EU Renewable energy community for rural areas: systematic and meta-analysis to define a transferable model to Italian small towns.

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In the "Sharm el-Sheikh Implementation Plan", issued at the end of 2022 United Nations Climate Change Conference (COP 27), there is recognition that limiting global warming to 1.5 °C requires rapid and sustained reductions in global greenhouse gas emissions by 43% by 2030 compared to 2019 levels. Participating countries are urged to accelerate the implementation of technologies and policies to transition to low-emission energy systems. Recent geopolitical dynamics have highlighted a growing need to review and overcome traditional energy supply models, increasingly focusing on innovative models of self-production and energy consumption from renewable energy sources (RES). In this context, renewable energy communities (RECs), as organized coalitions of prosumer users who collaborate to produce, consume, and manage clean energy, represent a fundamental tool for giving even greater impetus to the country's ecological transition. Innovation, environmental sustainability, and social development are the keywords of this model to the extent to involve also small rural realities, implementing a process of integrated growth using a place-based approach. The Italian Recovery Plan, considering the centrality of RECs, through the Mission 2.C.2 “Renewable energy, hydrogen, network and sustainable mobility” has allocated almost €2.20 billion to increase the spread of self-consumption methods, mainly intended for municipalities with fewer than 5,000 inhabitants. Consequently, it raises the necessity to figure out a new growth model with best exploitation of the natural resources of these territories for retrieving the sociodemographic gaps as well as tackling the rise of energy price. However, to achieve this goal it is necessary to investigate which structure of RECs, replicable and scalable, best suits the Italy’s particular social, economic, and environmental characteristics, on the grounds that the scientific literature interest on energy communities has grown enormously in recent years generating a wide range shaping of this theme. That is why there still needs to be a clear definition of the phenomenon, accompanied by a structured study of the critical factors that have determined the success of RECs in Europe. To disentangle the vast literature, this research aims to perform a systematic literature review, commonly known as the best methodology for ordering and clarifying literature contents. The expected result is to identify the critical success factors of existing renewable energy communities in Europe and the definition of a unique business model replicable in Italian rural areas. Subsequently, once the success factors are identified, a meta-analysis will be conducted to verify the actual levels of performance and efficiency of RECs and the

effects that have occurred in terms of emissions reduction, energy production, cohesion, and social development. The meta-analysis results will outline an analytical and strategic framework of energy communities and show how they impact the socio-economic fabric of the municipalities where they are implemented. The expected results of this research will be functional to identify, through a combined analysis of the literature, a self-consumption model based on RECs replicable in Italian rural areas and small municipalities with fewer than 5,000 inhabitants. This model will be the way to achieve scheduled sustainable development objectives, social and economic growth of marginalized areas, local community involvement, and renewable energy production to achieve energy autonomy, generating a new useful attractivity for these places that are often not considered.