REPowerEU from the Bottom-Up?

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Abstract

The European Union relies on several programmes to implement its climate, energy, and environmental policies, co-funding related projects with a predominant theme around Energy Efficiency. While only the LIFE programme is solely dedicated to these themes, other programmes such as Horizon Europe, the Innovation Fund and Interreg might similarly contribute. Following the 2022 invasion of Ukraine and resulting energy crisis, the European Commission designed the REPowerEU strategy to accelerate clean energy, save energy and diversify energy supplies. Analysing a sample of 81 projects in terms of their respective contributions to the achievement of the three REPowerEU pillars, this paper examines whether bottom-up approaches may aid policy design and implementation, particularly around Energy Efficiency. A systematic literature review identifies a significant literature gap, highlighting the report's relevance. A theoretical framework is built and explained, to then thematically analyse a 30-project subsample. Two case studies, supported by interviews, supplement findings and enable an outlining of policy recommendations. Despite challenging conclusions regarding the causal nature, most projects targeted at least two pillars and an EU-wide improvement of policies, while others focused nationally. Broadly, the findings indicate that bottom-up approaches still have untapped potential, as they lack a clear pathway to drive institutional change.

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1. Introduction

Energy efficiency (EE) has gained increasing attention in the European Union (EU) energy agenda in recent years, particularly following Russia's invasion of Ukraine, which highlighted vulnerabilities in European energy security. In response, the REPowerEU policy was developed, emphasising the acceleration of clean energy, energy savings, and diversification of energy sources (European Commission, 2022). EE emerges as a crucial tool in addressing these challenges, offering advantages through energy savings, decarbonisation, and economic benefits (International Energy Agency, 2019). The 2023 Energy Efficiency Directive (EED) recast underscored the importance of EE, setting it as the first principle (European Commission, 2023). EU-funded research and innovation projects play a significant role in furthering the EU's decarbonisation objectives, with LIFE projects specifically targeting climate and environmental ambitions. Notably, the new LIFE cohort demonstrated a shift from the traditional focus on biodiversity towards energy, with the addition of the 'Clean Energy Transition' subcategory (European Commission, 2021).

To date, there has been limited research examining to what extent these EU-co-funded projects further the EU's energy goals. Aiming to bridge this gap, this paper analyses to what extent EU funded projects may contribute to achieving the REPowerEU policies from a bottom up perspective. Through the examination of 81 selected EU-co-funded projects, this paper seeks to explore how bottom-up initiatives enable the sharing of best practices and lessons learnt, potentially serving as a feedback loop in EU policymaking. This would allow for effective capacity building initiatives and policy harmonisation across the EU.

The paper will begin with a review of the literature on EU-funded projects to identify relevant gaps. This will lead to the methodology, outlining the criteria on which the projects will be analysed. A brief quantitative and in-depth qualitative analysis of a chosen number of projects will then follow to provide comprehensive insights which will consequently feed into policy implications and recommendations.

2. Literature Review and Theoretical Framework

2.1. Introduction to Energy Efficiency

EE has gained increased academic and political attention as it is recognised as one of the most cost-effective ways to tackle climate change due to its ability to "perform the same task or produce the same result" (US Office of Energy Efficiency and Renewable Energy, 2024; Mahi et al., 2021; Rosenow & Kern, 2017). By reducing energy dependence and use while maintaining output levels, EE increases energy security, decreases prices, and minimises environmental impact, thereby simultaneously tackling all dimensions of the "energy trilemma" of affordability, security and sustainability (Bonafé, 2022, 18; Alola et al., 2023; Rinkinen & Shove, 2019). Despite advances in EU policy, indicated by ambitious recasts of two of its most central EE policies - the EED and Energy Performance of Buildings Directive (EPBD) - an "EE gap" remains (Economidou et al., 2020; O'Connor, 2023; Morvaj and Bukaric, 2010). This "discrepancy between optimal and actual implementation" arises largely due to different types of barriers that implementation is facing, ranging from economic or financial, over institutional or political to behavioural, technical or social ones (Backlund, et al., 2012, 393; Cattaneo, 2019; Bagaini et al., 2020; Papantonis et al., 2022).

EU funding programs like those explored below may address barriers to EE implementation, including political distrust, which hinders policy acceptability (Faure et al., 2022). Civic engagement, encouraged by EU projects, can improve political trust, which may tackle such behavioural obstacles (Blind, 2007). These initiatives also offer financial support, expertise, and knowledge-sharing, tackling economic and technical challenges (Interreg EU, 2024). Additionally, projects focused on capacity-building may overcome social and technical hurdles, such as knowledge gaps, while technologically-focused projects may advance technical capacities and inform policymaking, both of which may further support EE policy design and implementation (Evans et al., 2021).

2.2. Introduction to REPowerEU

The aftermath of Russia's February 2022 invasion of Ukraine highlighted strong vulnerabilities in the EU's energy supply due to its heavy reliance on Russian gas, representing 45% of its imports, with countries like Germany being even more dependent (>52%) (Vezzoni, 2023; Bundesnetzagentur, 2023). The resulting energy crisis, exacerbated by sanctions and Russia's strategic supply disruptions, led the EU to initiate the REPowerEU plan on the 18th May 2022 (European Commission, 2022). This strategy aims to reduce and eventually eliminate reliance on Russian fossil fuels by 2030 through its three pillars of energy savings, diversified energy supply, and an accelerated clean energy transition (European Commission, 2022; Popa et al., 2023; Andrei, 2023; Mathiesen et al., 2022). Given the focus in terms of investments as well as the focus of this report, specific attention is given to the EE pillar which led to an increase of the EU's binding EE Target from a 9% to a 13% reduction of primary and final energy consumption by 2030 compared to the business as usual scenario of 2020 (REF2020) (European Commission, 2022; Rosenow, 2022; Mathiesen et al., 2022).

2.3. Introduction to the EU's funding mechanisms

Launched in 1992, the LIFE programme is the only EU funding instrument solely dedicated to the environment and climate action and aims to disseminate the most up-to-date approaches, maximise energy saving performance, and develop green skills (CINEA, 2024; Hermoso et al., 2017; Fetsis, 2017). Complementing an immense budget increase from under €450mil in 1992 to €5.4bil for 2021-2027, the programme gained importance within the EU policy sphere and recently incorporated a clean energy transition pillar, which, alongside its new "Private Financing for Energy Efficiency Instrument" underscores its prioritisation of EE (CINEA, 2024; Yougova, 2018; Behan et al., 2023; Lakatos et al., 2019).

Beyond LIFE, various other EU programmes support causes around climate change,and thus also EE. With a budget of €95.5bil, the Horizon Europe fund[1] is dedicated to research and innovation. Its climate change focal area may address EE barriers through enhancing collaboration and the impact of research and innovation in EU policymaking (DG RTD, 2024a). The Interreg Europe Fund, strives to improve interregional cooperation and reduce disparities by sharing solutions to regional development issues, thereby also addressing institutional/political and technical barriers (Interreg Europe, 2024). The Innovation Fund, financed by the EU Emission Trading System, focuses on highly innovative technologies and, by increasing their cost-effectiveness and accessibility, may tackle technical and economic barriers to EE (DG CLIMA, 2024).

These EU-co-funded projects may play a crucial role in tackling EE barriers through a bottom-up approach, since "local actors and NGOs outside the core policy network often play an important role in initiating [project] proposals" (Vihma & Wolf, 2023, 187). Following diverse understandings of bottom-up approaches, this report focuses on three primary interpretations: initiatives including local participation and thus originating from sub-national levels, adaptation to specific local project implementation contexts, and inspiration from previously successful local initiatives (Rayner, 2010; European Commission, 2024; Sabel & Victor, 2015; Panda, 2007; Godenhjelm, 2016).

[1] Note that Horizon Europe follows up on the previous initiative Horizon 2020 which ran for the last funding period and included energy projects now funded under LIFE (DG RTD, 2024b).

2.4. Review of previous analyses of EU-co-funded projects

EU-co-funded projects, similar to those explored in this report, are assumed to have contributed to shaping the design and implementation of EU environmental and EE policies. Projects such as Renew Building, EDEA, DOMOTIC, and Dyemond Solar led to identifying best practices in the "energy-efficient renovation of social housing, offices, factories and technology parks, schools and other public buildings, providing direct energy-saving benefits" (Fetsis, 2017, 914). Despite the projects' success allowing the inference of their potential influence on policies such as the EED and EPBD, Fetsis (2017) does not explicitly mention or analyse these, providing an incomplete review for the given purposes (CINEA LIFE, 2024; EU, 2019).

