

FINANCING SUSTAINABILITY: ASSESSING EU GREEN FINANCING INSTRUMENTS

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Abstract

This article analyses the role of the European Union's LIFE Clean Energy Transition (CET) programme in shaping patterns of small and medium-size enterprise (SME) participation in the green transition. The study applies a comparative approach, examining CET projects implemented in Lithuania and Germany during the period 2021 to 2024. The analysis focuses on project distribution, funding volumes, institutional composition, thematic scope, and SME involvement. The findings reveal significant differences between the two countries. Germany demonstrates a larger and more diverse project portfolio, with SMEs actively participating in technologically oriented and governance-related initiatives. In contrast, Lithuania's participation remains more limited, and is concentrated primarily in capacity-building activities, with SMEs playing a more indirect role. The results indicate that the effectiveness of EU green policy instruments depends on national institutional capacity, innovation infrastructure, and administrative experience. The study contributes to the literature by providing a comparative empirical analysis of the LIFE CET programme, and highlighting uneven outcomes of EU green policy implementation across Member States.

KEY WORDS: EU green policy, LIFE programme, SMEs, energy transition, multilevel governance.

Anotacija

Šiame straipsnyje analizuojamas Europos Sąjungos „Perėjimo prie švarios energijos“ (angl. *LIFE Clean Energy Transition* – CET) programos vaidmuo skatinant mažų ir vidutinių įmonių (MVĮ) dalyvavimą vykdant žaliosios transformacijos programas. Tyrime taikomas lyginamasis metodas, analizuojant 2021–2024 m. Lietuvoje ir Vokietijoje įgyvendintus CET projektus. Analizė apima projektų pasiskirstymą, finansavimo apimtį, institucinę sudėtį, teminę struktūrą ir MVĮ dalyvavimą. Tyrimo rezultatai atskleidžia reikšmingus šalių tarpusavio skirtumus. Vokietijoje stebimas didesnis ir įvairesnis projektų portfelis, kuriame MVĮ aktyviai dalyvauja technologinėse ir valdymo srityse. Lietuvoje dalyvavimas išlieka ribotesnis ir daugiausia telkiasi gebėjimų ugdymo veiklose, kur MVĮ dažniau atlieka antrinį vaidmenį. Tyrimo rezultatai atskleidžia, kad ES žaliosios politikos priemonių efektyvumas priklauso nuo nacionalinių institucinių gebėjimų, inovacijų infrastruktūros ir administracinės patirties. Straipsnis papildo mokslinę literatūrą, nes pateikia lyginamąją empirinę LIFE CET programos analizę ir atskleidžia netolygų ES žaliosios politikos įgyvendinimą skirtingose valstybėse narėse.

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Introduction

The European Union has positioned itself as a global leader in climate policy through initiatives such as the European Green Deal and the ‘Fit for 55’ package, which aim to achieve climate neutrality by 2050, and reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels (Brühl, 2021). These policies frame the green transition not only as an environmental objective but also as a driver of economic transformation, innovation and competitiveness (Manta, 2020; Koval et al., 2022).

To implement these goals, the EU has developed a complex system of green finance instruments, combining regulatory and financial mechanisms, including the Sustainable Europe Investment Plan, the Just Transition Fund, and the Innovation Fund (Dobre-Baron, 2022; Brühl, 2021). Within this framework, the LIFE programme plays a distinct role as the only EU funding instrument fully dedicated to environmental and climate action. Its Clean Energy Transition (CET) sub-programme, introduced in 2021, focuses on removing market barriers and supporting the implementation of energy transition policies (European Union, 2021; Bertagna et al., 2025).

Small and medium-size enterprises (SMEs) are central to this transition, representing more than 99% of EU firms, and contributing significantly to innovation and employment (Margosi, 2022). However, SMEs face persistent barriers, including limited access to finance, administrative complexity, and higher perceived risks, which constrain their participation in EU-funded initiatives (Abilakimova et al., 2025; Boeva, 2025; Anyfantaki et al., 2022; Petrov et al., 2024).

