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Title

THE EU-FUNDED GREEN DEAL AND THE SUSTAINABILITY OF A LOCAL REALITY:
THE CASE OF WESTERN SPAIN

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Abstract

Awareness of how the green transition may help people beyond just providing energy results in initiatives that benefit people's livelihoods in several areas is critical for complying with sustainable development. This research project aims to determine the impacts on local people's livelihoods and the three main sustainable dimensions of EU-funded green transition projects in rural areas in Western Spain. The case study to demonstrate so is the Francisco Pizarro solar plant, the largest in Europe. Climate change has had a negative impact on people's livelihoods all over the world lately. Renewable energy projects are the ones to help keep them under control, eventually. The entire socioeconomic framework cannot be understood as separated from the green energy transition as shifts in the renewable energy system impact the economy. The methodology applied to develop this research is mainly qualitative, but there are also some quantitative inputs. Semi-structured research interviews and participant observation were carried out through the in-field internship to collect the required data. The results obtained from the data collected in the fieldwork demonstrate that the impact of this specific case study on local people's livelihoods in rural areas in Western Spain depends mainly on local authorities. They are responsible for developing several social initiatives to improve local people's livelihoods. They conclude that there is a lack of monitoring and policy initiatives from the regional government and the company to ensure that these macro renewable energy projects positively impact local people's livelihoods as they are doing at the economic and environmental levels.

Keywords: people's livelihoods, solar energy, EU, green transition, Spain, SDGs, Iberdrola, sustainable development, macro solar plants, public policy

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1. Introduction

1.1 *Research Topic Premises*

Understanding the broader impacts of the green energy transition, beyond energy provision, can lead to initiatives that improve people's livelihoods in various areas, which is crucial for aligning with the United Nations (UN) Sustainable Development Goals (SDGs). They include developing accessibility to healthcare, gender equality, and human well-being and enhancing energy affordability, availability, and accessibility (IRENA, n.d.-c). The goal of achieving sustainable development has become significant in the public view on a global scale. Energy is among the prominent topics generating debate because fossil fuels are the major pollutants and the largest contributors to the greenhouse effect (Contreras, 1999). The entire socioeconomic framework cannot be understood as separated from the green energy transition, as shifts in the renewable energy system directly impact the economy (IRENA, 2019). Due to that, in areas of expertise such as education, governance, policy-making, and development management, sustainable development has got considerable attention lately. That is because its principles and ethics would help to solve humankind's issues nowadays – including “climate change, depletion of ozone layer, water scarcity, loss of vegetation, inequality, insecurity, hunger, deprivation and poverty” (Mensah, 2019, p. 15). Since their reduced carbon emissions, wind and solar power are appealing because they directly improve public health and the environment (Veers et al., 2019).

Climate change, in the form of droughts, floodings, animal migrations, forest fires, and the earth's temperature, has a larger and more noticeable impact on people's livelihoods and health every year, especially in developing countries. However, it is an issue developed countries have to address directly. Thus, the European Union (EU) and its 27 Member-States are working to foster and pursue the 2030 Agenda for Sustainable Development at the international level. The 17 SDGs and their 169 targets aim to improve people's livelihoods and prevent environmental degradation so that the world can satisfy current and future generations' needs (European Commission, n.d.-a). It has significantly developed from a socioeconomic perspective, while environmental development has not kept the same pace (Social Justice Ireland, 2023). The European Green Deal wants to reduce pollution, make transportation and manufacturing sustainable, achieve climate neutrality in Europe by 2050, and develop the economic system through renewable energies (European Commission, n.d.-

a). Creating chances out of climatic and social challenges will make that sustainable transition equitable and fair for all. The EU Zero Pollution Action Plan pursues a toxic-free world by reducing air, water, and soil pollution to levels no longer considered hazardous to human health and natural ecosystems (European Commission, 2021). The action plan mainly seeks to improve the EU's economic, technological, and sustainable leadership while fostering a healthier and fairer world.

