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How does society assess the impact of renewable energy in rural inland areas? Comparative analysis between the province of Jaén (Spain) and Somogy county (Hungary)

¿Cómo valora la sociedad el impacto de las energías renovables en áreas rurales de interior? Análisis comparativo entre la provincia de Jaén (España) y el condado de Somogy (Hungría)

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Abstract

This article seeks to contribute to the knowledge of energy transitions in Europe by focusing on community perceptions in two European regions belonging to two divergent spatial models of energy transition on the continent. Through a series of questions, it addresses the social assessment of the impact of renewable energies in three main dimensions: environmental, landscape and socio-economic. The article is based on the comparison of two case studies, the province of Jaén (Spain) and the county of Somogy (Hungary). Both are characterised as rural inland regions with a similar level of renewable energy development (not very high) and fairly similar socio-economic characteristics (agrarian economy and ageing). The results show that there are no major differences between the two territories. In general, there is a tendency to assess the impact of renewable energies as negative, especially in the case of wind farms, with the exception of the positive assessment made by respondents when they were asked about local tourism. However, the option "No impact" was mainly selected by respondents when assessing the impact in most questions. Factors such as the lack of knowledge and information, the lack of social consideration in projects or even a lack of interest towards these topics could explain this social stance.

Keywords: social assessment; local acceptance; renewable energy; landscape; impact; province of Jaén; Somogy county.

Resumen

Este artículo pretende contribuir al conocimiento de las transiciones energéticas en Europa centrándose en las percepciones de las comunidades de dos regiones europeas pertenecientes a dos modelos espaciales divergentes de transición energética en el continente. A través de varias preguntas, aborda la evaluación social del impacto de las energías renovables en tres dimensiones principales: medioambiental, paisajística y socioeconómica. El artículo se basa en la comparación de dos estudios de caso, la provincia de Jaén (España) y el condado de Somogy (Hungría). Ambas se caracterizan por ser regiones rurales de interior con un nivel similar de desarrollo de energías renovables (no muy elevado) y características socioeconómicas bastante parecidas (economía agraria y envejecimiento). Los resultados muestran que no existen grandes diferencias entre territorios. En general, se aprecia una tendencia a valorar el impacto de las energías renovables como negativo, especialmente para el caso de los parques eólicos, con excepción de la valoración positiva que hacen los encuestados al ser preguntados por el turismo local. Sin embargo, la opción "Sin impacto" fue la más seleccionada por los encuestados a la hora de valorar el impacto en la mayoría de las preguntas. Factores como la falta de conocimiento e información, la falta de consideración social en los proyectos o incluso la falta de interés hacia estos temas podrían explicar esta postura social.

Palabras clave: valoración social; aceptación local; energía renovable; paisaje; impacto; provincia de Jaén; Condado de Somogy.

1. Introduction

Global concern about the climate emergency has prompted energy companies to switch from traditional fossil fuel energy sources to a renewable energy source (Hiremath et al., 2007). This phenomenon has been intensified due to the Russia-Ukraine war, which has induced higher oil prices as well as global inflation (Deng et al., 2022), opening the door to a long-term change towards energy sustainability (Zhou et al., 2023).

The energy transition, in most cases, has taken place in rural areas, where the energy crisis tends to be high in terms of demand and level of supply (Shamsuzzoha et al., 2012), as well as being areas that offer a diversity of resources that allow progress towards the energy transition (large land extensions, water, renewable energy sources, etc.). In addition, unlike conventional energies, electricity generation from renewable energies (especially wind and on-land solar photovoltaic energy) uses dispersed resources, which explains their preferential location in rural areas, where they are simple, quick and cheap to install (Prados et al., 2012). But, by occupying a larger surface area the territorial effects are more significant, such as the intensive demand for land in the case of solar photovoltaic plants, or in terms of landscape impacts in the case of wind farms due to the great height of these installations and their location, which sometimes coincides with the most visually exposed areas (Kumar, 2020). As a result, despite the fact that renewable energies enjoy a high degree of social acceptance in Europe, as the European Commission's citizens' surveys over the last decades have shown (Eurobarometers), there are more and more frequent demonstrations of citizens' rejection in Europe where public acceptance is becoming a barrier for large renewable energy projects (Segreto et al., 2020).

Surveys carried out in 2006, 2012, 2019, 2021 and 2022, show show how considerable support has been maintained over time from the EU population for renewable energies in general, as well as for greater use of these energy resources (European Commission, 2006; 2012; 2019a; 2021; 2022), with a high degree of social acceptance in Spain and, in general, in south-western European countries (Barral et al., 2019). However, despite the widespread acceptance of renewable energies, it is observed that in local contexts, specific projects of renewable technologies are often rejected (Musall & Kuik, 2011). Rejection that arises when different interests clash, either due to land occupation, environmental effects or landscape impact (Prados et al., 2012). This makes it necessary to know the perception and knowledge that society has about renewable energies and the impact that they conceive these installations have on the environment and on their personal socio-economic context.

In this way, a growing attitude of rejection among rural communities in countries such as Spain, has in some cases triggered of social opposition to renewable energy projects (Bayona, 2020; Bella, 2021; Mohorte, 2021), with the landscape impact being the increasingly relevant argument. This stance against some renewable energy plants could put a brake on the path to reducing dependence on fossil fuels and achieving the EU's target of a reducing emissions by 55% for 2030 (European Commission, 2019b).

The tarjet for renewable energy in the share of final energy consumption is 32% for all member countries. This figure was subsequently raised to 40% and which it is currently considering raising to 45% against a context of high prices (European Commission, n.d), consequently, the transition to renewables will be one of the major forces transforming European landscapes in the coming decades. Therefore, it is important to know the opinion and the level of awareness of the population about renewable energy technologies and their environmental, socioeconomic, landscape impacts. The aim of this paper is to carry out a comparative analysis of local population perception of these impacts of renewables in two case studies, the first one in Spain (Jaén) and the second one in Hungary (Somogy). This perception must be taken into account by politicians and decision-makers if they really want to avoid conflicts with the local population and achieve success in the design and implementation of the renewable energy project, which would guarantee the achievement of the EU energy objectives.

Research about the topics of scientific studies on renewable energies, show a priority of efficiency, energy policy, economic evaluation and environmental impact issues over landscape impact analysis (Alcayde et al., 2020; Park & Kim, 2021). And within the studies that evaluate or analyse the landscape impact, there is a disproportion between technologies, with a clear predominance of studies on wind turbines compared to other technologies such as solar panels or the scarcely considered biomass plants (Ioannidis & Koutsoyiannis, 2020). Interest in wind energy and wind turbines is linked to the high vertical visual impact of wind turbines, which has traditionally led studies to suggest that the aesthetic dimension of energy installations is a key indicator of social acceptability.

This paper aims to provide information on this gap by exploiting the opinion and level of awareness of the population in relation to renewable energies impact from a general perspective beyond the visual impact of the landscape, considering at the same time different factors that may influence perception. As a recent study shows, factors such as the scale of the projects, health concerns, distance of installations from inhabited area, and distributional injustice (no money for neighboring municipalities) play a major role in social acceptability and perception of the impact of renewable energies (Frantal et al., 2023).

In contrast to research that focuses on a single renewable energy technology, this study will take into account the three main technologies used in these territories: solar photovoltaic, wind and biomass. The latter, moreover, is often neglected in this type of study.

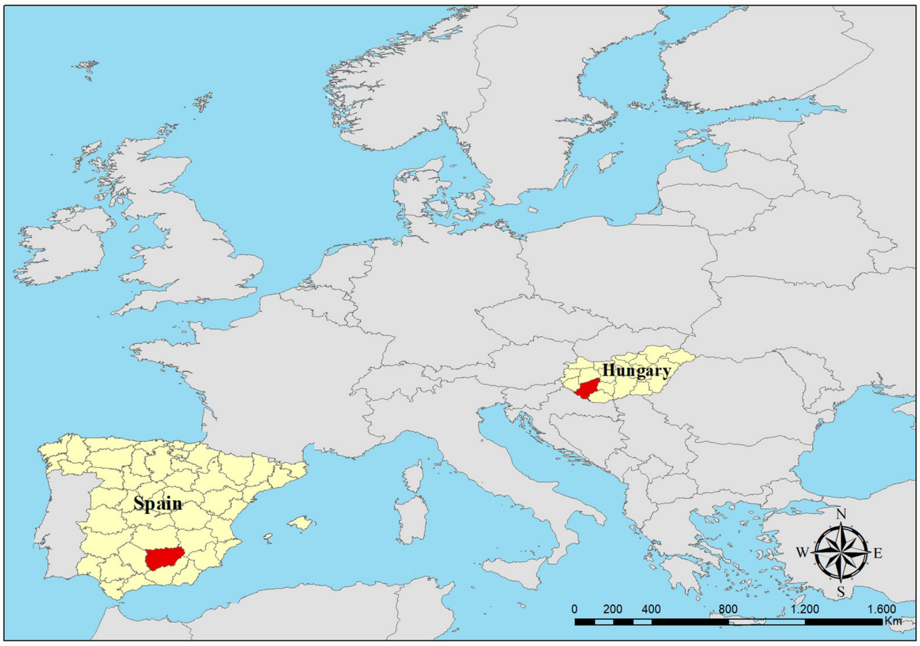
For this purpose, the responses of a survey conducted in two territories located in European countries with different spatial models of energy transition will be analysed. A model typical of Southern European countries, to which the province of Jaén belongs, is characterised by an early incorporation into the European institution, and an approach to energy transition framed in the decarbonisation of the economy, as opposed to a model present in Central-Eastern Europe, to which Somogy county belongs, where the legacy of a socialist economy of national energy policies means that the energy transition has adopted an economic approach through liberalisation and privatisation of the energy sector (Frolova et al., 2019). This comparison, including the study of the convergences and divergences between the two models in greater depth, will allow us to examine one of the challenges that the future of renewable energies in Spain and Hungary must face: the interaction between the social dimension and the landscape dimension of the energy transition (Rodríguez Segura & Frolova, 2021).

2. Metodology

2.1. Study areas

The energy transition, both in the province of Jaén (P.J) in Spain and Somogy county (S.C) in Hungary (see Figure 1), starts from a natural context in which large forest areas predominate, a social context tending towards depopulation and ageing, and an economic context marked by the primary sector and a weak industrial fabric (Ruiz-Arias et al., 2012; Weiperth, 2018).

Figure 1. Location of the province of Jaén (Spain) and the Somogy county (Hungary) in the national and European context



Source: Datos Espaciales de Referencia de Andalucía (DERA). Own elaboration

These two study areas have a natural environment in good conditions of preservation and a great renewable energy potential (Ruiz-Arias et al., 2012; Titov et al., 2018). However, this potential is hardly exploited and the development of renewable energies is still in its infancy, especially in the case of Somogy. As can be seen in Table 1 in the Hungarian county there are no wind farms or some installations are still under construction.