Despite growing academic interest in sustainable finance, limited research has examined how EU funding instruments are implemented across different national contexts. In particular, comparative analyses of the LIFE CET programme and its role in facilitating SME participation remain scarce, especially in relation to differences in institutional capacity between Member States.

This study addresses this gap by analysing how the LIFE Clean Energy Transition programme supports SME participation in different national contexts.

Research question:

How does the LIFE Clean Energy Transition programme influence SME participation in the green transition across Member States with different institutional capacities?

Research aim:

To assess how EU green financing instruments, with a focus on the LIFE Clean Energy Transition programme, shape patterns of SME participation across different national contexts.

Research objectives:

1. To analyse EU green policy financing instruments and the role of the LIFE CET programme;
2. To examine opportunities and barriers for SME participation in CET projects;
3. To compare Lithuania and Germany in order to identify differences in SME participation.

1. Literature review

Over the past decade, the European Union has strengthened its role in global climate governance, through initiatives such as the European Green Deal and the ‘Fit for 55’ package, which aim to achieve climate neutrality by 2050, and reduce greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. These initiatives are interpreted not only as environmental policy strategies but also as broader frameworks for economic modernisation linking sustainability, innovation and competitiveness (D’Alfonso, 2020; Brühl, 2021; Manta, 2020).

To support these objectives, the EU has developed a complex system of green financial instruments combining regulatory and financial mechanisms. This framework includes investment initiatives such as the Sustainable Europe Investment Plan, and regulatory tools like the EU Taxonomy and the Sustainable Finance Disclosure Regulation, which aim to steer capital flows towards sustainable activities (Anyfantaki et al., 2022). EU climate policy also relies on a combination of funding programmes and policy instruments forming a multi-level governance system, linking financial, regulatory and innovation policies (Koval et al., 2022; Knodt, 2021).

Within this architecture, the LIFE programme occupies a distinctive position as the only EU funding instrument fully dedicated to environmental and climate action (European Union, 2021). Established in 1992, the programme has gradually expanded from biodiversity conservation to broader climate policy objectives (Rigo et al., 2022; Dobre-Baron, 2022). In the 2021–2027 financial framework, LIFE was extended with the Clean Energy Transition (CET) strand, focusing on energy efficiency, renewable energy deployment, and the removal of market barriers in the energy sector (Bertagna et al., 2025; Venner et al., 2025).

Small and medium-size enterprises (SMEs) represent more than 99% of firms in the EU, and play an important role in innovation and economic development (Margosi, 2022). However, research identifies several barriers limiting SME participation in the green transition, including high investment costs, limited access to finance, technological uncertainty, and administrative complexity (Kekkonen et al., 2023; Abilakimova et al., 2025; Boeva, 2025). These constraints often reduce SMEs' ability to access EU funding programmes and participate in international projects (Margosi, 2022).

Recent literature also highlights emerging financial mechanisms that complement traditional public funding instruments. FinTech platforms, digital financial services, and blended finance schemes can mobilise private capital and reduce investment risks associated with sustainability projects (Macchiavello & Siri, 2020; Sánchez Torrente et al., 2020). Instruments such as green bonds and other de-risking mechanisms further support investment in environmentally sustainable activities (Anyfantaki et al., 2022; Petrov et al., 2024).

From a governance perspective, EU climate policies are commonly analysed through policy instrument analysis, multi-level governance, and Europeanisation frameworks. These approaches emphasise that EU policies are designed at the supranational level, but implemented through national governance structures, which may lead to variations in policy outcomes across Member States (Gupta, 2007; Knodt, 2021; Swacha et al., 2022; Zepa & Hoffmann, 2023).

Although previous studies examine EU green finance instruments and SME participation, empirical research specifically analysing the LIFE Clean Energy Transition programme across Member States remains limited. This study addresses the gap by analysing the distribution, institutional composition, and thematic scope of CET projects implemented in Lithuania and Germany during 2021–2024.

Theoretical framework. The study is grounded in three complementary theoretical approaches: policy instrument analysis, multi-level governance, and Europeanisation. Policy instrument analysis is used to conceptualise EU funding mechanisms such as the LIFE CET programme as instruments designed to influence economic actors and facilitate the green transition (Howlett, 2011; Peters, 1998).