Another analysis, focussing on eco-innovation (EI) and circular economy (CE) practices within Horizon and Interreg projects, suggests that project findings could serve as "replicable best practices" and inform existing policy around EI and CE (Hojnik et al., 2024, 9). However, once again, specific gains or implementations from these projects are not covered. The same can be said for a review of LIFE Integrated projects[2], however, it concludes that projects had "been highly useful [so that…] project leaders encourage the Commission to continue supporting this type of projects" (Harju-Autti et al., 2023, 49). Similarly, Thema and Rasch (2018, 10) present results of their own Horizon 2020 project 'COMBI' and state that it may aid future policy design by quantifying "the additional multiple impacts of more ambitious policy action".

Network analyses by Andriollo et al. (2022, 2023) explore how LIFE projects foster collaboration across multiple jurisdictional levels and may thus promote polycentric governance aiding environmental governance (see e.g. Sovacool et al. (2018), Lockwood (2010) and Köpeczi-Bócz (2018)). Additionally, they argue that projects play a pivotal role in developing, testing and spreading technical knowledge to empower people, thereby not only tackling EE barriers identified in section 2.1. but also further contributing to the implementation of a successful bottom-up approach, as described above.

Vihma and Wolf's study (2023) is one of only two identified analyses exploring direct project impact. Focussing on nine Estonian LIFE projects (2008-2018), a relational perspective regarding the level of autonomy of projects is taken to find that seven out of the nine analysed projects induced some institutional change, with three of those resulting in substantial policy learning (ibid.). Additionally, different pathways of institutional change are highlighted, alongside policy change, such as through the "engagement of commercial or academic actors, or through horizontal dissemination of professional knowledge" which will inform the analysis below (ibid., 198).

[2] A new sub-category added in 2014.

The other analysis was performed by Evans et al. (2021) for CINEA and assessed 41 projects seeking to increase the market uptake of EE measures. They establish that these projects reached over 4.5 million people across the EU, produced 368 good practice guides, case studies and fact sheets alongside 3,500 energy audits and the training of 10,000 people (ibid.). However, even more relevant for this report, they manage to indicate and quantify the real impact of implemented projects, having led to a "final savings rate of 4.5% per conducted energy audit" (ibid., 9). Additionally, they specifically outline "success stories" of projects such as STEAM-UP outlining non-energy benefits of EE and leading to real and long-term energy savings of 1 GWh/year for Fahnen-Gärtner which they supported, or SCOoPE and STEEEP providing energy audits and trainings, equally leading to long-term implementations in different companies, tackling barriers such as long payback times and behavioural barriers (see section 2.1.). Moreover, they outline the adoption of ENERWATER's methodology for assessing EE in wastewater treatment as a European standard, illustrating the possibility for tangible policy impact of EU-co-funded projects despite the apparent literature gap.

Nevertheless, while the analyses outlined here explore EU-co-funded projects in terms of their outcomes within the EU policy context, it is evident that they rarely dive into the broader institutional changes or their policy implications. This gap in the literature may be attributable to an outlined lack of "quantitative information on outcomes and impacts achieved by [EU-co-funded] projects" alongside no clear and direct avenue for projects to influence EU policies and practices (Pisani et al., 2020, 12; Vihma & Wolf, 2023). Following a systematic literature review approach (see section 3.3.), many more studies were reviewed[3], yet could not contribute to this review, largely due to the recency of projects analysed and their lacking depth of analysis. Additionally, no extensive reviews on the connection to EE or REPowerEU initiatives, including connected practical project evaluations, could be identified in either academic or grey literature.

Despite these challenges regarding this review, the literature seems to consistently highlight the importance of a bottom-up approach for policy design, deployment, and innovation. Projects that are significantly shaped by local actors and NGOs outside of the core policy network allow for the response to local conditions and interests,thereby contributing valuable insights and means for increased implementation and legitimacy. Nevertheless, not only has this review led to the identification of a clear research gap, but also the difficulties of projects to directly inform EU policy besides providing additional best practices, due to a lack of clear avenues.

[3] These studies include: Behan et al. (2023), McAuley et al. (2019), Thema et al. (2017), Marzi et al. (2022), Pacheco-Torgal (2014), Husiev et al. (2023), Moseley (2017), Mexis et al. (2021), Loureiro et al. (2020), Moseley & Bruhin (2018), Trotta et al. (2018), Saletti et al. (2020), Marongiu et al. (2022).

3. Methodology

3.1. Epistemology

Given the identified gap in the academic and grey literature regarding the impact of EU-co-funded projects on policymaking, linkages to REPowerEU as the specific policy in question, and any structured theories around projects' bottom-up approach, this research applies a predominantly exploratory approach. Thus, this report represents a first attempt to map the (potential) impact of EU-co-funded projects on REPowerEU and EU EE policymaking as a whole, including interlinkages. Based on the reviewed literature and methodologies applied therein, a preliminary theoretical framework is formulated to deductively guide the exploratory research and a systematic review of all projects, aiming to enable more objective and generalisable findings.

3.2. Theoretical Framework

The theoretical framework is of a descriptive nature, extrapolating the process of project formulation and implementation, comprising specific components and steps encountered across preparatory to concluding phases. Using this structured framework, entailing presumed components across this process and interrelations between them, the research paper aims to not only go into greater detail regarding which specific themes can be found within each component, but to also potentially identify additional elements and relationships between components that remain currently unidentified.

The theoretical framework's rationale and components are displayed in Figure 1. It is tailored to analysing individual projects separately so that it connects several components in line with the process over time. This dimension is reflected in the visualisation along the x-axis, where every component is linked to a specific project stage, namely preparation, inception, implementation, and conclusion. Starting with the preparation phase, which, according to this theoretical framework, is either influenced by top-down influence, in this case specifically the REPowerEU policy (with its three pillars), or by a bottom-up approach, or both. Hence, one step of the analysis would entail determining to what extent these REPowerEU objectives have influenced the project's conceptualisation until inception. Notably, these two understandings of a bottom-up approach were derived from the literature, which further suggests that the concept of "bottom-up approach" in the context of such projects seems to be understood differently across stakeholders, leading to the assumption that these categories within the bottom-up approach might need to be expanded upon the conclusion of the analysis. Analysing the preparation phase per project would require identifying to what extent these components were involved, and which directionality of interactions can be determined between the projects and the bottom-up and top-down components in question.

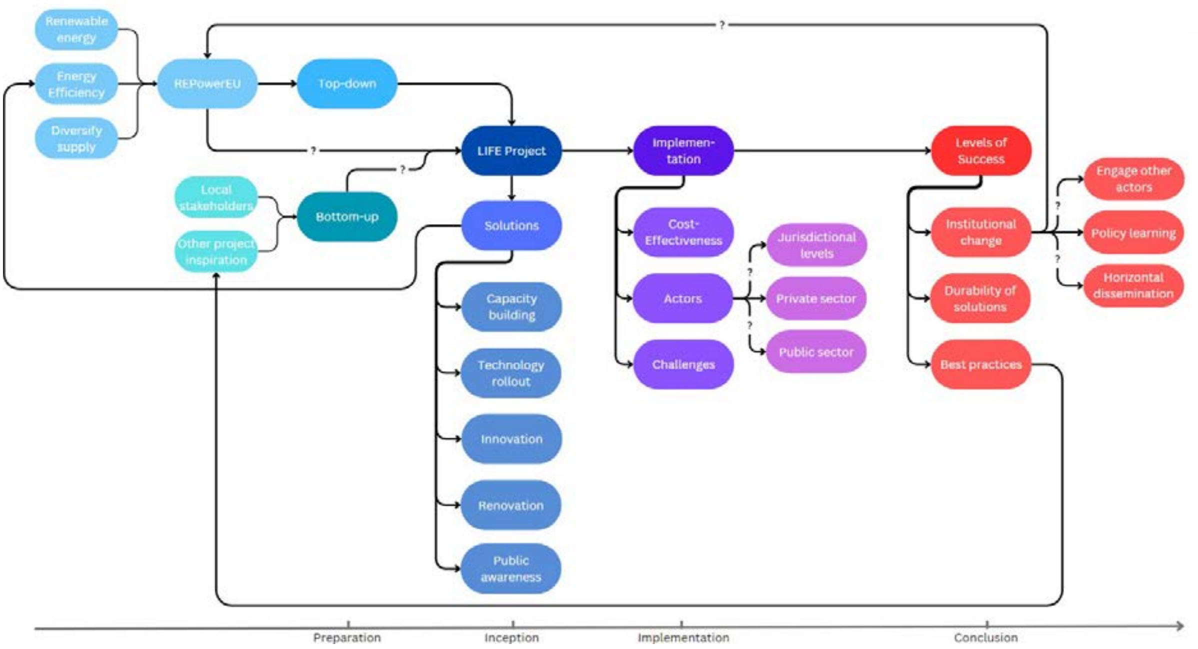

Figure 1: Guiding theoretical framework, based on reviewed literature

During inception, the framework focuses on the solutions that the project aims to advance, framed around five overarching categories from the literature and a preliminary screening of projects: capacity building, rollout of existing technology, innovative technology, renovation, and public awareness. This research aims to identify common themes between projects sharing the same high-level solution approach, paying additional attention to potential interrelations between these approaches and parallels with other commonalities across project phases.

