DECISIO: A Participatory Decision-Support Framework for Inclusive Energy Transition in Renewable Energy Communities

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Abstract. The transition toward renewable energy systems increasingly intersects with issues of social equity, governance, and territorial inclusion. Renewable Energy Communities (RECs), particularly Solidarity RECs (CERS), are expected to play a key role in this transition; however, their decision-making processes often lack structured methodologies that integrate economic efficiency, social impact, and participatory governance. This gap is significant for Third Sector organisations tasked with allocating financial resources among competing social-impact initiatives. This paper presents DECISIO, a participatory decision-support framework designed to enhance transparency, inclusiveness, and coherence in resource-allocation processes within renewable energy communities. The framework integrates multi-criteria evaluation methods with participatory co-design practices, translating stakeholders' qualitative preferences into structured and comparable project assessments. It also includes a set of indicators to evaluate redistributive governance, territorial vulnerability, and stakeholder engagement. The framework has been developed in collaboration with the Fondazione Energie di Comunità ETS, which coordinates multiple CACER configurations in the Turin metropolitan area. Although the project is still in its early stages and has not yet been empirically implemented, this paper outlines the framework's methodological design and its anticipated contributions, grounded in a Theory of Change perspective. By embedding evaluation practices directly within governance processes, DECISIO seeks to provide a structured decision-support system that promotes greater transparency, strengthens stakeholder participation, and fosters a more territorially responsive energy transition. These expected outcomes will be empirically tested in forthcoming phases of the project's implementation.

Keywords: Participatory Decision-Making · Social Impact Assessment · Renewable Energy Communities

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1 Introduction

The transition toward renewable energy systems is no longer a technological challenge; it has increasingly become a matter of governance, social inclusion, and distributive justice [1]. Renewable Energy Communities (RECs) have emerged as key actors in this shift, promoting decentralised energy production while fostering collective ownership and local participation [2]. However, their ability to generate meaningful social impact depends greatly on the quality of their internal decision-making processes, particularly regarding the allocation of economic resources [3].

In Italy, the emergence of Solidarity Renewable Energy Communities (CERS) reflects an evolution of the REC model. While maintaining the existing regulatory framework, these initiatives place a stronger emphasis on addressing energy poverty [4–6], redistributing benefits to vulnerable groups [7], and strengthening social cohesion at the local level. Moreover, decisions about how funds are distributed within CERS often rely on implicit criteria or fragmented evaluation methods [8], limiting transparency and restricting genuine stakeholder participation [9]. This challenge is especially pronounced for CERS established as Third Sector organisations, which must balance economic sustainability with social objectives. As a result, there is a pressing need for structured methodologies that help decision-makers navigate complex trade-offs between efficiency, equity, and territorial relevance [10].

Responding to this need, the DECISIO project (DECISIO – "*DEcisioni Condivise per l'Inclusione Sociale e l'Innovazione Oltre i progetti energetici*/Shared Decision-Making for Social Inclusion and Innovation Beyond Energy Projects") introduces a participatory decision-support framework that reimagines decision-making as a collective, reflective, and inclusive process, rather than a purely technical one. DECISIO seeks to promote decision processes that are more transparent, legitimate, and context-sensitive by integrating multi-criteria evaluation methods with participatory practices [11, 12]. The effectiveness of such participatory evaluation processes depends on the continuity and representativeness of stakeholder engagement: in diverse REC contexts, variations in institutional capacity, technical literacy, and levels of social participation can critically shape both the quality and perceived fairness of deliberation.

Conceptually, this research stands at the intersection of decision-support systems, participatory governance, and energy justice [13]. These domains converge on the shared assumption that the quality of governance and decision-making within RECs directly affects their capacity to redistribute economic value and generate social impact, particularly in vulnerable territories [14]. Enhancing these decision processes is therefore not just an administrative improvement but a fundamental condition for achieving a socially just energy transition [9].