An EU solar market between Southern and Central-Northern European countries may be highly useful for improving the EU sustainable development objectives as it would provide energy independence and security (Díaz-Vázquez & Caldés-Gómez, 2018). The favourable solar conditions in Central and Southern Spain make these regions perfect for photovoltaic-electrolysis systems that produce hydrogen through solar electricity. The most crucial factor in Earth's energy system stability is the solar radiation that reaches the ground. That is why regions like Extremadura, where there are 127 fully clear days on average annually and in which the mean amount of bright sunlight per day in July is 87% of the highest benefit for such climate, are of particular interest for the whole world (Cancillo, 2005). An evaluation of its benefits regarding the import dependence on fossil fuels, the Gross National Product (GNP), the pollution reduction, and the enhanced life standards occurred (Contreras, 1999). For all those reasons, Spain has been working hard towards sustainable development lately and it has settled several objectives to increase renewable energies' role in the current energy system. Several policies and social initiatives have also been implemented to reduce the green transition's negative impacts and improve the country's energy efficiency and security.

In addition, the Alianza, Energía y Territorio (ALIENTE) (2022) study "*Renovables Sostenibles: Fotovoltaica*", developed by the Sustainability Observatory, confirms that in Spain there are enough anthropised surfaces to install 181 GW still. That would produce more than 272,037 GWh/year in solar energy, more than the 2021 consumption in the country (Observatorio de Sostenibilidad & ALIENTE, 2022). Thus, it is possible to develop significant progress in solar energy production, reducing environmental impact, ensuring a sustainable and efficient green transition, and respecting the effects assessment procedures of the energy industry has on society and the environment.

1.2 Research Relevance

The relevance of this research relies on a bottom-up, people's livelihoods approach being investigated in a Green Transition EU-funded investment in Western Spain. This study focuses on the impact on local people's livelihoods of EU-funded investments in green energy. There has been a trend lately, not only in Spain but also all over the EU, to install macro renewable energy projects in either rural areas or oceans, as many lands are available in those areas. Thus, the fact that the solar plant of this study is the largest in Europe is vital to understanding the importance of the project. If this one, which was already supposed beforehand to be the subject of several studies, were not carried out respecting the three sustainable development dimensions, it would be very likely that, in smaller and not that mainstream ones, these projects might not take into consideration their impact on local people's livelihoods.

It is also worth bearing in mind that the economic system of every area in the world suffers from shifts in the energy system, and the socioeconomic footprint has been seriously affected by climate change lately (IRENA, 2019). Then, the green energy transition is expected to increase GDP, create new jobs, and improve people's well-being and livelihoods at the international level (IRENA, 2019). However, renewable energies could also provide some worthwhile career prospects in rural areas. Rural areas have profited from the influx of operations and maintenance employees (OECD, 2012). Climate change is a social reality because it is primarily caused by humans (Pardo Buendía, 2007).

Furthermore, societies in the world, and the individuals who made them up, suffer directly or indirectly from their opposing sides. Studying climate change's impact on the social dimension of sustainable development is a crucial topic, not only at the academic level but also for its practical management (Pardo Buendía, 2007). Areas, usually rural ones, suffering from a lack of economic diversification often tend to make agriculture and farming a source of livelihood. Therefore, they are much more vulnerable to changes in climate than regions with a diversified economy (Pardo Buendía, 2007).

Given the Paris Agreement and the EU Climate and Energy framework, the EU should figure out ways to decarbonise its economy affordably. At the same time, it should enhance energy security, promote social and economic development, seize leadership positions in the renewable energy sector, and advance towards an integrated and efficient Energy Union (Díaz-Vázquez & Caldés-Gómez, 2018). Some nations and regions will perform more

effectively than others throughout the economic transition from a fossil fuel-based economy to a circular one. Regions with a firm reliance on the export of fossil fuels and insufficient and unbalanced local distribution networks will struggle with that transition (IRENA, 2019). Significant transition challenges may also take place if distributional issues are unaddressed.