During implementation, three specific components stood out as most relevant: cost-effectiveness, involved actors, and challenges. Project implementation cost-effectiveness is determined using information regarding received funding, resources, and planned deliverables. Some preconceived notions from the literature frame the analysis of involved actors. Firstly, differences between the number and level of involvement of actors within these projects span jurisdictional levels, meaning international, national, regional, or local organisations. Secondly, private and public actors' divergence in involvement and influence on project outcomes was prefaced by the literature. These three sub-components should be analysed towards establishing the level of multi-level governance involved in these projects' bottom-up approach. Lastly, the literature review established a more extensive academic coverage on project challenges, from which the analysis will build with the aim to potentially identify novel challenges. Guided by these three components, the implementation analysis should initiate identifying more detailed commonalities across life projects, whilst also noting interlinkages between these differing components and final outcomes, specifically potential impact on policy learning and institutional change.

For the conclusion phase, the framework focuses on determining the projects' achieved or potential success. According to the literature, three specific components must be identified to determine levels of success: triggered institutional change, solution durability, and best practices identification and lessons learned. Currently under-researched, this theoretical framework focuses on the success of achieving institutional change. Research shows institutional change can be achieved vertically by spreading information and learning through engaging with other types of actors and horizontally by exchanging within categories, alongside achieving policy learning by changing top-down policies according to findings. For the latter, the analysis will prioritise identifying whether projects were, or could be, able to influence REPowerEU or other top-down policies, establishing a potential bi-directional relationship between EU policies and their funded projects. Regarding durability, project deliverables and resources will be linked to examine whether outcomes are sustainable without continuous funding by the European Commission. Finally, best practice identification will not only need to comprise the extent to which this is a dominant output, but also assess potential to serve as a starting point for new projects.

3.3. Methodology

Given this research's exploratory epistemology, this paper employs a multifaceted methodology, characterised by a descriptive and an analytical objective. Entailing three approaches, the data collection serves both objectives. First, the research focuses on 81 projects, mainly funded by LIFE but also Horizon EU, Innovation fund and Interreg, starting between 2014 and 2024, which form the research sample, derived in collaboration with CINEA. For each project, the corresponding EU webpage, potential publications, project-specific websites, and other relevant grey literature was identified, forming the preliminary data. At this stage, a potential bias needs to be acknowledged, stemming from CINEA's predetermined project selection. Regarding selection criteria, the researchers understand these projects were all invited to a conference organised by CINEA and hosted in Italy; more specific selection criteria are currently unknown. Hence, certain bias introduction (i.e. regarding their geographical coverage, their potential to interlink with REPowerEU, their involved actors, their solutions, etc.) cannot be disregarded in this selection. The paper's descriptive component aims to mitigate this bias by maximising sample transparency.

Second, an extensive systematised literature review established the current state of the literature, including potential coverage of LIFE projects related to a "bottom-up approach" and "REPowerEU" policy. Using the database Google Scholar, the review employed the search terms "REPowerEU," "LIFE,", "project," "LIFE program", "LIFE programme", "EU", "energy", "energy efficiency", "CINEA", "bottom up approach", "bottom up", and "policy". Combining search terms narrowed down results to below 2,000 results for REPowerEU and EE related literature, and below 100 results related to LIFE projects specifically, showcasing the latter's limited coverage. Around a total of 65 articles were selected based on perceived relevance, title judgement, occurrences of specified concepts in the text, and abstracts. Given the limited relevant academic and grey literature available, the exploitation of additional data pathways was needed.

Third, in-depth semi-structured interviews with project leaders or personnel enabled extrapolating more detailed information regarding underlying processes, bottom-up approaches, solutions, challenges, and connections with REPowerEU. Interview partners were selected by CINEA, which risks biassing the interview sample; yet these interviews represent project diversity across solutions, geography, and actor involvement axes, allowing some representativeness and generalisation. Constraining factors, like the limited availability of interviewees over the holidays and the seven-week research period resulted in only four completed interviews. Based on identified themes and perceived gaps, a prepared interview protocol (see Appendix I) was minimally tailored per interview, using open-ended questions to encourage elaborated answers and avoid bias. Interview findings comprise the primary empirical data for the case studies.

The descriptive and the analytical objectives divide the split data analysis method of this report. Pursuing the descriptive objective, a landscape analysis examines a broader categorisation of all 81 projects across programme type (LIFE, HORIZON, INNOFUND, INTERREG), solution type (capacity building, rollout of existing technology, innovative technology, renovation, public awareness), timeline (early, ongoing, closed), REPowerEU pillar linkage (primary and secondary), coordinating country, implementation countries, type of coordinating entity (public, private, NGO, research), level of EU funding contribution, and total budget. Accordingly, a transparent overview of the project sample's characteristics is extrapolated, indicative of representativeness and certain biases and serving as a data basis for the analytical objective.

Thematic and in-depth case study analyses characterise the analytical objective. Analysing themes, 143 project resources were coded with Dedoose using the developed theoretical framework, aiming to establish underlying project components, identify more detailed themes within, and highlight commonalities, differences, and interconnections. A representative sample of 30 projects (see Appendix II) was selected in order to enable in-depth review of project documentation, while seeking nearly equal coverage across solutions, actors, geographical coverage, funding, and REPowerEU pillar coverage, while privileging LIFE projects given the research focus. Following methodology proposed by Kyngäs (2020), material is coded according to categories from the theoretical framework, while within, more inductive coding identities more detailed themes. Extrapolations regarding bottom-up approaches, project relations to REPowerEU, and potential to inform policymaking are made on this basis. Drawing conclusions, descriptive landscape analysis data is further consulted.

Taking a more detailed look at specific projects, the in-depth case study analysis showcases the coding results and interviews insights within two case studies. While the former thematic analysis presents a holistic sample snapshot, these case studies enable increased understanding of contributing factors and the theoretical framework's application and analytical power. Together, the triple data analyses offer a holistic assessment of provided EU-co-funded projects and inform policy recommendations to CINEA for increased policy learning and policy impact, representative of bottom-up potential and enhanced policy connection, particularly REPowerEU.

4. Results

4.1. Landscape analysis

4.1.1. REPowerEU pillars tackled and type of projects

Considering the preparation phase, the strong representation of the *Saving Energy* (55%) and *Accelerating Clean Energy* (41%) over the *Diversifying Energy Supply* pillar (4%) stands out, which might be attributable to the political nature of the latter, leaving less room for project-level impact. Figure 2 dives into the inception and implementation phases, indicating that ‘innovative technology’ and ‘capacity building’ clearly dominate ‘renovation’ and ‘public awareness’ solutions and private actors (nearly 50%) are the most prominent coordinating actors, ahead of research and governmental actors which together comprise the remaining 50%, leaving NGOs critically underrepresented with only one project. Interestingly, there seems to be a significant association between the type of solution implemented and the type of coordinating entity (p-value = 0.02): Capacity building efforts are predominantly undertaken by public actors, while innovative technology solutions are dominated by private actors alongside research institutions (see Table 1). This is likely due to these actors’ focus on technological advancement while public actors often prioritise enhancing public welfare leading to the dedication of their significant resources to facilitating collaboration.

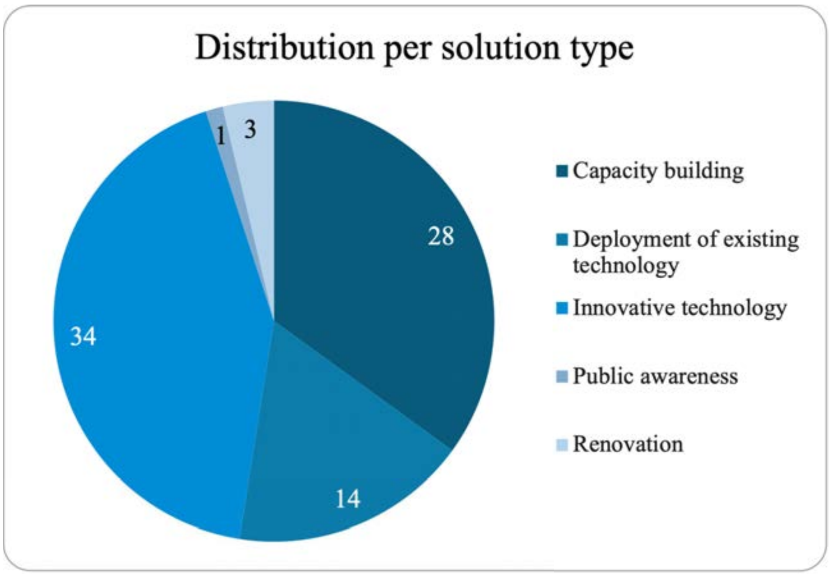

Figure 2: Type of solution employed

Type of Solution	Government	NGO	Private	Research
Capacity building	13	1	8	6
Deployment of existing technology	3	0	5	5
Innovative technology	1	0	24	9
Public awareness	0	0	1	0
Renovation	1	0	1	1

Table 1: Type of Solution implemented by entity

4.1.2. Budget allocations and EU contributions

When assessing the relation between the EU contribution to the budget and the coordinating entity in Figure 3, one can see that, on average, government projects receive the largest EU contribution, closely followed by research actors and then private actors, with NGOs taking the smallest share.