Despite growing scientific attention to RECs, there remains a notable gap in the availability of operational frameworks that effectively combine participatory approaches with structured evaluation models. Existing studies tend to address either social participation or economic assessment, without offering tools that bridge these dimensions within actionable decision-support systems. This gap is especially critical in contexts where organisations must distribute limited resources among competing projects with heterogeneous impacts.

The primary aim of this study is therefore to develop and test a methodological framework that enables the equitable and transparent allocation of funds within RECs. As the DECISIO project is still in its early stages and has not yet been fully implemented, this paper focuses on presenting the methodological design of the framework and its expected contributions, rather than empirical results. Specifically, it seeks to formalise a participatory evaluation model [11], apply it in a real-world context, and assess its potential to enhance governance outcomes. In doing so, the study also develops a set of indicators designed to measure the economic, social, and territorial impacts of decision-making processes, providing a foundation for continuous monitoring and adaptive improvement.

These indicators are structured in alignment with a Theory of Change approach, enabling the identification of causal linkages between inputs, activities, outputs, and expected outcomes. This framework supports a more comprehensive assessment of how specific decisions contribute to both short- and long-term impacts, while fostering learning, adaptation, and evidence-based refinement of governance practices.

The paper is organised as follows: Sect. 2 introduces the conceptual framework and research objectives, situating the study within the broader fields of energy justice, participatory governance, and decision-support systems. Section 3 details the methodological approach, describing the DECISIO framework, the multi-criteria evaluation model, and the system of social impact indicators. Section 4 presents the case study context and illustrates the framework's application in a real-world setting. Section 4 discusses preliminary methodological results and their implications, while Sect. 5 concludes by outlining the main contributions, limitations, and directions for future research.

2 Methodological Approach

This research adopts a transformative action-research approach, combining methodological development with empirical application in a real-world context. The DECISIO framework is structured around an iterative process, based on the "Theory of Change" [1–3], that integrates co-design, implementation, and evaluation, ensuring continuous interaction between researchers and stakeholders. In the medium to long term, DECISIO aims to foster a structural transformation in the governance of RECs and CERS and in the decision-making practices of the Third Sector, by translating principles of equity and transparency into operational metrics. The project contributes to consolidating enduring capacities in participatory evaluation and to establishing a stable framework for co-decision processes oriented towards the equitable allocation of resources and socially driven innovation.

The methodological structure comprises two main components: a decision-support model for evaluating social-impact projects [4–6] and an integrated set of indicators to measure socio-economic outcomes and impacts.

The decision-support model is grounded in a multi-criteria evaluation framework [4, 5], which enables the systematic comparison of alternative projects generated through a participatory process involving stakeholders. Within this process, stakeholders (namely, participants of RECs or CERS) are actively engaged in co-creating social-impact project ideas that reflect their needs, priorities, and aspirations.

The participatory activities are facilitated by trained experts who structure and guide the process to elicit and refine initial project proposals that respond to the community's specific socio-territorial context. This phase ensures that the set of alternatives under evaluation is both context-sensitive and collectively constructed.

Subsequently, evaluation criteria are co-defined with REC decision-makers to establish shared objectives and strategic orientations. During this phase, facilitators support the development of a structured evaluation framework that assigns relative importance to multiple dimensions, including economic efficiency, social impact, and territorial coherence. Stakeholders' qualitative preferences are thus translated into formalised evaluation metrics, enhancing the transparency, consistency, and traceability of the decision-making process (Fig. 1).