Table 1. Installed renewable power capacity in the province of Jaén and Somogy count by 2023

	Power Installed (MW) (TJ)		
	BIOMASS	**SOLAR PV**	**WIND**
Province of Jaén	37.0	177.97	15.18
Somogy county	34[1] 330 TJ[2]	106.9	0

Source: Agencia Andaluza de la Energía, 2022; Somogy Megyei Önkormányzat, 2021

Despite this installed capacity, the renewable electricity generated in Jaén only accounts for 30% of the total final energy consumption of the province in 2022, while in Somogy only accounts for 16% approximately (Agencia Andaluza de la Energía, 2022; Somogy Megyei Önkormányzat, 2021). This, together with the fact that there are no fossil fuel generation facilities in the regions, means that most of the electricity consumption in Jaén and Somogy has to be imported from other areas.

Therefore, we are dealing with two rural inland regions, which belong to two completely different spatial models of energy transition in Europe, with a similar level of renewable energy development and quite similar socio-economic characteristics (developed in the following subsections, which is the starting point for a comparison between the population of the two case studies.

Finally, the scope for the development of renewable energies in both regions is quite large.

However, this development must face one of the greatest challenges of the energy transition: the population's rejection of the installation of renewable energies projects in their territory (Pasqualetti, 2011). This leads us to hypothesis that the implementation of renewable energies in regions with these contexts is slowed down by social barriers. This research aims to shed light on local people's knowledge of the landscape impact of renewable energies in rural inland areas.

2.1.1. Geographical overview of the province of Jaén

Located in the northwest of the autonomous community of Andalusia (see Figure 1), the province of Jaén is one of the fifty-two administrative districts that make up Spain. With a surface area of 13,496 km^2 and a population of 627,190 people (Instituto Nacional de Estadística [INE], 2020)

Although the population of the province of Jaén follows a recessionary trend in the last years and represents approximately 1.33% of the national total, it is not one of the most depopulated provinces in Spain (Ministerio de Trabajo y Economía Social, 2021). The population is highly concentrated in the main industrial centres such as Jaén, Linares, Andújar or Martos. Consequently, it is in the mountainous areas where the highest rates of ageing are found in the region, associated with high rates of unemployment and labour shortages for certain activities (Martín Mesa & Herrador Lindes, 2000; Instituto de Estadística y Cartografía de Andalucía, 2022).

The GDP of the province of Jaén barely represents 1% of the national total, with a gap in relative terms if we compare it with the Spanish average of approximately 35% lower. In addition, the average income level of the population of the province is the lowest in Spain, being a 31% lower than the national average, which would explain the low standard of living of the province (Instituto Nacional de Estadística, 2019).

Regarding the economic structure of the province of Jaén, it should be noted the rural and agrarian character of the province, with 550,000 hectares of olive groves, a crop with great importance in the local economy (Herrador Lindes & Martín Mesa, 2020). However, the greatest sectoral contribution to the provincial GDP is made by the service sector thanks to the large extensions of natural spaces and the cultural-historical legacy that the province has (Martín Mesa & Herrador Lindes, 2000; Ministerio de Trabajo y Economía Social, 2021). For its part, the industrial sector is the least important in the economic structure of Jaén, with the large presence of the olive oil industry at provincial level, and at local level some factories producing canned food, handicrafts or wood (Herrador Lindes & Martín Mesa, 2020).

1 This biomass plant, which will use wood chips and wood waste from the wood-processing factories in Kaposvár, is still in the construction phase.
2 This power is shown in TJ (TeraJoules) as the plant uses the sugar beet waste during the sugar manufacturing process to generate heat and biogas.

With regard to land use, there is a contrast between the potential use of the land and the actual exploitation of it in the province of Jaén. Thus, 65% of the provincial territory is classified as marginal or non-use and 21% as protected (CNIG, 2018). However, 53% of the land in the province is under agricultural use (CNIG, 2018), despite the fact that experts define 17% of the land as having good or excellent agricultural functionality (Martín Mesa & Herrador Lindes, 2000).

Finally, the province has insufficient electricity network infrastructures and is dependent on electricity generated in other regions to supply more than 75% of the province's total electricity consumption (Agencia Andaluza de la Energía [AAE], 2022). Despite these facts, there is a renewable energy potential that can be exploited in the short-term. (Ruiz-Arias et al., 2012; Osorio-Aravena et al., 2022). For this reason, this region was chosen as study case of Spain.

2.1.2. Geographical overview of Somogy county

Located in the southwest of Hungary (see Figure 1), Somogy county is one of the twenty regions into which the country is administratively subdivided. With a surface area of 6,065.07 km² and a population of 299,950 people (Hungarian Central Statistical Office, 2020).

Demographically, Somogy county, with an approximately 3.2% of Hungary's population is one of the most depopulated counties in the country, and with a polarized population distribution around the capital, Kaposvár, and Lake Balaton (the region's main tourist attraction). Consequently, most of the county is made up of small settlements far from the cities characterised by relatively low and highly aged population density, and high unemployment (Somogy Megyei Önkormányzat, 2020). Excluding the agglomeration zone besides Lake Balaton and Kaposvár, Somogy county is strongly a rural region (Somogy Megyei Önkormányzat, 2014b).

Somogy county's per capita GDP is a half of the Hungarian average. Somogy's total value added to the country's GDP is only 2%, while 3.2% of the population lives in this region. The low standard of living is evidenced by the fact that the average income in Somogy county is only a quarter of that of Hungary (Somogy Megyei Önkormányzat, 2014b).

The economic structure of Somogy is primarily agricultural. Agriculture has a bigger weight in the county in GDP generation and in employment than the national average, and regarding the development of the area, it is clearly the most important sector (Somogy Megyei Önkormányzat 2014b). Industry, mainly wood processing, alongside food industry and metal industry, remains the county's second most important economic sector, although the value of industrial production per capita in the county is lower than the national average. Finally, the tourism sector plays an increasingly important role in the economic structure of the country, however, it is concentrated entirely in the vicinity of Lake Balaton (Somogy Megyei Önkormányzat 2014b).

With regard to land use, the agriculture potential in Somogy county is rated by experts as exceptional, better than the national average. In addition, the 60% of the county is mainly slopes and plains with good conditions for agriculture (Somogy Megyei Önkormányzat 2014c), which makes about 60% of Somogy's territory is under agricultural use (CNIG, 2018). Forestry is the second largest land use in the county, occupies about 30% of its surface (CNIG, 2018).

This region was chosen, as study case of Hungary, taking into account already existing initiatives related to the development of local society and renewable energies, and future plans for local implementation of solar PV and biogas plants (Somogy Megyei Önkormányzat, 2021). The region is located in one of the most underdeveloped Hungarian territories with serious economic, social and infrastructural problems (Magyar Köztársaság, 2008). Despite this fact, there is significant potential with regard to the renewable energy sector if one considers the essential amount of local production of raw biomaterials (Mezei at al., 2018).

2.2. Contextualisation of the renewable energy landscape

Since the working areas belong to two European countries, the definition of landscape as set out in the European Landscape Convention will be taken as a reference. In this convention, landscape was defined as "any part of the territory as perceived by the population, the character of which is the result of the action and interrelation of natural and/or human factors" (Conseil de l'Europe, 2000, Art. 1).

This approach to landscape, which has influenced the way in which renewable energy landscapes are studied in Europe, goes beyond the "expert" view of landscape, understood as a purely material entity. It takes into account the importance of people's perceptions of the landscape that they share, value and use (Olwig, 2019).

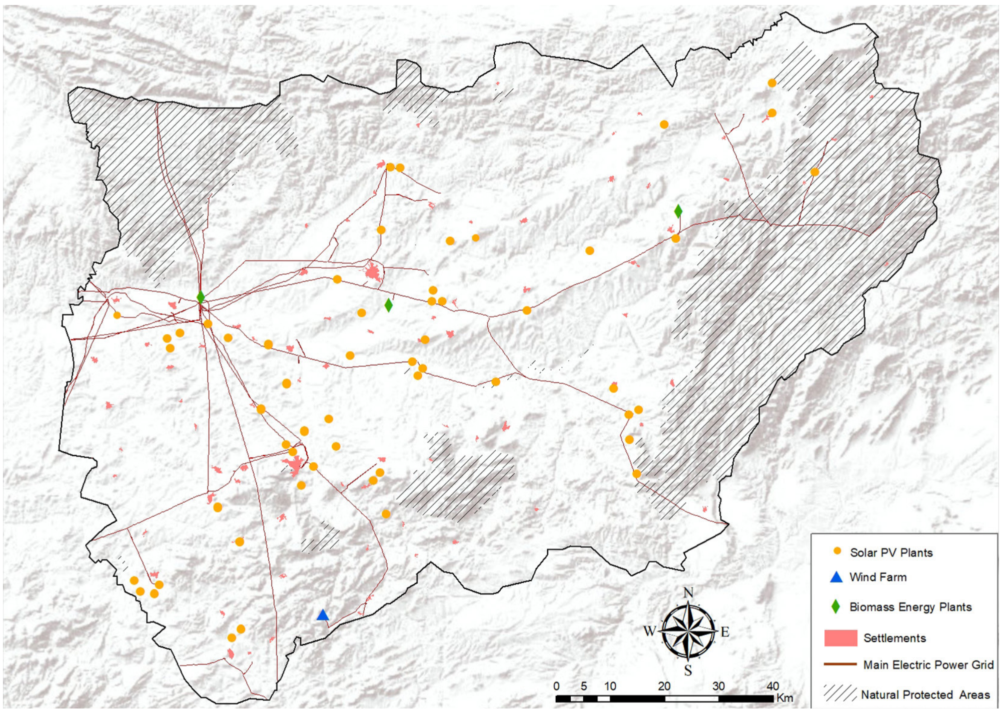
In consecuence, renewable energy landscapes become a complex system that is not limited solely to their visibility but also reflects socioeconomic and environmental exchanges, interrelationships, and dynamics at different spatial and temporal scales (Horstink et al., 2021). Therefore, renewable energies and their integration into the landscape pose a challenge in new territorial planning and management practices. As a result of the need to move towards a socio-economic model based on renewable energies, new territories and landscapes with new characteristics and actors are emerging, as well as new relationships between these actors and the territories (Frolova et al., 2015). Therefore, renewable energies not only transform landscapes but also contribute to enriching the dialogue between society and its territory, shaping a new framework of relationships (Fouquet & Nysten, 2012).

2.2.1. Temporal evolution of renewable energy landscapes in the case studies

In the study areas, the renewable energy landscapes have been shaped recently, and are still in the process of transformation, since, as indicated in Table 1, some infrastructures are still in the construction phase.

