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SOCIAL ACCEPTANCE OF LOCAL RENEWABLE ENERGY PROJECTS

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Abstract

Advancing the decarbonization of the economy will involve deploying many renewable energy facilities and infrastructure in the coming years. Despite the socioeconomic and environmental benefits of renewable projects, infrastructure deployment is hampered by opposition from the local population in the areas where the projects are located. This study analyzes the factors that influence the acceptance of renewable energy projects in local environments, the causes of the population's rejection, and the policies, measures, and strategies that can favor their deployment in those cases where the projects are economically and technically viable. Through a review of academic literature and case descriptions on the social acceptance of renewable energy projects in local environments, the main barriers and determinants of the acceptance and participation of the population in these projects are identified. We also draw conclusions and lessons learned that facilitate the development of barrier mitigation strategies and best practice guidelines for developers.

Resumen

Avanzar en la descarbonización de la economía implicará desplegar en los próximos años un gran número de instalaciones de energías renovables. A pesar de los beneficios socioeconómicos y medioambientales de los proyectos renovables, el despliegue de infraestructuras se ve dificultado por la oposición de la población en los entornos geográficos locales donde se ubican los proyectos. En este estudio se analizan los factores que inciden en la aceptación de los proyectos de energías renovables en entornos locales, las causas del rechazo de la población a este tipo de proyectos y las políticas, medidas y estrategias que pueden favorecer su despliegue en aquellos casos en los que los proyectos sean viables desde el punto de vista económico y técnico. Mediante una revisión de literatura académica y descripción de casos sobre aceptación social de proyectos de energía renovable en entornos locales, se identifican las principales barreras y determinantes de la aceptación y participación de la población en estos proyectos para extraer conclusiones y enseñanzas que faciliten el desarrollo de estrategias de mitigación de las barreras y un manual de buenas prácticas para las entidades desarrolladoras

Laburpena

Ekonomiaren deskarbonizazioan aurrera egiteak energia berriztagarrien instalazio ugari eraikitzea ekarriko du datozen urteetan. Proiektu berriztagarriek onura onura sozioekonomiko eta ingurumeneko nabarmenak dituzten arren, azpiegiturak hedatzea zaila da, proiektuak kokatzen diren ingurune geografetako herritarrak aurka daudelako. Azterlan honetan, tokiko inguruneetan energia berriztagarrien proiektuak onartzean eragiten duten faktoreak aztertzen dira, herritarrak horrelako proiektuak kontra azaltzearen arrazoiak, eta proiektu horiek hedatzen lagundu dezaketen politikak, baldin eta proiektuak ikuspuntu ekonomikotik eta teknikotik bideragarriak bideragarriak badira. Literatura akademikoa aztertuz eta tokiko inguruneetan energia berriztagarriei lotutako proiektuen gizarte onarpenari buruzko kasuak deskribatuz, herritarrek proiektu horiek onartzeko eta horietan parte hartzeko oztopo eta baldintzatzaile nagusiak identifikatzen dira, oztopoak arintzeko estrategiak garatzea erraztuko duten ondorioak eta ikaskuntzak ateratzeko eta erakunde garatzaileentzako jardunbide egokien eskuliburua egiteko.

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Executive summary

The deployment of infrastructure needed to move forward with the energy transition and the decarbonization of the economy is facing difficulties in many geographic areas due to opposition from the local population

The phenomenon of rejection of energy infrastructure, known as "not in my backyard" or NIMBY, taking place in geographic areas where projects are located, is preventing the deployment of renewable energies at the desired and necessary pace to achieve the energy transition goals and reach zero net emissions in the economy.

It is of utmost importance to ensure the acceptance and the willingness to participate or even finance renewable energy projects by the local population in local areas, such as municipalities of different sizes, rural areas or city neighborhoods, since the viability and implementation of the projects depend to a large extent on their acceptance by the citizens.

The development of renewable energy projects can be very positive for the public, involving various social, economic, and environmental benefits, which in many cases are unknown to the public

Renewable projects generate value by contributing to local economic development and creating opportunities for local suppliers (e.g., of components or services associated with the project facilities in their different phases, such as construction services, cleaning, security, O&M, etc.), leading to the consolidation and growth of local business and employment. In addition, they increase the municipality's tax revenues, an important way to improve and finance local services and facilities. Projects can also create synergies with other economic activities in the surroundings of the projects (e.g., land sharing with agricultural, livestock, or tourism activities) or with other projects (e.g., civil or energy infrastructure development).

In specific cases, the projects may offer outcomes that help promote social acceptance, such as reducing electricity bills or compensation in terms of goods or services. The empirical evidence shows that this type of development generates positive impacts in terms of increased local economic activity and employment and reduces the depopulation trend relative to other rural geographic areas where such developments do not take place.

At the environmental level, there are positive impacts globally (reduction of greenhouse gas emissions) and locally (e.g., natural environment conservation projects or R&D activities related to biodiversity or the natural environment). At the social level, there are multiple benefits related to access to clean energy at affordable prices, empowerment of the population through active participation in developing these projects, and greater social cohesion and training, among others.

Community resistance to the development of energy projects is mainly due to their perception that the costs and benefits or value generation of the project are not equitably distributed

Community opposition or non-acceptance of renewable projects is often due to limited information on the benefits and characteristics of the project. In addition, the lack of opportunities and alternatives for participation generates community distrust toward the project developers. Therefore, when there are spaces and opportunities for the population to get involved in the project with different degrees and levels of commitment, the probability of obtaining higher support increases.

In addition, certain socio-demographic and economic characteristics make people more or less likely to accept or participate in projects (when they are open to active participation)

In general, the empirical evidence shows that older people, women, people with lower levels of education and income, or with low levels of financial literacy tend to participate to a lesser extent in projects that offer the possibility of active participation or involvement. On the contrary, people with children, financial literacy, and previous experience in volunteering tend to accept and participate in projects to a greater extent.

A detailed knowledge of the characteristics of the local population increases the possibility of augmenting the levels of social acceptance and citizen participation

Given that the potential rejection of renewable projects in local settings is mainly due to the particular characteristics of the local population and the perceived positive or negative value of the project, a thorough knowledge of the socio-economic, cultural, and educational characteristics of a particular population will increase the ability of project developers to design appropriate acceptance and participation strategies with a greater likelihood of success.

It is crucial to strengthen the social acceptance determinants and reduce the impact of barriers at the sites where projects are developed. It is also important to bear in mind that subgroups within the same population may have different perceptions and ideologies and, therefore, different attitudes toward the projects, making it necessary to collaborate directly with the different local groups.

Actively involving the local population through various mechanisms can also increase the social acceptance of projects

The evidence suggests that greater social acceptance of projects is achieved when citizens develop a sense of psychological ownership of the projects. This type of ownership is achieved through co-participation mechanisms from the early stages of the projects (i.e., bottom-up approaches where citizens can deliberate and cooperate with developers and public institutions), effective communication and information strategies on all aspects of the developments (technical, economic-

financial, and environmental), project designs that take into account the specific characteristics and needs of each local population and area, and a positive perception of the net benefit of the projects.

There are different forms of citizen participation in projects, including direct financial participation schemes, with or without co-ownership, and other indirect participation schemes

There are four forms of citizen financial participation: (1) financial participation with full ownership (by the participating individuals); (2) financial participation with shared ownership with other entities (e.g., project developers, municipalities); (3) financial participation, as lenders or financiers, through online platforms (e.g., crowdfunding, crowdlending, etc.); and (4) indirect participation, through representatives such as local authorities and other entities. In addition, individuals can actively participate in various activities related to the project's operation, management, or promotion.

The most appropriate form of citizen (financial) participation for a particular project depends on multiple factors, and it is very relevant to understand the preferences of the population in the community involved. In general, the more participation options (involving co-ownership of the project or not) there are, the greater the likelihood of actively involving a relevant and representative part of the local community.

Benefit sharing and citizen participation schemes are mostly voluntary

In general, developers decide how to socialize renewable energy projects and what benefits may or may not be shared with the local community. Thus, very restrictive or strict regulations regarding benefit sharing of projects may reduce the incentives for developers.

Although certain mandatory mechanisms seek to encourage the deployment of renewables and citizen participation, they may generate greater resistance from the community, as they are usually standard schemes where the local context has not been taken into account appropriately and where citizens have not necessarily participated in the project development process or the design of the participation or socialization schemes of the project.

Communicating benefits and other relevant project information clearly and assertively is essential for renewable energy project developers

Given the variety of local contexts and the different variables that affect citizen perception of the impacts and value generated by renewable energy projects, there is no “one-size-fits-all” solution to achieving social acceptance and citizen participation in projects. However, developers can implement tailor-made strategies for approaching, developing, and communicating projects that facilitate their acceptance by the local population.

In this context, there are desirable practices in the development of social acceptance of renewable energy projects that can contribute to greater community support and can be grouped into the following areas of action:

- development of detailed intelligence and knowledge about the local context;
- in-depth assessment of social viability (i.e., ensuring an expectation of net positive social impacts);
- assessment of the distribution of socio-economic and environmental benefits;
- evaluation of the citizen participation model proposed by the developer to improve its acceptability;
- implementation of actions or use of tools to mitigate barriers to acceptance;
- elaboration of an ad-hoc communication strategy;
- identification of the role and level of participation of local authorities;
- support of national or regional authorities in training and communication of the benefits of renewable energy projects;
- implementation of a model for the relation with the citizens based on transparency and fluid communication;
- implementation, if possible, of information and monitoring schemes and continuous evaluation of the projects.

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Definitions

Social acceptance of a renewable project	Public response to a renewable project that does not imply rejection. Acceptance can have different degrees (tolerance, explicit support, or active participation).
Economic benefits of a renewable project	Monetary or economic benefits linked to the development of a project, such as the development of economic activity and the local business fabric, employment, income for the community (land rental, purchase of local goods and services), income for the municipality from taxes and in specific cases, compensation or mitigation mechanisms (reduction of the electricity bill or compensation through goods and services to the community).
Social benefits of a renewable project	Social benefits that improve people's quality of life through compensation from the project developer in the form of goods or services for the community. Empowerment of the population through participation in the project, greater social cohesion and improvement of human capital through new knowledge and training.
Environmental benefits of a renewable project	Contribution to climate change mitigation, reduction of greenhouse gas emissions, and improvements in air quality linked to project development. Development of parallel projects to improve biodiversity or conserve the natural environment.
Green bonds	Financial debt instrument issued by public or private entities to finance sustainable or socially responsible projects (green projects).
Co-investment in a project	Participation as an investor in a project, together with other investors.
Co-ownership of a project	Participation in a local project development scheme involving ownership (together with other actors) of infrastructure, etc.
Crowdfunding	A financing system through which multiple agents (investors) contribute capital to a project.
Crowdlending	A financing system through which multiple actors lend capital to a project.
Developer	Entity that undertakes the design, planning and execution of a renewable project.

Citizen participation scheme	A mechanism through which citizens can become involved in a local energy project, usually involving their participation in the project (to varying degrees) and the sharing of benefits (social, environmental and economic).
Socialization strategy	Developer's strategy to raise awareness of the project, its impacts and benefits.
Facilitator	Entity that carries out activities (of a different nature) to promote or facilitate the development of a project without necessarily participating actively in it.
Energy justice (procedural, distributive, and recognition)	Perception of equitable distribution of benefits and costs of energy projects. It can be divided into procedural justice (existence of opportunities for stakeholders to participate in project decision-making), distributive justice (equitable distribution of project benefits and costs), and recognition justice (considers which people or institutions are included and which are not included in project decision-making).
Social license to operate	Concept that refers to the implicit acceptance (as if it were an implicit contract) of a project by the citizenry and that requires renewal from time to time.
Social risk matrix	Matrix that presents the social risks (identified through the social impact assessment), quantifies them (impact and probability of), and gives recommendations for managing them.
Stakeholder mapping	The process of identifying the people and entities of interest in the project that can influence its realization and the developing entity. They can be companies, citizens, associations, organizations, or government.
Narrative of the local context	History of the local context and the community/population where a renewable project is located, including its main characteristics, values, and attributes (demographic, cultural and historical) relevant to the development of the project.
Not in my backyard (NIMBY)	Social phenomenon of rejection of installations and infrastructures near residential areas or populations.
Local renewable project	Renewable energy infrastructure development project (e.g., wind or photovoltaic) in a localized geographical environment, either urban or rural.

Social viability	**Situation when there is a (net) positive assessment of the social benefits and costs of a given local energy project and, therefore, a high probability of social acceptance of the project.**

1. Introduction

The development of local renewable energy projects can be very positive for citizens in different dimensions, as well as for the fight against climate change and the reduction of external energy dependency. In addition to the potential economic and environmental benefits for people in local environments, it is important to highlight the crucial role that renewable energy developments can play in achieving social objectives, such as facilitating access to clean energy at affordable prices or contributing to the alleviation of energy poverty by involving vulnerable households and groups in the projects.[1]

The acceptance and willingness to participate in or even finance renewable energy projects by the population in local environments, such as municipalities of different sizes, rural areas, or city neighborhoods, is of utmost importance, as the viability and implementation of projects depend to a large extent on the acceptance of the project by the citizens.

In particular, benefits associated with most renewable energy projects in local environments can be highlighted at:[2]

- local economic development and employment generation, local commerce opportunities, and community income from land rental, purchase of local goods and services, etc. (see Subsection 3.4, Local employment development), resulting in the maintenance and creation of the local business fabric, employment, and increased income;

[1] According to the Spanish Government's National Strategy against Energy Poverty 2019-2024 (2018), a vulnerable consumer is defined as "a *consumer of electricity or thermal energy who is in a situation of energy poverty and may be a beneficiary of the support measures established by the administrations."* In addition, the strategy points out that some groups are particularly vulnerable and, therefore, require special protection. These groups are:

- *"Older people, children, pregnant women, dependent people, people with illnesses, and those with disabilities are more vulnerable to extremes of heat and therefore to energy poverty.*
- *People with a lower cultural level, which makes it difficult for them to access existing social resources either because of the complexity of filling in applications or because they are unaware of their existence.*
- *Those living in substandard housing, where the lack of thermal comfort may be compounded by unsafe and unhealthy circumstances.*
- *Women due to the phenomenon of the feminization of poverty and the higher incidence of precarious employment and wage gaps, as well as households where women are the sole income earners.*
- *Single-parent/single-parent households.*
- *Migrants*" (Government of Spain, 2018, p.28).

[2] These benefits are explicitly recognized in the regulation. The draft ministerial order on the procedure and requirements for the concession of evacuation access capacity for renewable energy projects that were submitted for public consultation in June 2023 indicated, for example, that "*...The criteria for the award of the tender will include local socio-economic benefits, such as job creation, promotion of female employment, training for the unemployed, investments in the provincial value chain, participation of local investors in the generation project, promotion of self-consumption and support for local industrial, agrarian or social projects. Priority will also be given to projects that minimize their environmental impact...*". See https://energia.gob.es/es-es/Participacion/Paginas/DetalleParticipacionPublica.aspx?k=603.

- increase in revenue for the municipality from taxes such as the Tax on Construction, Installations, and Works (ICIO), Property Tax (IBI), Tax on Economic Activities (IAE), etc., which are an important way to improve the services and facilities of the municipalities;
- in specific cases, mitigation measures or measures to promote social acceptability of projects, such as reduction of electricity bills or compensation in terms of goods or services (see Subsection 3.4.2.2). 3.4);
- the overall positive environmental impacts (reduction of greenhouse gas emissions) and on the local environment, depending on other activities that often run in parallel to the projects (e.g., diversity enhancement projects, conservation of the natural environment, regeneration of natural areas, R&D activities related to biodiversity or the natural environment, etc.);
- empowerment of the population through active participation in the development of the projects, greater social cohesion, and improvement of human capital through new knowledge and training;
- synergies with other projects that may be developed in parallel (e.g., land sharing with traditional economic activities, civil engineering infrastructure, development of electric mobility, smart grids, etc.);
- a positive demographic impact, especially in less populated areas[3], related to generating project value (in terms of economic, social, and environmental benefits).

Despite these potential economic, environmental, and social benefits, in many cases, the promoters of initiatives involving the deployment of renewable energies in local environments encounter certain barriers and strong social opposition to this type of project (unlike, in general, other types of non-energy infrastructure development) and, therefore, they are not being developed at the desired pace.

Barriers faced by developers can be associated with low economic viability if the development of projects involves additional costs in transferring significant monetary or economic flows to ensure their approval by local institutions and the support of the population[4].

On the other hand, social rejection of projects may be due to multiple causes, including cultural, political, or ideological factors, the population's education and knowledge, the demographic or

[3] The Metyis study (2021) suggests that the population decline in municipalities with less than 10,000 inhabitants between 2010 and 2020 was lower in municipalities with renewable energy projects than in municipalities without projects. Although the Metyis report does not assess the factors that explain this positive demographic impact, the effect may be due to the fact that in municipalities with renewable projects there is also a better evolution of unemployment and a higher growth of average gross income (See Metyis, 2021). Furthermore, the Ecodes study (2022) presents cases such as that of Albacete, where there is evidence of a slowdown in the depopulation of the municipality associated with the wind farms in Higueruela.

[4] The regulatory framework is in some respects not conducive to project development. For example, the process of allocating network access capacity may involve certain costs for project developers (local fees or charges, etc.) which may subsequently increase significantly during the negotiation process at the local level with municipalities or the population.

socio-economic structure of the local population, or the visual or environmental impact perceived by citizens.

Therefore, it is essential to analyze the causes of the local population's rejection, or lack of acceptance or commitment, to this type of projects and to understand the policies, measures, and strategies that can favor their deployment in those cases in which the projects are viable from an economic and technical point of view.

This report reviews academic literature and case studies on the social acceptance of renewable energy projects in local settings, analyzing the barriers and determinants of local people's acceptance and participation in these projects. Social acceptance is broadly understood as the lack of opposition to the project or positive attitudes towards it, while participation is where the project has been accepted, and people decide to get involved in its development or financing.

It is important to mention that in the business debate, project socialization refers to providing opportunities for the community to participate in and benefit from renewable projects[5]. Promoters can also have socialization strategies where they make known the project's characteristics, impacts, and benefits; in this way, they can increase social acceptance and even promote citizen participation.