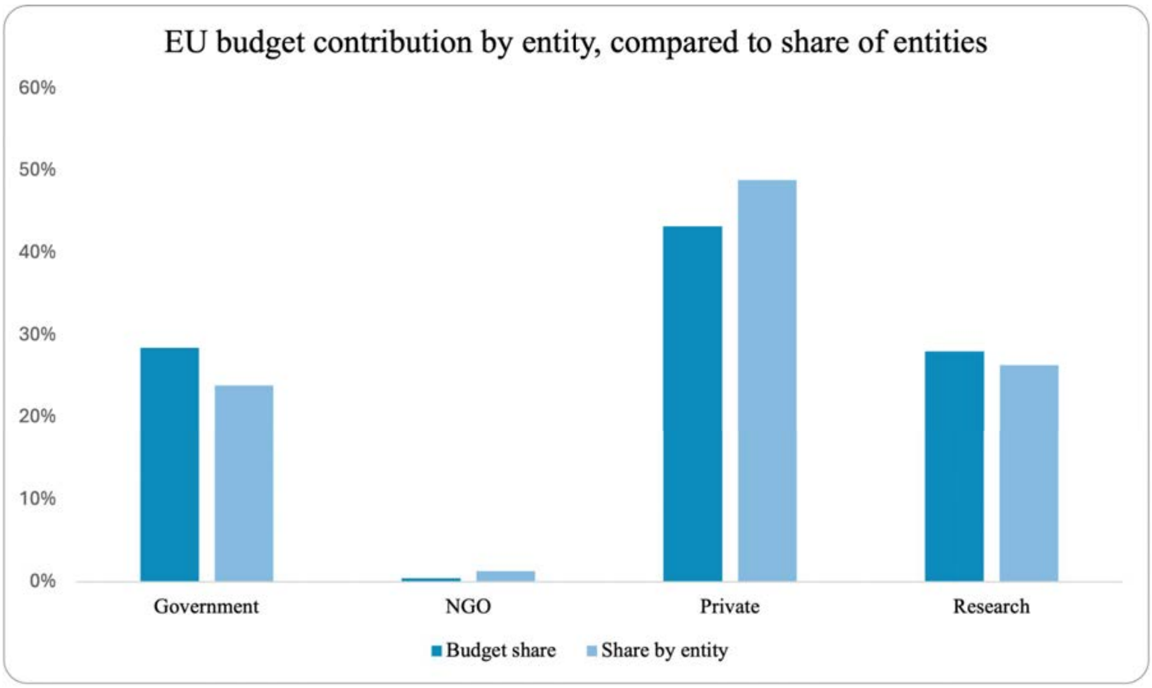

Figure 3: Budget allocation by entity

When examining the budget allocations in relation to the solutions implemented, Figure 4 demonstrates that on average, innovative technology takes the largest EU contribution. Deployment of existing technology and renovation follow, with public awareness projects receiving the smallest EU contribution on average.

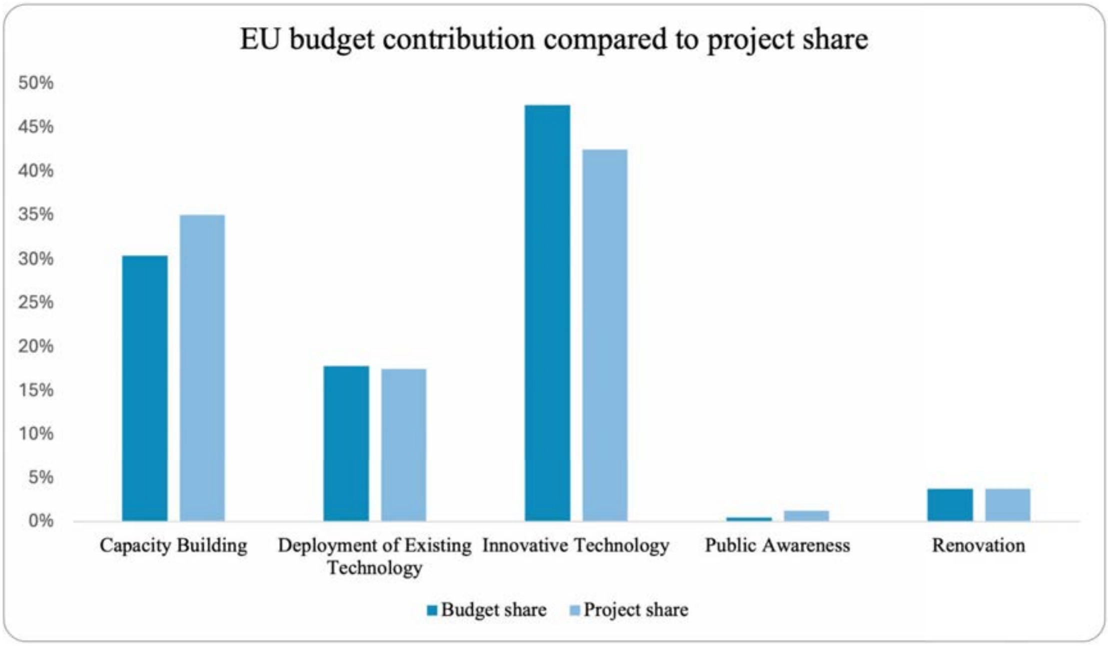

Figure 4: Shares of EU contribution by solution implemented (compared to the share of projects in sample)

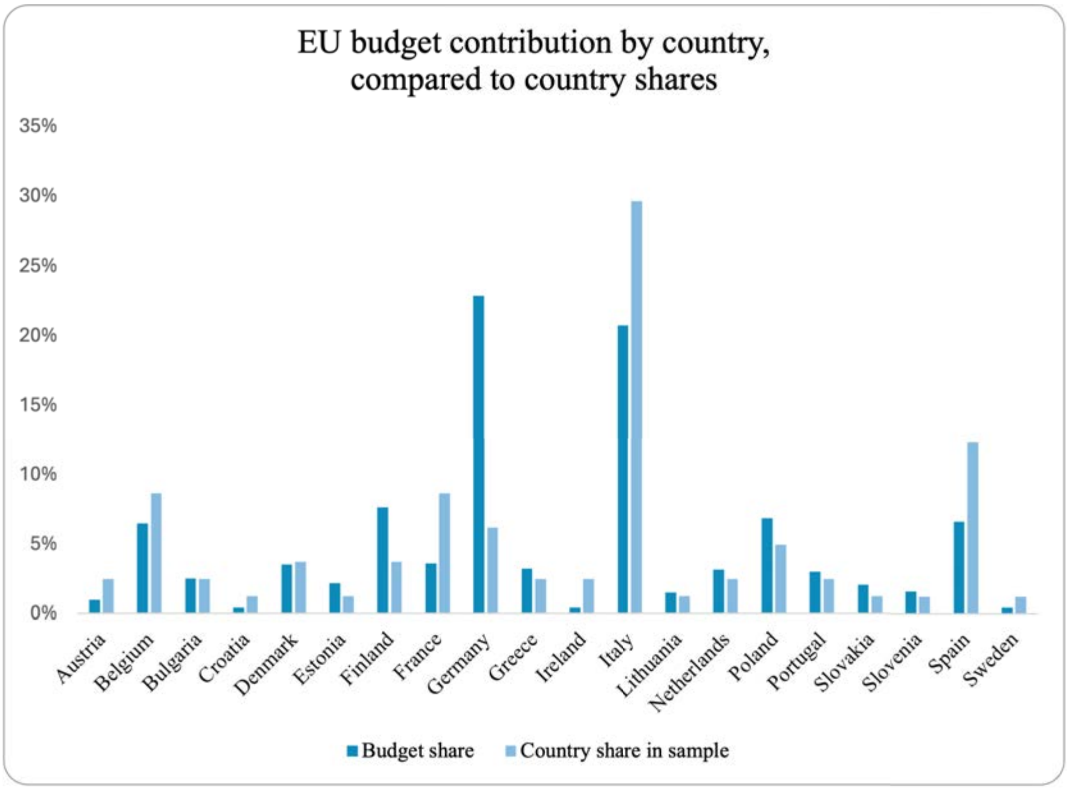

Figure 5: Shares of EU contribution by country and country representation in sample

Geographically, Figure 5 shows that Italy dominates the sample, followed by Spain, Germany, France and Poland. In terms of EU contribution to projects, Germany receives the highest average funding, followed by Finland, Estonia and Slovakia. Ireland, Croatia, Sweden and Austria received the lowest share.