In the province of Jaén in Spain, as in the rest of the countries belonging to the energy transition model of southeast Europe, the early incorporation into the European institution meant that the renewable energy landscapes took shape earlier (Rodríguez Segura & Frolova, 2021). Thus, in 2001, the first and only wind farm in the province was built, covering an area of 6 hectares in the Sierra del Trigo, in the south of the province (Agencia Andaluza de la Energía, 2022). At the same time, the three existing biomass plants were built between 2005 and 2010. All of them are located in industrial areas linked to oil production (Agencia Andaluza de la Energía, 2022). At parallel, photovoltaic solar energy plants began to emerge in the territory. However, their maximum development will take place from 2018 due to the elimination and restriction of subsidies for renewable energies between 2012 and 2018 (Rodríguez Segura & Frolova, 2021). Currently there are more than 50 solar PV power plants throughout the province (see the spatial distribution of the installations in Figure 2), with surfaces between 0,030 and 18 hectares.

Figure 2. Spatial location of existing renewable energy plants in the province of Jaén

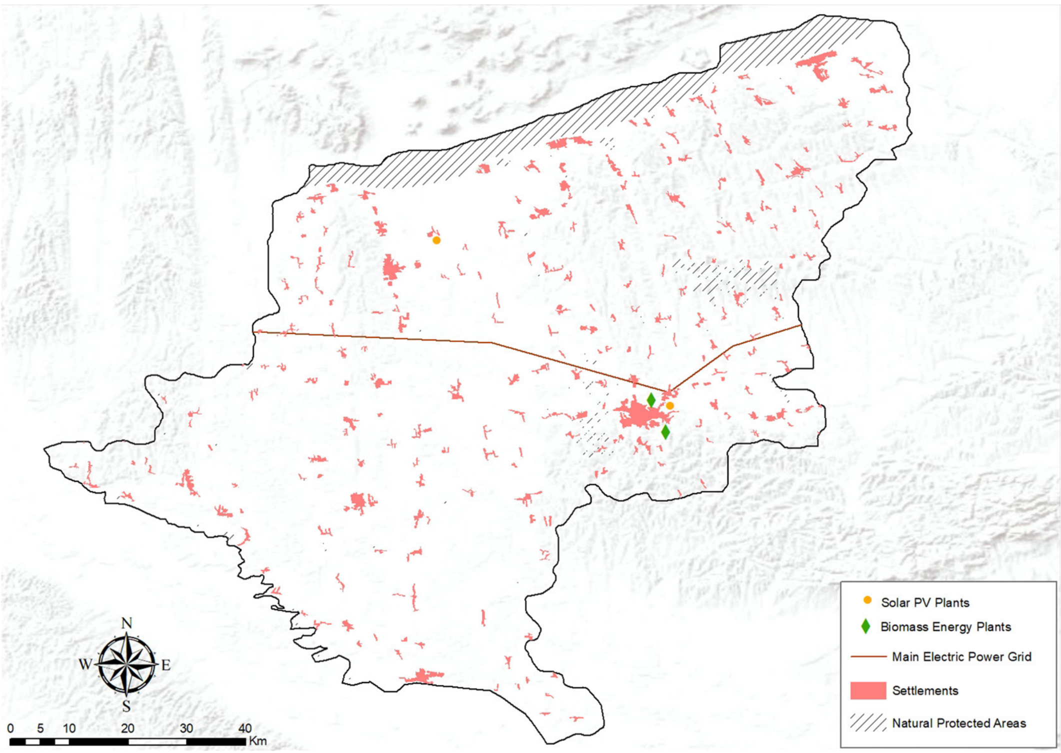


Source: Datos Espaciales de Referencia de Andalucía (DERA). Own elaboration

Instead, Somogy county in Hungary belongs to an energy model typical of Central and Eastern European countries, where dependence on Russian hydrocarbons has meant that renewable energies have been introduced into the energy structures more slowly and belatedly. Therefore, renewable energy landscapes have started to take shape more recently.

The first foray into renewable energy in Somogy County came in 2007 with the installation of a biomass plant attached to the existing sugar factory in the capital (Somogy Megyei Önkormányzat, 2014a). However, it was not until 2016 that the first solar plant was built in the county to supply energy to the villages most lacking in facilities. This plant occupies an area of 3 hectares (Somogy Megyei Önkormányzat, 2021). The second active solar photovoltaic plant in the county, with an area of approximately 200 hectares, will not be built until 2019 in the nearby of the capital Kaposvár (Bolygónk És Városunk, 2021). Near, a biomass plant is currently under construction that will make use of wood chips from the wood mills (see the spatial distribution of the installations in Figure3) (Bolygónk És Városunk, 2021).

Figure 3. Spatial location of existing renewable energy plants in Somogy county



Source: European Environment Agency. Own elaboration

2.3. The survey

The results analysed below have been extracted from local population responses to a series of questions that aim to explore the opinions and the level of awareness of local population towards three renewable electricity generation technologies (solar PV, wind and biomass) and landscape issues. These questions are part of a larger structured survey that was carried out in province of Jaén (Rodríguez-Segura et al., 2023) and Somogy county in 2021-2022, the main objective of which was to examine the social acceptance of the local population towards renewable electricity generation technologies and their possible location in both regions.

Overall, the final objective of knowing the acceptability of renewable energy, the possible locations of these technologies and the degree of knowledge that society has on the subject is to provide useful information for decision-makers so that they can devise policies and plans that can break down the social barriers that stand in the way of the successful implementation of renewable energy technologies.

The procedure for carrying out this work, which can be replicated at other territorial scales (e.g., regional and/or national), was divided into three stages.

The first stage consisted of the elaboration of the survey. First of all, the renewable electricity production technologies to be asked about were selected. For this purpose, the existing renewable electricity production plants in both territories were considered as a criterion. In the same way, it was considered those technologies that represent a higher percentage in the electricity generation structures of both countries, since it is understood that they have a greater potential and possibilities of implementation in the short-term. For this reason, previous studies were consulted based on the potential for renewable energy in the province of Jaén (Ruiz-Arias et al., 2012; Osorio-Aravena et al., 2022), and the Somogy county (Somogy Megyei Önkormányzat, 2014a; Žnidarec et al., 2019).

The survey was structured in three main blocks that aimed 1) to evaluate the levels of acceptance of renewable energy technologies within the local community and the possible sites where they could be located in the province; 2) to assess the acceptability of each renewable technology in line with different possible locations for their installation; and 3) to identify criteria and situations that could influence the acceptance/rejection of renewable energy projects in the study area. At no point during the survey were images or visual support used to accompany the questions, in order to avoid influencing or conditioning their perception. In each block, the following questions were asked with the aim of finding out the degree of knowledge and consideration that the population has of the impact generated by renewable energy installations:

In Block 1, the question was: "Please rate the level of impact of the following facilities: - The impact of solar photovoltaic panels on the local ecosystem. - The impact of wind turbines on the local ecosystem. - The impact of a renewable energy project on tourism in the area.". Respondents had to show their degree of agreement to three questions which, from a general perspective, were intended to provide a first approximation of the population's knowledge of the repercussions that renewable electricity installations have on both the natural environment and the socio-economic space in which they live. Using a Likert scale, the respondents were asked to select their degree of agreement – very negative (1), negative (2), no impact (3), positive (4), very positive (5) –. The Likert scale was configured as a latent construct of 5 progressive categories. Therefore, in order to evaluate the subject's position on the impact of renewable energies, the categories "very positive" and "very negative" were established as scale thresholds. Accordingly, the category "no impact" was established as an intermediate value, allowing the subject to mark an option closer to his/her position, in this case neutral, in case he/she does not feel represented by any of the following. Given that the "Don't know/No answer" option was not included in the survey, it was necessary to inform the subject beforehand (in this case in the Facebook post) about the interpretation for a correct use of the intermediate category in the scale of values shown for answering (Rojas & Fernández, 2000; (Asensio & Rojas, 2002). Thus, the intermediate category "No impact" would be marked when the respondent did not feel represented by the rest of the categories and/or wanted to be neutral in their response as a lack of positioning or lack of knowledge.

In Block 2, more precisely, they were asked for "Assess the level of impact of the installation of photovoltaic solar power plants on the landscape" and "Assess the level of impact of the installation of wind farms on the landscape".

In the case of the biomass powerplants, it was observed in both study areas that they are always linked to existing industrial activities and do not constitute a new landscape element, as is the case for the other two technologies. Therefore, a multiple-choice question was asked about the most disruptive element from the powerplants that would lead to the rejection of their construction, "Which of the following factors would imply their rejection of the construction of a biomass plant (you can select more than one option)"-.

In Block 3, the respondents were asked about multiple-choice questions which sought to identify the factors that influence the acceptance or rejection of renewable energy projects in the study area.

In the first question, "Point out those criteria that would improve your vision for a renewable energy project in your municipality (You can select more than one option)", respondents were asked to choose the criteria that would improve their perspective regarding the possible implementation of a renewable energy project in the municipality. In the second question, "What do you think are the main impediments to the development of renewable energies in your municipality? (You can select more than one option)", the respondents were asked to indicate which situations might be conceived as a barrier for the development of renewable energy projects in their municipal areas. Among the options for each question, visual/environmental impact was inserted as an option to compare the degree of consideration that the population has for the preservation of this element in relation to other factors (economic, social, cultural, etc.).

At the end of the survey, the respondents were asked to provide the following details: age, sex and municipality of residence

Secondly, the survey was administered. Due to the health emergency as a result of COVID-19, the survey was developed virtually using Google Form survey management software, and distributed online via Facebook social groups. To ensure maximum territorial coverage and to try to reduce bias as much as possible in the sample, the online questionnaire was sent to social/neighbourhood groups in each municipality. Therefore, the aim was to obtain a heterogeneous sample representative of the province/county's socioeconomic diversity. It should be noted that, for Somogy county, the survey was translated into Hungarian.

The virtual format of the survey also facilitated the collection of information for further analysis, as the responses were recorded in a digital database linked to the online questionnaire.

Finally, as third stage, the analysis of the responses and interpretation of the results. They are analysed descriptively according to the number of times each of the options was ticked (in the multiple-choice questions) or according to the number of respondents who selected each option in relation to the total (question on degree of conformity).

The analysis of the surveys was carried out with the aim of obtaining a general overview, so parameters such as age, gender or income level were not taken into account when observing the population's perception of the impact of renewable energies.

2.4. Limitations

Not including the option "Don't know/Don't answer" in the survey may mean that respondents with doubts or with a real lack of knowledge about the question, may have marked the middle category of the scale even though the use of such a category was indicated. However, since the present work is part of a larger research project, to correct for response bias and to discard those respondents who interpreted the "No impact" option as "Don't know/no answer", a short interview model will be conducted in order to improve the interpretation of future data to avoid confusion.