The empirical evidence provided by the case studies and the literature review in different countries or regions with various types of generation technologies allows to draw conclusions and lessons on the determinants of the acceptance and more or less active participation of citizens in local projects that involve, in a generic way, the deployment of renewable energy facilities or other energy infrastructures.

The report is organized as follows. Section 2 defines and analyses the concepts of social acceptance of energy infrastructure projects and energy justice, which allow for a better understanding of the behavior and reaction of local populations to proposals for the development of renewable energy projects in their immediate environment.

Section 3 identifies and analyses the determinants of the acceptance of renewable energy and energy infrastructure projects at the local level, including, among others, socio-demographic, economic-financial, and technical variables and the willingness of people to actively participate in the projects. In addition, it summarises the main barriers to acceptance and participation found in the case studies analyzed and identifies possible strategies to mitigate and overcome them.

Section 4 provides guidance for the definition of strategies to promote the acceptance of renewable energy projects, which should be defined taking into account the different areas of local people's participation sought (e.g., information, consultation, involvement in activities linked to project development, collaboration in decision-making and community empowerment or leadership). Such strategies should take into account (1) a detailed analysis of the local context; (2) analysis of social feasibility (complementary to economic and technical feasibility); (3) assessment of the distribution of benefits generated by the project; (4) assessment of the

[5] See news on project socialization: https://www.eldiario.es/economia/electricidad-ejemplos-socializacion-renovable-espana_1_1674533.html; https://www.lainformacion.com/economia-negocios-y-finanzas/las-renovables-reclaman-un-esfuerzo-legislativo-para-socializar-sus-beneficios/2858230/

citizen participation strategy; (5) actions to mitigate barriers to acceptance; (6) the definition of a specific communication strategy for the specific case (additional to a general strategy of the Public Administration on the need for an energy transition based on renewable energies and its benefits); (7) the participation of local authorities and institutions; (8) the establishment of mechanisms for citizen relations (information mechanisms, conflict management and channeling of complaints and suggestions); and (9) mechanisms for monitoring, evaluation and *reporting/information*.

Finally, Section 5 presents the main conclusions of the analysis and some recommendations for fostering public acceptance of local energy community projects.

2. Social acceptance of renewable energy projects and energy justice

This section defines and analyses the concepts of social acceptance of energy infrastructure projects and energy justice. These concepts allow for a better understanding of the behavior and reaction of citizens and local populations to renewable energy project developments in their immediate environment.

The population accepts a renewable energy project in local environments when there is no active opposition to its development. However, there are varying degrees of tolerance to active involvement and participation among the population that does not explicitly and actively oppose the projects.

The social perception of the benefits or value generation and costs (individual and community) of energy projects is a key determinant of social and individual acceptance of local energy projects. The notion of integrity in the energy sector and the relationship between benefits and costs is framed by the concept of energy justice, a key concept in determining the social perception of renewable energy projects and the willingness of the population to participate in them actively.

2.1. Social acceptance

Public acceptance of energy infrastructures is crucial for developing any energy project, regardless of its technical or economic characteristics. Different disciplines have studied this concept under names such as social, public, or local acceptability (Cohen et al., 2014). It has also been analyzed from the point of view of opposition to the development of projects in citizen movements and attitudes known as NIMBY (not in my backyard), which generally imply that people want to enjoy the benefits of renewable energies but are not willing to assume the costs of having infrastructures in their vicinity.

Social acceptance could be broadly defined as a lack of opposition to the project or positive attitudes toward the project (Cohen et al., 2014; Devine-Wright, 2008; Ellis et al., 2023; Kraeusel & Möst, 2012). However, these definitions are ambiguous, as they leave open the question of which actions or behaviors do or do not support the project. In this regard, Cohen et al. (2014) develop a concrete definition of social acceptance, which allows for a more detailed analysis. The authors argue that for a project to be socially acceptable, it must meet the following definition for all the people involved:

> *"Social acceptance of new infrastructure occurs when welfare-decreasing aspects of the project are balanced by welfare-enhancing aspects of the project, to leave each agent at worst neutral and indifferent to the completion of the project, or better off and supportive of the completion of the project"* (Cohen et al., 2014, p.5).

Aspects that often decrease the well-being of communities include changes to the landscape, ecological effects, health or safety concerns, pollution, noise, decreased property values, and

little or no involvement of people in the process. While aspects such as local economic development, increased security and reliability of energy supply, or compensation (monetary or in-kind) to the community and individuals can increase social well-being (Cohen et al., 2014).

The factors affecting the well-being of citizens and, thus, the social acceptability of the project are grouped by Devine-Wright (2008) into three categories: personal or demographic, social and psychological, and contextual (project type and procedures). Table 2.1 presents some examples of factors affecting the acceptance of energy infrastructure deployment projects.

Table 2.1 Examples of factors affecting the social acceptability of infrastructure deployment projects

Category	Examples
Demographics	• Age • Gender • Income • Educational level
Social and psychological	• Knowledge and direct experience • Perception of impacts • Environmental beliefs • Political affiliation • Territorial belonging or attachment
In context	• Type of technology • Project scale • Stages and past of the project • Institutional structure and governance (project ownership, benefit, and cost-sharing, mandatory participation schemes) • Spatial context (regional and local context, proximity of the project) • Technological development and industrial organization

Source: Devine-Wright (2008) and Ellis et al. (2023).

The different factors can be determinants or barriers in the social acceptance of the project, and the outcome will depend on whether the benefits and costs or negative aspects of the project are balanced in such a way that citizens are left at least as well off as they were before the project was implemented. Section 2.3 further discusses the various factors influencing the social acceptability of renewable energy and other energy infrastructure deployment projects.

Additionally, it is relevant to clarify that different degrees of acceptance of a local energy project can be observed in a population as a whole or in specific groups of people (e.g., environmental activists, municipal leaders, etc.), including opposition, tolerance, and participation (see Graph 2.1).

Graph 2.1 Degrees of social acceptance of a renewable energy project

Source: own elaboration.

Thus, for example, if the community perceives greater costs than benefits from implementing the project, the result would be one of opposition. If, in terms of welfare, the community perceives that after the project is implemented, it will be the same as before the project was implemented, its attitude towards the project will probably be more neutral, and the result would be one of tolerance to the project. If the community perceives a higher net welfare associated with the implementation of the project, there will be a result of acceptance of the project, which may in turn be accompanied by active support and even participation in the project where this is possible. (European Commission et al., 2022; Ruddat, 2022).

Box 2.1 Green transition in Li, Finland.

An example of direct public participation in transformational projects in the energy sector was seen in the town of Li, Finland, where municipal leaders and stakeholders joined together in a collaborative approach to design the future of low-emission transport and public services in the municipality. People of all ages were involved in the project, created a joint strategy, and avoided opposition to the project's development by creating a sense of ownership among citizens (Haf & Robison, 2020). Li is now one of the few municipalities in Europe close to being carbon neutral, having achieved an 80% reduction of its CO_2 emissions compared to 2007.

Source: https://s3platform.jrc.ec.europa.eu/en/w/green-transition-becomes-reality-in-ii-municipality-oulu-region-finland.

2.1.1. Citizens' attitudes in the Basque Country

In the Basque Country, existing data show high public awareness (and concern) about environmental issues and active involvement with environmental organizations (Eustat, 2021; Basque Government, 2021).

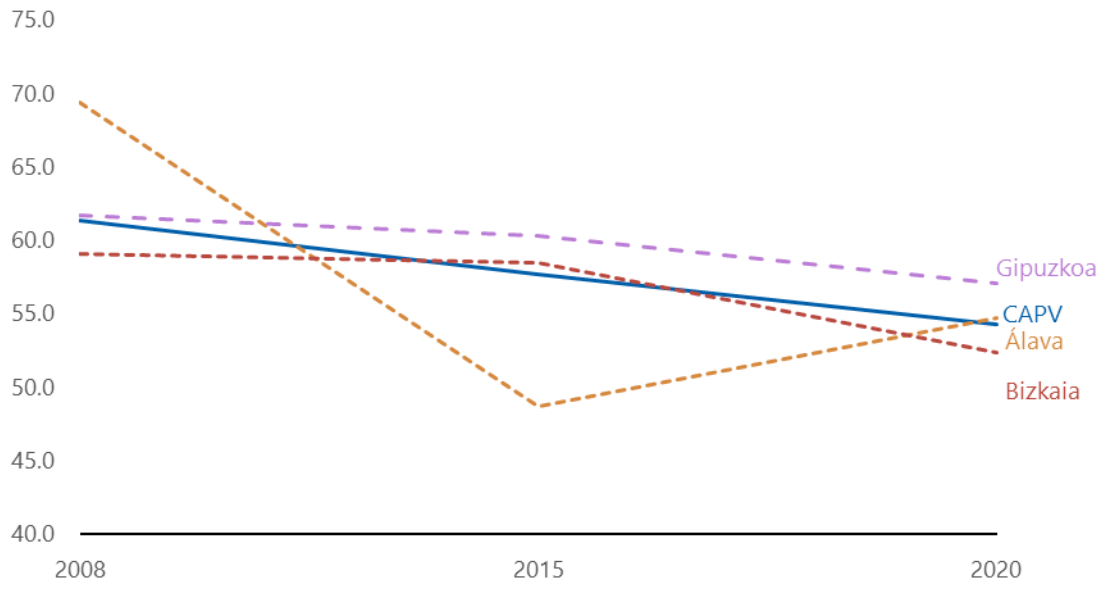
According to Eustat data, Basque citizens also show a high level of support for many measures to reduce environmental impacts and improve the environment, such as making it compulsory to separate household waste, restricting abusive water consumption, establishing a fuel tax, or reducing traffic noise.

Other types of measures, such as restrictions on private transport, a tax on tourism, the installation of renewable energy parks or, especially, paying more for alternative energies, garner less social support.

The percentage of people with favorable attitudes towards installing renewable energy parks in 2020, for example, was around 54%, with slight variations depending on the Historical Territory. It is worth highlighting the drop in this favorable attitude since 2008 (Graph 2.2). This downward trend is generalized in most population strata and is independent of gender, age group, household income level, economic activity, or level of education (see Annex 1).

These data reflect attitudes in the population similar to those observed in other territories in Europe, especially concerning the deployment of large wind (to a greater extent) and photovoltaic (to a lesser extent) energy installations. While the general acceptance of renewable energy is relatively high, local acceptance levels of renewable energy projects are much lower and subject to the NIMBY phenomenon (Segreto et al., 2020).

Graph 2.2 **People with favorable attitudes towards the installation of renewable energy parks (%)**



Source: Prepared by the authors with data from Eustat.

2.2. Energy justice

Aspects that explain the lack of community acceptance or opposition or resistance to the development of energy projects, as mentioned in the previous section, are directly linked to the perception of whether or not the costs and benefits or value generation of the project are distributed equitably between the community and the project developers, i.e., the perception of whether there is energy justice in the development of the projects (Sovacool et al., 2017).

Energy justice can be defined as " *a global energy system that fairly distributes both the benefits and burdens of energy services and one that contributes to more representative and inclusive energy decision-making*" (Sovacool et al., 2017, p. 1)[6].

On the other hand, according to the conceptual framework of energy justice proposed by Jenkins et al. (2016), it can be divided into three types:

- procedural justice (existence of opportunities for stakeholders to participate in decision-making);
- distributive justice (equitable distribution of project benefits and costs);
- recognition justice (recognizing groups with energy vulnerability at risk of exclusion).

In the following, the three types of energy justice are briefly described, and some successful cases of social acceptance of projects that consider this concept are presented.

2.2.1. Procedural justice

According to Gross (2007), for an energy project in a community to be fair with respect to the procedures for planning, development, and implementation, the community must have full participation in the process, the possibility to express their views and be heard, receive all relevant information, be treated with respect and have the opportunity to participate in decision making. In other words, the processes and mechanisms used in energy policy development must consider the views and opinions of all those involved.

According to the literature (see Annex 2), bottom-up approaches to renewable energy project developments, where project governance follows a democratic (i.e., participatory or collaborative) rather than a hierarchical approach, lead to greater public acceptance, as community members feel collective psychological ownership of the project and that the project is better suited to their needs.

On the contrary, when a more hierarchical or top-down approach is followed, the population tends to reject developments due to a lack of information on the characteristics and benefits of the project, as well as a lack of opportunities and alternatives for participation, resulting in a lack of trust in the developing entities.

In this way, the effective involvement of the main local actors (political, social, and economic) of the territory is crucial in the process of project acceptance, as more transparent project management can be achieved, in which the benefits and costs of the project are discussed, and the planning of the project is done with a shared vision of the territory.

In order to ensure that project development is procedurally fair, it is crucial to design a strategy for social ownership of the project, including ways for people to participate in one or several

[6] The concept of energy justice is framed within the broader concept of just transition. The latter concept is defined by the International Labour Organisation as "just transition means making the economy as fair and inclusive as possible for all stakeholders, creating decent work opportunities and leaving no one behind. A just transition involves maximizing the social and economic opportunities of climate action while minimizing and carefully managing challenges, including through effective social dialogue among all affected groups and respect for fundamental principles and labor rights".

stages of the project and different mechanisms to achieve this participation (Section 4 further discusses the design of a social acceptance and participation strategy for renewable energy projects).

Box 2.2 Swansea Community Energy and Enterprise Scheme (Wales)

Swansea Community Energy is a community-owned renewable energy company that Swansea City Council initially established but now operates independently. Swansea Community Energy has a member of the local authority on its board who promotes the development and uptake of projects (Haf & Robison, 2020). (Haf & Robison, 2020). Its projects are carried out for the benefit of the public, and its profits are used to invest in environmental and business projects in the community.

Source: https://www.swanseacommunityenergy.org.uk/

Box 2.3 Citizen juries in wind farm development (Scotland)

Citizen juries was a project developed by the Universities of Edinburgh and Strathclyde that explored citizen participation in the decision-making process of wind energy projects using juries. In this way, people gained skills and capacities in wind energy development in Scotland, which they used to deliberate and make joint decisions with the community. (Haf & Robison, 2020).

Source: https://involve.org.uk/resources/case-studies/citizens-juries-wind-farm-development-scotland

2.2.2. Distributive justice

Although the national or global benefits of renewable projects in terms of climate change and energy transition are widely known, the local population bears the costs related to landscape alteration, visual affectation, and the impact on flora and fauna. While the territories where the projects are developed receive economic benefits *per se* (in terms of increased economic activity, employment, income from land rental, and income to the municipality), mechanisms are not always established to share or distribute the value generated by the project to all the people who live in the localities, which creates the risk that the population may feel that it is not shared equitably with the entire community. In other words, citizens may perceive a negative net benefit of projects for the local community (Lienhoop, 2018).

Compensation mechanisms are a way of redressing perceived inequities in the distribution of project benefits by transferring resources to the community, which can take different forms (see Section 3 and Subsection 4.4). In turn, the public's perception of the benefits that the project may bring is a determining factor in the acceptance of the project and even in its financing by the community.

The benefits or value generation that a population and its constituent people can derive from the deployment of renewable energy projects are varied, regardless of whether they are directly involved in the financing or ownership of the project or not.

Benefits without financial participation can be distinguished by the type of compensation, e.g., monetary (including job creation), in terms of goods or services to the community, or in terms

of the benefits to the community (Mansfield et al., 2002) or through individual or collective rewards (Terwel et al., 2014). In addition, projects can make fiscal contributions (e.g., ICIO, IBI, IAE) that increase the budgets of municipalities and can thus be passed on to community benefits (e.g., increased services and amenities of the municipality, discount vouchers, etc.).

Community benefits can also be derived from people's participation as investors, financiers, or owners of projects. In this case, people can receive financial benefits, either through the purchase of shares, co-ownership of the project, participation in cooperatives, energy or renewable energy communities, the purchase of debt through government or corporate green bonds (Yildiz, 2014), or crowdfunding on digital crowdfunding platforms (see Section 3 for a more in-depth presentation of different citizen participation schemes).

In line with the discussion on procedural justice, according to the literature (see Annex 2), the available evidence suggests that if the community can influence the determination of the type and size of the benefit, people perceive a greater interest of the project developer in increasing the welfare of the locality; hence, compensation may positively impact on project acceptance.

Depending on the needs and characteristics of each local population, different types of benefits may be perceived differently. Some case studies have found that people prefer developers to pay local taxes to improve community conditions rather than direct individual monetary transfers, which may sometimes be perceived as bribes.

People in the case studies express mixed views regarding investments: some people perceive these financial instruments as risky or unfair (as not all people can access them), while others are willing to invest.

All of this suggests that no one type or scheme of compensation favors widespread acceptance of projects and that the compensation mechanisms that may have the most positive impact in the case of a particular project depend on factors such as people's preferences, cultural context, socioeconomic variables or regulation (e.g., the obligation to pay certain fees or taxes that are then passed on in benefits to local people).

Box 2.4 Convive Program (Iberdrola)

Iberdrola's Convive program aims to integrate initiatives and alliances around renewable energies and their contribution to socioeconomic development and biodiversity conservation to increase the positive impacts of projects and facilitate their social acceptance. For example, the program developed Spain's first smart agrovoltaic pilot plant in Guadamur, Toledo. In the Winesolar installation, the solar panels adapt their orientation to the needs of the vineyards to regulate the incidence of the sun and the temperature.

Source: https://www.iberdrola.com/conocenos/nuestra-empresa/energias-renovables/programa-convive

Box 2.5 Hornsdale Wind Farm (Australia)

Hornsdale is a 316 MW wind farm with 99 wind turbines owned by Neoen, located between 8km and 24km from Jamestown. The project was designed based on the local context, especially involving the local Aboriginal community from the early stages, with whom they developed a cultural heritage management

plan. This collaborative relationship between the developer and the community resulted in Aboriginal artwork being installed at the base of the wind turbines, creating a sense of community ownership of the project. The Neoen company also developed and funds a nature reserve to conserve an endangered lizard species. The environmental and social benefits of the wind farm resulted in a high level of acceptance and participation from landowners, local people, construction contractors, local council, and community groups (Lane & Hicks, 2017).

Source: https://hornsdalewindfarm.com.au/

2.2.3. Recognition justice

Recognition justice considers the people or institutions included and those not included in the decision-making process in the framework of renewable energy projects. Thus, this notion is related to the identification and recognition of vulnerable people and households at risk of being excluded from the processes and developments in the localities through the detailed analysis of their socio-demographic and economic characteristics to involve them more effectively in the projects in their community and to be able to approach the relevant social authorities.