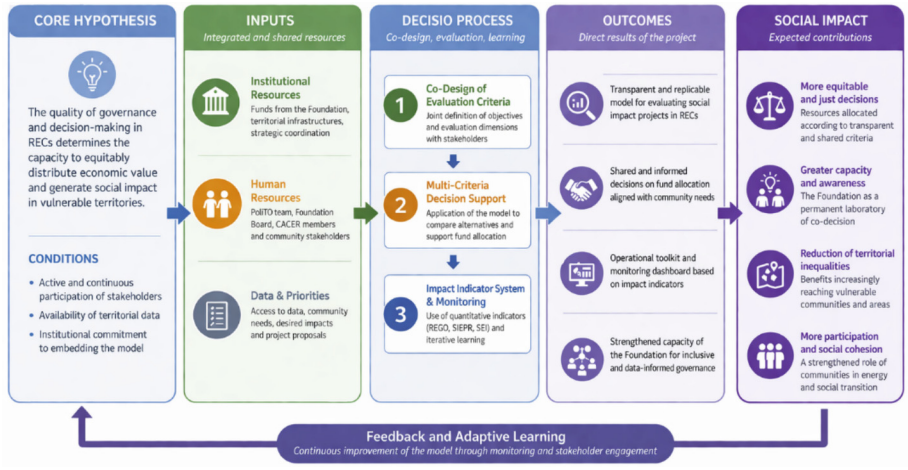

Fig. 1. Project workflow. (Authors' elaboration, generated with AI graphic support, OpenAI DALL·E).

Social-Impact Assessment. The impact assessment framework developed within DECISIO is based on an integrated system of quantitative and qualitative indicators, designed to systematically capture the economic, social, and territorial effects of applying a redistributive governance model. These indicators are developed using a combination of primary and secondary data, gathered through surveys, interviews, participant observation, open datasets, and administrative data sources:

– REGO (Redistributive Energy Governance Index): developed within the project, this index captures the quality of redistributive governance by combining two key dimensions: economic efficiency (the ratio between generated value and resources invested) and distributive equity (the proportion of benefits directed toward vulnerable groups or disadvantaged areas).
– SIEPR (Spatial Index for Energy Poverty Risk, [6]). This index measures territorial energy vulnerability by integrating energy-related and socio-economic variables,.

It is calculated through GIS-based spatial analysis using official national statistics, complemented by context-specific data on energy consumption and user profiles.

– SEI (Stakeholder Engagement Index, [7]). This index evaluates the quality and depth of stakeholder participation in collective decision-making, drawing on three dimensions: participation (attendance and continuity of engagement), representativeness (diversity of social groups involved), and perceived influence (the degree to which participants feel their input shapes decisions). Data collection relies on pre- and post-process questionnaires, direct observation of deliberative sessions, and analysis of workshop documentation.

Expected effects move across three interconnected levels, each explicitly linked to the proposed set of indicators. At the institutional level, improvements in the quality and coherence of economic decision-making are assessed through variations in the REGO (Redistributive Energy Governance Index). In particular, an increase in the average REGO value compared to the baseline is interpreted as evidence of enhanced alignment between efficiency and distributive equity within governance processes.

At the socio-economic level, the model captures changes in both the extent and the quality of participation. These effects are measured through the SEI (Stakeholder Engagement Index), which reflects participation intensity, representativeness, and perceived influence in decision-making processes.

At the territorial level, the framework assesses the model's capacity to address spatial inequalities. This dimension is operationalised through the SIEPR (Spatial Index for Energy Poverty Risk), with expected outcomes including a reduction in energy vulnerability and greater convergence of benefits towards marginal or disadvantaged areas. Such changes are assessed by comparing SIEPR values across pilot and control configurations over time.

To strengthen methodological robustness, DECISIO adopts a dynamic approach that enables the simulation of alternative investment scenarios and makes explicit the trade-offs between economic efficiency, social equity, and decision-making inclusiveness. Quantitative results are complemented by participatory evaluation moments, in which stakeholders and decision-makers collectively interpret observed divergences and iteratively redefine priorities. This integration of data analysis, numerical simulation, and social learning enhances the model's external validity and supports its scalability across diverse territorial contexts. Finally, the introduction of threshold-based alert mechanisms enables the early identification of unintended dynamics and supports timely adjustments in strategic decision-making.

