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## Energy communities in heritage districts: Energy Community (EC) Alhambra Districts (Grenade)

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The last two decades have seen an energy transition in Europe, based mainly on the promotion of renewable energy sources (RES), the reduction of energy consumption and an increase in energy efficiency. Despite the evolution of the energy transition in the EU-27, the efforts made have not been sufficient to drastically reduce energy dependence. This became particularly evident in the last year, due to the Ukrainian war, which has strained international markets and endangered the supply of fossil fuels. These circumstances have led to an increase in electricity and fossil fuel prices along with inflation, placing the EU-27 in a situation of critical vulnerability where all efforts are necessary and essential.

For its part, the proliferation of these energy sources in rural areas, in a disorderly manner and without prior territorial planning, is leading to an intensive land use (Calvert & Mabee, 2015). As a result, there is a loss of land and agricultural activity (Varho, 2002; Hoogwijk, 2004), together with impacts on biodiversity and landscape (Frolova et al., 2015). Moreover, if we add the possibility of competition with other traditional economic activities and tourism (Pérez-Pérez & Díaz-Cuevas, 2022; Frolova et al., 2022), a form of social rejection is generated. To reverse these impacts and improve social acceptance, it is essential to adopt different scales of energy planning that allow the understanding of the reality in all its complexity (Díaz-Cuevas et al., 2017), including urban and rural areas, as an energetically balanced whole (Poggi et al., 2015) and formulating spatial strategies that ensure sustainable energy planning; especially where ecological sensitivity, agriculture, environment and natural resources are important (Poggi et al., 2018; Polatidis et al., 2006).

Self-consumption, through local energy systems, can contribute to overall energy and climate goals, helping to reverse trends in energy consumption and greenhouse gas emissions. Add to that the existence of specific regulation, this has led many individuals and groups to seek ways to reduce their energy dependence and has favoured the proliferation of individual and collective self-consumption and EC (energy communities). Although the EU-27 has established a regulatory framework that is highly conducive to the development of self-consumption and EC, the transposition of the EU Directives has been partial in Spain. The main reason being the exclusion of the definition of the figures of local energy community and citizen energy community and the establishment of the distance limitations for energy sharing, first at 500m (RD 244/2019), then at 1000m (RDL 18/2022) and finally at 2000m radius as a result of repeated complaints from different groups at national level (RDL 20/2022).



It is important to note that a draft Royal Decree has recently been published to regulate renewable energy communities and citizen energy communities (MITECO, 2023) which would extend the distance for sharing energy in municipalities with more than 50,000 inhabitants to 5 km. However, the text is generating many doubts due to the fact that it does not expressly repeal the regulation on shared self-consumption distances of RDL 20/2022. In addition, it does not reflect a participatory process for its drafting nor does it transpose some of the fundamental issues of Directive (EU) 2019/944 that are important for energy sovereignty, such as the fact that CIs can be managers of self-consumption. Moreover, the text does not regulate the system of dynamic coefficients, demanded by various national groups, giving the Coalition for Community Energy as a clear example.

In addition to everything mentioned, there are other limitations related to cultural heritage. Most studies find that, in historic buildings, it is better to focus efforts on improving the envelope and heating, ventilation, air conditioning and domestic hot water systems, since it is difficult to integrate renewable energy sources and energy storage systems, due to a lack of available space (Becchio et al., 2017) or due to the visibility, considering that it's incompatible with the preservation of cultural values. In this way, architectural conservation and cultural barriers, present an obstacle in cases where the energy transition of historic buildings, finding opposing positions regarding the compatibility of RES in historic heritage, can give rise to conflicts. In this context, while the proliferation of energy communities in Spain has encountered various regulatory difficulties and a lack of legal protection, the difficulties are even more multiplied in the case of populations living in districts or towns protected by their cultural heritage.

The aim of this work is to study the strategies for setting an urban energy community in two heritage districts in the city of Granada (Spain) and the usefulness for its residents. We have analysed the opinion of the neighbouring areas on this issue, their main motivations or objectives, the type of projects and Badly cut systems that seem most suitable to them and the way of integrating these projects into the cultural heritage. This study is a pilot initiative in heritage districts.

A diverse methodology has been used, based on a bibliographical and documentary review, community accompaniment and mapping of options, alongside a survey designed for the residents of the selected districts. The results of the surveys have been analysed through contingency tables of parameters to study the differences by age and gender group as well as between members and non-members of the EC project. The interest in sharing energy collectively by adopting a horizontal decision-making system and exploring various alternatives for integrating energy infrastructures into the cultural heritage has been observed.

It has shown that the objectives they pursue transcend economical ones, as well as the objective of improving the environmental, economic and social sustainability of their districts, surpasses the objective of economic savings. In addition, we have noticed an interest in objectives such as helping vulnerable groups and energy poverty, learning about energy issues and promoting the circular economy and neighbourly relations.

As conclusion, it has become clear that with the increase in the number of participants, the EC has moved from consensus-based decision-making to mixed decision-making combining consensus and voting, more in line with institutional and formal governance systems, so that innovation in governance systems is called into question when the number of participants increases. However, this is still a matter of debate as the driving group continues to rely on and work through consensus. On the other hand, despite increased regulations on shared self-consumption and energy communities and several pilot projects on the integration of renewable energies in cultural heritage, there is still no effective solution for heritage districts.

Overall, the analysis of the topics showed that the discrepancies depend on the group's age and gender (belonging or not to the project "Energy Community Alhambra Districts"). For example, there is greater support from members of the EC project for horizontal decision-making while being a more blurred issue in respondents who do not belong to the project. Therefore, this highlights the commitment of the members of the EC project to exploring diverse options to integrate renewable energies into cultural heritage. However, for the majority of respondents, there outtake on the subject is not clear. There are also differences by age and gender, as support for the integration of renewables in cultural heritage and horizontal decision-making decreases with age.



On the other hand, the male gender has a clearer understanding of horizontal decision-making, whilst with the female gender it's found that more information is needed to make a decision on these issues. Furthermore, it can be seen that women are more inclined to explore different options whereas men opt for installations with photovoltaic materials that can be integrated into the cultural heritage.

This shows the need to deepen the cross-analysis of data, which serve to compare the results obtained with other samples belonging to EC that are being established in different geographical contexts and even expand the sample size in the "Energy Community Alhambra Districts" to homogenise the results on the training of respondents with that of the population they represent.