Some socioeconomic parameters such as income, profession, or education of the surveyed individuals were not asked, which could result in biases in the sample and responses since only a portion of the population might have responded. However, efforts were made to achieve broad territorial coverage in the survey distribution and to reach diverse social groups, as described in section 3.1.

Although age and gender were asked in the survey, no analysis was conducted on how these parameters could influence social perceptions. However, the proportion of male and female respondents is quite similar. As for the age groups, there is a similarity between the representation of different age groups and population structures. Nevertheless, these parameters, along with the previous ones, should be thoroughly studied to determine if their consideration influences the responses shown in this study.

3. Results

3.1. Characteristics of the sample group

For the province of Jaén, the sample size was a total of 329 respondents (n = 329), which implies a margin of error of 5.4% in the extrapolation to the whole population of the province, according to the formula applied by Gareiou et al., (2021), which implies a survey confidence level of 94.6%. The proportion of female and male respondents in the sample was 47% and 53%, respectively, with the age groups 51-60 years (26% of respondents) and 41-50 years (24%) being more representative, reflecting the age structure of the inhabitants of the province according to INE (2021).

Spatially, responses were received from 60 municipalities out of a total of 97 that make up the province. This indicates that the residence of the respondents coincides with the main settlements of the 10 counties that make up the province, so the sample provides an overview of the different county realities.

For the county of Somogy, the sample size was a total of 101 respondents (n=101), which implies a margin of error of 9.75% in the extrapolation to the whole population of the county, according to the formula applied previously for the case of Jaén (Rodríguez-Segura et al., 2023), which means a survey confidence level of 90.25%. The proportion of female and male respondents was 54% and 46%, respectively, with a higher representation of the age groups over 60 years old (22.77% of respondents and 51-60 years old (20.79%), reflection of the ageing society of rural areas in Hungary (Titov et al. 2018).

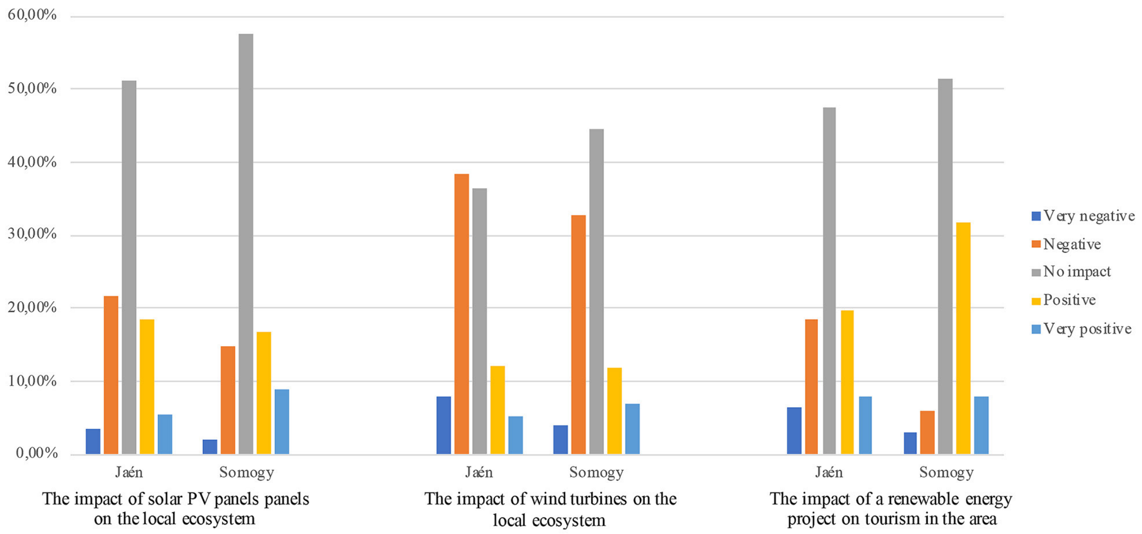
Spatially, responses were received from 73 municipalities out of 246, with representativeness of the 11 micro-regions that make up the county, so the sample provides an overview of the different territorial realities.

3.2. Trends in social perception of the impact of renewable energies installations

The results shown below correspond to the question asked in Block 1, in which they were asked to assess the impact of the following installations, in order to obtain a general trend in the population's perception and awareness of renewable energies.

In general terms, it can be seen that the population of both territories consider that renewable electricity generation facilities do not have an impact on the local ecosystem or on the tourist activity that takes place in the area. A position, which as was made clear in the methodology, may come from a true consideration that renewable energies do not generate any impact in these areas, or it may come from a lack of knowledge or positioning of the respondent. Consequently, this general trend gives greater relevance to "positive" or "negative" responses, which do show a more solid position of the population's perception, as can be seen in Figure 4 below.

Figure 4. Comparison of responses (%) to the question: "Rate the level of impact of the following installations"



Own elaboration

On the question of the impact of solar photovoltaic panels on the local ecosystem, the majority of respondents in both territories selected the option "no impact". 51.06% of respondents in the province of Jaén and 57.43% in Somogy county, which shows a clear lack of positioning when it comes to assessing the impact of these facilities on the local ecosystem; especially as the "positive" and "negative" positions are barely considered by 20% of respondents. However, it is in the latter mentioned categories where a real difference in social perception between territories can be seen. While among the population of Jaén there is a predominantly negative perception of the impact (21.58%), in the county of Somogy the trend is more positive, with a weight of 16.83% for this option.

Instead, when the population of both territories is asked about the impact of wind farms, a clearer position is observed, tending in both cases towards a negative assessment.

In Somogy county, the majority of responses are still "no impact". However, this option is only selected by 44.5% of respondents compared to 57.43% for solar PV installations (12.8% less). Consequently, the options "negative impact" and "very negative" are more considered by the respondents, these options being selected 2 and 2.2 times more respectively compared to the previous question.

In a more visible way, in the province of Jaén, the majority of respondents (38.3%) considered the impact of wind turbines on the local ecosystem to be negative.

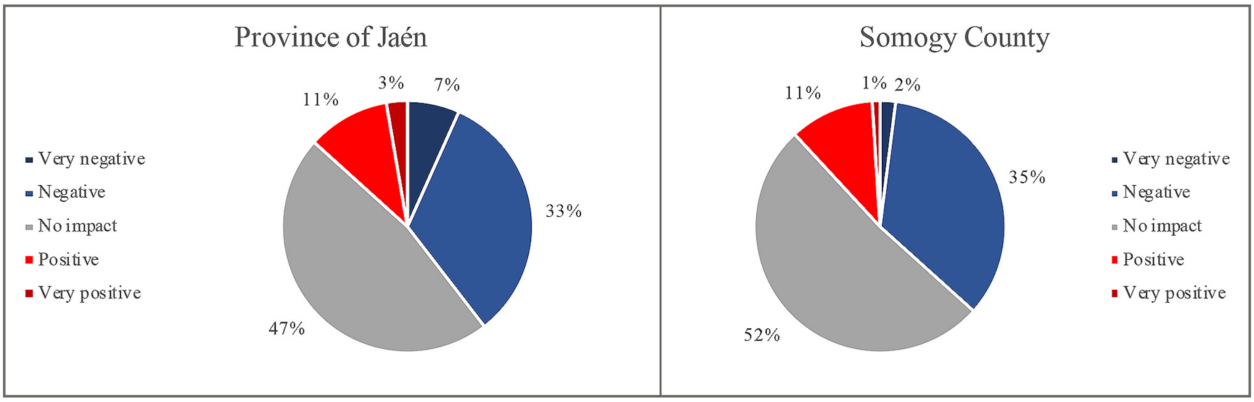
Finally, respondents were asked to assess the impact that a renewable energy project would have on local tourism. As in the two previous cases, there is a predominant lack of positioning in the assessment, with 47.42% (P.J) and 49% (S.C) of respondents giving the option "no impact". Furthermore, if we look at the rest of the responses and compare them with the two previous ones, we can see an opposite trend. While the impact of facilities on the local ecosystem tends to be seen as negative, in the case of tourism the option "positive" is the second most selected option as opposed to "negative", with 19.76% of respondents in the province of Jaén and 31.68% in the county of Somogy.

3.3. Perception and awareness of the landscape impact of renewable energies

Figure 5 (solar photovoltaic energy) and figure 6 (wind energy) show the answers given by respondents from the province of Jaén and Somogy county when they were asked about "Assess the level of impact of the installation of solar photovoltaic plants on the landscape" and "Assess the level of impact of the installation of wind farms on the landscape".

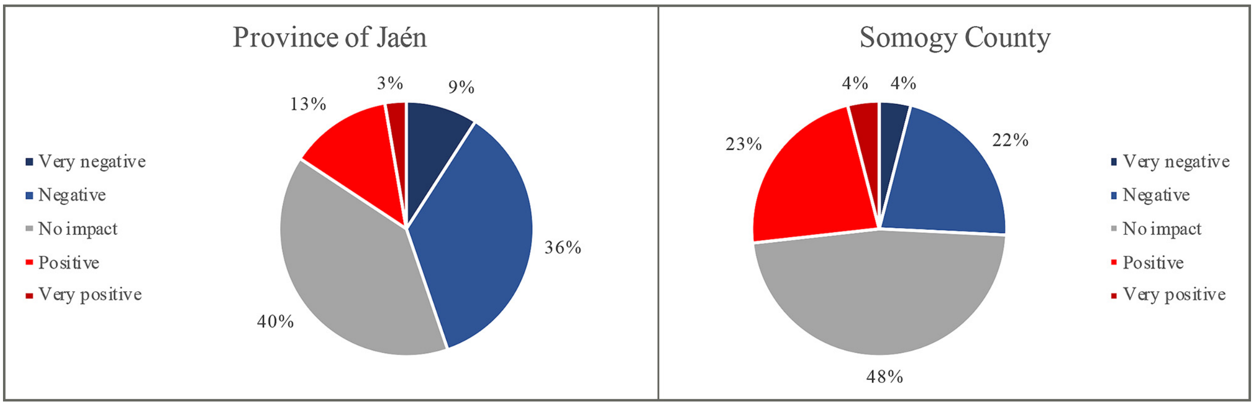
As can be seen in both figures, the responses follow the same trend as in the previous questions, with a strong predominance of "no impact".

Figure 5. Comparison of responses on the perception of the landscape impact of solar photovoltaic installations between the province of Jaén and Somogy county



Own elaboration

Figure 6. Comparison of responses on the perception of the landscape impact of wind installations between the province of Jaén and Somogy county



Own elaboration

If we compare the answers for both technologies in the province of Jaén, in general, the population does not have a clear position when it comes to assessing the impact, which explains the high percentage of "no impact" option for both technologies, especially in the case of solar energy where this option was considered by 47% of those surveyed. However, the population's negative consideration of renewable energies and the landscape is very marked. This is also evident in the case of wind farms, where despite the fact that 40% of respondents selected the "no impact" option, if we add the percentage of respondents who marked the "negative" option and the "very negative" option, we obtain 45%, 5% more than the "no impact" option.