In this sense, projects that are perceived as fair identify factors that may make it difficult for vulnerable people to participate in renewable projects in their local geographic environment. These factors may include gender, age, income level, race, migration status, digital skills, or internet access (see Government of Spain, 2018).

For example, the academic literature provides evidence of significant differences in the ratio of women's participation, ownership, investment, and decision-making compared to men in renewable energy projects. Different cultural, social, economic, and political factors impede women's greater participation in energy projects close to their locality. People's age, race, low income, and digital capabilities can also negatively affect their participation. Social authorities need to know and work with vulnerable individuals and households to promote greater recognition justice to encourage their participation in projects (see Annex 2).

Box 2.6 Support to vulnerable households (Local Energy Community of Zumarraga, Gipuzkoa) (Repsol)

Repsol (Edinor) has approached the residents of Zumarraga who form part of the Local Energy Community of this municipality (TEK Zumarraga) and the town council itself with an initiative to include vulnerable households, facilitating their incorporation and permanence in the CEL for three years free of charge. The Repsol Foundation has developed the initiative in collaboration with the Red Cross, which includes training and promoting energy efficiency in the most disadvantaged neighborhoods of the municipality. The action progressively generates public confidence in new electricity generation projects about an energy community that is very present in the municipality. In addition to the town council itself, 180 families and small businesses form part of it.

Source: https://www.tekzumarraga.eus/, https://www.elespanol.com/enclave-ods/historias/20230228/euros-ahorro-factura-revolucion-energetica-pueblo-gipuzkoa/744675598_0.html.

2.3. Relevant Factors in Citizen Acceptance and Participation: Barriers and Determinants

Several studies have analyzed the factors determining citizens' acceptance or opposition to energy projects in local contexts. These studies illustrate how different socio-demographic, psychological, economic, and context-related variables relate to people's perceptions of the benefits and costs of projects and their position on their development.

Annex 3 presents a brief literature review of the main factors determining the social acceptability of renewable energy and energy infrastructure projects in different countries or regions with different types of technologies. Table 2.2. presents a list of the main variables found in the literature that can determine the levels of public acceptance of energy projects in their local environment. It is important to note that these variables, or their effects, may differ depending on the specific community under analysis or the characteristics of the particular project.

The academic and case study literature generally finds that older people, women, and people with lower education and income tend to be less likely to participate in projects. In contrast, households with children and people with financial literacy and previous volunteering experience are more likely to accept and participate in projects.

Regarding the decision to invest in projects, the literature concludes that higher income levels, previous investment experience, financial patience, and high project profitability induce project investment. However, variables such as lack of savings, experience in investment decisions, access to loans, high levels of investment risk, and lack of trust and information on renewable technologies are barriers to social acceptance of projects.

Thus, a detailed knowledge of the socio-economic, cultural, and educational characteristics of the population is crucial to increase the likelihood of success of citizen acceptance and participation strategies (see Section 4). Efforts should be made to provide the public with transparent and reliable information about the project, especially in the initial phases of development, which is when there is a higher level of rejection and a higher level of investment risk. Providing access to low-cost capital for those interested in investing in projects, as well as education and communication on energy policy, is also crucial.

In addition, there are differences in the acceptance of projects according to their technical characteristics. Lower-income populations are more likely to accept solar generation projects, while higher-income populations are more likely to accept wind generation projects. Solar installations generally tend to have higher acceptance levels than wind farms.

Table 2.2 Main factors affecting citizens' acceptance of energy projects in their locality according to the literature reviewed

Variable	Description

Individual characteristics (socio-demographic variables, economic variables, beliefs/perceptions and knowledge)	
Age	In most of the studies analyzed older people tend to be less willing to accept the project than younger people.
Gender	Women tend to have lower participation or investment rates than men.
Level of education	People with higher levels of education tend to be more interested in the project.
Income level	Individuals and households with higher income levels are more willing to participate.
Children	Households with children have a long-term vision that makes them more interested in the project's benefits.
Trust	People with higher levels of interpersonal trust towards politicians and decision-makers at national/regional/local levels and investors tend to be more willing to accept the project.
Sense of belonging or territorial attachment	People with a greater sense of belonging or territorial attachment may exhibit rejection of project development in their locality.
Perception of return on investment	People are more willing to participate or invest in projects if they perceive that investments in green projects or sustainable equity funds are more profitable than investments in conventional funds or projects.
Perception of the level of investment risk	People who perceive higher risk in investments in sustainable equity funds than in traditional ones are less inclined to invest in the project.
Experience in volunteering	In some cases, people with previous experience in certain volunteering activities may be more willing to participate.
Social expectations	The expectations of people's close social circle influence their acceptance of the project. If their social circle expects the person to behave sustainably, they will be more willing to participate.
Talking about investments	People in the habit of talking about investments (which may be related to the level of financial literacy) are more willing to participate and invest.
Financial patience	People willing to give up something beneficial today in exchange for benefiting more in the future tend to accept and participate in the project.
Technical characteristics of the project	
Solar energy	Solar generation projects are generally more widely accepted by the population.
Wind energy	Higher-income communities tend to accept wind installations more readily than lower-income communities. The size, visibility, and proximity of wind turbines are often barriers to social acceptance of the technology.

Other sources of generation	Generation projects with technologies such as coal- and gas-fired plants do not meet with general public approval due to their association with negative impacts on the climate and on people's health and safety. Biomass plants often do not meet with social approval due to people's lack of knowledge of the technology.
Electrical infrastructures	Local people often reject grid development if it involves the installation of large structures that block views and alter the landscape. In addition, people do not perceive grids as green structures. People prefer underground grids with less visual disturbance, which is also associated with greater safety.
Impacts on the environment	
Physical impact	Landscape disturbance and impacts on biodiversity and wildlife hinder project acceptance.
Greenhouse gas emissions	The project's contribution to reducing greenhouse gas emissions promotes local acceptance.
Impacts on the economy and society	
Personal and local income and profits	The project's impact on employment, local tax revenues, and the value added to the locality can positively affect acceptance. Positive effects on personal finances (e.g., reductions in electricity tariffs and income to landowners) also promote acceptance. However, projects may negatively impact property values, which detracts from social support for them.
Co-ownership of the project	Having financial ownership of the project tends to facilitate acceptance.
Benefit and cost-sharing	Having a fair distribution of project benefits and costs promotes buy-in and participation.
Health and safety	Impacts on people's health and well-being (such as electromagnetic frequencies, intermittent shadow effect, noise, odors, or pollution) negatively affect acceptance.
Context	
Market factors	A higher share of renewables in the national or regional generation matrix induces a higher level of acceptance. A high level of electricity demand and increased security of electricity supply resulting from the project promotes community acceptance.
Procedural justice	Providing appropriate and transparent information about the project from its early stages and having opportunities for participation in decision-making and planning generates greater social acceptance of developments. Generating collective psychological ownership of the project by tailoring it to the community's needs is a crucial determinant of local acceptance.

Source: own elaboration, based on the literature presented in Annex 3.

Finally, as discussed in Section 2.2 on energy justice, the main drivers of public rejection of projects include a lack of trust in the developers, lack of information, and limited opportunities for participation. Therefore, when there are spaces and opportunities for the population to get involved with different levels of commitment in the project, the likelihood of gaining greater support increases. Another determinant of social support is providing transparent and concrete information to the public on the benefits and costs.

Given that social acceptance depends on the specific context of the project and the characteristics of each locality, it is vital to strengthen the acceptance determinants and reduce the impact of barriers. It is also crucial to bear in mind that within the same population, subgroups of people may have different perceptions and beliefs and, therefore, different attitudes towards the projects.

Table 2.3 summarizes the main barriers to public acceptance and participation in projects in their vicinity and possible mitigation strategies to encourage higher levels of public acceptance.

Table 2.3 Barriers to acceptance and participation in energy projects and potential mitigation strategies

Barrier	Mitigation strategy	Examples of mitigation actions
Lack of information on technical aspects and economic, environmental, and social benefits and costs	• The community should be informed from the early stages of the project (the stage when most resistance is registered) using assertive communication strategies • Strategies should have a clear communication objective, involve the community in the campaign's planning, use an appropriate mix of communication channels, and be flexible	• Traditional briefings • Project host centers • House-to-house/neighbourhood-to-neighbourhood visits • Use of social networks and websites • On-line and face-to-face discussion and feedback forums • Videos with interviews or testimonials • Information on non-monetary benefits (e.g., socio-economic impact on local environments, etc.)
Lack of participation in the decision-making process	• Planning and decision-making processes should be oriented towards a more cooperative and participatory approach rather than top-down schemes • Opportunities should be offered to the community to get involved in the project at different levels of engagement	• Round table discussions • Working groups • Workshops
Lack of trust in the developer, electricity companies, or public institutions	• Adequately inform the community through spaces where developers, public institutions, and community representatives can meet and discuss the benefits and costs of projects for the inhabitants	• Provide information sessions and participation activities • Involve all stakeholders from the early stages of the project • Involvement of the municipal government to provide information and encourage participation • Engaging local leaders • Have people from other nearby communities who can report on the project based on their experience

		• Involve non-governmental organizations and training institutions (e.g., universities) or research institutions in the processes
Opposition from specific local social or political groups (e.g., due to negative impact on the landscape or the flora and fauna of the region, cultural rejection of the occupation of the territory, etc.)	• Adequately inform these groups about all the benefits and costs of the project and how they can be equitably distributed among all stakeholders under different schemes. • Select the project's location considering land with environmental or social value • Carry out preventive, corrective, and compensatory actions for the fauna, flora, and local heritage that may be affected by the project's development	• Offer information sessions designed for specific target groups • Involving local representatives • Engaging political leaders • Conduct studies of the ecological value of the land, environmental impact, and local heritage. Avoid areas included in the Natura 2000 Network and areas affected by Conservation Plans and Strategies for Endangered Species and Species under Special Protection Regime • Minimize the length of electricity transmission lines by promoting their location as close as possible to the point of connection to the transmission and distribution grid • To build evacuation lines to allow the connection of future installations • Design perimeter enclosures (photovoltaic plants) in a permeable way, with gates and beacons • Create living hedges with native species that allow the integration of the plants into the environment, recover the natural vegetation with seeds of native species, increase the vegetation cover of the area with the planting of trees • Increasing biodiversity in the area by, for example, creating bird reserves, installing nest boxes and bird guards, GPS bird marking, installing reptile shelters and insect hotels, monitoring noise levels, creating amphibian passes, rabbit breeding sites and ponds

		• Archaeological clearing and excavations in areas of local heritage significance • Plan for the return of the land to its original state once the installation is decommissioned
Lack of a proper distribution of project benefits and costs or a proper perception of the project's value	• Report on the project's contribution to the locality and how to mitigate negative costs or impacts • Offer benefits or compensation mechanisms, if feasible in the context of the project, ideally discussed and agreed with the community	• Reduced energy tariffs • Discounted energy efficiency services • Payment of a charge/fees by the developer (in the Spanish case, these are the tax charges paid by the developer to the municipality) • Various goods and services for the community, including social and environmental programs • Engaging local businesses and workforce • Offer investment opportunities for the population through shares, bonds, or crowdfunding
Characteristics of the infrastructure	• Select the project's location as far away as possible from the population, and do not install it in places valued by the community (e.g., at environmental or archaeological levels, etc.)	• Knowing the community and the sense of belonging to the locality and its identity • Adequately identify the people most affected by the infrastructure • Design concrete strategies to minimize environmental impact (e.g., design of structures and access, noise reduction, protection of flora and fauna, material recycling schemes, etc.) • To monetarily compensate people who have a loss of value in their property • Support and promote land sharing to integrate the installation with activities such as agriculture (agro-pastoralism), beekeeping (solar honey), livestock, forestry management or tourism
Lack of financial or technical literacy (lack of knowledge of	• Have sufficient information on civic investment options and their risks	• Conduct courses and workshops on the energy and environmental sector

the energy and environment sector)	• To understand the functioning of the energy sector and the risks arising from climate change	• Offering professional support for financial or technical questions • Conduct awareness-raising activities such as guided tours of the project facilities and talks with local actors
Lack of financial participation due to low disposable incomes	• Promote and support the financial participation of vulnerable groups with low levels of disposable income to make investments	• Raise awareness in the community of public financial assistance program options • Reducing membership fees for cooperatives • Reduce investment values and amounts • Shared investments • Consider participation schemes based on third-party ownership of assets (e.g., tolling agreements)

Lack of participation of vulnerable groups in the project	• **Promote the participation of vulnerable groups in the community.**	• **Provide more time slots for work or volunteer groups so that women who are heads of households, pregnant, in precarious employment or on low incomes can participate or be paid for their work in the project** • **Conduct mentoring programs to exchange experiences, ideas and competences** • **Networking with leaders who can share their experiences and encourage the participation of vulnerable people in the community** • **Using inclusive imagery and language in campaigns and advertising** • **Involve young people by offering free participation in the project (e.g., in exchange for participation in idea or innovation competitions, etc.).** • **Implement communication strategies focused on young people through social networks** • **Create employment or internship programs for young people through government institutions** • **Carry out communication strategies targeting non-digitized groups through house-to-house visits, drop-in centers and exhibitions (e.g., in retirement homes or people's homes, etc.)**

Source: own elaboration based on the literature review presented in Annex 3.

3. Citizen participation schemes for renewable energy projects

Citizen participation schemes for renewable energy projects at the local level can be classified into those that involve people financially and those that involve people without investment or financial participation.

Investment schemes can be further divided into equity-based schemes (full or shared citizen ownership) and debt-based schemes (bond issuance or financing through online platforms)[7]. On the other hand, participation schemes can also be classified according to the degree of direct participation and citizen ownership.

The different classifications of participation schemes found in the literature and successful cases of citizen participation in renewable projects are presented below.

3.1. Typology of citizen participation

Graph 3.1 presents the typology of citizen participation proposed by Dudka et al. (2023). This typology analyzes two dimensions of citizen participation: the degree of direct participation and the degree of ownership in the project. Thus, citizen participation can be:

(1) direct and complete (full citizen ownership quadrant);

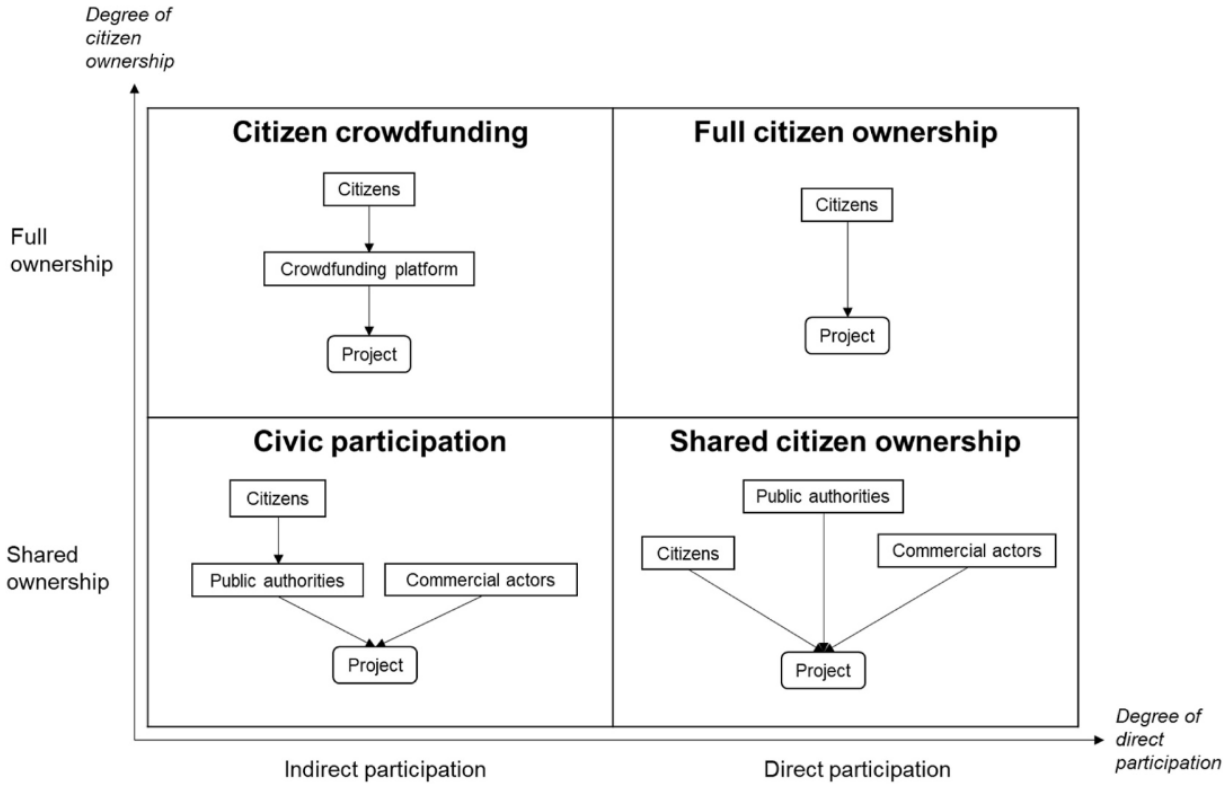
(2) directly but shared with other entities (shared citizen ownership quadrant);

(3) indirectly, through platforms (citizen crowdfunding quadrant); or

(4) indirectly, through local authorities and other entities (public participation quadrant).

[7] It is important to bear in mind that as with any financial investment, financial participation in projects may entail losses.

Graph 3.1 Typology of citizen participation in renewable projects



Source: extracted from Dudka et al. (2023).

Full citizen ownership

In this model, the citizenry owns all the actions of the project, and, therefore, the community is the financial partner of the project during its time of operation. The fraction of the citizenry that is part of the project participates in the management and governance of the project.

This model has the advantage of greater acceptance of the project by the community, as it is initiated and owned by the population, and the community receives most of the project's benefits. However, a major disadvantage is the lack of technical knowledge and financial muscle, a weakness covered in other forms of participation through collaboration with private developers and local authorities. In fact, Dudka et al. (2023) find that projects with this participation scheme have smaller scales of operation due to a lower level of capital investment.