Nonetheless, solar and wind energies have the potential to be significant providers of the expanding green energy demands of the global energy system because of their accessibility, price, and emission levels (Veers et al., 2019). Thus, a comprehensive redesign of the renewable energy system is required to integrate the economic and environmental SDGs more effectively and, primarily, to mitigate the climate-related effects caused by a global economic system that relies on fossil fuels (IRENA, 2019). Furthermore, issues first emerge in rural areas, where a discussion about unusual renewable energy policy initiatives takes place. In the same manner, regional institutions may encourage innovation in policymaking by either offering inputs to national governments or testing out fresh policy approaches that are more capable of combining the implementation of renewable energy with sustainable rural development (OECD, 2012). In that way, the development of green energy may promote economic growth, new employment, and national well-being. Nevertheless, the primary socioeconomic outcomes, GDP and employment, need to adequately account for the effects of climate change, which is the main driving force behind the energy transition (IRENA, 2019).

1.3 Research Question and Objectives

Given the contextualisation mentioned above, the research question that arose is: “What are the impacts on the livelihoods of local people in Western Spain as a result of the EU-funded Green Transition investments, as viewed through the lens of the three dimensions of sustainable development?” This research aims to determine the impacts on local people’s livelihoods, according to the three main sustainable dimensions – social, economic, and environmental, of EU-funded green transition projects in rural areas in Western Spain. This study focuses on three villages. The first one is Almaraz, located in Extremadura, where the electricity produced by the Francisco Pizarro solar plant is directly evacuated to Almaraz’s Power Station. The solar energy industry in that area is essential to Spain’s renewable energy mix. It has played a significant role in the country’s efforts to reduce its reliance on fossil fuels and tackle climate change. Furthermore, this village is also home to a nuclear energy

plant, meaning the energy sector has completely industrialised it. For those reasons, its population has gone through the impacts renewable energy projects have on their livelihoods.

Torrecillas de la Tiesta and Aldeacentera are the other two villages, the main ones where the solar plant was installed. Spain may start supplying renewable energies, positively impacting GNP development and quality of life, using undeveloped rural lands in Central and Southern Spain to produce solar-hydrogen energy through photovoltaic-electrolysis (Contreras, 1999). Furthermore, the use of renewable energies may boost and strengthen agricultural revenues, support the creation of new commodities, technologies, and policy frameworks, increase rural areas' total potential for innovation, encourage local communities, and, finally, provide isolated regions with more affordable and secure energy choices (OECD, 2012). Thus, since the most substantial solar resource potential in Europe is in the least developed regions, the implementation of solar energy export from South to Central/North Europe might have significant socioeconomic impacts for those regions, helping to minimise regional inequities within Europe (Díaz-Vázquez & Caldés-Gómez, 2018).

Along that line, the main objective of this master's thesis is to analyse the impacts the EU Green Transition initiatives and fundings have on local people's livelihoods and citizens' quality of life in rural areas in Western Spain. It should be noted that most investments in implementing renewable energy projects are directed towards rural areas (OECD, 2012). The reason is that facilities must be placed where there is enough land for them and where renewable energy sources are accessible and sufficient. Low-population locations, such as rural areas, are more likely to meet those requirements, making them the ideal locations for green energy projects (OECD, 2012). Thus, the bottom-up and sustainable livelihood approaches will be applied to analyse the semi-structured research interviews and participant observation. Another objective is to evaluate if sustainable rural development has been achieved in the case under scrutiny. Besides, studying the economic and environmental dimensions through existing data to prove if the three sustainable development dimensions are developing at the same pace is also an objective for this study.

This thesis is structured into seven sections. The first section is the introduction, followed by the presentation of the theoretical framework in the second section. The third covers the methodology applied to develop this master's thesis, while the fourth section focuses on the case study's contextual framework. The fifth section is the results, the sixth is

the discussion of those results and some policy recommendations, and the seventh and last one are the conclusions of this study.