Although the tendency to consider the impact of these installations is negative, and more so in the case of wind energy, it is noteworthy that 13% of respondents consider the impact of wind installations on the landscape to be positive, which is 2% more than for solar photovoltaic installations, possibly due to the fact that local population is less familiar with wind farms impacts on landscape: there is still only one wind farm in the province of Jaen, while there are more than 50 solar PV powers plants throughout the province (see Figure 2), but with individual power generally below 10 MW, and the largest being 11.8 MW.

In the case of Somogy county, where the development and territorial expansion of renewable energies has been lower, the lack of positioning or ignorance on the part of the respondents is more appreciable. For both technologies, the percentages of "no impact" are higher than in the case of Jaén, as there are no wind farms in the county, and two solar photovoltaic plants with 6.9 and 100 MW of installed capacity. Non-existence of wind farms in the county reinforces the idea mentioned above that the greater or lesser proximity of the population to these installations could influence their ability to imagine and value the impact they may have on the landscape. However, in this case, the tendency to consider the impact as negative is only applicable to solar PV installations, where 35% of the respondents ticked the option "negative impact", being the second most considered option and 2% higher than in Jaén. For wind installations, as can be seen in figure 6, for the first time the option "positive impact" is more considered by respondents than the option "negative impact", although both options show a fairly similar percentage.

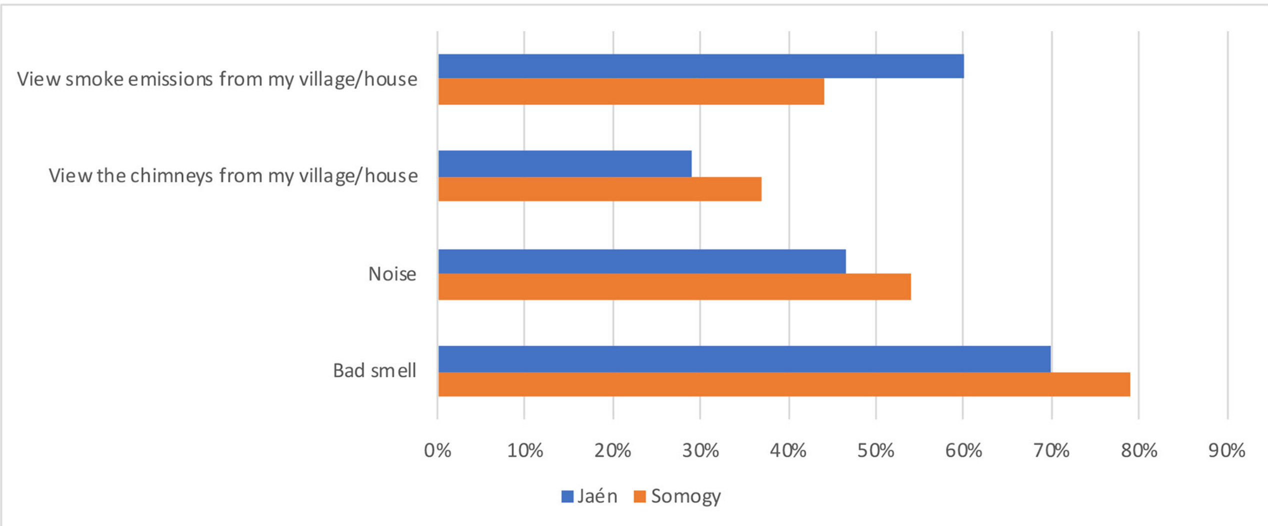
In the study of the landscape impact of biomass, it was taken into account that the biomass energy plants in both study areas are linked to/inserted in industrial facilities from which they obtain the raw material. The 550,000 hectares of olive groves in the province of Jaén and the 220,000 hectares with great wood and forest coverage in Somogy county are large reserves of biomass that can be exploited directly in the consumption of wood or indirectly through the residues generated in the production of oil (in the case of Jaén) (Somogy Megyei Önkormányzat, 2014a; Herrador Lindes & Martín Mesa, 2020). However, it should be noted that there are currently only 3 biomass plants in the province of Jaén. All of them are linked to oil factories to make use of the waste generated during the manufacturing process. While in Somogy County there are only one has been built, inserted within a sugar factory, which uses beet waste to generate energy (heat used in the manufacturing process itself and biogas used for heating public buildings in the city), while a biomass plant is under construction that will use wood chips from the local timber industry to generate electricity.

A priori these plants do not represent a new landscape landmark to be assessed. However, there are precedents in the province of Jaén where those biomass plants that are located far from the industrial area and therefore closer to the urban centre have aroused public rejection due to different items derived from the energy generation in these plants that indirectly imply a landscape impact (smell, sound or visual).

Therefore, based on this context, respondents from both territories were asked about "Which of the following factors would lead to your rejection of the construction of a biomass plant (you can select more than one option)". Factors that they consider to have the greatest impact and which would therefore lead them to reject the construction of a biomass plant.

As can be seen in figure 7, the bad smell is considered by the population of both territories as the main impact of a biomass power plant and therefore as the main reason for rejection. This factor is more considered by the Hungarian population than by the Spanish population.

Figure 7. Social perception of the impact associated to a biomass power plant[3]



Own elaboration

On the other hand, while for the population of Somogy, noise is the second most marked and considered factor, in the case of Jaén it is the vision of emissions. This discrepancy shows the need to take into account the energy context and the background in the development of renewable energies in each territory, in order to minimize social rejection of a project.

Meanwhile, the visibility of the chimneys from the urban nucleus or home is the least marked option in both territories.

3 Based on the number of answers as a percentage of the total number of respondents – respondents could tick as many boxes as they liked

3.4. The perception of impact of renewable energy as a criterion for the acceptance or rejection of a project

Table 2 shows the answers associated with the question: "Which criteria would improve your attitude towards a renewable energy project in your town or village?". These show that in general terms local population would have a better opinion of renewable energy projects if they provided some kind of benefit for the town. The table shows how economic factors are the main attraction for accepting and positively considering a renewable energy project, as "generates economic benefits for the population" and "satisfies local energy demand" are the first and second most frequently selected factors by the respondents from both territories.

Table 2. Criteria that would improve public opinion towards a renewable energy project[4]

Criteria	Province of Jaén	Somogy County
No visual/environmental impact	38,30%	36,60%
Located in rural areas	21,90%	20,80%
Economic benefits for the population	77,50%	79,20%
Located on the edge of municipality	36,20%	38,60%
Satisfies local energy demand	67,20%	82,20%
Allows previous land use to be maintained	31,30%	44,60%
Small plant	14,60%	31,70%
Has an educational function	20,40%	33,70%
Located in no cultivated or environmentally degraded land	58,40%	65,30%
Located in industrial or energy production areas	53,50%	60,40%

Own elaboration

However, the fact that the focus of acceptance is on economic factors means that other criteria such as visual/environmental impact, size or educational function are not so highly regarded by the population. Even so, for more than half of the respondents in both regions, the location of the facilities is seen as a positive criterion in the projects, and one that would have a positive impact on their acceptability. So, 58.4% (P.J) and 65.3% (S.C) marked as an option "located on uncultivated or environmentally degraded land", and 53.5% (P.J) and 60.4% (S.C) marked "located in industrial or energy production areas". Locations, which are related to the criterion visual/environmental impact, considered by 38.30% (P.J) and 36.60% (S.C) of the respondents.

In order to get a better understanding of citizens' perception of renewable energies and to contrast with the previous question the importance of landscape impact for the public, the question "What do you think are the main impediments to the development of renewable energies in your municipality?" was asked, in order to find out which situations would negatively influence their perception.

According to the results shown in Table 3, the interests of the population in both regions are quite similar, with the lack of information and public awareness, together with the lack of support and local initiatives, as the main obstacles to the development of renewables energies in the respective territories.

Table 3. Situations that could hinder the advancement of renewable energy growth[5]

Situations	Province of Jaén	Somogy County
1. Lack of public information and awareness	68,70%	63,40%
2. Lack of subsidies and grants	64,70%	66,30%
3. Interests of local people ignored	31,60%	31,70%
4. No interest from the Council	36,50%	38,60%
5. Lack of public participation in the projects	28,30%	34,70%
6. The projects could provide greater benefits for the local economy	29,50%	16,80%
7. The visual/environmental impact that they produce	23,70%	26,70%
8. Lack of local initiatives and projects	57,40%	50%

Own elaboration

4 Percentage based on the number of responses to the total number of respondents to the question: Which criteria would improve your attitude towards a renewable energy project in your town or village?"

5 Percentage based on the number of responses to the total number of respondents to the question: What do you think are the main impediments to the development of renewable energies in your municipality?"

Furthermore, it is worth noting that the population of both territories prioritize all the situations and criteria mentioned over the option of visual/environmental impact, this being the option least considered as an obstacle to the implementation of a renewable energy project in their municipality.

4. Discussion

The problems of social acceptance and the existence of a high-risk perception of renewable technologies have been conceptualized in the field of energy planning as social barriers (Cruz et al., 2020). Although the social acceptance of renewable energies is generally high, low local acceptance has hindered the development of renewable energy projects (Sagreto et al., 2020), social acceptance becoming a major barrier in the implementation of renewable systems (Rosso-Cerón & Kafarov, 2015).

In this sense, the use of conventional energies, which are considered to be a main cause of the current climate emergency, have been linked to a high social perception of risk and impact, so it is not common to associate this perception with those renewable energy sources that are consolidating as an alternative and solution (Prados et al., 2012). In addition, social perception studies such as the one hold by Tudela Serrano and Molina Ruiz (2006), show how those surveyed consider the implementation of renewable energies in their municipalities to be beneficial, alluding to the fact that this type of technology, in addition to generating less environmental impact than other energies, does not leave waste or generate emissions that damage the environment. Along these lines, these grounds would justify the fact that the majority of respondents consider that this type of installation does not pose an impact.

At first it could be thought that the predominant neutrality in the answers of this work may come from a lack of familiarization or proximity of the respondents to renewable energy installations, since there are few existing projects in these territories. However, similar studies carried out at the local level show significant levels of indifference towards these energy facilities, even among residents who live very close to them (Delicado et al., 2016); or do not associate any environmental or economic problems with renewable energies, even when the concentration of these facilities is high, as is the case with the 180 wind farms in Galicia (Blanco et al., 2007).