The multi-level governance perspective provides a framework for understanding how EU-level policies are implemented through national institutional structures, which may result in variation across Member States (Hooghe & Marks, 2001; Knodt, 2021).

Finally, the Europeanisation approach is applied to examine how EU policy frameworks interact with domestic institutional contexts and shape patterns of par-

ticipation in transnational programmes (Radaelli, 2003; Swacha et al., 2022; Zepa & Hoffmann, 2023).

Together, these theoretical perspectives provide the basis for analysing differences in SME participation across national contexts.

2. Methodology

This study applies a comparative empirical design to examine how EU green financing instruments shape patterns of SME participation, focusing on the LIFE Clean Energy Transition (CET) programme.

The analysis is based on project-level data from the LIFE Public Database, and covers all CET projects involving Lithuania and Germany during the period 2021 to 2024, corresponding to the initial implementation phase of the CET sub-programme introduced under Regulation (EU) 2021/783.

The research procedure consists of three steps. First, all relevant CET projects were identified and selected based on the involvement of Lithuanian and German partners. Second, project-level data were collected, including total budget, EU contribution, number of partners, and thematic classification. Third, project participants were classified according to institutional type (SMEs, large enterprises, research and educational institutions, public authorities, and NGOs), and projects were grouped into thematic categories (buildings, industry and technology, communities and governance, skills and capacity, and social inclusion).

The empirical analysis focuses on three key variables: (1) project scale (the number of projects and funding volumes); (2) institutional composition (the types of participating organisations and share of SMEs); and (3) thematic distribution of projects. These variables were analysed using descriptive statistical methods and cross-country comparison.

Germany and Lithuania were selected as contrasting cases to capture differences in institutional capacity within the EU. Although these countries differ significantly in terms of the size and structure of their economies, this contrast is analytically useful, as it allows for the identification of how EU-level instruments operate under different institutional and economic conditions. Germany represents a large Member State with a mature innovation ecosystem, while Lithuania represents a smaller Member State with more limited administrative and absorptive capacity. This comparison allows for the identification of structural differences in programme implementation.

To complement the quantitative analysis, elements of qualitative interpretation were applied to assess discrepancies between the formal objectives of the CET

programme, particularly SME inclusion, and observed participation patterns (Hajer, 1995; Dryzek, 2013).

The study has several limitations. The classification of SMEs is based on available project data and supplementary verification from external sources, which may introduce minor inaccuracies. In addition, the analysis covers only the initial implementation phase (2021–2024), and focuses on two Member States, which limits generalisability, but enables a more detailed examination of institutional differences.

Artificial intelligence tools were used exclusively for language editing and translation purposes, and did not influence the research design, the data analysis, or the interpretation of the results.

3. Results

This section presents the empirical findings of the analysis of the LIFE Programme ‘Clean Energy Transition’ (CET) projects implemented in Lithuania and Germany during the period 2021 to 2024. The results focus on differences in project distribution, funding volumes and institutional composition, with particular attention paid to the participation of small and medium-size enterprises (SMEs).

SMEs account for more than 99% of all enterprises in both Lithuania and Germany; however, their absolute number and sectoral distribution differ significantly. Germany has a substantially larger SME base, including a stronger presence in industrial and technological sectors, while in Lithuania SMEs are more concentrated in services, and less represented in high-tech energy-related activities.

Project distribution and funding volumes. Data from the LIFE Public Database show differences between Lithuania and Germany in participation in the Clean Energy Transition (CET) strand during the 2021–2024 period.

Lithuania participated in two CET projects with a total eligible budget of €1.72 million, including €1.64 million from the European Commission. The average project budget is €860,852, with an average EU contribution of €817,810 (approximately 95% co-financing).

Germany participated in 11 CET projects with a total budget of €20.52 million, including €19.49 million from the European Commission. The average project budget is €1.86 million, with an average EU contribution of €1.77 million (approximately 95% co-financing).