3 Case Study Context and Application

Context. RECs are a relatively recent paradigm for the collective generation, sharing, and consumption of renewable energy, introduced at the European level by Directive (EU) 2018/2001 (RED II) [8]. In Italy, the current regulatory framework is mainly defined by ARERA's Integrated Text on Distributed Self-Consumption (TIAD, Annex A to Resolution 727/2022/R/eel, as subsequently updated) [9] and by the MASE Ministerial Decree No. 414/2023 (the so-called CACER Decree), together with the related GSE Operational Rules [10].

In this context, a REC is an autonomous legal entity whose main purpose is "to provide environmental, economic, or social benefits to its members or to the local area in which it operates, rather than to maximise financial profits" [8] (RED II). It may include citizens, associations, local authorities, and small and medium-sized enterprises (SMEs), which jointly manage renewable assets (e.g., photovoltaic panels) and to share the locally produced energy through the mechanism of "collective self-consumption". From a territorial perspective, REC members are connected through the public distribution network and, under the current Italian framework, must belong to the area underlying the same primary substation. This requirement usefully identifies the REC as a local energy configuration, even though energy sharing remains virtual rather than based on direct private lines.

REC members maintain their ordinary. At the same time, At the same time, producers may inject electricity into the grid according to relationships with the electricity supplier and the public grid: consumers continue to purchase electricity from their supplier. In contrast, producers may inject electricity into the grid under the applicable market arrangements. Within this scheme, the GSE calculates the "shared energy" as the minimum, in each hour, between the total electricity injected into the grid and the total electricity withdrawn by the members of the configuration. Such shared energy is compensated for by avoided high-voltage transmission losses and further supported by an incentive scheme designed to enhance the profitability of these investments. The resulting benefits can be redistributed among members, reinvested in the community, or allocated to social purposes, according to the governance rules defined by the REC itself.

Building upon the REC model, recent experiences in Italy have fostered the development of Solidarity Renewable Energy Communities (*Comunità Energetiche Rinnovabili Solidali*, CERS), which explicitly integrate energy objectives with social inclusion and welfare goals. While maintaining the technical and regulatory structure defined for RECs, CERS place a stronger emphasis on addressing energy poverty, redistributing benefits toward vulnerable users, and supporting local social services. In this sense, they represent an evolution of the community energy paradigm, in which the collective management of renewable resources is leveraged not only for environmental and economic purposes but also as a tool for territorial cohesion and social equity.

Case Study. The DECISIO framework is applied to the Fondazione *Energie di Comunità ETS*[11], which coordinates a network of CACER configurations (REC arrangements) in the Turin metropolitan area in Northern Italy. The Foundation operates within

a complex multi-level governance structure, ensuring coherence between locally generated initiatives and broader social and redistributive goals. Following the acquisition of new financial resources, the Foundation faced the challenge of allocating funds among multiple project proposals developed by local communities, each with heterogeneous economic, social, and territorial impacts.

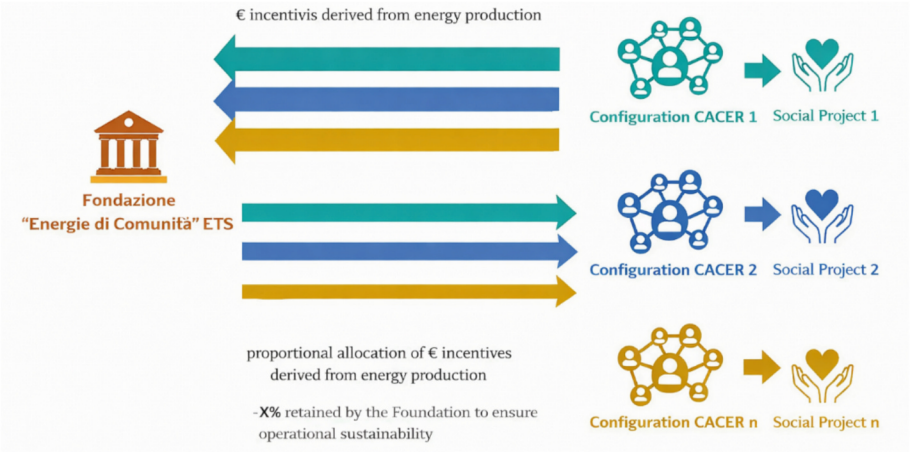

Fig. 2. Conceptual scheme of the governance and resource allocation mechanism adopted by the Fondazione Energie di Comunità ETS. (Authors' elaboration).