Shared citizen ownership or co-ownership

In this model, citizens also have a direct stake in the project, but ownership is shared with commercial developers or local authorities, which generally provide capital for financing. Although ownership is shared, citizens usually have the largest equity stake.

In this scheme, developers have the advantage that they can count on investment from the community, share the risks of the project with the citizens, and know the local needs. Citizens benefit from the developers' technical knowledge, capacities, and financial resources. However,

tensions may arise between local people and commercial actors due to possible conflicts of interest or lack of trust (Dudka et al., 2023).

Box 3.1 Solar Village of Cedillo, Extremadura (Iberdrola)

The solar energy community of Cedillo is the first solar community open to the participation of the whole village. Iberdrola Spain launched it at the beginning of 2023, and 305 of the 450 inhabitants of the town joined the project. The residents of Cedillo will save 50% of their annual energy bills, which is expected to boost the village's economy, attract new residents, and promote local development.

Source: https://www.iberdrolaespana.com/sala-comunicacion/noticias/detalle/230620-ponemos-en-marcha-el-pueblo-solar-de-cedillo-en-extremadura

Citizen crowdfunding/crowdlending

In this model, people own the project but do not participate directly in its execution. They finance the project through online crowdfunding platforms through crowdfunding (co-investment) or crowdlending (co-financing). In crowdfunding or co-investment models, individuals acquire the right to a fraction of the project's profits but have no decision-making power or control over the project's development.

In crowdlending models, individuals in the scheme lend small amounts of money for project development in exchange for a financial return stipulated in a loan contract. The advantage of this model is the ability to reach a larger number of investors, which would not be possible without online platforms (Dudka et al., 2023).

Box 3.2 Fundeen Co-investment Platform

Fundeen is a co-investment or crowdfunding platform authorized by the Comisión Nacional del Mercado de Valores (CNMV) that allows individuals to invest in renewable energy projects from €500. It aims to democratize investment in renewable energy projects. All projects are financially, technically, and legally assessed to ensure their viability. Fundeen has financed over 16 projects in Spain and France, raising more than €8 million. They currently have more than 20 different projects available for investment.

Source: https://www.fundeen.com/sobre-nosotros

Public participation

In this scheme, citizens do not have a stake in the project and are not actively involved in its governance. In this case, the project's owners are the local authorities or commercial developers. Here, those who represent the public must pursue the public interest. Although the population in this model is not directly involved, the local authorities try to make the community aware of the initiative, the project details, and the local energy policy (Dudka et al., 2023).

3.2. Capital-based citizen participation schemes

Citizen investment in renewable projects can also be classified according to whether the investment scheme is equity-based or debt-based. In the case of equity-based participation, citizens as shareholders may have the right to vote and participate in decision-making (Knauf & le Maitre, 2023). The purchase of shares in the project can be done individually or through a community investment vehicle.

Following the typology proposed by Dudka et al. (2023), citizens can finance projects through equity investment with different structures by having full ownership of the project or sharing ownership with other actors.

In the case of co-ownership, the community has ownership, through an investment vehicle, of part of the development and has an active role in decision-making. The community may be the project's initiator and have a majority stake or a minor role. The community investment vehicle, in this case, faces risks and liability during the project's life and is also usually responsible for the strategy to achieve social acceptance of the project within the community. The investment vehicle can be a firm, a cooperative, an association, or a fund (Lane & Hicks, 2017).

As mentioned in the previous section, co-investment, which involves raising funds through online platforms or community investment vehicles, is also possible. In this case, the community investment vehicle acquires the right to a share of the project's profits but has no decision-making power or control over the project's development. As in the case of shared ownership, the investment vehicle can be a company, a cooperative, a partnership, or a fund (Lane & Hicks, 2017).

Box 3.3 Coonooer Bridge Wind Farm (Australia)

Coonooer Bridge is a 19.8 MW wind farm located in rural Australia. Ownership of the project is shared between the local farming community and two private developers (Windlab Limited and Eurus Energy). The landowners were consulted and helped to develop a scheme whereby people within three kilometers of the project were given shares and the opportunity to invest directly. In addition, more traditional schemes were carried out where the developers provided the community with other benefits without investment.

Windlab also conducted community interaction activities through one-on-one meetings with project staff. Staff regularly visited the site and facilitated discussions and debates with landowners and neighbors. This participatory approach achieved much faster project development than the industry average, and there was minimal community opposition (Lane & Hicks, 2017).

Source: https://coonooerbridgewindfarm.com.au/

According to the report of the European *WISE* Power project (Knapen et al., 2015), which aims to increase the uptake of wind projects, the most innovative equity-based financial models for financing developments that can promote social acceptance are:

- Crowdfunding or co-investment through online platforms.
- Private partnerships that include at least one citizens' cooperative.

- Public-private partnerships involving a public entity (municipality, public authority).
- Fund set up with public bodies. In this case, the project can be designed by a private developer or a cooperative. The fund ensures that the necessary financing is obtained for the project's development regardless of the money raised by the developer or cooperative.
- Fund established with cooperatives. In this case, the project can be designed by a private developer or a cooperative. The fund is constituted by one or more cooperatives, ensuring that the necessary financing is obtained for the project's development.

3.3. Debt-based citizen participation schemes

Debt-based schemes as an instrument of citizen participation are rarer than equity-based schemes. According to Knauf & Wüstenhagen (2023), in Germany, some wind energy developers distinguish their financing offers according to the stage of the project. In the early stages, they offer equity to a smaller number of investors who are willing to take a higher risk. At a later stage, they offer bonds, seeking the participation of a more general and risk-averse public.

In the case of debt financing, the community can finance the project through bonds. The providers of these instruments are usually banks in cooperation with the developers (Yildiz, 2014). Debt-based financing schemes can also include more complex structures, such as mezzanine finance[8] or performance-based debt return schemes.

As mentioned in section 3.1, it is also possible to raise debt-based funds through a crowdlending model, where individuals lend small amounts of money for project development in exchange for a financial return using an online platform.

Box 3.4 Crowdlending platform Ecrowd!

Ecrowd! is a platform based on the crowdlending model specializing in investment projects in Spain in energy, water, health, circular economy, mobility, communities, education, and food. The model without financial intermediaries provides more affordable financing to companies and a higher return to investors.

Source: https://www.ecrowdinvest.com/inversiones-con-impacto

3.4. Citizen participation schemes without investment

Community benefit schemes that allow citizens to participate in projects without investing also increase distributive justice and foster social acceptance. However, benefit-sharing schemes must be designed to effectively achieve project acceptance with the specific local context and

[8] The term *mezzanine finance* refers to financing structures based on debt instruments with higher yields, but with a lower level of repayment seniority than senior debt.

community needs in mind. As mentioned in Section 2.2.2, if these schemes are designed jointly with the community and offered early in the project rather than in its final stages, it reduces the risk of the community perceiving them as a purchase of support (Lane & Hicks, 2017).

Following van den Berg & Tempels (2022), Lane & Hicks (2017), and Lane & Hicks (2019), Table 3.1 provides a summary of the different benefits distinguished by type of compensation.

Table 3.1 Types of community benefits

Type of benefit	Definition	Examples
Monetary or economic benefits	**Provision of money or monetary benefits on an individual or community-wide basis** **Generation of other forms of economic benefit for the local community**	• **Employment generation by the project** • **Activation of the local industrial and economic fabric** • **Land sharing to integrate the facility with local economic activities (agriculture, beekeeping, animal husbandry, forestry management, or tourism)** • **Land rental income** • **Fiscal contribution of projects to the municipal budget and application of these funds to projects identified by the local community** • **Income from the purchase of local goods and services** • **Reducing the price of energy bills** • **Reduction of local taxes or charges** • **Innovative product development**
Compensation through goods or services for the community	**Provision in the form of goods or services to the community, such as in-kind benefits (e.g., infrastructure), local services, or impact mitigation and environmental improvement projects**	• **Community funds** • **Community centers, recreational facilities, etc.** • **Sponsorship programs and legacy initiatives** • **Construction of local energy projects** • **Construction of electric vehicle charging stations** • **Energy efficiency programs** • **Education programs** • **Programs for the protection of local flora and fauna** • **Volunteering programs by project staff**

Source: own elaboration based on van den Berg & Tempels (2022), Lane & Hicks (2017, 2019).

Given the different characteristics of community benefits, some are discussed in more detail below.

Local employment development

The Metyis report (2021) provides evidence of the positive impact of renewable energy projects on local employment in Spain. Thus, between 2010 and 2020, municipalities with less than 10,000 inhabitants with renewable energy developments registered a greater decrease in unemployment than municipalities without renewable energy developments. This relationship holds for all types of territories (national level, provinces, and counties) regardless of the size of the municipalities.

For local employment generation, the developer needs to communicate in advance the type of knowledge, skills, and abilities required to develop the project. For example, the developer can publish the project's job opportunities online and offer the public the possibility to register and get updates on job vacancies.

In this way, the community can be prepared to benefit from the project's employment opportunities. The developer can also discuss and promote the development of education programs in the locality, for example, by partnering with local vocational training programs (Lane & Hicks, 2017, 2019).

Regarding procurement of local goods and services, the developer can create a local procurement policy, provide timely information on opportunities at different stages of the project, and provide support and training on the capacity of local businesses to respond to project demand (Lane & Hicks, 2017).

Box 3.5 Internship program at the Winton solar plant (Australia)

The GOTAFE vocational training center partnered with FRV, the developer of the Winton solar plant, to develop an apprenticeship program where three local apprentices took courses in electrical engineering and high voltage to subsequently work at the plant. FRV developed the program because it identified low rates of community people trained to work on the project. The trainees also had the opportunity to visit the project site during their training to gain experience in renewable projects (Lane & Hicks, 2019). (Lane & Hicks, 2019).

Source: https://www.gotafe.vic.edu.au/whats-on/news/gotafe-winton-solar-farm-scholarships

Land sharing

Projects can create partnerships to share land use with other economic activities relevant to the region. These activities could be agriculture, beekeeping, or livestock farming. This compatibilization of land use between renewable electricity generation and other traditional economic activities generates benefits for both parties and can avoid the use of machinery, herbicides, and chemical pesticides in some cases (Ecodes, 2022).

Box 3.6 Minglanilla photovoltaic park (Cuenca)

The Minglanilla photovoltaic park has the following three alliances to share land use with local economic activities: with the company Bealar S.L., a saffron producer and marketer; with Nómadas de la Miel, a

beekeeping company; and with the extensive grazing of Manchega sheep. These alliances not only benefit local businesses and the photovoltaic park but also contribute to the enrichment of the soil and the development of biodiversity.

Source: Ecodes (2022).

Innovative products

Among the innovative programs that the project developer can offer, we can highlight, for example:

- micro Power Purchase Agreements (PPAs) for small local industrial consumers;
- behind the meter arrangements (where a proportion of the electricity generated in the project is sold locally rather than fed into the grid through self-consumption or other schemes);
- the development and support of circular economy projects, such as waste treatment and fertilizer production;
- offer certificates to offset the carbon footprint of local actors;
- tourism programs (Lane & Hicks, 2019), including energy tourism programs[9].

Box 3.7 Hepburn Cooperative (Australia) and Las Corchas and Los Naranjos Photovoltaic Park (Seville)

The Hepburn Wind Energy Generating Cooperative offers the neighborhood around the 2.5 km wind farm a contribution of $200 per year towards paying their electricity bills. It offers local citizens, businesses, and associations the option to mitigate their carbon footprint by selling emission certificates. It also conducts tours of its facilities (Lane & Hicks, 2019).

Las Corchas and Los Naranjos photovoltaic plants in Seville have developed a space with local businesses in the municipality to market the honey produced in the solar apiary located inside the plant's facilities. They also have a collaboration space with two start-ups to implement technological developments in installing sensors in the hives and making the work of beekeepers more efficient. In addition, they offer tourist visits to the apiary and solar plant with the support of the city council (Ecodes, 2022).

Source: https://www.hepburnenergy.coop/ and Ecodes (2022).

Sponsorship programs and legacy initiatives

Sponsorship programs contribute to the activities of different local groups in exchange for *marketing* and promoting the project. They can be carried out with local events and environmental or sports groups. On the other hand, legacy initiatives are carried out with local organizations and aim to have a longer-term impact and benefit the community in different

[9] In energy tourism programs, for example, groups of people can visit renewable projects, and learn about how they work and how they contribute to the local community (Lane & Hicks, 2017). In addition to being a source of income for the community, this type of tourism serves to raise awareness of the importance of renewable projects, both on an energy, economic, and social level and contributes to an improvement in the general perception of citizens.

areas. For example, legacy initiatives can be carried out in populations at risk of vulnerability in educational institutions or health centers.

Box 3.8 Sponsorship and community support programs

Renewable energy company Pacific Hydro owns and operates six wind farms in the Portland region of Victoria. When it learned that the district hospital was struggling to cover the cost of its electricity bills, the company decided to spend $40,000 to install solar panels on the hospital's roof. The savings in the hospital's electricity costs have enabled it to improve the health services provided to the community. (Lane & Hicks, 2019).

Statkraft Development Spain S.L., developer of the Talayuela photovoltaic parks in Cáceres, donated €15,000 to the local food bank to support the difficulties arising from the pandemic health emergency. It also sponsored the local football club's development (Ecodes, 2022).

Source: https://www.re-alliance.org.au/portland_s_wind_brings_out_the_sun_for_portland_district_health and Ecodes (2022).

Voluntary community assistance programs

Finally, voluntary programs within the project refer to the fact that commercial project staff or local authorities can collaborate and assist the community voluntarily (e.g., by providing labor, machinery, or funding to help develop another small-scale energy project) (Lane & Hicks, 2017).

Box 3.9 Sapphire Wind Farm (Australia)

The Sapphire wind farm is a 270 MW project located in an agricultural region bordered by a series of mountains in New South Wales. The approach of the project developers to the community has been based on building a long-term social acceptance plan. On the one hand, they teamed up with the three main construction entities (Vestas, Zenviron and Transgrid) to collaborate and co-finance different infrastructure projects in the community. Community members can submit applications for small-scale infrastructure projects with long-term benefits for the population. In addition, the project created a community fund that seeks to implement projects of interest to the community. (Lane & Hicks, 2017).

Source: https://www.squadronenergy.com/our-projects/sapphire-wind-farm

3.5. Mandatory regulatory mechanisms

Benefit sharing and citizen participation schemes are mostly voluntary in almost all countries. Thus, the developer chooses how to socialize the renewable energy project and what benefits it can or cannot share with the local community.

There are also more formal and legally based regulatory or policy mechanisms for citizen participation and benefits from renewable energy projects (Knauf & le Maitre, 2023), such as in the cases of Mecklenburg-Western Pomerania in Germany, the COMFIT program in Nova Scotia in Canada or the Balearic Islands in Spain.

In 2016 in Mecklenburg-Western Pomerania, legislation was passed that sought to increase social acceptance of wind generation projects by requiring developers to create a company for each project and offer up to 10% participation to citizens and municipalities (Yildiz et al., 2019). The COMFIT program in Nova Scotia paid community owners of small-scale renewable projects a predetermined rate per kWh produced (Knauf & le Maitre, 2023). In the case of the Balearic Islands, Law 10/2019 of 22 February on climate change and energy transition establishes that projects with a capacity of 5 MW or more must have mandatory local participation, and at least 20% of the ownership of the project must be offered to the population.

Although mandatory mechanisms seek to encourage the deployment of renewables and citizen participation, they may even generate greater resistance from the community, as they are usually standard schemes where the local context has not been taken into account and where citizens have not necessarily been involved in the project development process or the design of participation schemes.

Additionally, the obligation to incorporate certain fees or taxes in tenders for access to grid access nodes can significantly increase project development costs and negatively influence investment or financing decisions.

4. Designing a strategy to achieve social acceptance in renewable project development

A renewable project that achieves the acceptance and participation of the local community must have a strategy that allows interaction between the developer, local authorities, and citizens and serves as a guide during the development of the project. This process includes communication, dissemination, consultation, participation, and co-development activities (Lane & Hicks, 2017).

Since each project is unique, starting from certain economic, technical, and legal characteristics, the community participation level may differ at each stage. One way to analyze the possible levels of citizen participation is to use the conceptual framework developed by the International Association for Public Participation, presented in Table 4.1. According to this framework, the developer can determine the level of participation it wishes the local community to have in the project at each stage.

Table 4.1 Spectrum of citizen participation

	Report	See	Involve	Collaborate	**Empower**
Participation objective	**Provide all relevant information** **Help the community understand all aspects of the project, including direct and indirect benefits and problems or costs**	**Get feedback from the community on plans, options, or decisions**	**Working directly with the community during all stages of the project** **Ensure that all community concerns and aspirations are heard and taken into account.**	**Partnering with the community in every aspect of planning, development, and decision-making, including the consideration of alternatives and identification of preferred solutions**	**The community leads the development of the project** **Project decisions remain in the hands of the community.**
Project development	**Keep the community informed during all stages of project development, including**	**Keeping the community informed** **Listening and acknowledging suggestions and concerns**	**Work with the community to ensure that the alternatives developed directly reflect concerns and aspirations**	**Ask the community for direct advice on how to formulate solutions.** **Incorporate advice and recommendations**	**Implementing community decisions**

	problems or delays.	Providing feedback on how community input influenced the decision	Providing feedback on how community input influenced the decision	into decisions to the maximum extent possible	
Identification and distribution of benefits and costs	Securing the optimal location for the installation of renewable infrastructure Obtain the necessary permits	Minimize social opposition to the project Handling complaints effectively Fostering good stakeholder relations Work on a good level of trust within the project framework	Have long-term plans for acceptance and active participation. Strengthening local relationships and trust Having local advocates for the project	To have general community involvement and support Having some degree of local ownership of the project To have greater community benefits Developing a high level of confidence Carry out a timely development with more effective planning and approval Share some benefits of the project with the local population	Assessing benefit sharing Possibility of benefit or compensation schemes, depending on the local context Harnessing skills and capital of the community Training community members to manage the project Having a project that is majority community-owned

Source: adopted from Lane & Hicks (2017).