2. Theoretical Framework

In the framework of the natural sciences, as well as in the human and social sciences, the term development has gone through a gradual shift for centuries (Ubilla-Bravo, 2017). Its changes have depended on the societies' culture where it originated and the fields of study which have analysed it. In that way, development history is usually associated with the biology field, and it was then incorporated and sophisticated within social sciences. According to Ubilla-Bravo (2017), the popularity and overcrowding use of the term took place in Western Europe in the course of the Industrial Revolution (1760-1840) and the Technological Revolution (1870-1914). The target return of the owners of the production resources, along with the political elites, associated the term development with wealth creation during a global leadership competency between Germany, the United Kingdom, and France. From that moment, "state intervention, for all its bureaucratic deficiencies, was good for the working class. The Fordist virtuous circle linking increased productivity to increased incomes for people who had to spend them provided a logic for growth with development" (Peet & Hartwick, 2015, p. 284). Finally, in the post-war period, political actors justified the mass production increase and the structure of social classes with the development discourse. That created a strong bond between development and the well-being term (Ubilla-Bravo, 2017).

This section thoroughly presents the definition and evolution of sustainable development throughout its history. Firstly, it covers the idea of development. Secondly, it goes through the term sustainability. Thirdly, it ends up in the concept of sustainable development. Apart from that, it also states at the end the interdependence among the different sustainable development dimensions and the importance of working to achieve them simultaneously to improve people's livelihoods and well-being.

2.1 Exploring the Concept of Development: Perspectives, Definitions, and Livelihood Approach

Researchers such as Mensah (2019) have linked the term development to various definitions, interpretations, and theories. In general terms, development refers to improving or

advancing something over time. Amartya Sen's definition must be highlighted in this research area, as he is one of the most prominent scholars in development studies. For Sen (1999), development is increasing human freedom. The expansion of freedoms enables individuals to live lives for which they have worthy goals. Hence, development involves eradicating primary sources of unfreedom: poverty and oppression, low economic possibilities and systematic social deprivation, lack of public spaces and hostility or overactivity of oppressive authorities (Sen, 1999). According to Peet and Hartwick (2015), development is a process of evolution in which human ability improves in terms of creating infrastructures, dealing with issues, adjusting to constant innovation, and working consciously and creatively to reach new goals. In the areas of expertise of economics and social sciences, development refers to the process of improving people's livelihoods, quality of life, and wealth in a country (Huntington, 1971; Mensah, 2019; Peet & Hartwick, 2015; Reyes, 2001; Todaro & Smith, 2006). That implies the development of several services, such as access to education, infrastructure, and economic development. Hence, it is the process of advancing in any aspect of human lives, either at the personal, economic, or technological level. Reyes (2001) also defined *development* as a social state within a country in which the demands of its citizens are met via the reasonable and sustainable consumption of its natural resources and assets. Todaro and Smith (2006) described development as a somewhat complex process that includes significant adjustments to social structures, beliefs, and institutions in addition to economic development, eradicating extreme poverty, and decreasing inequalities.

Appropriate emphasis must also be given to rural development approaches, such as life quality enhancement, sustainable farming, rural security, circular economy, and inequalities, to accomplish the full spectrum of SGDs (Mihai & Iatu, 2020). The necessities of rural inhabitants must be met by dependable public services and technological, socioeconomic, and ecological requirements to sustain the rural economy and urban-rural relationships. It should also be noted that to achieve that, according to Rapley (2007, p. 7), "the concern with individual well-being also began to work its way into development theory" through Sen's Sustainable Livelihood and Capability approaches. It "entails two normative claims: first, the claim that the freedom to achieve well-being is of primary moral importance and, second, that well-being should be understood in terms of people's capabilities and functionings" (Robeyns & Byskov, 2020, p. 1). At that point, the idea of 'human development' was incubated to be later defined as "the progress of human freedom and

capability to lead the kind of lives that people have reason to value” (Drèze & Sen, 2013, p. 43). Thus, according to Robeyns and Byskov (2020), the Capability Approach relies on three main elements:

- 1) functionings, “consisting of beings and doings” (Sen, 1992, p. 39, as cited in Crocker, 1995, p. 155),
- 2) capabilities, “refers to the alternative functionings that are feasible for her to achieve. Capability is thus a kind of freedom: the substantive freedom to achieve alternative functioning combinations (or, less formally put, the freedom to achieve various lifestyles)” (Sen, 1999, p. 75), and
- 3) agency, “someone who acts and brings about change, and whose achievements can be judged in terms of her own values and objectives, whether or not we assess them in terms of some external criteria as well” (Sen, 1999, p. 19).

2.2 Sustainability: Balancing Human Development and Environmental Preservation for Future Generations

Sustainability refers to the ability to maintain or preserve something over time. Concerning nature, sustainability often refers to responsibly employing natural resources to ensure their conservation for future generations (Mensah, 2019). The first concerns about how our civilisation’s development would affect the Earth’s ecology and assets emerged over two centuries ago. As food supply could not keep up with population increase, Malthus (1766-1834) anticipated in 1798 that the world’s population would soon starve or live at a level of survival (Bac, 2008). Criticism has inquired about how feasible it is to have a six-fold growth in world population since 1798, from one to six billion people, and still be able to feed most people worldwide. That discussion concerning Malthusian limitations has persisted over time. The famous work “The Limits to Growth” emphasised the decreasing number of non-renewable resources and subsequent increases in commodity costs (Meadows et al., 2004). In that way, it represented those theories provided by MIT scholars as the next wave of Malthusianism. Furthermore, according to Cole and Lucchesi (2007), that theory predicted that population and industrial wealth would keep increasing rapidly, ending up in a similar increase in pollution and the need for food and sustainable supplies. The Malthusians’ foremost goal was to warn about the current consumption habits and the issues local, national,

and global governments may have to deal with shortly if it is not adequately approached (Bac, 2008).

According to Stoddart et al. (2011), sustainability is the efficient and fair allocation of assets among different generations while allowing socioeconomic activities to occur within a limited environment's boundaries. In a larger sense, sustainability refers to achieving a fair world for future generations to meet their economic, social, and environmental needs. For Ben-Eli (2015), sustainability refers to a dynamic balance between the carrying ability of the environment and the people that develop their maximum capabilities without hurting the environment's available capacity. That often implies finding proper ways to meet current generations' needs without jeopardising future ones (Imperatives, 1987). Thus, sustainability emphasises human behaviours and their capacity to meet needs and desires without diminishing or exhausting the available productive assets (Thomas, 2015). That raises questions about how people should conduct their economic and social relationships while maximising the ecological resources available for human development (Mensah, 2019).

Sustainability is properly managing resources to meet current needs without jeopardising future needs, guaranteeing a balance between social well-being, economic development, and environmental care. It is about assuming that nature and the environment are not inexhaustible sources of resources. Hence, their protection and responsible consumption are required for future generations' wealth. In that way, sustainability promotes social development by building a link between communities and cultures. Then, it seeks to achieve satisfactory levels of people's livelihoods, well-being, and education. Apart from that, sustainability also promotes economic development to reach an overall equitable wealth for all human beings without damaging the environment.