Within this context, the case study involves a set of interrelated stakeholders with distinct but complementary roles. The Foundation Energie di Comunità ETS acts as the primary institutional partner and direct beneficiary of the project, coordinating the CACER network and adopting the DECISIO framework as a decision-support tool for the socio-economic evaluation of funded initiatives. The CACER configurations themselves represent key territorial stakeholders, acting as intermediaries between local communities and the Foundation (Fig. 2). They actively participate in the co-design of project alternatives and in their co-evaluation to both construct the empirical dataset and validate the indicator system.

From a beneficiary perspective, the project generates both direct and indirect impacts. Direct beneficiaries include the Foundation and the participating CACER configurations, which benefit from the adoption of a structured, transparent, and redistributive governance model. Through the implementation of the evaluation framework and the associated monitoring indicators, the Foundation is expected to enhance the equity, consistency, and legitimacy of its resource allocation decisions. Indirect beneficiaries include socially and territorially vulnerable communities connected to the energy configurations, which are expected to benefit from more targeted, inclusive, and collectively defined investments. Beyond these immediate effects, the case study also highlights broader systemic implications. The DECISIO framework contributes to generating learning and capacity-building processes among a wider set of actors, including local administrators, Third Sector organisations, cooperatives, and other energy communities not directly involved

in the project. These actors may adopt or adapt the model within their own decision-making processes, thereby amplifying its impact. In the longer term, the application of DECISIO is expected to strengthen the collective capacity to address energy justice challenges, promoting more equitable, participatory, and territorially responsive governance practices.

4 Preliminary Results

At its current stage, the DECISIO project has not yet generated empirical results, as the pilot implementation is forthcoming. However, the project has already produced a set of methodological preliminary outcomes that define the conceptual architecture, analytical structure, and operational feasibility of the proposed framework.

First, DECISIO has established a formalised decision-support methodological approach to integrate multi-criteria evaluation methods with participatory governance processes. The model was designed to translate heterogeneous and qualitative stakeholder preferences into structured evaluation criteria and comparable project alternatives. While not yet applied, this formalisation provides a theoretically grounded and operationally explicit framework for addressing the allocation of resources in socially oriented RECs and CERS.

Second, the project has defined a co-design and co-evaluation approach that structures stakeholder involvement across different phases of the decision process. It uses specified methods, tools, and interaction formats (e.g., workshops, surveys, deliberative sessions) [5, 12, 13] to ensure inclusiveness, representativeness, and traceability of preferences. Although its empirical effectiveness remains to be tested, the co-evaluation approach [12, 13] constitutes a key methodological advancement by embedding participatory practices within a formal evaluation model, rather than treating them as external or ancillary components [14].

Third, the study has clarified the role of indicators as boundary objects between analytical and deliberative dimensions. Rather than being used solely as measurement tools, the proposed indicators are embedded within the decision process [2], supporting dialogue among actors, making trade-offs explicit, and enabling shared interpretation of outcomes. This shifts the function of evaluation from ex post assessment to an integral component of decision-making [4, 5].

At this stage, these indicators remain conceptual and operational constructs, whose robustness and sensitivity will be tested during the pilot phase. Nevertheless, their joint design already outlines a multidimensional evaluation framework that links governance processes to socio-spatial impacts [15].