Nevertheless, these studies pointed out how some respondents did show concern when asked about the landscape, being common to find in the energy transition literature that wind farms and, to a lesser extent, solar power plants have a negative aesthetic/visual impact.

Throughout the survey there is a predominantly neutral attitude towards renewable energies, although there is a tendency to consider their impact on the environment and the landscape as negative, being much more pronounced in the case of wind energy installations. In this way, the 36% of the population consulted in the province of Jaén and 22% in Somogy county, considered that wind energy does have a negative impact on the landscape. Figures that are lower than those found in another study, where 58% of respondents considered the landscape impact of wind energy to be negative (Blanco et al., 2007). In this sense, that these figures are not so representative, even though when the impact to landscapes and environment have been identified as major drivers of social opposition against renewable energy projects, has also been observed in rural areas where hardly any renewable energy projects have been developed, where respondents consider that corrective or compensatory measures could be applied in case of an impact (Tudela Serrano y Molina Ruiz, 2006; Ioannidis et al., 2022). Or even studies indicate how people sometimes attribute a positive aesthetic value to renewable energy projects, as symbols of progress, modernity and development (Zoellner et al., 2008; Enserink et al., 2022).

In this sense and in line with our results, it can be seen that the lack of familiarity or proximity to the facilities does not in all cases justify the neutrality of the respondents' stance. So, on the one hand, studies carried out in rural areas where renewable energy projects do not exist, or are not highly developed, show that the indifference of citizens towards facilities often stems from a lack of awareness and knowledge about the risks, impacts and implications of renewable electricity generation facilities (Shamsuzzoha et al., 2012; Campo et al., 2021). A lack of knowledge and awareness that in the case of Somoy county is corroborated by previous studies carried out for Hungary which concluded that the rooting of renewable energies in public awareness is currently weak and uncertain (Csorba et al., 2020; Szakály et al, 2020). Consequently, nn many cases, a lack of ability to understand the technology and its implications is a factor that can lead to a misperception (Painuly & Wohlgemuth, 2021).

And on the other hand, it is common to find this type of response in southern European countries, among other reasons for a real lack of concern or interest in the subject compared to other European countries (Delicado et al., 2016).

Regardin the economic implications of renewable energies, respondents were asked about the impact of renewable energy projects on local tourism, as the nature tourism sector plays an important role in the socio-economic development of inland rural areas. As in the rest of the survey, the "No impact" rating was predominant among the respondents. In line with these findings, in a survey carried out on the Noth Davon coast (England) to ascertain the public's assessment of the growing wind projects in the region, the majority of respondents (58.2%) thought that wind farms have "no impact" on the visitor or tourist experience, while 18.4% of those questioned thought that wind farms have a positive impact on the visitor or tourist experience (Aitchison, 2012). In line with the results of the aforementioned work, our research also shows that the "positive impact" option has been highly considered by respondents. A positive stance among respondents has also been observed in other studies that have analysed the link between tourism and renewable energies. On the one hand, according to some studies these technologies are perceived by the local population as beneficial for tourism due to their capacity to generate new tourist modalities and thus attract new clients, to conserve the natural resources that are the main tourist attraction of these areas and to help local development by creating jobs (Stigka et al., 2014; Beer et al., 2018). However, this positive stance is not as pronounced in the working areas as energy projects are not as present in the main tourist areas of the regions, Sierra de Cazorla, Segura y las Villas in the province of Jaén and Lake Balaton in Somogy County (see map X), which may mean that the local population is not as aware of the influence of these installations on the tourism.

On the other hand, and from the tourist's perspective, a study conducted in rural areas of Scotland analysed the general opinion of tourists and the impact of local wind farms on tourists' decisions through 300 surveys. In this study, around 55% of the tourists surveyed expressed positive impressions, while only 8% of the opinions were negative (Prinsloo, 2013).

As for the social perception of biomass plants, bad smell, noise and the visibility of emissions from the urban core or home are the main reasons why the population would reject the construction of a biomass power plant in their municipalities. Although the location of installations is an important factor in the social acceptability of all renewable energy sources, in the case of biomass it plays an important role beyond visual landscape disruption of the installation, as it is a renewable electricity generation technology with a high probability of provoking a NIMBY reaction (Ribeiro et al., 2014). In this context, there are previous case studies in the United Kingdom and in Spain, where citizen opposition prevented the construction of biomass energy plants, alleging that, in addition to environmental risks, these installations imply health risk for local residents, due to bad smell and pollution from their emissions (Upreti & van der Horst, 2004; Rodríguez Cámara, 2016; López, 2019).

Finally, in the results obtained in the final part of the survey, it can be seen how among all the situations and factors that can influence the social perception, the landscape/environmental impact is hardly considered. These results may reinforce the idea that local population does not consider landscape impact as a priority aspect of rejection or acceptance compared to factors of social and/or economic benefit. Furthermore, in line with researches that have analysed trends in the social acceptance of renewable energies, economic and social benefits and advantages of installing a renewable energy project were identified as the most influential factor in social acceptance (Savacool, 2009; Segreto et al., 2020). Even so, these studies are aware of the importance of the social perception of the landscape impact of these installations, since conflicts can arise that can delay or even cancel the execution of a project.

5. Conclusions

This article set out to provide an empirically sustained contribution on the community perceptions of renewable energies, comparing two case studies belonging to two completely different spatial models of transition in Europe (southern European country versus central-eastern country). However, the study has shown that there are many similarities in community perceptions of renewable energies in both countries. In general terms, the most part of respondents takes a neutral stance in assessing the impact that renewable electricity generation facilities could have on the ecosystem, tourism activity or the landscape of their municipality. In all the questions, except for one case, the intermediate option "no impact" is the most frequent answer. However, the "Don't know/No response" option was not considered in this study, which may have influenced the respondents' answers even though the use of the "No impact" option was explained. Therefore, in the interpretation of the results, the lack of positioning or ignorance has been considered as motivations for which the respondent has also been able to mark this option, which gives greater relevance to the positive or negative responses when reporting the perception of the population from a more stable position. Additionally, how social and economic variables (such as age, gender, income level, or education) can influence social acceptability was not taken into account. These limitations are identified and developed in the following section. Therefore, it is considered necessary to continue this work with a more detailed study that delves into citizen acceptability based on the general overview provided in this study.

The fact that the vast majority of respondents ticked this option indicates that there must be an external factor that makes it impossible for the subject to adopt a negative or positive stance towards renewable energies and their impact. Even more so, when it is known that on many occasions it is the negative impact of installations on the ecosystem or the landscape that triggers social movements of rejection. Therefore, the non-existence of renewable energy projects close to the population, the lack of knowledge and information, the lack of social consideration in the different phases of the projects or even a lack of interest/concern towards these topics are reasons that could explain the behaviour of those surveyed when evaluating the impact of renewable energies.

The diversity of reasons that can influence citizens' perceptions, causing them to adopt neutral or indifferent positions, even when these are issues with great social repercussions, leads us to consider future lines of work in which, through interviews with the population, we can discern why they consider that renewable energy installations do not have an impact on the different spheres questioned.

However, it can be seen through the rest of the responses that there is a tendency to consider the impact of the installations as negative, as it is an option highly considered by a large proportion of the population in all the questions. Negativity is greater (in terms of the percentage of the population that selected this option) in the case of wind installations than in the case of solar photovoltaic installations. It is also greater in the province of Jaén than in Somogy county, where quite a lot of the population considers the impact of wind turbines on the landscape to be positive.

In contrast, this general trend does not apply to the tourism sector, where, on the contrary, renewable energies are perceived to have a positive impact. Even though the neutral option "no impact" is the most marked by respondents, "positive impact" is considered to be more important than the option "negative impact". Along these lines, economic factors are highly regarded by respondents as a key factor with a major impact on the acceptance or rejection of any renewable energy installation. The socio-economic benefit prevails over the visual or environmental impact of an energy project.

Finally, the location of the facilities must be considered as a determinant factor of social acceptance because it is related to many other concerns, such a environmental risk, which would imply the rejection of the construction of a biomass plant in the proximities of their urban centres.

Our research findings underline the importance of proper information about technology, its benefits and impacts, so that the population is aware and can generate a clear and consolidated position on the subject, as its absence can lead to misunderstandings or indifference. So, public opinion phase can be an essential tool in renewable energy projects. Consulting the population on the suitability of the location, the extension or the benefits for the municipality, would minimize citizen rejection movements that may delay or prevent the implementation of a renewable energy project, or that may cause distrust once it is built. Since distrust also creates a negative perception of renewable energies in society, studies such as the present should be taken into account by decision-makers and politicians, to help alleviate community concerns and increase the level of mutual trust. To this end, the involvement of society during the different phases of project development and information dissemination is crucial to correct any misconceptions and mitigate concerns about the location, the impact on the landscape or the environment.

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References

Agencia Andaluza de la Energía. (2022). *Informe de Infraestructuras Energéticas. Provincia de Jaén*. Agencia Andaluza de la Energía. Junta de Andalucía. https://www.agenciaandaluzadelaenergia.es/sites/default/files/Documentos/Infraestructuras/20220630_informe_prov_ja_miea.pdf

Aitchison, C. (2012). *Tourism impact of wind farms*. Edinburgh, University of Edinburgh. http://www.scottish.parliament.uk/S4_EconomyEnergyandTourismCommittee/Inquiries/20120426_uni_of_ed.pdf

Alcayde, A., Montoya, F. G., Baños, R., Perea-Moreno, A. J., & Manzano-Agugliaro, F. (2018). Analysis of research topics and scientific collaborations in renewable energy using community detection. *Sustainability*, *10*(12), 4510. https://doi.org/10.3390/su10124510

Asensio, M. & Rojas, A. (2002). Análisis de la categoría central de los items en función de su denominación mediante el modelo de escalas de clasificación. *Metodología de las Ciencias del Comportamiento, volumen especial,* 55-59.

