects.

The study offers two potential contributions to the literature on sustainability transition. First, it offers exploratory insights into SME-specific transition pathways that complement accounts primarily focused on large firms. Second, it illustrates how the SME-oriented reinterpretation of the MLP can be applied to examine the potential contributions of SMEs to transition processes. In the present cases, pioneering activity, knowledge sharing, and employee initiative emerge as themes for further investigation.

The study has several limitations. The empirical focus on three SMEs in two sectors and one regional context limits the transferability of the findings. Due to the purposive selection of sustainability-oriented SMEs, the findings may overemphasize the role of pioneering activities, employee engagement, and knowledge sharing processes in SME sustainability transitions. Their transferability to less sustainability-oriented SMEs and other contexts requires further comparative research. Future research could apply and refine this conceptual approach in other sectors, regions, and comparative settings, as well as examine how SME contributions to sustainability transitions develop over time. Overall, interview accounts from these three cases suggest that SMEs may play a meaningful role in sustainability transitions by translating sustainability into organizational practices, networks, and institutional contexts. However, these findings are exploratory and require further investigation.

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Declarations

Competing Interests The authors declare no competing interests.

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Use of AI During the preparation of this work, the authors used Claude (Anthropic) and Undermind to identify literature, summarize content and to improve language and readability. After using these tools, the authors reviewed and edited the content and take full responsibility for the content of the published article.

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