The research outlines a scalable and transferable methodological framework, grounded in an adaptive logic. The combination of iterative evaluation, participatory feedback, and scenario simulation defines a flexible structure that can accommodate contextual variability while maintaining methodological coherence. This positions DECISIO as a candidate framework for broader application in contexts characterised by complex governance and competing socio-economic objectives.

Overall, these preliminary results should be interpreted as design-oriented contributions that establish the analytical and methodological foundations of DECISIO. The forthcoming implementation will be crucial for validating the model, testing its applicability, and assessing its scalability and replicability across different territorial contexts.

5 Conclusion

This paper has introduced DECISIO as a methodological framework designed to support inclusive and transparent decision-making in RECs and CERS, addressing a critical gap between normative principles (such as equity [16], participation [17], and energy justice [18]) and their operational implementation. Rather than focusing on empirical validation, the study provides a structured positioning contribution, outlining how decision-support systems can be integrated with participatory governance in complex socio-technical contexts. Although participatory MCDA approaches have been widely applied in environmental governance and energy planning, DECISIO stands out from existing frameworks in three key ways.

First, it embeds indicators of social redistribution and territorial vulnerability directly within the evaluation framework, rather than treating them as secondary or complementary dimensions. Lastly, it blends deliberative co-design practices with structured multi-criteria assessment, enabling collective priority-setting processes within Third Sector–led Renewable Energy Communities. Third, DECISIO adopts a Theory of Change [2] perspective, understanding evaluation not merely as a technical ranking exercise, but as a governance tool aimed at enhancing transparency, traceability, and stakeholder alignment in resource allocation processes.

At the output level, DECISIO establishes a comprehensive decision-support architecture that integrates participatory co-design, multi-criteria evaluation, and indicator-based monitoring. Together, these components produce a suite of operational tools, such as evaluation models, structured workflows, and composite indicators, that turn fragmented decision-making into transparent, traceable, and replicable procedures.

In the case of the Fondazione Energie di Comunità ETS, the framework is applied to a real allocation challenge involving the distribution of financial resources for social-impact initiatives across multiple CACER configurations. Here, the Foundation acts as a coordinating body, tasked with balancing local priorities against broader redistributive goals. DECISIO facilitates this role by structuring the collection, comparison, and assessment of project proposals emerging from local communities. This enables the Foundation to make explicit the trade-offs among economic efficiency, social equity, and territorial coherence, reinforcing its capacity to serve as a key node in redistributive governance. The case study demonstrates how the framework can be integrated into existing institutional routines, linking funding decisions to clearly defined outputs, expected outcomes, and long-term impacts.

From a methodological perspective, a major innovation lies in the active role assigned to indicators. Instead of being used solely for ex post evaluation, indicators are embedded within the decision-making process as instruments for interpretation, negotiation, and collective learning. This integration makes trade-offs explicit and supports adaptive decision-making, thereby improving the framework's scalability and transferability across diverse territorial settings.

Nonetheless, several limitations must be acknowledged. First, as the project remains in its early stages, the framework has not yet undergone full empirical validation, and its effectiveness in generating the expected outcomes remains to be tested. Second, implementing participatory decision-support processes may entail notable organisational and cognitive costs, raising questions about scalability and long-term sustainability. Third, the transferability of the indicator system may be limited by data availability and contextual variability, particularly in areas lacking robust informational infrastructures.

Although DECISIO was designed with adaptability in mind, its scalability across different REC configurations still requires empirical assessment. Variations in organisational structures, governance models, and local regulatory environments may all affect its transferability.

Future work will focus on the empirical application and validation of the framework within the case study, including the measurement of changes in governance quality, stakeholder participation, and territorial outcomes. Further research will refine the indicator system, test the model's robustness across different contexts, and explore its embeddedness in policy-making processes. Particular emphasis will be placed on assessing the approach's scalability and its potential to inform decision-making across varied institutional and territorial environments.

Acknowledgments. Ultimately, DECISIO reframes decision-making as a central mechanism of the energy transition, not simply a technical function, but a socio-political process through which equity, inclusion, and territorial justice can be actively built.