Bolygónk És Városunk. (2021, June 09). KAPOSVÁR, KLÍMABARÁT TELEPÜLÉS I. HELY. *Bolygónk És Városunk.* https://bolygonkesvarosunk.hu/kaposvar-klimabarat-telepules-i-hely/

Barral, M. Á., Iglesias-Pascual, R., Carmona, R. G., & Prados, M. J. (2019). Planificación, participación e innovación social en los paisajes de las energías renovables. *Estudios Geográficos, 80*(286), 010. https://estudiosgeograficos.revistas.csic.es/index.php/estudiosgeograficos/article/view/748/833

Bayona, E. (2020, June 29). El rechazo a la ‘nueva industria’ florece en la España vacía: renovables, macrogranjas y ecología productiva disparan los recelos. *Público*. https://www.publico.es/sociedad/negocios-espana-vaciada-rechazo-nueva-industria-florece-espana-vacia-renovables-macrogranjas-ecologia-productiva-disparan-recelos.html

Beer, M., Rybár, R., & Kal'avský, M. (2018). Renewable energy sources as an attractive element of industrial tourism. *Current Issues in Tourism*, *21*(18), 2139-2151. https://doi.org/10.1080/13683500.2017.1316971

Bella, B. (2021, March 19). Energías renovables, ¿amenaza u oportunidad para el turismo? *ViaEmpresa*. https://www.viaempresa.cat/es/territorio/camaras-territorio_2149686_102.html

Blanco, A. P., Rodríguez, M. X. V., & Millán, M. S. (2007). Percepción social sobre generación de electricidad con fuentes de energía renovables en Galicia. *Revista Galega de Economía*, *16*(1), 0. https://www.redalyc.org/pdf/391/39116101.pdf

Campo, V. J. I., Rivera, N. N. M., & Moscote, A. J. P. (2021). Sistema híbrido de energías alternativas y su percepción social en la Alta Guajira. *Aglala*, *12*(1), 173-191. https://dialnet.unirioja.es/servlet/articulo?codigo=8458746

Council of Europe (2000) European landscape convention. STE, 176 http://conventions.coe.int/Treaty

Cruz, I., Sauad, J., & Condorí, M. (2020). La planificación energética de las energías renovables: un estudio de percepción social y validación social del modelo de planificación energética de cinco dimensiones. *Avances en Energías Renovables y Medio Ambiente-AVERMA*, *22*, 33-43. http://portalderevistas.unsa.edu.ar/ojs/index.php/averma/article/view/1217

Csorba, P., Tóth, T., Szabó, G., Fazekas, I., Radics, Z., Teperics, K., Reváknė Markóczi, I., Mika, J., Patkós, C., Kovács, E., Ütőné Visi, J., Csákberényi Nagy, M., & Bartha, J. (2020). *A társadalmi tanulási folyamatok szerepe a megújuló energiahordozókkal kapcsolatos ismeretekben két magyarországi megye példáján*. NKFIH K 116595; National Research, Development and Innovation Office: Budapest, Hungary. http://hdl.handle.net/2437/288703

Datos Espaciales de Referencia de Andalucía (DERA) (n.d). *Descarga de Información: Contexto Mundo.* DERA. Instituto de Estadística y Cartografía de Andalucía. Junta de Andalucía. https://www.juntadeandalucia.es/institutodeestadisticaycartografia/DERA/descargainfo.htm

Delicado, A., Figueiredo, E., & Silva, L. (2016). Community perceptions of renewable energies in Portugal: Impacts on environment, landscape and local development. *Energy Research & Social Science*, *13*, 84-93. https://doi.org/10.1016/j.erss.2015.12.007

Deng, M., Leippold, M., Wagner, A. F., & Wang, Q. (2022). Stock prices and the Russia-Ukraine war: sanctions, energy and ESG. *CEPR Discussion Paper No. DP17207. In* SSRN. https://ssrn.com/abstract=4121382

Enserink, M., Van Etteger, R., Van den Brink, A., & Stremke, S. (2022). To support or oppose renewable energy projects? A systematic literature review on the factors influencing landscape design and social acceptance. *Energy Research & Social Science*, *91*, 102740. https://doi.org/10.1016/j.erss.2022.102740

European Environment Agency (n.d). *Hungary Shapefile*. EEA. European Union. https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2/gis-files/hungary-shapefile

European Commission. (n.d). *Renewable energy targets*. Energy. European Commission. https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en#:~:text=The%20REPowerEU%20plan%20is%20based,directive%20to%2045%25%20by%202030.

European Commission. (2006). *Attitudes towards Energy*. Eurobarometer. European Commission. https://europa.eu/eurobarometer/surveys/detail/1500

European Commission. (2012). *Energy for all: EU support for developing countries.* Eurobarometer. European Commission. https://europa.eu/eurobarometer/surveys/detail/1032

European Commission. (2019a). *Europeans' attitudes on EU energy policy*. Eurobarometer. European Commission. https://europa.eu/eurobarometer/surveys/detail/2238

European Commission. (2019b). Seamos climáticamente neutros en 2050. Una visión estratégica a largo plazo para una economía de la Unión Europea próspera, moderna, competitiva y climáticamente neutra. In *Oficina de Publicaciones de la Unión Europea.* https://data.europa.eu/doi/10.2834/000998

European Commission. (2021). *Special Eurobarometer 513. Climate Change.* Eurobarometer. European Commission. https://europa.eu/eurobarometer/surveys/detail/2273

European Commission. (2022). *Key challenges of our times - the EU in 2022.* Eurobarometer. European Commission. https://europa.eu/eurobarometer/surveys/detail/2694

Fouquet, D., & Nysten, J. V. (2012). The role of renewable energy in the changing energy landscape in Europe. Some reflections. *VGB powertech*, *92*. https://www.osti.gov/etdeweb/biblio/21538948

Frantál, B., Frolova, M., & Liñán-Chacón, J. (2023). Conceptualizing the patterns of land use conflicts in wind energy development: Towards a typology and implications for practice. *Energy Research & Social Science*, *95*, 102907. https://doi.org/10.1016/j.erss.2022.102907

Frolova, M., Frantál, B., Ferrario, V., Centeri, C., Herrero-Luque, D., & Grónás, V. (2019). Diverse energy transition patterns in Central and Southern Europe: A comparative study of institutional landscapes in the Czech Republic, Hungary, Italy, and Spain. *TÁJÖKOLÓGIAI LAPOK, 17*(Spec.), 65-89. http://real.mtak.hu/106845/1/06_Frolovaetal.pdf

Frolova, M., Prados, MJ., & Nadaï, A. (2015). Emerging Renewable Energy Landscapes in Southern European Countries. In M. Frolova, M. J. Prados, & A. Nadaï (Eds), *Renewable Energies and European Landscapes* (pp. 3-24). Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9843-3_1

Gareiou, Z., Drimili, E., & Zervas, E. (2021). Public acceptance of renewable energy sources. In *Low carbon energy technologies in sustainable energy systems* (pp. 309-327). Academic Press. https://doi.org/10.1016/B978-0-12-822897-5.00012-2

Herrador Lindes, I., & Martín Mesa (2020). *Actualización del II Plan Estratégico de la provincia de Jaén.* Fundación Estrategias para el desarrollo económico y social de la provincia de Jaén. https://www.planestrajaen.org/galerias/galeriaDescargas/plan-estrategico/libros/Actualizacion_II_Plan_Estrategico_provincia_Jaen_2020.pdf

Hiremath, R. B., Shikha, S., & Ravindranath, N. H. (2007). Decentralized energy planning; modeling and application—a review. *Renewable and sustainable energy reviews*, *11*(5), 729-752. https://doi.org/10.1016/j.rser.2005.07.005

Horstink, L., Wittmayer, J. M., & Ng, K. (2021). Pluralising the European energy landscape: Collective renewable energy prosumers and the EU's clean energy vision. *Energy Policy*, *153*, 112262. https://doi.org/10.1016/j.enpol.2021.112262

Hungarian Central Statistical Office. (2020). *A lakónépesség nem szerint, január 1*. KSH. Központi Statisztikai Hivatal. https://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_wdsd003c.html

Instituto de Estadística y Cartografía de Andalucía (2022). *Distribución de la población según sexo y tamaño del municipio. Provincia de Jaén.* IECA. Junta de Andalucía. https://www.juntadeandalucia.es/institutodeestadisticaycartografia/badea/operaciones/consulta/anual/12547?CodOper=b3_6&codConsulta=12547

Instituto Nacional de Estadística. (2020). *Contabilidad nacional anual de España: agregados por rama de actividad. Revisión Estadística 2019*. INE. España. https://www.ine.es/jaxiT3/Datos.htm?t=50825#!tabs-tabla

Instituto Nacional de Estadística. (2020). *Cifras oficiales de población resultantes de la revisión del Padrón municipal a 1 de enero*. INE. España. https://www.ine.es/jaxiT3/Datos.htm?t=2876

Instituto Nacional de Estadística. (2021*). Índice de envejecimiento por provincia*. INE. España. https://www.ine.es/jaxiT3/Datos.htm?t=1489

Ioannidis, R., & Koutsoyiannis, D. (2020). A review of land use, visibility and public perception of renewable energy in the context of landscape impact. *Applied Energy*, *276*, 115367. https://doi.org/10.1016/j.apenergy.2020.115367

Ioannidis, R., Mamassis, N., Efstratiadis, A., & Koutsoyiannis, D. (2022). Reversing visibility analysis: Towards an accelerated a priori assessment of landscape impacts of renewable energy projects. *Renewable and Sustainable Energy Reviews*, *161*, 112389. https://doi.org/10.1016/j.rser.2022.112389

Kumar, M. (2020). Social, economic, and environmental impacts of renewable energy resources. *Wind solar hybrid renewable energy system*, *1*. https://doi.org/10.5772/intechopen.89494

López, J. (2019, November 26). Protesta de centenares de personas de Villanueva del Arzobispo contra la contaminación ambiental. *ABC Andalucía*. https://sevilla.abc.es/andalucia/jaen/sevi-protesta-centenares-personas-villanueva-arzobispo-contra-contaminacion-ambiental-201911161953_noticia.html

Magyar Köztársaság. 2008. évi CII. Törvény a Magyar Köztársaság 2009. évi költségvetéséről. https://net.jogtar.hu/jogszabaly?docid=A0800102.TV&searchUrl=/gyorskereso%3Fkeyword%3DA%2520kedvezm%25C3%25A9nyezett%2520k%25C3%25B6rzetek%2520besorol%25C3%25A1sa

Martín Mesa & Herrador Lindes (2000). *Plan Estratégico de la provincia de Jaén.* Fundación Estrategias para el Desarrollo de la provincia de Jaén. https://www.planestrajaen.org/export/sites/default/galerias/galeriaDescargas/plan-estrategico/libros/Plan_Estratxgico_provincia_de_Jaxn_2000.pdf

Mezei, C., Horváthné Kovács, B., Barna, R., Csonka, A., Szabó, K., Nagy, M., Nagy, I., Stettner, E., Csuvár, Á., Imre, B., Csizmadia, A., Topić, D., Šljivac, D., & Gelencsér, G. (2018). Economic and ecological factors of territorial capital in Koppany Valley micro region. In *Socio-economic, environmental and regional aspects of a circular economy. International Conference for the 75th Anniversary of DTI. Pécs, Magyarország, 2018.04. 19-2018.04. 20.*. MTA KRTK RKI Transdanubian Research Department. http://www.regscience.hu:8080/xmlui/bitstream/handle/11155/1719/mezei_economical_2018.pdf?sequence=1