While an assessment of the conclusion requires projects to be closed, this only applies to 14, while 19 projects are at an early stage, making their analysis particularly difficult.

4.2. Thematic analysis

Applying the preconstructed theoretical framework, the thematic analysis examined common themes across a representative sample of 30 reviewed projects. Within the constrained scope of this report, the following discussion selectively identifies most notable and relevant themes for the research objective.

4.2.1. Preparation phase

The theoretical framework assumes that a project's preparation is influenced by top-down policies, bottom-up approaches, or a combination of both. It was of particular interest to review whether EU-funded projects demonstrated an initial top-down influence from the REPowerEU policy, which was mentioned by only two projects (HP4ALL and LIFE Hypobrick) amidst the reviewed resources. Here REPowerEU was discussed only within implementation, suggesting no influence on the preparation phase amongst sampled projects. REPowerEU's recent adoption may explain this finding, with most projects preceding the policy such that REPowerEU incorporation likely only happened retrospectively (see section 4.3.2). More broadly, other EU-level policies and legislations such as European EED and the EPBD were mentioned by various projects that focused on saving energy, showcasing that it is standard practice for projects to tailor their objectives towards EU policies.

Bottom-up elements, contrastingly, tend mostly to influence the preparation phase by drawing inspiration from predecessors when characterising novel projects. For instance, DigiBUILD's (2023) stakeholder identification built directly on "the co-creation approach developed by one of the Bauhaus Lighthouse projects DESIRE.". Furthermore, heavy reliance on previously developed research findings and best practices was common. Examples include BuildEST's expansion of wooden elements research to improve energy efficient renovations or CARE4CLIMATE's best practice application in pre-inception stakeholder engagement including extensive consultations and invitations for cooperation when identifying suitable pilots.

4.2.2. Inception

Different objectives, scopes, and approaches, alongside varying resources characterise the inception of EU-funded projects. Main divergences were categorised into five identified solution pathways that projects pursue: capacity building, public awareness, innovative technology, deployment of existing technology, and renovation. Overall objectives of most projects include at least two solution pathways, demonstrating a holistic approach encompassing various pathways to success and seeking synergies. Nevertheless, several projects with highly specialised approaches remain, predominantly those comprising innovative technology, showcasing greater focus on creating one new solution rather than simultaneous pathways.

Establishing patterns regarding resources, it was noteworthy that publicly-coordinated projects were generally awarded the highest level of overall funding (> €5 million), suggesting greater trust to manage bigger investments and subsequently larger-scale projects. Research actors attracted the lowest levels of funding, perhaps due to weaker funding management reliability or increased small-scale project proposals. Resultantly, project success and scope is conditioned by the level of trust and resources afforded by funding institutions like the EU.

4.2.3. Implementation

Characterising general project implementation, various interpretations of a bottom-up approach were classified into five forms: determining broader dissemination based on local projects, using former project inspiration, involving local stakeholders, contextualising local pilot project testing, and tracing stakeholder connections and demands. Most projects combined at least two approaches during implementation. Since projects must become durable and self-sufficient, the determination of broader dissemination was a predominant characteristic, however the extent of its development differed largely. Whereas some projects focused such efforts on networking and stakeholder engagement, such as HEATLEAP designating one particular actor for technological dissemination, others strategically proved project sustainability and transferability into other sectors, such as BuildEST applying a sectoral approach to ease initiative adoption.

Local stakeholder involvement ranged widely, including: engaging municipalities (ActionHeat) or citizens through panels, developing energy communities with energy sobriety (LetsGo4Climate), consultations and dissemination campaigns targeting industrial stakeholders, end users, policymakers, and the general public to ensure good reception (RAPID DRY), and establishing diverse local working groups to align future energy outlooks (DecarbCityPipes2050). Many projects conducted pilot studies to test projects in a localised context. While some pilots pursued a single approach, like SUNIFIX's decarbonised fertiliser production technology and CoolDH's low-temperature district heating network, others applied co-creation strategies, developing projects tailored to different local environments and hence differing in approach, aiming to determine commonalities and contextualised best practices. HP4ALL's public awareness and capacity building campaigns applied co-creation with "each pilot region [taking] specific approaches […] depending on different market scenarios in each country" (Energiesparverband, 2021). Lastly, several projects (e.g. DigiBUILD, CARE4CLIMATE, CO2-INT-BIO, and HEATLEAP) traced particular supply chain stakeholders to ensure project feasibility and durability.

Evidently, the bottom up approach is understood differently depending on the targeted type of solution. While determination of broader dissemination of project outcomes, like best practices, was mentioned across all solution categories, it was particularly prevalent among public awareness and capacity building solutions. Local stakeholder involvement was additionally prominent among deployment of technology projects which is sensible considering their inherent connection with achieving outcomes and impacts for local stakeholders, while deployment also affects them directly. When considering code co-occurrence, innovative technology projects seem to resort more to developing context-specific pilot studies and tracing stakeholder connections and demands within the project, i.e. across a specific supply chain, while these two bottom-up avenues are rarer in public awareness and capacity building projects (see Appendix III).

Beyond diverse actors, projects also took diverging approaches to networking and collaboration. While a theme of partnership and collaboration building was established among most reviewed projects, the degree varied. Several projects (e.g. CARE4CLIMATE, DecarbCityPipes2050, LIFE Veneto, GREENSTOVE, Life4HeatRecovery) had entire website sections dedicated to "networking", actively seeking synergies with previous EU-funded projects addressing similar issues. Alternatively, event organisation and attendance was another main avenue seeking increased project awareness. Degrees of success regarding building collaboration are hard to establish, considering the available resources rarely elaborated upon partnership nature and content. However, assigning communications and networking responsibility to specific actors, as seen in HEATLEAP and DigiBUILD, seems to increase visibility and prioritisation within projects and may hence lead to more successfully establishing resourceful collaborations. Additionally, creating collaboration was especially dominant amongst the lowest- and highest-funded projects, potentially because the lowest-funded relied on subsequent collaborations to achieve greater dissemination, scaling, and durability, while the highest-funded had resources available for this specific priority.

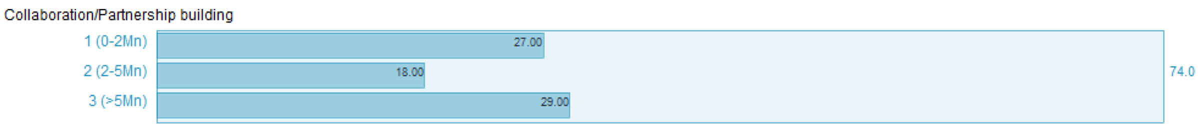

Figure 6: Number of codes focused on partnership building depending on total project budget

Coordinating entities take diverging approaches to project cost-effectiveness and durability. The only actor category to mention pay-back periods regarding economic feasibility, private actors more explicitly assessed and sought cost-effectiveness while simultaneously emphasising the durability of solutions. Greater awareness of aiming to build a business concept that can be commercialised and self-sustaining can explain this prioritisation within privately-coordinated projects.

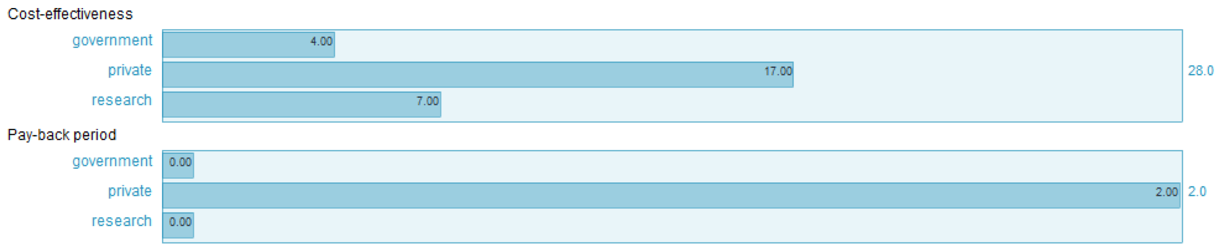

Figure 7: Mentions of cost-effectiveness and pay-back period based on coordinating actor type

Among the frequent challenges identified during implementation, most were systemic rather than project-specific. Firstly, several projects identified inherent challenges in renovation roll-out. BuildEST established Estonia-specific barriers, including highly-varied rural building materials and construction types, with citizen's tendency to build housing components themselves hindering a more standardised approach. Specific bureaucratic barriers were also evident; for instance, CARE4CLIMATE faced low willingness to cooperate amongst Slovenian state authorities, shifting their focus to regional and local climate awareness campaigns and capacity building. ActionHeat (2022) found that "the commitment of decision-makers is a precondition for [strong plans]." Internal challenges were nevertheless also identified; short project time spans hindered CoolDH's developed optimiser in establishing its full potential and ActionHeat project managers struggled initially to build common visions.