Following Lane & Hicks (2017), Lane & Hicks (2019), and Haf & Robison (2020), there are desirable practices in the development of project socialization that can contribute to greater community support. These good practices for developing a successful socialization strategy to achieve buy-in for projects with particular participation models and some tools for carrying them out are presented below. These are divided into: (1) knowledge of the local context; (2) assessment of social viability; (3) assessment of benefit sharing; (4) socialization and citizen participation strategy; (5) identification of actions and tools to mitigate barriers to social acceptance of projects; (6) elaboration of a communication strategy; (7) participation of local authorities; (8) role of national and regional authorities; (9) model of citizen relations; (10) information, monitoring and evaluation scheme.

In any case, each developer must apply these principles to the reality of its projects and the territories and populations where it wishes to develop them.

4.1. Knowledge of the local context

The socialization strategy of a project must be carried out considering the specific characteristics and peculiarities of the local context. This requires an in-depth knowledge of the locality, and the best way to do this is with community members, bearing in mind that communities are not homogeneous and may have different groups within them.

Thus, Lane & Hicks (2017) suggest developing a local context narrative, where a history of the community is constructed that tells the story of its main characteristics, values and attributes. This "local context narrative" should include key demographic, cultural, and historical characteristics relevant to the project's development.

The local context narrative serves as an input to identify how the project can be aligned with the context and identity of the community and to identify ways to maximize citizen acceptance and active participation in the project. In addition, this tool can be used by the developer and local authorities to develop project benefit-sharing and benefit-sharing schemes, where necessary (and feasible), to promote acceptance of the project's benefits (Lane & Hicks, 2017).

Following Lane & Hicks (2017), the context narrative should contain:

- a summary of the characteristics of the community and how its members identify with them (e.g., relevant historical events);
- a summary of the local narrative regarding renewable energy and proposed projects;
- questions about the community's historical legacy.

The authors suggest first conducting research based on queries of relevant historical and demographic data (e.g., age, education level, occupation, income level). Subsequently, it is suggested to conduct field research in the local community where questions such as the following are asked/answered:

- About nearby municipalities or villages:
  - "How do they differ from each other?
  - How do they relate to each other?" (Lane & Hicks, 2017, p.28)

- About the most important local groups:
  - "What does this say about the values, hobbies, and identity of local people?
  - Which groups seem to influence community life the most?
  - Are there local members at different levels of power, and what are the key concerns of the electorate?" (Lane & Hicks, 2017, p.28)

- Interviews with citizens:
  - "What defines the locality?
  - Are there agricultural or community holidays?
  - Are there weekly, monthly, or annual events that are very important for the local community?

- What is the main source of employment, and how does it affect local identity?" (Lane & Hicks, 2017, p.28)

- On the physical environment:
  - "What are the sites of historical or cultural significance?
  - Where do people go for recreational purposes?
  - What has been the historical reaction to other infrastructure projects?
  - What species of flora and fauna are particularly important to local people?" (Lane & Hicks, 2017, p.29)

- About the project:
  - "What has been the response to the project so far?
  - Are there other renewable projects in nearby localities? What has the response of these populations been like?" (Lane & Hicks, 2017, p.29).

Box 4.1 Minimizing the environmental and economic impact of renewable installations in Spain

Aurinka, the Belorado I photovoltaic park developer in Burgos, applied its methodology for selecting the project's location, choosing the land with the least environmental and agricultural impact and with the maximum benefit for the community. The methodology uses environmental, agronomic, and archaeological studies to avoid occupying land of significant value to the community.

In the case of the El Cabrito wind farm in Cádiz, the developer analyzed the local context and found possible environmental impacts of the project on the local community and biodiversity. Thus, measures were taken to reduce the visual impact of the type and number of wind turbines, which the study of the local context found to be a relevant factor in the physical environment, by installing 12 tubular turbines (more efficient technology) instead of 90 lattice machines (older technology).

Source: Ecodes (2022).

4.2. Social viability

The Victorian state government (Australia) suggests that projects should not only be economically and technically viable but also socially viable. This requires good practice in social risk analysis, as well as economic and technical analysis. Social feasibility analysis seeks to understand, minimize, and counteract the negative social impacts of the project (Lane & Hicks, 2017).

Social viability is a continuous process that needs to be worked on throughout the project life cycle. Boutilier & Thomson (2011) define the term social license to operate (SLO) as a license where the level of acceptance of the project is granted on an ongoing basis during the project's operation by the local community. Thus, obtaining a social license to operate implies that the community is willing to accept the changes in their locality that the project implies because they know the importance of the project and its benefits (Lane & Hicks, 2017).

To assess the project's social viability, the local context's narrative must first be available (see section 4.1); then, a social impact mapping of the project, a social risk matrix, and a stakeholder mapping can be carried out.

Social impact map

Social impact mapping is constructed using the narrative of the local context and is a visualization of the social characteristics of the locality. It should contain (Lane & Hicks, 2017):

(1) the location of residents within 3-5 km of the planned facility;

(2) the proximity of the installation to localities between 10-15 km away and other regionally relevant localities or settlements (50 km);

(3) the electricity grid infrastructure;

(4) indicate places of historical or cultural importance to the community;

(5) indicate the places where flora and fauna important to the locality are found;

(6) describe visibility and hearing issues that may affect members of the community.

This map serves as input for analyzing the social risks of the project and creating mitigation strategies. It can be done with the community's support through a participatory exercise, e.g., by conducting qualitative research through collaboration with a community group willing to discuss the potential social impacts of the project (Lane & Hicks, 2017).

Social risk matrix

The social risk matrix presents the social risks (identified in the local narrative exercise and social impact mapping), assesses them, and makes recommendations to mitigate them. The matrix should contain the project's key social, physical, economic and policy aspects. In addition, the risk and its probability of occurrence should be ranked. Finally, possible actions to mitigate the identified risks should be identified (Lane & Hicks, 2017).

Table 4.2 presents a template for the social matrix based on the ISO:31000 risk management tool (used in enterprise risk management).

Table 4.2 Social risk matrix template

Aspect	Key problem	Recommendation	Probability	Consequence	Risk level
Social	**E.g., culture, history, values, identity**		**Very likely, likely, unlikely, unlikely**	**Higher or lower**	**Low, medium, or high**
Physical	**E.g., location of the installation,**				

	environment, visual aspects.
Economical	**E.g., Identification and distribution of benefits, local job creation, creation of funds, etc.**
Policy	**E.g., regulation**

Source: extracted and adapted from Lane & Hicks (2017).

Some key considerations for the realization of the matrix are:

- "How many owners are involved?
- Are there other relevant energy projects around (50 km) or plans to be built?
- How has the community been informed about the project, and what social impacts are likely to occur?
- Are there new members in the community, and how will they be contacted?
- What is the relationship with the local council or authorities, and are they willing to facilitate communication with local members?
- How does the project relate to local strategy and policy?
- What are the local environmental concerns?
- What is the density of properties within 3-5 km of the installation?
- What are the plans for benefit sharing - are there 'winners and losers'?" (Lane & Hicks, 2017, p.30).

Box 4.2 Identifying and mitigating physical risks in photovoltaic parks

At the Talayuela photovoltaic parks in Cáceres, the developer Statkraft Development Spain S.L. identified different physical risks of the installation, one of them being the evacuation line of the project. The company decided to design an evacuation line with supports away from the region's natural areas and parallel to the existing high-voltage power line up to its connection with Red Eléctrica. In addition, the evacuation line and electrical substation were designed to connect other solar projects with additional power of up to 320 MW so they could use the line without generating additional impacts.

Source: Ecodes (2022).

Stakeholder map

Stakeholder mapping seeks to identify the project stakeholders. They can be companies, individuals, associations, organizations, and government. This identification should contain:

- "Type of stakeholder (e.g., government, individual, business)
- Name
- Role in the organization, company, or government
- Contact details
- Ability to influence the project and the developer's reputation
- At what stage of the project should you get involved
- Desired level of participation (Table 4.1)" (Lane & Hicks, 2017, p.34).

This database is crucial for developing each phase of the project, especially for monitoring and evaluating the project (see Section 4.10).

Box 4.3 Stakeholder mapping at the Talayuela Solar and Talayuela II photovoltaic farms (Cáceres)

The project promoters identified local agents that were impacted or related to the project. The stakeholders included the Talayuela Town Council, local businesses (pharmacies, restaurants, hotels, etc.), the Regional Government of Extremadura, and the Extrepronatur environmental office. This stakeholder mapping allowed the developer to communicate and collaborate with the people and entities identified from the early stages of the project to facilitate the integration and acceptance of the project in the locality.

Source: Ecodes (2022).

4.3. Benefit-sharing assessment

According to the conceptual framework of energy justice described in Section 2.2, projects are more likely to be accepted by the local population if there is a widespread perception that they distribute the benefits and costs of developments equitably between citizens and developers.

The set of benefits that the project brings to the community should, therefore, be assessed, which may include (see Introduction) among others:

- access to clean energy at affordable prices;
- contribute to the alleviation of energy poverty;
- boosting local economic development (creation of business fabric and employment);
- revenue to the municipality from tax contributions;
- overall positive environmental impacts;

- positive local environmental impacts (e.g., improved diversity, conservation of the natural environment, regeneration of natural areas, etc.);
- empowerment of the population;
- synergies with other projects that may be developed (e.g., development of electric mobility, smart grids, etc.);
- positive demographic impacts.

Adequately informing the local population about these benefits will increase the likelihood of project acceptance.

In some cases, and where the economic viability of the project allows, securing the acceptance of the local community will involve the developer being obliged to negotiate voluntarily with the community to transfer a share of the economic benefits to the community (e.g., through reduced electricity tariffs) or some form of compensation to the local community (e.g., support for local programs, funding of infrastructure or services, etc.).

In these cases, the project socialization scheme could also contain a strategically designed benefit-sharing program that adds value to the locality during project development, ideally built with the active participation of citizens. (Lane & Hicks, 2017, 2019)[10]. If such a program is implemented, it will be useful to identify potential challenges during implementation and evaluate its results over time to make the necessary adjustments and modifications to meet its objectives and have the expected impacts[11].

4.4. Citizen participation strategy

A detailed study of the local context in which a given project will be developed, including the preferences of the population, the map of stakeholders, and the impact of the different types of cultural, economic, social, and environmental factors that may have an impact on the public's perception of the project, will give a detailed view of the level of acceptance of the project.

Together with an analysis of the technical, economic, and social feasibility and an assessment of the distribution of the value generated by the project (to design an appropriate

[10] Following Lane & Hicks (2017, 2019) benefit-sharing programs can include the following elements: (a) goals and objectives; (b) program development design and the role of the community in the process; (c) budget for the benefit or compensation program, including the monetary value; (d) a list of stakeholders who will receive benefits or compensation and the corresponding justification; (e) a timeline for program implementation; (f) a theory of change (or methodology that identifies roadmaps to reach certain goals or objectives - e.g., a roadmap for the program's implementation); and (g) a plan of action for the program's implementation (e.g., a plan for the program's implementation). e.g., (h) a community communication plan (see subsection 4.6); (i) an evaluation process (see sub-section 4.10).

[11] There are a number of ways to carry out this continuous assessment. The theory of change, for example, is a conceptual framework that proposes a methodology that identifies medium- and long-term goals and problems to be solved based on matrices of change and facilitates the development of a roadmap for change and its implementation (Lane & Hicks, 2019). Using these methodologies can help renewable project developers ensure that their benefit-sharing program generates the expected outcomes and impacts on local people (Lane & Hicks, 2019).

communication strategy or benefit-sharing scheme, where feasible and deemed necessary by the developer), it can serve as a basis for assessing whether the proposed model of socialization and citizen participation is the most appropriate.

This assessment of contextual conditions and potential responses of the local population to a particular project could lead, if the developer has the flexibility to modify some parameters of its proposal, to changes in the socialization and citizen participation scheme. Ideally, it should be an orderly process that does not jeopardize compliance with project implementation deadlines.

4.5. Actions to mitigate barriers to civic acceptance

Section 2.3 presented a set of common barriers to the acceptance of citizen communities and different strategies to mitigate their effect (see Table 2.3).

These barriers include:

a) lack of information on technical aspects and economic, environmental, and social benefits and costs;

b) lack of participation in the decision-making process;

c) lack of trust in the developer, electricity companies, or public institutions;

d) opposition from specific local social or political groups

e) the perception of an inadequate distribution of the value generated and costs of the project;

f) specific characteristics of the infrastructures;

g) lack of financial or technical education;

h) lack of financial participation due to low disposable incomes;

i) lack of participation of vulnerable groups in the project.

Based on the information gathered by the developer on the general context of the project (characteristics of the population, etc.) and the social viability and potential distribution of benefits and costs of the project, the developer can identify the main barriers to a specific project and implement measures or actions to mitigate them, in line with the information provided in Section 2.3.

Box 4.4 Photovoltaic park Extremadura I, II, III (Bajadoz)

The developer of the three photovoltaic plants in Bajadoz carried out different actions to mitigate the project's environmental and social impacts. These preventive, corrective, and compensatory measures were carried out on the fauna, flora, and local heritage. Regarding the impact on fauna, steppe bird reserves were created, nest boxes were installed, birds were marked with GPS, reptile shelters and insect hotels were installed, noise levels were monitored, and amphibian crossings were created. The impact on plants was mitigated by creating a three-hectare protected flora reserve, monitoring dust

accumulation on vegetation, watering paths, and transplanting olive trees to the land indicated by the town council. Finally, regarding local heritage, archaeological clearing and excavation of 11 archaeological sites were carried out.

Source: Ecodes (2022).

4.6. Communication strategy

The project must also have a communication and marketing strategy. Since the people in the communities are not homogeneous, it is important to carry out appropriate communication and marketing campaigns focused on each specific population group.

A campaign that considers the differences in the local population and the composition of the population can more effectively target different population subgroups and thus achieve greater community approval.

Thus, communication campaigns should:

- have a clear objective (e.g., to improve community perception of the project);
- take into account the characteristics, needs, and concerns of the population;
- involve the target groups in the development of the campaign;
- select appropriate messages for the population as a whole and each target group;
- select a proper mix of communication channels (digital vs. more traditional media);
- be flexible with possible changes in the different stages of the process (European Commission et al., 2022).

Box 4.5 Belorado I photovoltaic park (Burgos)

The developer of the Belorado I photovoltaic park carried out its communication campaign with a forestry engineer from the same municipality. This person was in charge of presenting the project to the local authorities and landowners. In addition, the developer designed a communication strategy with the community to keep them informed about the evolution and implementation of the project.

Source: Ecodes (2022).

4.7. Involvement of local authorities

As local authorities play a key role in the social acceptance of projects, they can contribute to the process by supporting already underway initiatives. The role of local authorities will vary from case to case depending on different factors and may involve different levels of

participation and responsibilities (from information, facilitation, stakeholder dialogue roles, to direct[12] or indirect participation - with monetary or non-monetary implications - in the projects).

For example, local authorities can establish local procurement and contracting schemes taking into account the needs of the project. They can also partner with the community and cooperate in joint ventures for the development of the project and can achieve benefits to the extent that they can expand the supply of services or facilities for the community with the funds generated by the project to the municipal budget.

Along these lines, local authorities can develop project co-ownership initiatives with the community, where citizens benefit from the investment opportunities and co-design the process (see Section 3.1) (Haf & Robison, 2020). They can also indirectly participate in projects, e.g., by contributing public space (considering the legal terms for transferring public space) to install energy infrastructure (solar, roof space on public buildings, etc.).

Local authorities can also increase the visibility and recognition of the project within their members and different departments. Regardless of their department of work, all local authority staff should be aware of the challenges of the energy transition, regional and national energy policy, and the advantages of renewable energy projects in communities (Haf & Robison, 2020).

Finally, local authorities could be involved in citizen discussions where the population can voice their concerns regarding energy policy and projects. Thus, as the local authority is more accessible, it can contribute to establishing a relationship of trust with the community, benefiting the social acceptance of the project (Haf & Robison, 2020).

4.8. Involvement of national or regional authorities

In addition to the involvement of local authorities in specific projects, there is also a need for more general communication and involvement by regional and national authorities about the need for and benefits of such projects and the mechanisms currently in place to ensure the protection of people and the environment arising from them.

Regional or national authorities can carry out communication, training, and capacity-building campaigns on the value generated by renewable energy projects in localities. These campaigns can be carried out within the different departments of the regional/national authorities, with local authorities, and with citizens.

4.9. Relationship with citizens

Justice in the process

As discussed in Section 2.2.1, the perception of fairness in developing each project stage is a key factor for its social acceptability. The community's opinion must be taken into account, and citizens must perceive that they are being listened to and that their concerns and

[12] If direct participation involves energy consumption, the purchasing conditions set by the Public Sector Contracts Act (Ley de Contratos del Sector Público, LCSP) must be taken into account.

recommendations are being taken into account. Thus, trust between the developer and the community is built when people perceive integrity and transparency on the developer's part, and a social license to operate is acquired and maintained.

Developer-community interaction

One-to-one interaction with the community is a key determinant in building and maintaining trust and rapport between the developer and the local people. The developer should ideally have a channel of contact with the community operational during all phases of the project. The person in charge of communication and interaction should ideally be available in the locality, be able to answer people's questions about the project, and be aware of strategies for engaging them (Lane & Hicks, 2017).

Complaints, claims, and suggestions management process

The project's acceptance and social license to operate can be compromised if there is no protocol in place in case questions or concerns are raised. Therefore, the project should have a process for handling complaints, grievances, and suggestions that keeps the developer accessible and accountable. The communication channel can be structured around a toll-free number for calls, an email address, or a form on the website (Lane & Hicks, 2017). Ideally, complaints and their resolution should be made public (e.g., on the project website), notifying the stakeholders involved about all process steps.

4.10. Information, monitoring, and evaluation

It is essential to have, if feasible, a project reporting, monitoring, and evaluation plan. The plan can contain evaluation objectives, methods for monitoring and evaluation, metrics, and timelines for evaluation (Lane & Hicks, 2017).

Evaluation and monitoring metrics

Indicators of the socialization strategy’s success should be established here. These indicators should be specific, measurable, and realistic. Examples of indicators include: the number of newsletters produced per year with project information; the number of people who benefited from or invested in the project's distribution schemes; the number of visits to the website or interactions on social media; the number of times the website was updated; the number of local meetings or assemblies held; the number of attendees at meetings or workshops; the number of people who attended the meetings or workshops; and the number of people who participated in the project's activities (Lane & Hicks, 2017).