The EU co-financing rate is similar in both cases (approximately 95%). Germany’s total project budget is approximately 12 times higher than Lithuania’s, and the average project budget is also higher.

Institutional composition and SME participation. To ensure comparability between Lithuania and Germany, the project participants were classified into five categories, based on their legal status and activity profile: small and medium-size enterprises (SMEs), large enterprises (LEs), research and educational institutions (REIs), public authorities (PUBs), and non-governmental organisations (NGOs).

SMEs are defined as companies with fewer than 250 employees or an annual turnover of up to €50 million, while large enterprises exceed these thresholds. REIs include universities and research centres, PUBs refer to governmental institutions and agencies, and NGOs include associations and foundations.

This classification was applied to all project participants using data from the LIFE Public Database and supplementary organisational information sources.

Distribution of institutional types. The analysis covers 13 LIFE CET projects implemented in Lithuania and Germany during the period 2021 to 2024: two projects in Lithuania, and 11 in Germany. In total, these projects involve 130 institutions, of which 20 are in Lithuania and 110 are in Germany. Project consortia include actors from multiple sectors, such as public authorities, research institutions, non-governmental organisations, and private enterprises, enabling an assessment of public-private cooperation within the programme.

Clear structural differences emerge between the two countries. The German projects demonstrate a significantly higher number and a greater diversity of participating institutions. A total of 110 organisations are involved, with NGOs and associations (51), research and educational institutions (22), and SMEs (24) forming the dominant groups. Together, these categories account for more than three quarters of all participants, indicating a high level of inter-institutional integration.

In contrast, Lithuanian CET projects are more limited in scope. A total of 20 institutions were identified, consisting primarily of NGOs and associations (13) and research and educational institutions (4). Only two SMEs are involved, and both participate in a single project. No public sector institutions were identified among the Lithuanian participants.

Table 1. The distribution of LIFE CET project participants by institutional type (2021–2024)

Country	LE	NGO	PUB	REI	SME	Total	SME share (%)
Germany	5	51	8	22	24	110	21.8%
Lithuania	1	13	0	4	2	20	10.00%

Source: Compiled by the author, based on the LIFE Public Database (2021–2024) and institutional classification.

Table 1 highlights the differences in institutional composition between the two countries. The German projects exhibit a multi-layered structure, in which SMEs, public institutions and large enterprises all participate, reflecting a more balanced public-private partnership model. In contrast, the Lithuanian project consortia are dominated by associative and academic actors, while business participation remains limited.

These patterns indicate differences in institutional capacity. In Germany, project consortia reflect a mature innovation ecosystem, characterised by cross-sectoral collaboration. In Lithuania, participation remains more narrowly structured, with academic and non-governmental actors playing a central role, and SMEs occupying a complementary position.

Most active sectors by country. German CET projects are characterised by the strong presence of energy agencies, technology centres and applied research institutes, often operating in cooperation with SMEs. These actors are primarily involved in projects related to technological development, energy system management, and implementation-oriented activities.

In Lithuania, the most active participants are associations, universities and training institutions. Their activities are focused mainly on capacity building, information dissemination, and skills development, rather than technological innovation.

These differences reflect distinct sectoral participation patterns. In Germany, project consortia are more strongly oriented towards technology and implementation-related activities, with SMEs participating as active partners. In Lithuania, participation is concentrated on knowledge-based and training-oriented activities, where SMEs are less directly involved.

Overall, the institutional structure of CET projects differs between the two countries. The German projects demonstrate greater institutional diversity and broader SME participation. The Lithuanian projects, by contrast, are centred on academic and associative actors, with more limited involvement of business entities. This suggests that SME participation is more strongly embedded in project structures in Germany than in Lithuania.

Thematic scope of projects. The analysis of LIFE Clean Energy Transition (CET) projects implemented during the period 2021 to 2024 allows for the assessment of thematic distribution and SME involvement across different areas of the programme.

The analysed projects were classified into five thematic categories: (1) Buildings – energy efficiency and building renovation; (2) Industry & Technology – industrial decarbonisation, technological innovation and digitalisation; (3) Communities & Governance – energy communities and public sector initiatives;

(4) Skills & Capacity – training and institutional capacity-building; and (5) Social & Inclusion – energy poverty and social inclusion.