4.2.4. Conclusion

Seeking to determine whether projects achieve positive contributions to the REPowerEU policy within their lifecycle, assessment is often limited to expected outcomes as most projects are ongoing and hence their success cannot be effectively examined. While all reviewed projects except one related to at least one pillar of REPowerEU, the diversification of energy supply is mentioned with very low frequency, and mostly inexplicitly. Accelerating clean energy is more prominent, however, this pillar is more widely interpreted, ranging from classical decarbonisation to much broader incorporations of climate change mitigation (see e.g. BuildEST, CO"-INT-BIO, GREEN-STOVE or CARE4CLIMATE) or even going so far as to address climate adaptation (e.g. LIFE Veneto).

The most prevalent pillar, saving energy, gained special attention amongst private actors, attributable to the fact that energy costs directly impact their product profitability. Reducing energy requirements was dominated by efforts to increase efficiency or establish new processes altogether. Yet, "circular economy and resource efficiency" framed several projects (e.g. BuildEST, BipolymerEngine, HYPOBRICK and CO"-INT-BIO), extending the efficiency dimensions beyond energy.

Overall, it is premature to establish how projects trigger institutional change; nevertheless, extrapolation suggests several differences regarding preferences to invoke institutional change across the EU, national, and local policy levels. Given the funding source, the prioritisation of EU-level change is unsurprising. Regardless, projects aimed specifically at affecting national change existed and were most often publicly-led. This public tendency to aim for national policy advances is apparent in projects like CARE4CLIMATE or BuildEST (Ministry of Climate Estonia, 2024) aiming to "provide a national framework and starter mechanism for carrying out the EU Renovation Wave Initiative." DecarbCityPipes2050 (Energy Cities, 2020, p.16) focused similarly on national policy change, stating that "recommendations to policymakers on how to adjust national policy, procedures and legislation to enable the heat transition are formulated and discussed with the relevant [national] actors" and should serve towards the developments and updates of EU member states' National Energy and Climate Plans (NECPs) and Long-Term Strategies (LTSs).

Contrastingly, private actors focused more on affecting multinational strategy changes, as seen in WHIN and HEATLEAP, which can be explained by their attention to profitability, scaling, and multinational supply chains. HORIZON EURC EESV developed recommendations "focused on the EU scope, aimed at enhancing job opportunities…addressing workforce shortages, ensuring social acceptance…facilitating the implementation and rollout…by removing legal barriers, and creating more favourable policies" (Gentili et al., n.d.). Similarly, HP4ALL made EU-specific policy suggestions to "address an overarching EU scheme for the legal reinforcement of energy rehabilitation" and "draw-up EU-wide minimum content guidelines for specialised training programmes…to avoid gaps" (Garcia, 2022). SECRHC even resorted to writing a letter to the Director General for Energy to reinforce demands for "[creating] a dedicated Directorate on renewable heating and cooling to give this important sector institutional recognition and adequate capacity to design effective policy and support" (Dias et al., 2020).

Focusing on local-level policymaking, projects like DecarbCityPipes2050, Heat&Cool, WHIN, SUNIFIX, and CARE4CLIMATE enacted change using "modular factories [to] enable local production… [so] regions can secure their supply and create local and resilient food systems" (NitroCapt, n.d.).

Generally, best practice development seemed limited in innovative technology projects, but was observed consistently across the four other solutions. Striving to positively impact institutions, some stood out particularly in their potential to inform future policy. BuildEST (2023, 3) established an important equilibrium, recommending that "synergy between energy-efficient renovations and heritage preservation necessitates a collaborative effort involving financially capable owners, forward-thinking city officials, climate goal-oriented designers/consultants, and skilled builders." Heat4Cool (n.d.) innovated a digital management system for district heating and cooling, "which will allow controlling efficiently instantaneous heat/cool generation in function of the effective demand of each block". Lastly, EMB3Rs proposed a promising long-term EE solution, namely "a bottom-up, user-driven and open-source modelling platform to simulate alternative supply-demand scenarios for the recovery and reuse of industrial excess heat and cold" (CORDIS, 2019).

4.3. Case studies

4.3.1. BETTED

The LIFE22 BETTED (Boosting Energy Transition of ThE Dairy Value Chain) project, which was commenced in 2024 by the 'Università degli Studi di Brescia' and is anticipated to finish in 2027, aims to further decarbonisation measures of the dairy sector and therefore provides a compelling example of efforts to decarbonise hard-to-abate sectors (CINEA, 2023). The analysis draws on the LIFE database as well as a personal interview.

With large dependency on heat-based processes such as sterilisation, pasteurisation, and production, the cost-efficient and reliable synergy between coal and heat, and therefore the industry's large carbon footprint as one of the major polluters in the EU, has come under increasing criticism (BETTED representative, personal communication, 3rd April 2024). BETTED aims to counteract this through promoting the uptake of energy-efficient methods for heat recovery and the integration of renewable energy sources to yield decarbonisation benefits (CINEA, 2023).

The focus of BETTED is twofold: firstly, integrating heat pumps and renewables, such as photovoltaics (PVs) and bioenergy into the dairy sectors' industrial operations; and secondly, making such measures particularly accessible to small- and medium enterprises (SMEs) by utilising a holistic value chain approach (BETTED representative, personal communication, 3rd April 2024). This is of particular importance since large cooperatives hold the greatest market share in the dairy sector, making collaboration between large companies and SMEs a key focus of BETTED to ensure effective decarbonisation of the sector (ibid.).

4.3.1.1. Preparation phase

The preparation phase predominantly reveals a bottom-up approach. Firstly, the project draws on best practices identified from the Horizon2020 'Improving Cold Chain Energy Efficiency' (ICCEE) project, showcasing applicability (BETTED representative, personal communication, 3rd April 2024). Furthermore, BETTED aims to develop tools that can be adopted by all actors along the dairy value chain, emphasising its bottom-up nature (ibid.). Secondly, the project embodies multi-level governance, mobilising public and private actors alike, from research institutions as well as the food and energy sector from the industry side (ibid.). This holistic value chain approach facilitates coordination between SMEs and larger companies. Thirdly, the project displays potential in influencing policy through showcasing effective decarbonisation measures for the dairy sector. Nevertheless, the strong influence from the *Saving Energy* and *Accelerating Clean Energy* pillars of REPowerEU simultaneously showcase some top-down influence.

4.3.1.2. Inception phase

Capacity building emerges as the principal solution proposed by BETTED, embodied in its value chain approach of mobilising various actors and facilitating knowledge and skill and knowledge sharing between them. The rollout of existing technology is a secondary solution, through promoting heat pumps and renewables.

4.3.1.3. Implementation phase

Considering cost-effectiveness, the technical knowledge provided by experts, as well as the blueprint provided by ICCEE offer tangible measures based on lessons learnt (Zanoni and Marchi, 2020). While specific deliverables are hard to assess due to the project's early stage, expected outcomes should yield significant cost reductions through EE measures, as showcased by ICCEE (Zanoni and Marchi, 2020). However, investments needed to install the technology could pose challenges for SMEs, given their short-term vision expects quick returns on investments (BETTED representative, personal communication, 3rd April 2024). The diverse range of involved actors, including public research universities, intergovernmental organisations, industry associations, and energy experts, facilitates multilevel governance and allows for skill and knowledge sharing, which could aid SMEs. The Heat Pump Association plays a crucial role through sharing technical knowledge on heat pump deployment (ibid.).

4.3.1.4. Conclusion phase

Analysing the conclusion phase again proves challenging due to the project's early stage. However, the transferability of ICCEE to BETTED demonstrates the effectiveness and potential durability of the measures. While uncertainties remain on whether BETTED will lead to a positive feedback loop effect and prompt institutional changes, such as supporting top-down policies like REPowerEU, it does directly target two key pillars of REPowerEU, suggesting potential influence. The transferability from ICCEE to BETTED sets a promising precedent, highlighting the potential for impactful top-down policies. Thus, it could serve as a compelling example of durable policy measures aimed at decarbonising industrial sectors.

4.3.2. Heatleap

Active from June 2020 to August 2023, Heatleap was an innovative project aiming at recovering heat and energy from industry, as well as the gas transport network. It was composed of 3 pillars (Heatleap, 2023):

- Recovering hard-to-utilise low grade waste-heat (-75°C) from industrial processes, to heat district heating networks;
- Recovering heat from gas decompression in the transport network, to produce electricity through an electric generator in the gas expander; and,
- Developing a cloud-based software platform for system monitoring to allow output forecasting.

The project gathered different entities, which were dominated by private actors, over the involved research institution and industry union, to pursue its innovative objective of creating new technological processes to recover waste heat. The total eligible budget of the project was €4.49 million, of which the EU contributed €2.47 million. The project aimed to cut the plant's emissions by 5,750tCO2 and generate 2 GWhel/year. In the long run, the project aimed to increase the deployment of waste heat recovery technologies, and improve the business model of such technologies.