Evaluation process

To monitor the project and evaluate the socialization strategy, the developer may establish an evaluation committee or conduct surveys and ask for feedback. The evaluation committee may comprise internal and external stakeholders, such as the socialization staff, the technical project development team, the management team, community representatives, local associations, or external experts. The committee should evaluate the socialization strategy

according to the proposed objectives, the activities carried out, the benefit-sharing program (if any), and the management of complaints and grievances. Surveys and feedback schemes can be implemented on the project website or in writing with different project stakeholders (Lane & Hicks, 2017).

5. Conclusions and recommendations

5.1. Conclusions

Advancing the decarbonization of the economy, particularly the decarbonization of the electricity sector, will entail deploying many renewable energy installations (e.g., larger wind or photovoltaic farms or smaller distributed generation facilities) and other energy infrastructure in the coming years.

This infrastructure deployment is hampered by opposition from the population in the local geographic environments where the projects are located. This phenomenon of infrastructure rejection in local environments is known as not in my backyard or NIMBY.

In this study, we have analyzed the factors that influence the acceptance of renewable energy projects in local environments. Most of the findings presented below apply to deploying other energy infrastructures, such as grid infrastructures, energy storage, and even other infrastructures relevant to the sustainable transition (e.g., waste treatment facilities, hydrogen value chain infrastructures, etc.).

A. Social acceptance of local projects

The social acceptability of projects depends mainly on citizens' assessment of costs and benefits.

Social acceptability is when project outcomes leave people's well-being the same or better than before the project was implemented. Thus, the social perception of the benefits or value generated and costs (individual and community) of energy projects is a key driver of social and individual acceptance of local energy projects.

There are different degrees of social acceptance among individuals in the same local population, and the aggregate result depends on the weight of the different subgroups in the total population.

If people perceive greater costs than benefits of project implementation, they will generally oppose the project, whereas if they perceive that they will be the same as before, they will tend to show tolerance for the project. Likewise, if they perceive a higher net welfare associated with project implementation, people will show acceptance and even active support and direct participation in the projects. The aggregate outcome for a local population depends on how citizenship is distributed among these three groups (opposition, tolerance, and support/participation). Therefore, different populations with similar socio-demographic characteristics may show different aggregate results.

Community resistance to the development of energy projects is mainly framed by the perception that the value generated and project costs are not shared equitably.

The perception of fairness and equity is a fundamental variable in explaining the positioning of a given population towards a given infrastructure project. Projects are more acceptable to the local population if the costs and value generated by the projects are distributed equitably between citizens and developers, offering channels of information and representative and inclusive participation to the people.

B. Factors inducing rejection of local projects

Among the drivers of a local population's rejection of projects are a lack of trust in the developers, a lack of information, and limited opportunities for participation.

The lack of information about the value creation and characteristics of the project and the lack of opportunities and alternatives for participation (of different types) generate distrust on the part of the community towards the project developers. Therefore, when there are spaces and opportunities for the population to get involved with different degrees and levels of commitment in the project, the probability of obtaining greater support increases. Another determinant of social support is providing transparent and concrete information to the public on the benefits and costs.

Certain socio-demographic and economic characteristics make people more or less likely to accept and participate in projects.

On the one hand, in some cases, people in older age groups, women, and people with lower levels of education and income tend to be less likely to participate in renewable energy projects in their locality. On the other hand, having financial knowledge about the profitability and risks of green investments, being in the habit of talking about investments and financial patience, having previous experience in certain volunteering activities, and having children are variables that have a positive impact on project acceptance and participation.

There are differences in the acceptance of renewable projects depending on their technical characteristics.

In the cases analyzed, lower-income populations are more likely to accept solar generation projects, while higher-income populations are more likely to accept wind generation projects. Furthermore, solar plants generally tend to have higher acceptance levels, while the population perceives wind farms in a mixed way. On the one hand, people consider wind energy a clean energy source that contributes to climate change mitigation. On the other hand, this type of generation has a negative effect on the community because of the visual impact, local environmental disturbances, and potential decrease in the price of real estate.

C. Socialization strategies to promote social acceptance of renewable projects

Detailed knowledge of the characteristics of the local population increases the possibility of designing successful acceptance and participation strategies.

Since the potential rejection of renewable projects in local settings is due to the particular characteristics of the local population, a thorough understanding of the socioeconomic, cultural, and educational characteristics of a given population will increase the ability of project developers to design appropriate acceptance and participation strategies with a greater likelihood of success.

Bottom-up approaches (i.e., actively involving the local population) achieve a higher acceptance of projects by the people.

Early project development that is perceived by the local population as a whole facilitates people to have a sense of psychological ownership of the project and tend to perceive it as better suited to their needs. It is important that projects are designed according to each locality's specific characteristics and needs and that citizens can deliberate and cooperate with developers and public institutions.

There are different forms of citizen participation in projects, including schemes with financial participation and schemes without financial participation.

Schemes involving financial participation can be divided into equity-based schemes (full or shared citizen ownership) and debt-based schemes (bond issuance or financing through online platforms). On the other hand, participation schemes can also be classified according to the degree of direct participation and citizen ownership.

Thus, four forms of citizen participation can be found: (1) financial participation with full ownership (of the participating persons); (2) financial participation shared with other entities (e.g., project developers, municipalities, etc.); (3) financial participation through online platforms (e.g., crowdfunding, crowdlending, etc.); (4) indirect participation, through local authorities and other entities.

D. Value generation of renewable projects: distribution and communication

The benefits of local renewable projects can be environmental, socio-economic, monetary or compensation in goods and services to the community.

Renewable projects bring economic benefits such as the development of the local business and industrial fabric, employment generation, income for the community (land rental, purchase of local goods and services), land use shared with other traditional economic activities (agrovoltaic, beekeeping, livestock, tourism) and income to the municipality through tax contributions. In addition, the projects may bring other benefits such as reduced energy bills, reduction of other local taxes, etc. Also, the community could receive compensation in the form of goods or services for the community, such as in-kind benefits (e.g., community infrastructure, recreational facilities), local services, impact mitigation, and environmental improvement

projects or other programs with local impact (sponsorship programs, other energy projects, electric vehicle charging points, energy efficiency programs, training and education programs, local wildlife support programs, etc.).

In many cases, the public is unaware of the socio-economic benefits of renewable energy projects in local environments.

The positive impacts of local renewable energy developments are often unknown, especially in less populated areas, where empirical evidence shows that this type of development generates positive impacts in terms of greater economic activity and local employment and less depopulation in relation to other geographical areas where these developments do not take place. However, there are also groups of citizens who, although they have the necessary information about the project and its characteristics, reject its development.

Project value sharing and active participation schemes are mostly voluntary, and the developer chooses what kind of benefits they can or cannot share with the local community.

Highly restrictive regulations regarding project benefit sharing may reduce developers' incentives. For example, the obligation to incorporate certain fees or taxes in tenders for access to grid access nodes can significantly increase project development costs and negatively influence investment or financing decisions. Although certain mandatory mechanisms seek to encourage the deployment of renewables and citizen participation, they may even generate greater resistance from the community, as they are usually standard schemes where the local context has not been taken into account and citizens have not necessarily been involved in the project development process or the design of the project's participation schemes.

It is essential to communicate the value generated and other relevant information (e.g., on technical or environmental aspects) of the projects in a clear and assertive way and taking into account the characteristics of the local population.

For communication strategies to be successful, they must take into account the specific characteristics of each local population; they must have a clear communication objective, involve the community in the planning of the campaign, know and research the audience and stakeholders, use an appropriate mix of communication channels, not use highly technical language and be flexible. Conducting communication campaigns from the early stages of the project is crucial to strengthen the base of tolerance and support for the project, as it is in these stages that most opposition is registered. Finally, it is also important to have general strategies from national and regional authorities to inform, train, and communicate with local authorities and citizens about the need for and benefits of the renewable energy transition.

In any case, it is not enough to provide information on the characteristics of the project and its benefits to ensure social support for a project.

The support of local populations requires, in addition to knowledge about the project characteristics and its benefits and costs, certain levels of training on energy and environmental

issues (covering certain energy context and transition needs, as well as practical environmental issues) and providing information on citizen investment options and risks. In addition, the involvement of local, political, and social leaders is crucial for project acceptance. On the other hand, recognizing vulnerable groups can increase their participation in projects and contribute to the alleviation of energy poverty by overcoming cultural, social, economic, and political barriers that prevent greater participation of these groups in energy projects close to their locality.

In certain situations and if economic viability allows, project developers can offer benefits and financial participation mechanisms (individual or for the population as a whole) to induce greater social acceptance.

The financial benefits can change the public's perception of the benefits of renewable energy projects (individual or community) and induce a higher degree of community acceptance of the projects. When offering the option to invest in the project, the developer should clarify that this participation also entails assuming the risk of financial loss. In any case, it should be borne in mind that the different types of benefits can be perceived positively or negatively by the community, depending on the needs and characteristics of each local population. Direct involvement of the local community in the design or discussion of the distribution of benefits can facilitate the acceptance of the project.

5.2. Recommendations for project developers

Gaining public acceptance of renewable energy development projects in local environments is challenging. There is no methodology or strategy to ensure such acceptance.

Although renewable project developers can design more or less standardized products (e.g., energy community models or specific schemes for the development of solar or wind farms), the multitude of variables that affect the perception of citizens and local populations on the impacts, costs, and value generated by projects means that, in practice, each project is different. Each project should, therefore, present its particular strategy to the public, taking into account all the characteristics of the population and all the factors of the context in which the projects are developed. There is, therefore, no one size fits all solution.

In this context, developers can pursue outreach, development, and communication strategies to facilitate the local population's acceptance of the projects.

Based on the analysis in this document, there are desirable practices (or good practices) for achieving social acceptance of projects that can contribute to greater community support. Ideally, the strategy to promote social acceptance of a renewable energy project should contain objectives, expected results, and methods to involve the local population, and it should include the elements presented in the following checklist.

Table 5.1 Check-list for the development of a strategy to promote social acceptance of renewable projects

	Element	Comments
1	Local context intelligence	Requires resources to conduct a quantitative and qualitative analysis of the characteristics of the local population and their propensity to accept a particular project.
2	Social viability	Like the first element, it requires resources to develop a social impact matrix to identify and quantitatively and qualitatively assess the project's economic, social and environmental impacts.
3	Distribution of the value generated by the project	Once the project's impacts have been identified and assessed, a detailed analysis of its value creation and its economic, social, and environmental costs must be carried out.
4	Participation strategy	The assessment of the local context, the social viability of the project, and the distribution of benefits and costs should be complemented by an assessment of the project's socialization strategy. The quantitative and qualitative information gathered can facilitate the project's redesign to benefit the developer and the local population. At this stage, changes in the model of citizen participation in the project (e.g., different financial participation schemes, identification of community benefit or compensation schemes, etc.) could be identified to facilitate acceptance.
5	Mitigating barriers to acceptance	The quantitative and qualitative information and the different project analyses should lead to identifying and prioritizing barriers to project acceptance, which may be related to information, communication between actors, the participation scheme, the community perception of the developer, or the distribution of costs and benefits. The feasibility and desirability of using different tools to mitigate different types of barriers should be assessed, as discussed in Section 2.3.
6	Communication strategy	The communication strategy must consider all the population's characteristics and be structured around simple messages, with appropriate segmentation, and through different channels, depending on the reality of the local population. In general, it should be based on a complete, transparent, and accessible communication of relevant information on the project's technical, economic-financial, environmental, legal, etc. aspects.
7	Participation of local, regional, or national authorities	The involvement of local authorities is very important to ensure support for the project. The developer must engage local authorities with the most appropriate relationship model and role for each specific case, which will vary depending on several factors.

		This role may involve different levels of involvement and responsibilities (from information activities, facilitation, stakeholder dialogue to direct or indirect participation - with monetary or non-monetary implications - in projects). In the case of regional or national authorities, they should play a role in informing and training local authorities and citizens on the need for and benefits of the energy transition based on renewable energies.
8	Relationship with citizens	The developer should ideally have a channel of contact with the community operational during all phases of the project. The person in charge of communication and interaction should ideally be available locally, either in an office or a local shop, and be fully aware of all project details. In addition, there must be a protocol for resolving doubts, concerns, complaints, claims, and suggestions that shows the project developer to be accessible to the public and with efficient and accessible communication channels (e.g., toll-free telephone number, e-mail, website, etc.). Ideally, complaints and their resolution should be made public (e.g., on the project website), notifying stakeholders about all steps of each process.
9	Information, monitoring, and evaluation	If feasible, the developer should have a project reporting, monitoring, and evaluation plan containing evaluation objectives, methods for monitoring and evaluation, metrics and indicators, timelines, and evaluation processes. The developer can set up an evaluation committee (with internal or external project participants) or conduct surveys and ask for feedback from the population.

Source: own elaboration (see Section 4).

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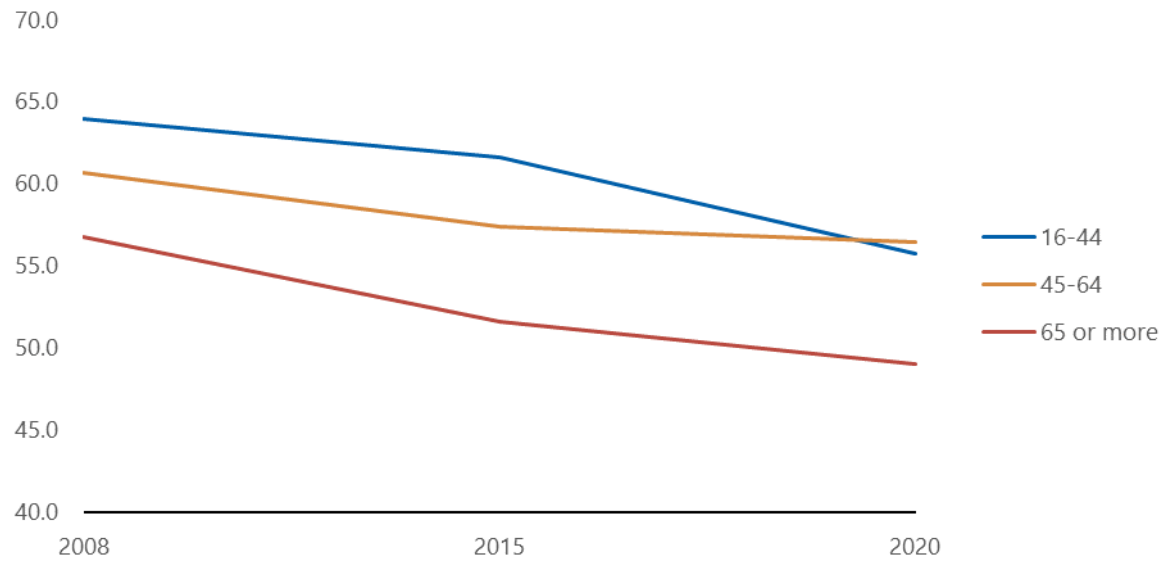
Annexes

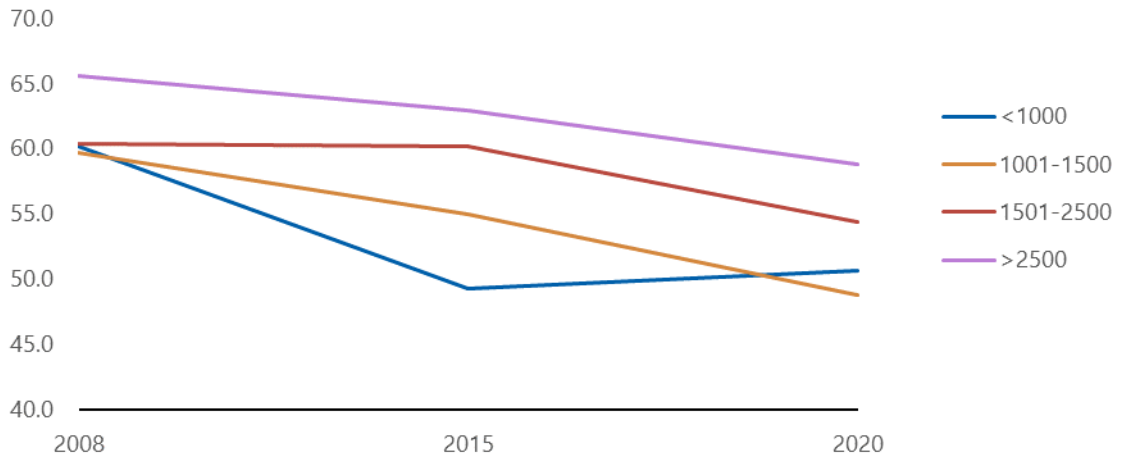
Annex 1. Statistics on environmental views and attitudes

Graph A.1 People with favorable attitudes towards renewable energy parks by age (%)



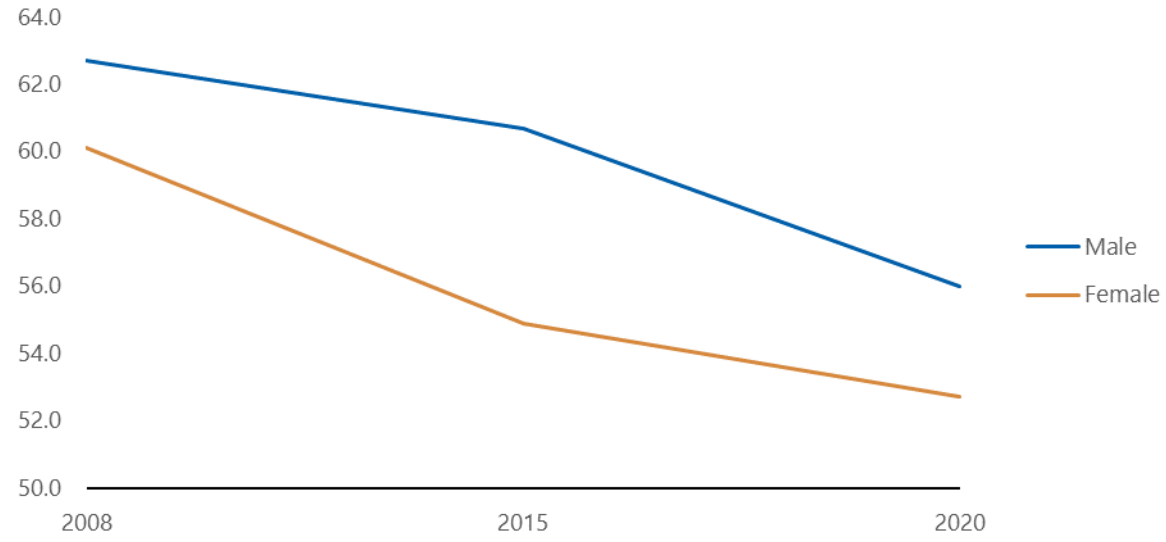
Source: Prepared by the authors with data from Eustat.