This classification enables a comparison of thematic priorities and the distribution of project activities across countries.

Table 2. The distribution of LIFE CET projects by thematic category (2021–2024)

Country	Build-ings	Industry & Technology	Communi-ties & Gov-ernance	Skills & Capacity	Social & Inclusion	Total
Germany	2	2	3	3	1	11
Lithuania	0	0	0	2	0	2

Source: Compiled by the author based on the LIFE Public Database (2021–2024) and project thematic classification.

Table 2 shows that the German CET projects are distributed across all five thematic categories, indicating broad thematic coverage. The highest number of projects is observed in the Communities & Governance and Skills & Capacity, followed by Industry & Technology and Buildings.

SME participation is more visible in the Industry & Technology and Communities & Governance categories, where projects involve technical implementation, data analysis and system-level solutions. In contrast, the Skills & Capacity and Social & Inclusion categories are primarily dominated by non-governmental organisations, research institutions, and training providers.

In Lithuania, all the identified CET projects fall within the Skills & Capacity category. No projects were recorded in technological or governance-related categories.

These results indicate that the thematic distribution differs significantly between the two countries. The German projects cover a wider range of action areas, while Lithuanian participation is limited to capacity-building activities. SME involvement follows this pattern, being more present in technology and implementation-oriented categories, and more limited in training-oriented activities.

Comparative analysis of SME participation models. A comparative analysis of Lithuanian and German LIFE Clean Energy Transition (CET) projects reveals clear differences in SME participation patterns across the two countries.

Table 3. Key CET project indicators: a comparison between Germany and Lithuania (2021–2024)

Indicator	Germany	Lithuania
Number of projects	11	2
Total project budget (million €)	20.52	1.72
Average project budget (million €)	1.86	0.86
Share of SMEs among participants (%)	21.8%	10.0%
Number of thematic categories	5	1
Dominant themes	Skills, Governance, Industry	Skills & Capacity
Type of SME participation	Direct (coordinators and technology partners)	Indirect (training partners)

Source: Compiled by the author, based on the LIFE Public Database (2021–2024) and project classification.

The German CET projects are larger in scale and cover a broader thematic range compared to the Lithuanian projects. The share of SMEs among the project participants is also higher in Germany (21.8%) than in Lithuania (10.0%). In addition, SMEs in Germany participate across multiple thematic categories, whereas in Lithuania their participation is limited to a single category.

Differences are also observed in the roles performed by SMEs. In Germany, SMEs participate as project partners, including in coordinating and technology-oriented roles. In Lithuania, SME involvement is more limited, and primarily takes the form of participation in training and capacity-building activities.

The thematic distribution further reflects these differences. The German projects cover multiple categories, including Industry & Technology and Communities & Governance, while the Lithuanian projects are concentrated exclusively in the Skills & Capacity category.

Overall, the results indicate two distinct patterns of SME participation. In Germany, SME involvement is broader in scope and more embedded across project structures. In Lithuania, SME participation is more limited in scale, thematic coverage and role within project consortia.

4. Discussion

This study has several limitations that should be acknowledged. Due to the data limitations, it is not possible to determine precisely the share of SMEs operating specifically in clean energy sectors. However, participation patterns within CET projects provide an indirect indication of their involvement. In addition, the

analysis is based on a relatively small number of projects (13), reflecting the early implementation phase of the LIFE Clean Energy Transition (CET) programme (2021–2024). Second, the classification of project participants is limited by the availability of publicly accessible data, which may introduce minor inaccuracies. Third, the focus on two Member States restricts the generalisability of the findings, although it enables a more detailed comparison of institutional differences.

Despite these limitations, the results provide important insights into how EU green financing instruments operate across different national contexts. The findings demonstrate that the implementation of the CET programme produces uneven participation patterns across Member States.

From the perspective of policy instrument theory, the CET sub-programme can be understood as an intermediate instrument combining financial support, knowledge transfer, and capacity-building functions. However, its effectiveness is strongly mediated by national administrative and networking capacities.