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References

1. Weiss, C.H., Weiss, Hirscbon, C.: Nothing as practical as good theory : exploring theory-based evaluation for comprehensive community initiatives for children and families (1995). https://docs.opendeved.net/lib/2URBNM2X
2. Anderson, A.A.: The community builder's approach to theory of change. Aspen Inst. **37** (2005)
3. Vogel, I.: Review of the use of "Theory of Change" in international development. Review Report (2012)
4. Cerreta, M., Daldanise, G., Poli, G., Regalbuto, S.: An innovative social multi-criteria evaluation methodology for ex-ante impact assessment of urban policy options: east Naples case study. Valori e Valutazioni (2024)
5. Cerreta, M., Panaro, S.: Collaborative decision-making processes for local innovation: the CoULL methodology in living labs approach. GeoJ. Libr. **128**, 193–212 (2022). https://doi.org/10.1007/978-3-030-78536-9_12
6. Lavecchia, L., Miniaci, R., Valbonesi, P., Venkateswaran, G.: Energy poverty risk: a spatial index based on energy efficiency. Questioni di Economia e Finanza (Occasional Papers) (2024)
7. GRI 413: Local Communities 2016 | ESG Docs. https://esgdocs.sustainability-report.kr/en/GRI_Standards_2021/GRI_413__Local_Communities_2016/. Accessed 25 Mar 2026
8. EU: Renewable energy directive (EU) 2018/2001. Official Journal of the European Union (2018)
9. ARERA: Allegato A 1 Testo integrato delle disposizioni dell'autorità di regolazione per energia reti e ambiente per la regolazione dell'autoconsumo diffuso (testo integrato autoconsumo diffuso-tiad) (2022)
10. Gestore Servizi Energetici.: ALLEGATO 1 Regole operative (2025)
11. Energie Di Comunita': https://energiedicomunita.eu/. Accessed 30 Mar 2026
12. Cerreta, M., La Rocca, L., Solli, V.: A decision support framework for a collaborative network strategy of cultural heritage enhancement: the co-HEva approach. In: Green Energy and Technology. Part F2560, pp. 361–376 (2024). https://doi.org/10.1007/978-3-031-53709-7_25
13. Cerreta, M., La Rocca, L., Micelli, E.: Impact assessment for culture-based regeneration projects: a methodological proposal of ex-post co-evaluation. In: Lecture Notes in Networks And Systems, vol. 482, pp. 501–511 (2023). https://doi.org/10.1007/978-3-031-06825-6_47

14. Sudhoff, R., Schreck, S., Thiem, S., Niessen, S.: Operating renewable energy communities to reduce power peaks in the distribution grid: an analysis on grid-friendliness, different shares of participants, and economic benefits. Energies (Basel). **15**, (2022). https://doi.org/10.3390/en15155468
15. Barreca, A., Curto, R., Rolando, D.: Assessing social and territorial vulnerability on real estate submarkets. Buildings. **7** (2017). https://doi.org/10.3390/buildings7040094
16. Bakhtavar, E., Prabatha, T., Karunathilake, H., Sadiq, R., Hewage, K.: Assessment of renewable energy-based strategies for net-zero energy communities: A planning model using multi-objective goal programming. J. Clean. Prod. 272, (2020). https://doi.org/10.1016/j.jclepro.2020.122886
17. Cutore, E., Volpe, R., Sgroi, R., Fichera, A.: Energy management and sustainability assessment of renewable energy communities: The Italian context. Energy Convers. Manag. 278, (2023). https://doi.org/10.1016/j.enconman.2023.116713
18. Hanke, F., Guyet, R., Feenstra, M.: Do renewable energy communities deliver energy justice? Exploring insights from 71 European cases. Energy Res. Soc. Sci. **80**, 102244 (2021). https://doi.org/10.1016/J.ERSS.2021.102244