Graph A.2 People with favorable attitudes towards the installation of renewable energy parks by the level of net household income (%)



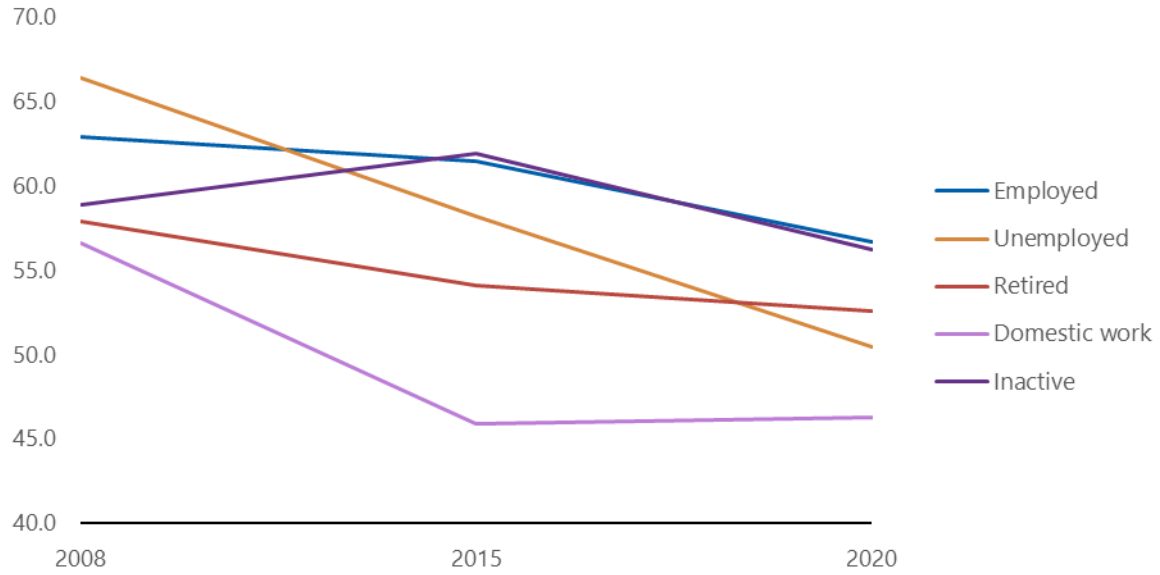
Source: Prepared by the authors with data from Eustat.

Graph A.3 People with favorable attitudes towards the installation of renewable energy parks by gender (%)



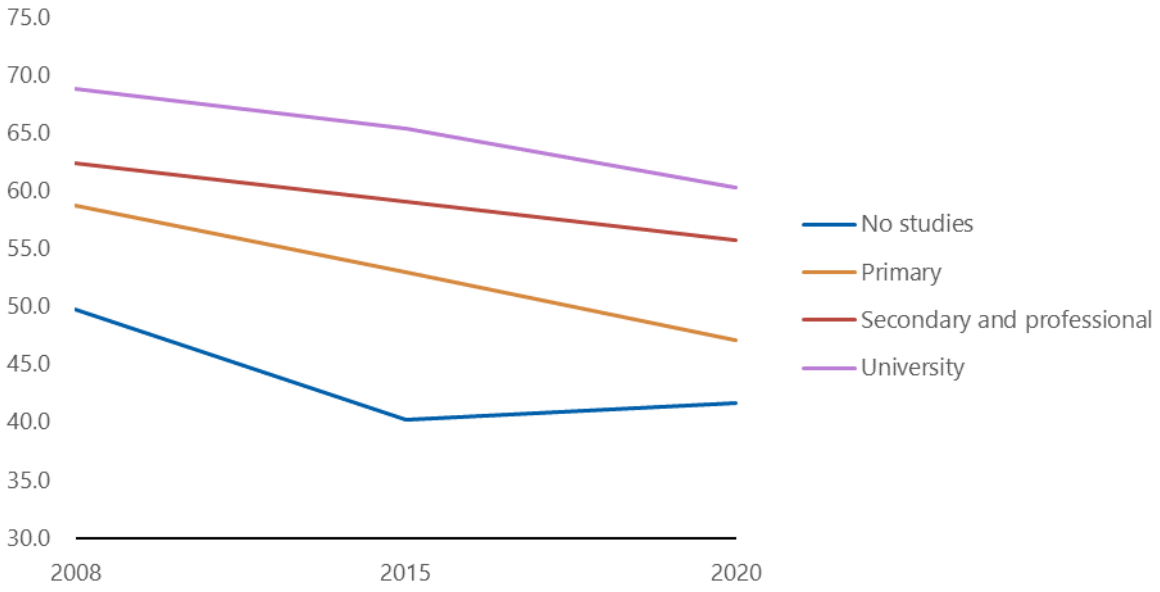
Source: Prepared by the authors with data from Eustat.

Graph A.4 People with favorable attitudes towards the installation of renewable energy parks by relationship to the activity (%)



Source: Prepared by the authors with data from Eustat.

Graph A.5 People with favorable attitudes towards the installation of renewable energy parks by level of education (%)



Source: Prepared by the authors with data from Eustat.

Annex 2. Literature review on energy justice

The following is a brief review of the literature on the three types of energy justice and how these can help explain local opposition to the development of nearby projects in different countries and with different types of technologies.

Procedural justice

Spain

In the region of Campo de Belchite, in the Autonomous Community of Aragon, Duarte et al. (2022) analyzed the community's perception of the effects of wind farms. The study suggests that moving towards a bottom-up approach, where project governance has a democratic rather than a hierarchical approach, would lead to greater public acceptance.

Furthermore, the authors find that an effective involvement of the main local actors (political, social, and economic) of the territory is crucial in the process of project acceptance, as more transparent management of the project can be achieved, in which the benefits and costs of the project are discussed, and the project planning is done with a shared vision of the territory.

Gómez (2023) conducts an analysis with 48 participants from six municipalities where renewable energy projects are being or will be implemented in Andalusia, Cantabria, and Catalonia. The author finds that only a minority is against developing energy infrastructures near their locality, while the majority is in favor or indifferent.

The rejection is mainly due to a lack of trust in the electricity companies and the project developers, as people do not see the climate argument as sufficient and perceive that the only interests that prevail are the private profits of the project developers.

Thus, although citizens are concerned about the landscape and the natural habitat of their locality, the main source of rejection is the lack of information about the benefits that the project may have for the population and, in general, about how the benefits and costs are shared between project promoters and citizens.

REDS-SDSN Spain (2023) and Ecodes (2022) present successful cases of social acceptance of renewable energy projects in different parts of Spain. These projects have in common participatory processes in all stages of the project, with special emphasis on the first stages, which are usually the most critical for acceptance. The projects seek to maximize the value generated for the community and its integration into the territory, as well as the listening, dialogue, and collaboration between actors.

Germany

In the study by Lienhoop (2018) in an experiment with a total of 388 respondents and three focus groups conducted in 2015 in Germany, the author found that the majority of people agree that wind energy project developers do not provide sufficient information and that there are no real opportunities to participate effectively in project decision-making.

Some respondents are interested in participating in discussions and working groups, but others find it too time-consuming and would only be willing to participate in information meetings. In

addition, the survey participants value the deliberation and cooperation of the developers with the municipal authorities or those representing the locality.

Fischer et al. (2021) interviewed 4,210 heads of households in Germany in 2019. The authors find that only 38% of the respondents are familiar with the term energy cooperative, so most people do not know it.

Ireland

In the study by Međugorac & Schuitema (2023), a community in central Ireland evaluated two scenarios for a renewable energy system: a top-down scenario (i.e., a project proposed by government and industry) and a bottom-up scenario (i.e., a project proposed by community members). The authors find that the community prefers the bottom-up scenario because people feel collective psychological ownership over the project and that it better suits their needs. In conclusion, they suggest that strengthening psychological ownership of projects and the perception of a better fit with local realities will improve project acceptance levels.

Several countries

Azarova et al. (2019) analyzed the responses of 2,000 people who participated in an experiment in Germany, Austria, Italy, and Switzerland regarding the acceptance of different types of projects. The authors find that involving people from the political class in community information and participation has different effects.

In Germany and Austria, political support does not influence community acceptance of the project. On the contrary, in Switzerland, the support of the local government has a positive impact, while in Italy, it is the support of the national and European governments that is relevant to the citizens' acceptance of the project. Thus, it is important to consider the political situation of the project country/region and the community's level of trust in the different levels of government (Azarova et al., 2019).

In the study by Kallis et al. (2021), the authors study the case of 17 islands in Australia, South Korea, Denmark, Scotland, the United States, Ireland, Italy and the Netherlands. Some of the islands studied are small, so project infrastructures affect a large proportion of the geographical area.

Greater community acceptance and participation in projects are found when discussions take place about the project's contribution to the community, and people perceive that their opinions influence decisions and that they can co-design projects. In contrast, the study finds tensions when agendas and decisions are developed and made outside the community in response to external political and economic interests.

Distributive justice

Spain

In the study by Gómez (2023), people who oppose the development of projects near their locality say that they distrust the electricity companies, as they perceive that there will not be a fair distribution of the project's benefits and that these will go only to the developer.

In addition, they perceive that employment is only generated in the short term, while the infrastructure is being built, as the subsequent operation of the infrastructure will be carried out by the company's staff. This is why the participants say they would be more willing to accept the projects if, for example, the tariffs on energy supply were reduced.

In this line, REDS-SDSN Spain (2023) proposes the creation of progressive subsidies for electricity bills for households and SMEs as a good practice from the success cases. In addition, these projects distribute the value generated by the projects through different mechanisms such as the promotion of energy projects (e.g., shared self-consumption facilities for people in the municipality), investment in local social projects, and the construction of infrastructures for the population, improvements to municipal infrastructures in terms of their sustainability or the promotion of financial investment by the community in the project.

In addition, the value generated by the project can also be expanded through partnerships to share land use with important economic activities in the locality. This is easier to do in wind installations where land use is minimal, and although photovoltaic installations are more land-intensive, it is also possible to integrate the installation with activities such as agriculture (agroforestry), beekeeping (called solar honey), livestock, forestry management or tourism (see Ecodes (2022)).

Project costs can be mitigated with different practices to maximize the net welfare perceived by the community. Ecodes (2022) and REDS-SDSN Spain (2023) present success cases in the deployment of renewable projects with visual impact mitigation practices, such as using native vegetation cover in the case of photovoltaic plants, painting wind turbine towers in shades similar to the environment and building power substations in line with regional architecture. These projects have also sought to ensure the protection of natural capital through measures favoring local flora and fauna by promoting spaces dedicated to birdlife (e.g., installation of nesting areas, passageways, and drinking troughs), promoting the biodiversity of other species (e.g., construction of reptile shelters, insect hotels, creation of ponds, etc.), recovery of interior vegetation, creation of living hedges for the integration of plants into the environment, etc.

Germany

Musall & Kuik (2011) conducted a case study with two communities in southeastern Germany and found evidence that co-ownership of wind energy projects leads to higher public acceptance than when development is done by a commercial company alone. The community values the implicit connection between their investments and the financial returns for their children in the long run.

In addition, the authors find greater acceptance in one community than the other, even though they have similar general characteristics (e.g., concern for environmental conservation and high energy consumption levels). This difference is attributed to the fact that in the community that received greater acceptance, the initiative was strongly supported by the mayor's office, which encouraged the community, and the population was provided with the necessary information about the project.

The study by Lienhoop (2018) analyses the population's preferences for three options for financial participation in a wind energy project in Germany: a local tax paid by the developer to

the community, financial compensation to the population, and co-ownership of the project through shares.

The community preferred the local tax case because even though the population does not receive a personal benefit, people understand that the community should benefit from hosting the infrastructure in their vicinity[13]. Most respondents rejected financial compensation as it was perceived as a bribe. Finally, the possibility of financial participation through the purchase of shares had mixed acceptance, as some people perceived it as risky or unfair, as not all people had the means to buy them, but others were willing to invest in such projects.

Knauf (2022) studies the impact of different types of compensation on the degree of acceptance of a hypothetical wind energy project close to households using a sample of 811 people in Germany. The analysis looks at trade-offs such as energy tariff reductions, payments to the municipality, and payments for social purposes. The authors find that the proposed benefits are not accepted by all participants but are accepted by the majority, although the population that opposes the projects says they value the benefits.

Denmark

Jørgensen et al. (2020) find that citizens perceive injustice in distributing project benefits and costs in three Danish wind energy projects. Injustice is in turn, associated with a lack of direct participation in decision-making, procedures and a lack of recognition of community characteristics and needs.

The study analyzed a mandatory compensation scheme whereby the developer has to pay mandatory compensation to households and offer them the opportunity to be project co-owners. The results indicate that these benefits are not sufficient to eliminate the perception of an unfair distribution of the negative benefits of the project, as in the case of mandatory compensation, the community does not have the possibility to discuss and define this compensation.

The Netherlands

The study by Terwel et al. (2014) surveyed 227 people in a medium-sized municipality in the Netherlands and found that participants prefer compensation in the form of goods or services to the community rather than direct monetary benefits. Furthermore, if the community influences the type and size of the benefit, people perceive a greater interest of the project developer in the well-being of the community, and thus compensation can have a positive impact on project acceptance.

van den Berg & Tempels (2022) study the relationship between benefits and public acceptance of solar plant projects. The authors find that discussing the type and size of the benefit with the public builds trust with the developer and public institutions, improving the acceptance of the project. In contrast, when the local population is not discussed and is not part of the decision-

[13] Revenues for the community do not necessarily have to go to the municipality; they can go to other municipal structures with fund management capacity.

making process, the trade-offs offered may not meet the needs of the citizens and lead to greater resistance from the people.

Switzerland

Vuichard et al. (2019), using a sample of 1,202 people in Switzerland, analyzed wind energy projects and found that a compensation scheme through a tax paid by the project developer to be distributed to the local population is preferred to other compensation/financing models such as shares or bonds (private investment models). This is because, in private investment models, only people who are able or willing to invest benefit from the redistribution of project revenues, while local taxes redistribute the benefits more equitably among the entire population, increasing the perception of distributive justice in the project, and thus promoting its acceptance.

United Kingdom

In the UK, Goedkoop & Devine-Wright (2016) interviewed 19 stakeholders from industry, community, and advisory committees about the possibility of sharing ownership of renewable energy projects between the company and the community. The authors find significant support for this participation scheme but identify some challenges in practice, such as whether the scheme is mandatory or not and how to improve the trust relationship between the developer and the community.

On the one hand, developers have doubts about the capacities of the local population to participate in the project; on the other hand, citizens see developers as motivated only by the project's financial returns. Thus, the authors highlight the importance of involving the different stakeholders from the early stages of the project to develop stable and trust-based relationships.

Several countries

Knauf & le Maitre (2023) conducted a literature review of 18 studies in different countries (Canada, Denmark, Estonia, Germany, Ireland, Scotland, South Korea, Switzerland, Ukraine, United Kingdom, and the United Kingdom) to analyze the impact of financial participation schemes on the development of onshore wind farms.

In the studies analyzed, the authors found a general concern among the local population about the distribution of the benefits of the projects and that citizens often lack information about investment opportunities. In addition, they find a lack of trust from the population towards the developer and in the opposite direction due to the lack of a close relationship between the parties.

Last but not least, Knauf & le Maitre (2023) find that there is greater acceptance of co-ownership regimes for projects, as the population feels ownership and expresses pride in the fact that local people lead the project.

Recognition justice and vulnerable groups

Karakislak et al. (2023) analyze the participation of women in energy cooperatives in Germany and the socio-cultural barriers they may face in the context of this participation. The study finds

that more men than women are involved in renewable generation projects. Furthermore, not only is there a lower participation rate of women, but the management of the cooperatives is also mainly carried out by men. In addition, there are higher levels of investment by men, a fact probably related to the income gap between men and women.

The study also finds that men tend to get involved in energy cooperatives mainly for the financial benefits and the opportunity to lead these projects, while women get involved mainly because they seek to contribute to the energy transition and the democratization of the energy sector. The authors also find that women and men have different information and perspectives on the benefits of renewable projects.

In terms of participation in the cooperative's activities, women's participation in volunteering is lower due to the negative effect of their domestic workloads. Increasing the time slots for this type of voluntary participation or paying women for their work in the cooperative may increase their participation in this type of community project (Karakislak et al., 2023).

In other studies in Germany (Fraune, 2015) and Sweden (Lazoroska et al., 2021) also find differences in the ratio of women's participation, ownership, investment and decision-making compared to men in renewable energy projects.

The analysis of Lazoroska et al. (2021) concludes that the energy sector is culturally masculinized. Given that women identify more with environmental preservation, efforts to raise awareness of the relationship between energy and the environment could help promote greater participation of women from a cultural perspective.

In short, different cultural, social and political aspects affect women's participation in renewable projects. As argued by Tsagkari (2022), based on their study on two islands in Spain and Greece, local renewable energy projects do not automatically imply energy justice and pluralism.

Annex 3. Literature review on barriers and determinants of social acceptability

The concept of social acceptability of renewable energy projects was introduced by Wüstenhagen et al. (2007) as a triangle of three dimensions: socio-political acceptance, community acceptance, and market acceptance. The socio-political acceptance dimension is broadly related to acceptance and depends on the acceptance of technologies, the public, stakeholders, and policymakers. Community acceptance refers to the specific acceptance by communities geographically close to the project development. In this case, acceptance is mainly related to energy justice (procedural, distributional, and recognition). In the case of market acceptance, this refers to the market adoption process of technologies and projects and thus relates to consumers, investors, and businesses.

The literature has also extended these three dimensions of social acceptability with the concept of dynamics of acceptability. The process of social acceptance of a project is not static and depends on time dynamics (project stages, external events, project past, and trajectory), scale dynamics (at the micro-social level or based on people's perceptions, at the meso-political level or governance relations and institutional processes and the macro-economic level or market and industrial organization) and dynamics in the distribution of power (developer versus community, proponent versus opponent, etc.) (see Ellis et al. (2023)).