4.3.2.1. Preparation phase

The project displayed some influence by REPowerEU, with the interviewees being highly aware of the pillars and related policies. The project's focus was on the *Accelerating Clean Energy* pillar through "promoting industrial heat recovery as a clean energy source" (Heatleap representative, personal communication, 5th April 2024). However, in recovering waste energy and feeding part of this into the Brescia heating network, it simultaneously addressed the *Saving Energy* and *Diversifying Energy Supply* pillars. Alongside REPowerEU, the broader energy and climate policy framework, policies such as the EED, the RED, the EU Taxonomy and the Net Zero Industry Act were cited as other key influences.

The project clearly displayed some bottom-up practices, with project leaders identifying the inclusion of local communities as essential. Engaging in dialogue with various local private and public entities, a special focus was given to capacity building on the plant-side and local stakeholder coordination.

4.3.2.2. Inception phase

Heatleap proposed innovative technology as their principal solution, embodied within their development of cutting-edge technology-based large heat pumps as well as their innovative gas expander. Nevertheless, given their focus on local-level engagement and interaction with communities as well as industry experts, capacity-building could be identified as a secondary solution (LIFE Database, 2024).

4.3.2.3. Implementation phase

The project webpage highlights that "waste heat recovery will make the European industry more competitive" (Heatleap, 2021). Despite this, and additional statements from interviewees according to which the project might generate "potential cost savings" and that "over time, the operational cost savings from reduced energy consumption can outweigh the initial investment", the cost-effectiveness of Heatleap is not well documented publicly. The most prominent challenges faced include high upfront investment for both technologies, difficult standardisation due to different needs in terms of temperature and industrial processes, and, most prominently, a lack of appropriate regulations, where three particular shortcomings of EU EE policies were identified:

- The non-continuation of the heat pump accelerator, launched by REPowerEU, for unknown reasons;
- The lack of mandatory requirements for the application of the EE principle in the gas transportation network; and,
- The incomplete definition of 'waste heat' at the EU-level, impinging the recognition of the importance of the sector to decarbonise and diversify the energy system.

4.3.2.4. Conclusion phase

The project was cross-cutting and far-reaching, and proposed a pilot project for technological innovation alongside formulating policy recommendations (Baresi, 2023), in line with the regulatory limitations identified above. It is hard to assess whether the project will lead or has led to institutional changes, but the support of the European Association for the Promotion of Cogeneration (COGEN) in the project is crucial to relaying the project's policy recommendations, which mainly target the European level. These recommendations relate to the incomplete definition of waste heat in the RED, the inclusion of waste heat in the National Climate and Energy Plans (NECP), the need to increase financial aid to the industries and to tackle the lack of skilled workers in the Operation & Management of waste heat recovery facilities.

Despite extensive desk-based research as well as an interview with project leaders, the future of the project and direct institutional change or implemented best practices remain unclear.

5. Discussion and Policy Recommendations

From the literature, project outputs, and case study evidence gathered throughout the research, overall findings identified a series of priority avenues and approaches through which these could be pursued.

1. **The equal representation of all three REPowerEU pillars at the top-down level should be ensured** to enable a holistic pursuit of objectives guided by an encompassing policy approach. One could facilitate this by creating calls for project applications that specifically target EU policies like the REPowerEU pillars that the EU aims to prioritise and address. Further, given the lesser mention of local strategy development and alignment, top-down efforts could focus on increasing the beneficial integration, prioritisation, and implementation of EE changes at this institutional level.
2. **The accessibility of data reporting on project outcomes and results on EE should be enhanced**, in the form of publicly-available databases and knowledge hubs, to enhance the materialisation of the identified potential of bottom-up approaches. Both top-down and bottom-up approaches can play complementary roles in leading initiatives and subsequent implementation to ameliorate EE monitoring, reporting and evaluation efforts. Efforts towards institutional change were mentioned across projects spanning the five solution categories, and most often in an overlapping context discussing public awareness, reiterating its importance.
3. **REPowerEU projects should be incentivised to expand existing efforts of collaboration** to ensure solution sustainability and efficacy. While it was already prevalent in many reviewed projects, this reaffirms the notion that relying upon stakeholder consultation, joint capacity building, increased public awareness efforts, and the inclusion of identified best practices (e.g. public engagement, partnerships, and holistic approaches) will aid in successful project implementation.
4. **Visibility in the academic literature should be increased**, to simultaneously support initiatives to clarify and mobilise direct avenues for projects to influence EU policies and practices, which was identified as a current gap. Bridging research institutions, local project leadership and relevant funding could play a critical role in producing and disseminating further findings.

To achieve these priority objectives and the multifaceted approaches for their implementation, this report concretely recommends:

1. **Efforts across project types should apply more concentrated capacity building around business model development**, leading to better replicability and scaling, alongside more targeted outreach to underrepresented regions, sectors, and stakeholder categories.

2. **Project design and implementation resources should be shared to mobilise knowledge**. This could occur through project output requirements (e.g. monitoring impact, publishing guides) to build stronger public databases and interdisciplinary partnerships.
3. **Frameworks at the regulatory and legislative levels should be created** to enable synergies between strategic political initiatives.

Specifically based on the case studies, further recommendations should be highlighted:

1. **An EU-wide waste heat cadaster should be created** to facilitate the access of data on industrial, commercial, and residential waste heat which was identified as a key issue for waste heat recovery to operate on a larger scale.
2. **More activities linked to waste heat recovery should be included in the EU taxonomy**, following Heatlap's insisting that the definition of waste heat in the RED was incomplete, suggesting a lack of inclusion or clarification of EE themes in European legislation.
3. **The announced Heat Pump Accelerator programme should be launched**, following the identified critical nature of heat pumps as EE technology.
4. **EU financial aid towards industries and individuals to incentivise the uptake of EE technologies should be increased**, following the identification of high upfront investment costs as a key barrier by all projects, which may also inhibit projects' replicability potential. This could come in the form of grants, subsidies or tax credits.

6. Conclusion

EU ambitions and strategies on energy, and especially EE, have substantially increased since 2022 with the launch of REPowerEU targeting the acceleration of clean energy, more energy savings and the diversification of energy supplies. The analysis finds that the majority of the 81 EU-funded projects tackle two of these three pillars, with a clear focus on *Acceleration of Clean Energy* and *Energy Savings*, despite being launched before 2022.

The application of the theoretical framework to a sub-sample of 30 projects suggested that many projects considered a bottom-up approach in both their preparation and implementation phases. During preparation, bottom-up approaches mainly manifested through building upon feedback and best practices from previous projects. As for implementation, the involvement of local stakeholders, building working groups and creating or engaging in network initiatives and partnerships were diverse concretisations of bottom-up approaches, predominantly found in capacity building projects. For projects that proposed concrete policy recommendations, capacity building projects were found to target national policies, whereas innovative projects, mostly led by private companies, often aimed for the EU level. Nevertheless, establishing a causal link between analysed projects and EU regulations remains difficult, although the findings indicate that bottom-up approaches still have untapped potential as they lack a clear pathway to drive institutional change.

Limitations of the study include a relatively small sample of projects analysed, with only four in-depth qualitative analyses in the form of project leader interviews. This was due to time constraints, alongside some unresponsiveness. Considering that for many projects information provided online is sparse, and that key elements such as policy recommendations were primarily obtained during the interviews, having more discussions with project leaders would definitely have improved the robustness of the results. Lastly, the ability to have obtained feedback from EU legislators on whether and how results and analyses of concrete projects co-funded by the EU are considered in the legislative process would have reinforced the rigour of the study.

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Appendices

Appendix I: Interview Protocol

Interview Protocol – *Analysis of the REPower EU Policies & Contributions of LIFE Projects in Presenting Concrete Solutions with a Bottom-up Approach*

Introduction

Thank you for agreeing to participate in this interview for the *Analysis of the REPower EU Policies & Contributions of LIFE Projects in Presenting Concrete Solutions with a Bottom-up Approach*, which is being undertaken by Sciences Po students in collaboration with CINEA.

This research will inform a background paper that provides an overview of the objectives, implementation pathways, and intended results of the REPowerEU policy, and assess the extent to which these are enabled through the current LIFE projects. It will provide lessons learnt around factors enabling or hindering the effectiveness and impact of related projects, particularly centred on concrete solutions emerging from a bottom-up approach. This review is set to analyse the relevance, coherence, effectiveness, impact, sustainability and efficiency of current projects. The methodology proposed includes an extensive literature review, stakeholder interviews, case studies and an in-depth portfolio review of the LIFE projects.

The purpose of this interview is to inform the research team's understanding of the REPowerEU policy framework and its representation in ongoing projects. We seek to gain your insights and perspective around the key characteristics that connect projects with the broader policy context, aiming to identify best practices and lessons learnt through the current outcomes and solutions.

You have been identified as a key stakeholder for this review, and we thank you for your participation in this confidential interview, which will last no more than 30 minutes. While your project will be identified as a key case study that informs the background paper overall, your specific contributions will be anonymous to all but the research team.