Ministerio de Trabajo y Economía Social (2021). *Informe del Mercado de Trabajo. Datos 2020 de Jaén.* Servicio Público de Empleo Estatal. SEPE. Observatorio de las Ocupaciones. https://www.sepe.es/eu/SiteSepe/contenidos/que_es_el_sepe/publicaciones/pdf/pdf_mercado_trabajo/2021/mercado-de-trabajo-provincial-2021/MT-Jaen-Datos-2020.pdf

Mohorte (2021, August 02). ¿Energía limpia o pesadilla paisajística? El creciente rechazo del mundo rural a los parques eólicos. *Magnet*. https://magnet.xataka.com/en-diez-minutos/energia-limpia-pesadilla-paisajistica-creciente-rechazo-mundo-rural-a-parques-eolicos

Musall, F. D., & Kuik, O. (2011). Local acceptance of renewable energy—A case study from southeast Germany. *Energy policy*, *39*(6), 3252-3260. https://doi.org/10.1016/j.enpol.2011.03.017

Olwig, K. R. (2019). The practice of landscape 'Conventions' and the just landscape: The case of the European landscape convention. In *Justice, Power and the Political Landscape* (pp. 197-212). Routledge. https://doi.org/10.4324/9781315878270-13

Osorio-Aravena, J. C., Rodríguez-Segura, F. J., Frolova, M., Terrados-Cepeda, J., & Muñoz-Cerón, E. (2022). How much solar PV, wind and biomass energy could be implemented in short-term? A multi-criteria GIS-based approach applied to the province of Jaén, Spain. *Journal of Cleaner Production*, *366*, 132920. https://doi.org/10.1016/j.jclepro.2022.132920

Painuly, J. P., & Wohlgemuth, N. (2021). Renewable energy technologies: barriers and policy implications. In *Renewable-Energy-Driven Future* (pp. 539-562). Academic Press. https://doi.org/10.1016/B978-0-12-820539-6.00018-2

Park, C., & Kim, M. (2021). A study on the characteristics of academic topics related to renewable energy using the structural topic modeling and the weak signal concept. *Energies*, *14*(5), 1497. https://doi.org/10.3390/en14051497

Pasqualetti, M. J. (2011). Social barriers to renewable energy landscapes. *Geographical Review, 101*(2), 201–223. https://doi.org/10.1111/j.1931-0846.2011.00087.x

Prados Velasco, M. J., Baraja Rodríguez, E., Frolova Ignateva, M., & Espejo Marín, C. (2012). Integración paisajística y territorial de las energías renovables. *Ciudad y territorio: estudios territoriales, 171, 127-143*. https://recyt.fecyt.es/index.php/CyTET/article/view/76113

Prinsloo, F. C. (2013). Impact of renewable energy structures on tourism. *Stellenbosch University*. https://www.researchgate.net/publication/262948582_The_impact_of_renewable_energy_structures_on_tourism

Ribeiro, F., Ferreira, P., Araújo, M., & Braga, A. C. (2014). Public opinion on renewable energy technologies in Portugal. *Energy*, *69*, 39-50. https://doi.org/10.1016/j.energy.2013.10.074

Rodríguez Cámara, J. (2016, June 07). Firmas de 650 tosirianos para exigir que la planta de biomasa sea limpia. *DiarioJaén*. https://www.diariojaen.es/provincia/firmas-de-650-tosirianos-para-exigir-que-la-planta-de-biomasa-sea-limpia-YY1643067

Rodríguez Segura, F. J., & Frolova, M. (2021). Los contextos institucionales de la transición energética en España y Hungría: la diversidad de un objetivo comunitario. *Boletín De La Asociación De Geógrafos Españoles*, (90). https://doi.org/10.21138/bage.3130

Rodríguez-Segura, F. J., Osorio-Aravena, J. C., Frolova, M., Terrados-Cepeda, J., & Muñoz-Cerón, E. (2023). Social acceptance of renewable energy development in southern Spain: Exploring tendencies, locations, criteria and situations. *Energy Policy, 173*, 113356. https://doi.org/10.1016/j.enpol.2022.113356

Rogers, J. C., Simmons, E. A., Convery, I., & Weatherall, A. (2012). Social impacts of community renewable energy projects: findings from a woodfuel case study. *Energy Policy*, *42*, 239-247. https://doi.org/10.1016/j.enpol.2011.11.081

Rojas, A., & Fernández, J. S. (2000). Análisis de las alternativas de respuestas intermedias mediante el modelo de escalas de clasificación (Analysis of the middle response options with the Rating Scale Model). *Metodología de Encuestas, 2*, 171-183. http://casus.usal.es/pkp/index.php/MdE/article/view/884

Rosso-Cerón, A. M., & Kafarov, V. (2015). Barriers to social acceptance of renewable energy systems in Colombia. *Current Opinion in Chemical Engineering*, *10*, 103-110. https://doi.org/10.1016/j.coche.2015.08.003

Ruiz-Arias, J. A., Terrados, J., Pérez-Higueras, P., Pozo-Vázquez, D., & Almonacid, G. (2012). Assessment of the renewable energies potential for intensive electricity production in the province of Jaén, southern Spain. *Renewable and Sustainable Energy Reviews*, *16*(5), 2994-3001. https://doi.org/10.1016/j.rser.2012.02.006

Segreto, M., Principe, L., Desormeaux, A., Torre, M., Tomassetti, L., Tratzi, P., ... & Petracchini, F. (2020). Trends in social acceptance of renewable energy across Europe—A literature review. *International journal of environmental research and public health*, *17*(24), 9161. https://doi.org/10.3390/ijerph17249161

Tudela Serrano, M. L., & Molina Ruiz, J. (2006). La percepción social de las energías renovables a través de una encuesta de opinión. Un caso práctico en localidades del noroeste murciano. *Papeles de Geografía*, (44), 141-152. https://revistas.um.es/geografia/article/view/43491

Shamsuzzoha, A. H. M., Grant, A., & Clarke, J. (2012). Implementation of renewable energy in Scottish rural area: A social study. *Renewable and Sustainable Energy Reviews*, *16*(1), 185-191. https://doi.org/10.1016/j.rser.2011.07.146

Somogy Megyei Önkormányzat (2014a). Szektorális tanulmányok: Energia. In *“Common cross border strategy”. Development of common regional strategy in Somogy, Koprivnica Krizevci and Bjelovar Bilogora Counties*. HUHR/1101/2.1.4/0005. http://www.som-onkorm.hu/static/files/nyertes_p%C3%A1ly%C3%A1zataink/_5_Energia_HU.pdf

Somogy Megyei Önkormányzat (2014b). Szektorális tanulmányok: Regionális fejlesztés. In “Common cross border strategy”. *Development of common regional strategy in Somogy, Koprivnica Krizevci and Bjelovar Bilogora Counties*. HUHR/1101/2.1.4/0005. http://www.som-onkorm.hu/static/files/nyertes_p%C3%A1ly%C3%A1zataink/_1_Region%C3%A1lis%20fejleszt%C3%A9s_HU.pdf

Somogy Megyei Önkormányzat (2014c). Szektorális tanulmányok: Mezőgazdaság. In “Common cross border strategy”. *Development of common regional strategy in Somogy, Koprivnica Krizevci and Bjelovar Bilogora Counties*. HUHR/1101/2.1.4/0005. http://www.som-onkorm.hu/static/files/nyertes_p%C3%A1ly%C3%A1zataink/2_Mez%C5%91gazdas%C3%A1g_06_20_EN_FINAL.pdf

Somogy Megyei Önkormányzat (2020). *Somogy Megye Területrendezési Terve 2020-*. Somogy Megyei Önkormányzat. http://www.som-onkorm.hu/somogy-megye-teruletrendezesi-terve-2020.html

Somogy Megyei Önkormányzat. (2021). Somogy Megye Területfejlesztési Programja. Somogy Megyei Önkormányzat. http://www.terport.hu/sites/default/files/somogy_megye_teruletfejlesztesi_program_tars_ih_09.12.pdf

Sovacool, B. K. (2009). The cultural barriers to renewable energy and energy efficiency in the United States. *Technology in Society*, *31*(4), 365-373. https://doi.org/10.1016/j.techsoc.2009.10.009

Stigka, E. K., Paravantis, J. A., & Mihalakakou, G. K. (2014). Social acceptance of renewable energy sources: A review of contingent valuation applications. *Renewable and sustainable energy Reviews*, *32*, 100-106. https://doi.org/10.1016/j.rser.2013.12.026

Szakály, Z., Balogh, P., Kontor, E., Gabnai, Z., & Bai, A. (2020). Attitude toward and Awareness of Renewable Energy Sources: Hungarian Experience and Special Features. *Energies*, *14*(1), 22. https://doi.org/10.3390/en14010022

Titov, A., Szabó, K., & Horváthné Kovács, B. (2018). Social and Natural Opportunities for the Renewable Energy Utilization in the Koppany Valley Development Area. In *MIC 2018: Managing Global Diversities; Proceedings of the Joint International Conference, Bled, Slovenia, 30 May–2 June 2018* (pp. 232-332). Koper, Izola: University of Primorska Press. https://www.hippocampus.si/ISBN/978-961-7023-92-3/237.pdf

Upreti, B. R., & van der Horst, D. (2004). National renewable energy policy and local opposition in the UK: the failed development of a biomass electricity plant. *Biomass and bioenergy*, *26*(1), 61-69. https://doi.org/10.1016/S0961-9534(03)00099-0

Weiperth, A. (2018). Faunisztikai (vízi makrogerinctelen, hal és herpetológiai) és vízminőség monitoring vizsgálatok a Koppányvölgyi Élőhely Rehabilitációs Kísérleti Területen. *Research Report; HSA Ecological Research Centre: Budapest, Hungary.* https://koppanyvolgy.files.wordpress.com/2018/06/weiperth-andrc3a1s_kutatc3a1si-jelentc3a9s_zc3b6ld-forrc3a1s-program_ptkf-657-2017.pdf

Zoellner, J., Schweizer-Ries, P., & Wemheuer, C. (2008). Public acceptance of renewable energies: Results from case studies in Germany. *Energy policy*, *36*(11), 4136-4141. https://doi.org/10.1016/j.enpol.2008.06.026

Zhou, X. Y., Lu, G., Xu, Z., Yan, X., Khu, S. T., Yang, J., & Zhao, J. (2023). Influence of Russia-Ukraine War on the Global Energy and Food Security. *Resources, Conservation and Recycling*, *188*, 106657. https://doi.org/10.1016/j.resconrec.2022.106657

Žnidarec, M., Primorac, M., Mezei, C., & Kovács, S. Z. (2018). Renewable energy potential and decision support in the cross-border region of Croatia and Hungary–potentials for a model application. http://regscience.hu:8080/jspui/bitstream/11155/1843/2/znidarec_renewable_2018.pdf