In the following, we present a literature review of the barriers and determinants of social acceptance, focusing mainly on the dimension of community acceptance with some aspects of the dynamics of the concept.

Spain

In Gómez's study (2023) with 48 participants from six Spanish municipalities, the high level of lack of knowledge about the projects stands out. For example, more than 65% of people said they did not know about the space to be occupied by the industrial infrastructure and the exact location of its implementation, job creation, positive and negative repercussions, economic costs, compensation, or economic benefits for the people affected. The data also show that most of the citizens surveyed (43%) perceive the projects as beneficial, compared to 24% who feel that the projects neither benefit nor harm them and 9% who feel that the projects harm them. The profile of the person who rejects the development of macro-projects in their territory is that of a man between 25 and 34 years of age who prioritizes economic development over environmental conservation.

Germany

Kalkbrenner & Roosen (2016) studied the role of different variables on community willingness to participate in renewable energy projects in Germany. The authors find that the variables that increase this willingness are trust, social norms, environmental concern, community identity, higher income level, and being male.

Fischer et al. (2021) analyzed data from a survey conducted in 2019 with a representative sample of 4,210 people living in Germany. Based on the survey results, the authors construct two variables of interest: willingness to participate in the project and willingness to invest in the project. In addition, they consider 23 factors as possible determinants of the variables of interest.[14]

The study finds that the most relevant variables in the willingness to participate in the project are a positive perception of the profitability of the project, a green political identification, having previously participated as volunteers in other projects or initiatives, expectations of sustainable behavior in their social circle (family, friends, colleagues), the habit of talking about investments and having financial patience[15]. In addition, if the person perceives a higher risk in investing in sustainable equity funds, they prefer only to participate in the project and not to invest in it.

Regarding socio-demographic variables, the authors find that only age and gender affect willingness to participate in the project, with older age or being a woman having a negative effect on willingness to participate.

The most relevant variables in the willingness to invest in the project are very similar to those that determine the willingness to participate, being the following in order of relevance: having a green political identification, the perception that investments in sustainable equity funds are more profitable than conventional ones, being more patient, having the habit of talking about investments, having a high family income, having a social environment with expectations of sustainable behaviors and having previously participated in volunteering activities. Finally, the older the age, the less willingness to invest in the project, but there is no gender effect on this willingness.

Ruddat (2022) reviews the determinants of public acceptance of wind energy in Germany, finding that the main related factors are visual effects, sense of territorial relevance, proximity effect, trust, perception of risks and benefits, and participatory process.

According to the study, wind turbines not only have a negative visual effect, but are also sometimes seen as a symbol of progress. However, visual impact is one of the most important factors influencing opposition to the development of wind projects. Similarly, the proximity of

[14] The variables they take into account are: risk attitude (willingness to take risks in general), patience (willingness to give up something that is beneficial today in exchange for benefiting more in the future), altruism (willingness to participate in social causes without expecting something in return), trust (different levels of interpersonal trust), positive reciprocity, negative reciprocity, perception of higher returns on investments in sustainable equity funds (perception that investing in sustainable equity funds is more profitable than in traditional equity funds), perception of higher risk in sustainable equity funds (perception that investing in sustainable equity funds is riskier than in traditional equity funds), financial literacy (level of financial literacy), habit of talking often about investments, conservative political identification, liberal political identification, social political identification, ecological political identification, environmental awareness (level of awareness towards environmental care), environmental social expectations (whether the respondent identifies that their social circle expects them to behave in a sustainable way), volunteering (whether the respondent has participated in voluntary work before), age, gender, education level, income level, rural region (whether the respondent lives in a sparsely populated municipality), and whether the respondent lives in West Germany or not.

[15] That is, the ability and willingness to make investments with long payback periods.

the project to the locality is often a barrier to acceptance; thus, in general, the level of acceptance increases as the distance increases (this is the so-called NIMBY effect)[16].

Ruddat (2022) also finds that community trust and participation in project decision-making (see definition of procedural justice in Section 2.2.1) promote social acceptance. Likewise, the perception of how project benefits and risks are distributed is a crucial determinant of project acceptance (see definition of distributive justice in Section 2.2.2).

Ireland

Curtin et al. (2019) surveyed 1,280 people in Ireland to analyze the determinants and barriers to investment in renewable energy projects. The study finds that people with higher income levels and previous investment experience are the most interested in investing in projects. However, variables such as lack of savings, experience in investment decisions, access to loans, high levels of investment risk, and lack of confidence and information in renewable technologies are barriers to investment.

Thus, to encourage investment, it is crucial to provide the public with transparent and reliable information about the project, especially in the early stages of development, when there is a higher investment risk. It is also crucial to provide access to low-cost capital for those interested in investing in projects and provide education and communication on energy policy.

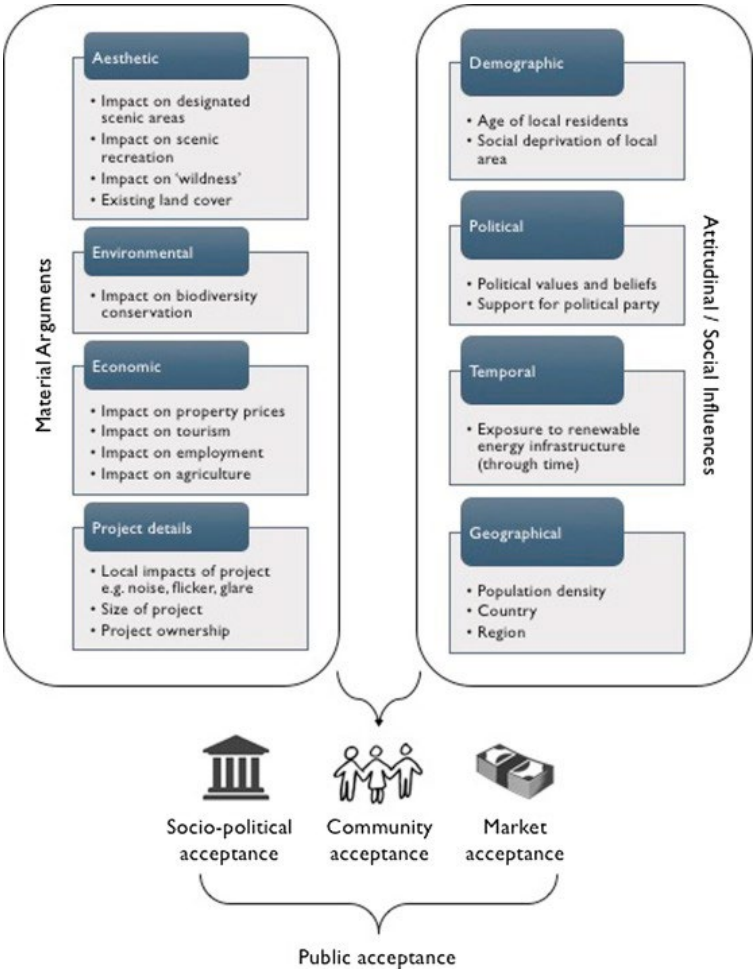
United Kingdom

Roddis et al. (2018) analyzed how the acceptance levels of local populations influence the planning (i.e., approval) of solar installations and onshore wind farms in the UK. Their framework of analysis identifies three dimensions to the concept of acceptance of renewable energy infrastructure projects: (a) socio-political; (b) community (i.e., local population); and (c) market (or technological) (see Graph A.6). The factors that influence the levels of community acceptance can be of two types: (1) material arguments, linked to aesthetic, environmental, economic or detailed aspects of the projects; and (2) aspects related to social attitudes and influences, such as demographic, political, time-related or geographic factors.

The study highlights that older people tend to be less willing to accept projects than younger people. Local populations with higher social capital (skills, networks, representation, etc.) tend to be more actively involved in planning processes. On the other hand, communities with lower incomes are more likely to accept solar power generation projects, while those with higher incomes are more likely to accept wind projects. Exposure to projects is another factor that can influence project acceptance, and longer exposure tends to be associated with higher acceptance levels.

[16] The concept of *not in my backyard* may be questionable because it is not the only factor explaining public resistance to wind energy developments, so it may be a simplistic explanation of this social issue.

Graph A.6 Variables determining the social acceptability of renewable energy projects



Source: extracted from Roddis et al. (2018).

Europe

Azarova et al. (2019) find in their case studies in Austria, Germany, Italy, and Switzerland that solar plant projects tend to have a higher level of acceptance by the local population, while wind farms have a mixed effect on the local population. On the one hand, wind generation has a positive effect because it is a clean technology and contributes to climate change mitigation, but on the other hand, wind generation has a negative effect because of its visual impact, noise, local environmental impact, and decrease in real estate value.

The study by Azarova et al. (2019) also finds that people in higher age groups (above 35 years), women, and people with lower levels of education show lower acceptance of renewable projects in their locality. In contrast, households with children show higher acceptance, which may be related to intergenerational interests from a long-term investment or benefit perspective.

Leiren et al. (2020) conducted a literature review and stakeholder surveys in regions in Germany, Spain, Italy, Latvia, Latvia, Norway, and Poland, with little experience in wind energy

development. The authors relate six categories of factors to the social acceptability of onshore wind developments: (1) technical characteristics of the project, (2) environmental impacts, (3) economic impacts, (4) social impacts, (5) contextual factors[17] , and (6) individual characteristics. Leiren et al. (2020) analyzed up to 34 factors within these categories and found that:

- Among the technical characteristics of the project, the size of the project (e.g., number and height of turbines), the visibility of the turbines, and the distance from the residential area to the project are considered barriers by the majority of respondents in the different regions. However, developments linked to the infrastructure of the electricity transmission and distribution networks and other infrastructure (e.g., transport and communications) are generally not considered barriers or determinants of social acceptance of the project.
- Environmental impacts related to physical impacts (e.g., landscape, protected areas, or increased traffic) and impacts on biodiversity and wildlife are generally considered barriers. On the other hand, the reduction of greenhouse gases resulting from the project's development is a variable that tends to increase the level of acceptance by the local population.
- Economic impacts are, on average, considered determinants of social acceptability; these are: impact at the individual level, the degree of local ownership of the project, the impact on the generation of local benefits and income, the distribution of benefits and costs among the community, and the effects on the agricultural sector. Only impacts on the tourism sector were considered as a barrier.
- Social impacts related to health and well-being (e.g., electromagnetic frequencies, noise, pollution, intermittent shadow effect) are generally considered barriers in the study regions.
- Among the contextual factors, the variables that are considered to induce a higher degree of acceptance are: having a high national or regional share of renewables in the generation matrix[18], energy demand, opportunities for participation in the process, information about the project, and the transparency of the process, and trust in the process and information in general. Trust in key actors such as the national or regional government or investors is a determinant of acceptance in some regions, while in others, respondents are indifferent to these factors. On the other hand, factors related to governance and regulatory structure, such as plans, targets, and fiscal and funding

[17] Contextual factors relate to the characteristics of the market and the project planning and development process. Thus, these factors shape how the environmental, social and economic impacts of developments are perceived by people, and hence their acceptance (or not) of the project. (Leiren et al., 2020)..

[18] The case of Norway, which has a matrix with a very high level of hydro generation, is special, as there is a high level of opposition to the destruction of the landscape and nature resulting from the development of non-conventional renewable energy projects.

policies at the national, regional, or local level, are determinant in some regions, and in others, they are neutral concerning project uptake.

- Individual characteristics that influence the perception of public discourse in the media and the political climate are inducers of greater acceptance in some regions and in others barriers. Sense of belonging, place attachment, and identity are generally barriers to acceptance, while socio-cultural values have a neutral effect.

In summary, the study finds a relatively broad consensus across the different regions analyzed on which the community sees factors as barriers to acceptance and which are seen as determinants or inducers of greater acceptance. However, there is variation between the study regions in the importance of each factor, suggesting that the specific results are not necessarily generalizable to other regions (Leiren et al., 2020).

Type of infrastructure

Sharpton et al. (2020) analyzed the determinants of and barriers to public acceptance of different power generation and other clean technologies and the expansion of transmission and distribution grids in the United States.

The authors find that the source of generation with the greatest opposition is coal-fired power plants, with 69% of the surveyed population rejecting them. The main barriers identified by the authors are worsening air quality, climate concerns, effects on landscape and water quality, and adverse health impacts. However, the beneficial effects on the local economy and employment are seen as positive.

In contrast, natural gas-fired power plants have a positive perception (75% of respondents), mainly because of their positive impact on the economy and employment in the locality. Factors related to water quality and concerns about climate change are perceived as barriers to a lesser extent (around 30% of respondents).

Biomass generation is the least well-known, and the participants in the study by Sharpton et al. (2020) reported a lack of knowledge about its impact on different factors, which results in a lower acceptance of this type of project.

On the other hand, wind power generation had a highly positive perception in the study (88%), with factors such as the impact on health, concern for the climate, or the impact on the local economy and employment being the main determinants of public acceptance. Thirty-seven percent of respondents reported a negative impact on the landscape and 30% on noise.

Photovoltaic generation is the source with the highest positive evaluation (90%), the main drivers of social acceptance being, as in the case of wind generation, climate concerns, health impact, impact on the economy and employment. In addition, 34% of respondents consider that solar plants positively impact the landscape.

The research also finds that participants have neutral to positive perceptions of grid expansion, with a strong preference reported for underground grids because of their landscape friendliness, greater safety, lower noise and environmental impact, and positive economic and employment impacts.

Finally, Sharpton et al. (2020) found that there is an overall positive perception of battery storage technologies (75% approval) and demand response devices in homes (77%). In these two cases, the determinants of participants' acceptance are the safety of the technologies and comfort.

Cohen et al. (2014) reviewed the most common factors for decreasing social acceptance of wind developments: visual impact, changes to the landscape, noise, environmental disturbance, technical aspects such as repair work, decreased recreational opportunities, and safety concerns.

Among the factors promoting uptake, the study highlights the following: reduced greenhouse gas emissions and fossil fuel dependence, local distinctiveness, economic benefits and monetary compensation, security of electricity supply, and procedural fairness.

The study also argues that many factors that negatively affect the development of wind energy projects also act as barriers to grid infrastructure development. For example, electricity towers, like wind turbines, are large structures that block views and alter the landscape. However, people do not perceive towers as green structures.

Finally, Cohen et al. (2014) also analyzed the case of pumped-storage hydropower plants and found that the factors that negatively affect their levels of social acceptance are environmental degradation, odor, noise and pollution during construction, and safety concerns. In addition, procedural aspects are particularly important with this type of technology because of the long construction times.

European Union and projects of common interest (PCIs)

The report of the European Commission et al. (2022) analyzed the levels of social acceptance in the case of trans-European energy infrastructure projects (transport networks, gas pipelines, or infrastructure facilities included in the TEN-E regulation between at least two member states) known as projects of common interest (PCIs).

This type of project also faces public resistance, which, as with other types of projects, stems from a lack of information and trust and a low level of participation in the planning and development process and can therefore lead to delays in implementation, relocation, or even suspension.

European Commission et al. (2022) studied strategies and actions to promote trust and social acceptance of CIPs. To this end, the study first analyzed the factors influencing the perception and position of individuals and communities towards CIPs through surveys and interviews with experts. Table A.1 presents the main determinants and barriers to local acceptance of CIPs, ranked from most to least relevant.

With regard to the individual characteristics of the population, the Commission's report finds greater local acceptance the older the respondents are (the average age of respondents is 33 years), the higher the level of education and among men. In addition, beliefs or perceptions about the importance of CIPs for sustainable development at the regional and national level and about the projects' contribution to improving the region's image also positively affect public acceptance.

The European Commission et al. (2022) also analyzed the perception of the surveyed population on the type of technology used in the project and found two types of technology groups. The first group consists of wind farms and solar plants. The second group contains coal and gas thermal plants, biomass plants, gas extraction wells, power grids, and pumped-storage hydroelectric plants. Citizens tend to be more supportive of infrastructure in the first group, as they see immediate benefits from renewable energy generation.

Table A.1 Determinants and barriers to social acceptance in CIPs

Determinants/Inducers	Barriers
• Awareness of environmental benefits • Transparency and fairness in the process • Security of energy supply • Positive impact on the local economy • Location of infrastructure • Citizen participation in the decision-making process • Confidence in the investors and owners of the project • Participation of local organizations • Financial ownership of the project by the local population • Use of a known technology	• Impact on air and water quality • Health and safety • Noise, odor, and other nuisances • Impact on the landscape • Impact on personal comfort and convenience • Unfair distribution of project costs and benefits • Lack of transparent communication • Lack of citizen participation in decision-making

Source: based on European Commission et al. (2022). The determinants and barriers are ranked from most to least important according to the study results.

In addition, the Commission's report presents a cluster analysis (population subgroups) to find different groups within the surveyed population with respect to their attitudes and perceptions of CIPs. The study calls these groups hidden clusters and identifies four:

- Cluster 1 is a group characterized by high social acceptance, with high approval of CIPs and high trust towards the EU.
- Cluster 2 has a lower level of social acceptance than Cluster 1, although it is still high. However, they have a lower level of trust towards projects carried out by the EU.
- Cluster 3 does not have as high a level of social acceptance as the previous two groups, but it does have a high level of trust in EU-driven projects.
- Cluster 4 shows low project acceptance and low trust in the EU.

People in each identified cluster do not differ statistically in socio-demographic aspects such as income level or employment, but they do differ in their age and educational level, with higher levels of education observed in Clusters 1 and 2.

Finally, the report of the European Commission et al. (2022), based on the differences found among participants in terms of their beliefs, perceptions, and knowledge about the development of electricity infrastructure between member states, raises the importance of appropriate and targeted communication campaigns for each specific population group. A campaign that takes into account the differences in the population and the composition of the population can more effectively target different population subgroups and thus achieve greater community approval.

In this way, communication campaigns should:

1) have a clear objective (e.g., to improve community perception of the project);
2) take into account the characteristics, needs, and concerns of the population;
3) involve the target groups in the development of the campaign;
4) select appropriate messages (e.g., do not be too technical);
5) selecting an appropriate mix of communication channels (digital vs. more traditional media);
6) be flexible to possible changes in the different stages of the process (European Commission et al., 2022).

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