Do you freely consent to this interview, and to the terms specified above?

Thank you.

Respondent Profile and Project Background

1. Please introduce yourself, and tell us a bit more about your involvement in the project as well as its alignment with the LIFE/REPowerEU/HORIZON programme.
2. How would you describe the current stage of the project or where could we find more information regarding the project timeline, particularly any key stages and milestones?

Questions

Project-Specific Solutions and Challenges

3. What types of solutions does your project offer? [*Capacity building? Deployment of existing tech? Innovative tech? Renovation? Public awareness?*]
   a. How do you view the role of a bottom-up approach in enabling the emergence of solutions and best practices?
   b. How do you view these solutions in relation to the broader EU policy framework? Do you identify overlapping areas with other projects/policies?
4. What do you view as the biggest strengths and/or weaknesses of the project? [*Cost effectiveness; contribution to immediate and long-term environmental, economic and social improvements; degree of innovation and transferability; relevance to policy*].
5. What are the biggest barriers you face, have these occurred mostly at certain stages of the project or throughout? To what extent did you envision these challenges before commencing the project? Which of these challenges appeared unexpectedly?
   a. How do you view the potential role of LIFE/REPowerEU/Horizon/Innofund in supporting solutions to these challenges?
6. What is the current level of collaboration in relation to your project, both internally and with other projects? Are you satisfied with this level?
   a. Are there persistent barriers or potential synergies to build further?
   b. How would you like to change or improve links between actors and the building of potential synergies with the other projects under this portfolio?
7. How would you describe the relationship between your project and CINEA?

Broader REPower EU Context

8. How familiar are you with the broader REPowerEU policy framework?
   a. What do you think about the level of alignment between theory and practice, expectations and reality in implementing LIFE projects based on these policies?
9. Are you familiar with the REPowerEU pillars? [*Saving energy, diversifying energy supply, accelerating clean energy*] Which of the pillars do you feel best aligns with your project?
   a. Do you feel there is an adequate level of synergy and alignment between the pillars, or is one area under- or over-represented in the current landscape?
10. Is the current LIFE project structure fit-for purpose, in alignment with REPowerEU policies and the broader energy transition context in Europe?
    a. How do you view the role/relationship of your project in contributing to REPowerEU policies? Is this a bi-directional relationship?

11. Could you describe the current partnership model and cross-national collaboration process in the context of your project?
12. Moving forward, would you recommend any changes to the role of the REPowerEU policy framework or structure of the implementation model?

Additional

13. Do you have anything else to share that would contribute to a successful review?

Thank you for your participation in this interview, your insights are valuable to our review!

Appendix II: Representative sample of 30 projects

ID	Project acronym	Programme	Category	Type of solutions implemented	Timeline	Country	Primary REPowerEU theme adressed	Secondary REPowerEU theme adressed	Type of entity	EU contribution	Total budget
6	LIFE-IP CARE4CLIMATE	LIFE	PLANNING	Capacity building	Ongoing	Slovenia	Saving Energy	Accelerating clean energy	Government	EUR 6,994,060.00	EUR 27,184,629.00
7	LIFE4HeatRecovery	LIFE	DH	Capacity building	Ongoing	Italy	Saving Energy		Private	EUR 3,360,079.00	EUR 5,612,877.00
9	LIFE-CO2-INT-BIO	LIFE	INDUSTRY	Deployment of existing technology	Closed	Spain	Saving Energy		Government	EUR 1,923,900.00	EUR 3,498,000.00
10	LIFE HYPOBRICK	LIFE	INDUSTRY	Innovative technology	Closed	Spain	Saving Energy		Research	EUR 868,297.00	EUR 1,578,722.00
11	LIFE-IP SK AQ Improvement	LIFE	BUILDINGS	Capacity building	Ongoing	Slovakia	Saving Energy	Accelerating clean energy	Government	EUR 9,000,000.00	EUR 15,000,000.00
15	LIFE RAPID DRY	LIFE	INDUSTRY	Innovative technology	Closed	Italy	Saving Energy		Private	EUR 709,250.00	EUR 1,289,547.00
17	LIFE HEATLEAP	LIFE	INDUSTRY	Innovative technology	Closed	Italy	Saving Energy	Accelerating clean energy	Private	EUR 2,468,216.00	EUR 4,487,668.00
18	LIFE IP BUILDEST	LIFE	BUILDINGS	Renovation	Ongoing	Estonia	Saving Energy		Government	EUR 9,500,000.00	EUR 16,226,711.00
20	LIFE GREEN-STOVE	LIFE	BUILDINGS	Innovative technology	Closed	Italy	Accelerating clean energy	Diversify energy supply	Private	EUR 1,164,199.00	EUR 2,116,727.00
21	Heat&Cool LIFE	LIFE	DH	Deployment of existing technology	Ongoing	France	Accelerating clean energy	Saving Energy	Government	EUR 1,507,940.00	EUR 2,741,710.00
22	LIFE_LETsGO4Climate	LIFE	BUILDINGS	Capacity building	Ongoing	France	Accelerating clean energy	Diversify energy supply	Government	EUR 2,471,727.00	EUR 4,494,054.00
24	LIFE WHIN	LIFE	INDUSTRY	Innovative technology	Ongoing	France	Saving Energy	Diversify energy supply	Private	EUR 3,215,678.00	EUR 5,359,466.00
27	LIFE BipolymerEngine	LIFE	INDUSTRY	Innovative technology	Ongoing	Germany	Saving Energy	Diversify energy supply	Private	EUR 1,540,357.00	EUR 2,800,650.00
28	LIFE-SUNIFIX	LIFE	INDUSTRY	Innovative technology	Ongoing	Sweden	Diversify energy supply	Accelerating clean energy	Private	EUR 2,104,316.00	EUR 3,507,193.00
31	DecarbCityPipes 2050	HORIZON	BUILDINGS	Capacity building	Closed	Austria	Accelerating clean energy	Diversify energy supply	Research	EUR 1,894,032.00	EUR 1,894,032.00
32	ActIonHeat	HORIZON	BUILDINGS	Capacity building	Ongoing	Germany	Accelerating clean energy	Diversify energy supply	Research	EUR 1,495,702.00	EUR 1,495,702.00
34	COHEAT2	LIFE	BUILDINGS	Capacity building	Ongoing	Denmark	Accelerating clean energy	Saving Energy	Government	EUR 1,480,176.00	EUR 1,558,081.00
37	SET_HEAT	LIFE	DH	Capacity building	Early stage	Poland	Saving Energy	Accelerating clean energy	Research	EUR 1,468,120.00	EUR 1,555,916.00
54	REWARDHeat	HORIZON	DH	Innovative technology	Ongoing	Italy	Accelerating clean energy	Saving Energy	Research	EUR 14,999,481.00	EUR 18,718,100.00
55	SecRHC 2022-2025	HORIZON	PLANNING	Deployment of existing technology	Ongoing	Belgium	Saving Energy		Private	EUR 10,493,875.00	EUR 10,493,875.00
63	DigiBUILD	HORIZON	BUILDINGS	Innovative technology	Ongoing	Italy	Accelerating clean energy		Private	EUR 4,578,873.00	EUR 5,525,782.00
64	EMB3Rs	HORIZON	INDUSTRY	Capacity building	Closed	Portugal	Saving Energy	Accelerating clean energy	Research	EUR 3,984,671.00	EUR 4,245,118.00
65	Heat4Cool	HORIZON	BUILDINGS	Renovation	Closed	Italy	Saving Energy	Accelerating clean energy	Research	EUR 5,703,012.00	EUR 7,934,577.00
66	HP4ALL	HORIZON	BUILDINGS	Capacity building	Ongoing	Ireland	Saving Energy		Research	EUR 996,286.00	EUR 996,286.00
67	COOL DH	HORIZON	DH	Innovative technology	Closed	Denmark	Accelerating clean energy	Saving Energy	Private	EUR 3,958,349.00	EUR 5,279,936.00
70	LIFE Veneto ADAPT	LIFE	BUILDINGS	Capacity building	Closed	Italy			Government	EUR 1,478,586.00	EUR 2,464,394.00
71	LIFE GREEN FACTORY	LIFE	INDUSTRY	Innovative technology	Ongoing	Italy	Saving Energy		Private	EUR 665,586.00	EUR 1,210,158.00
76	LIFE NIMBUS	LIFE	PLANNING	Innovative technology	Ongoing	Spain	Accelerating clean energy		Private	EUR 1,093,120.00	EUR 1,987,494.00
79	GEO4CIVHIC	HORIZON	DH	Innovative technology	Closed	Italy	Accelerating clean energy	Saving Energy	Research	EUR 6,841,960.00	EUR 8,143,120.00
80	COOLING DOWN	LIFE	DH	Innovative technology	Ongoing	Belgium	Accelerating clean energy		Private	EUR 1,908,021.00	EUR 2,008,444.00

Appendix III: Table 2: Co-occurence of codes from thematic analysis