Within the framework of multi-level governance, the results show that although the programme applies uniform rules across the European Union, its practical outcomes vary depending on national institutional environments. Germany represents a governance system in which EU, national and regional actors are strongly interconnected, enabling the formation of complex project consortia and broader SME participation. In contrast, Lithuania demonstrates a more limited participation structure, where projects are driven primarily by academic and associative actors.

The comparative analysis further indicates that SME participation reflects broader institutional and economic structures. In Germany, SMEs are integrated into technologically oriented and governance-related projects, often acting as innovation partners. In Lithuania, SME participation remains more limited, and is concentrated mainly on capacity-building activities.

Overall, the findings highlight a key challenge for EU green policy implementation: reconciling common climate objectives with heterogeneous institutional capacities across Member States. The case of the LIFE CET programme suggests that SME participation is shaped not only by the availability of financial instruments, but also by the institutional environments in which these instruments operate.

Conclusions

1. The financial mechanisms of the European Union's green policy, such as the LIFE programme and its Clean Energy Transition sub-programme, function as complex policy instruments that combine financial, regulatory and capa-

city-building dimensions. These instruments demonstrate that the effectiveness of the Green Deal and 'Fit for 55' implementation depends not only on the overall availability of EU funding, but also on the institutional and innovation capacities of Member States. Consequently, the ability of national actors to make use of these mechanisms is shaped by multi-level governance structures and differentiated levels of Europeanisation.

2. The comparative analysis of Lithuanian and German LIFE CET projects reveals significant differences in SME participation models. In Germany, SMEs act as active creators of innovation and technological solutions, often assuming coordinating or leading roles within project consortia. In Lithuania, SMEs tend to participate indirectly, mainly as training or consultancy partners, reflecting more limited institutional and managerial capacities. This suggests that the design of the CET programme is better aligned with the realities of mature innovation ecosystems, while SMEs in smaller Member States remain structurally constrained, until their institutional and technological capacities are further strengthened.

Recommendations and directions for future research

Theoretical implications. The findings of this study contribute to the existing literature on EU climate governance and policy implementation in several ways. First, from the perspective of policy instrument analysis, the results show that the effectiveness of EU financial instruments, such as the LIFE Clean Energy Transition (CET) programme, is not uniform, but depends on national institutional contexts. This suggests that policy instruments produce differentiated outcomes depending on the capacities of actors involved in their implementation.

Second, from a multi-level governance perspective, the results confirm that the implementation of EU-level policies varies significantly across Member States. Although the CET programme applies uniform rules, its outcomes differ due to variations in national institutional structures and networks.

Third, the findings contribute to the Europeanisation literature, by demonstrating that EU policy frameworks are not simply transferred to the national level, but are mediated by domestic institutional environments. This results in different patterns of SME participation, ranging from more integrated and technology-oriented roles to more limited, capacity-building forms of involvement.

Policy recommendations. The analysis indicates that the effectiveness of the LIFE Clean Energy Transition (CET) programme in fostering SME participation depends significantly on national institutional capacities. Several policy recommendations emerge from these findings.

First, EU funding instruments should better account for differences in institutional capacity across Member States. Additional technical assistance and project development support could help SMEs and regional organisations with limited experience in EU programmes to participate more effectively in international consortia.

Second, mechanisms facilitating SME integration into project networks should be strengthened. National contact points or intermediary platforms could help connect SMEs with research institutions, public authorities and international partners, thereby expanding opportunities for cross-sector collaboration.

Third, greater transparency in funding allocation would improve the evaluation of programme outcomes. Public access to more detailed information on the distribution of project budgets among different categories of participants would allow for a clearer assessment of SME participation.

Future research. Future research could further examine financial flows within CET projects and the long-term effects of programme participation on SME innovation capacity and competitiveness. Comparative studies including additional Central and East European Member States could also provide a broader understanding of institutional differences affecting SME engagement in EU green policy instruments.

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Conflict of interest

The author declares that there is no conflict of interest.

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FINANCING SUSTAINABILITY: ASSESSING EU GREEN FINANCING INSTRUMENTS

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