2.3 A Journey Towards Sustainability: Tracing the Evolution of Sustainable Development

Sustainable development is growth that may be sustained for a specified period or indefinitely (Stoddart et al., 2011). The concept of "sustainability" emerged as a general framework for human development at the end of the previous millennium. Its popularity can be attributed to the core thoughts of the existential issues facing humanity, which included increasing concerns about the overuse of natural resources and economic growth at the price of environmental sustainability (Keiner, 2005). In that way, when Carlowitz (1645-1714)

published his first book on ecological sciences in 1713, “sustainable development” was conceived in a way in human history. After that first contact, some contributions made by UNESCO, the United Nations agency focused on education, science, and culture, were the early institutionalisation of global environmental governance (Egelston, 2013). UNESCO worked intensively to promote the creation of Non-Governmental Organisations (NGOs) to address claimed gaps in global civil society. In that way, the Stockholm Preparatory Committee broke the impasse that discussions faced due to “eco-development”. It started “as a compromise between the North’s technically oriented environmental protectionism and the South’s concern with industrialization and need to avoid a new neocolonialism” (Egelston, 2013, p. 91).

The first international conference focused on environmental concerns in Stockholm, Sweden, in 1972 and discussed the connections between the environment and development (Bac, 2008). The establishment of the United Nations Environmental Programme (UNEP), whose goal is to give guidance and promote cooperation in caring for the environment, was another of the outcomes of the Stockholm Conference. The conference ratified the “Stockholm Declaration on the Human Environment”, which proclaimed the necessity of integrating and coordinating development planning with environmental preservation (Bac, 2008).

The World Commission on Environment and Development (WCED), subsequently referred to as the Brundtland Commission, was established by the UN General Assembly in 1983 (Bac, 2008). That resulted in the Brundtland Commission Report, *Our Common Future*, a document based on the accomplishments made in Stockholm and published in 1987 by the WCED and sponsored by the UN, which introduced the idea of sustainable development, defined how it might be reached, and offered the definition of the term that is still most frequently cited by experts (Schaefer & Crane, 2005). That definition includes two key ideas: 1) the idea of “needs”, especially the basic needs of the underdeveloped regions, which should enjoy priority over the developed ones, and 2) the concept of environmental limitations brought about by the current situation of technology and social structure (Bac, 2008; Kates et al., 2001). As public awareness concerning the new and terrifying phenomena of global climate change increased in developed regions during that time, sustainable development got political momentum and, in some aspects, substituted the early 1980s’ predominance of nuclear war worries (Vogler, 2014). Due to all of that, the definition mentioned above in this

paragraph has gone through a great variety of changes since the Brundtland Commission report's publication, and it has been rewritten in light of many points of view (Keiner, 2005). Nowadays, there is much more discussion than ever in history over the exact definition of the term. Most definitions focus on maintaining human livelihoods, economic development, and the long-term survival of natural environments and resources (Keiner, 2005). The WCED investigated the causes of biodiversity loss, attempted to comprehend the connections between social equity, economic growth, and environmental issues, and established policy proposals that combined all three aspects (Jarvie, 2014).

2.3.1 The Rise of Sustainable Development in International Environmental Politics

Sustainable development finally evolved into the core of international environmental politics. While research in academia frequently uses the Brundtland Commission as the starting point for the origins of sustainable development, the critical elements of this approach were established much earlier (Irwin, 2000). Nonetheless, the Brundtland Commission did not occur randomly at a particular time. It was also a result of the political exigency at that demand. According to Jain and Islam (2015), the Brundtland report provided the impetus for the 1992 Rio Earth Summit, also known as the United Nations Conference on Environment and Development (UNCED). It was in Rio de Janeiro, Brazil, and was a record-breaking historical event (Bac, 2008). It included several significant results from the summit in the conference's conclusion paper, including Agenda 21 (Worster, 1993). Agenda 21 was a mutually agreed-upon healthy practices and guidelines document for reaching sustainable development globally. It recommended that national policies be developed to address sustainable development's economic, social, and environmental elements after stating that it should become a prominent issue on the international community agenda (Allen et al., 2018). It also acknowledged that extreme poverty persists in some areas of the world. At the same time, other regions' standards of life depend on resource and environmental management, which developing and developed nations must implement (Bac, 2008).

The Kyoto Climate Change Conference occurred in 1997, and developed nations agreed to define goals for reducing greenhouse gas emissions (Bac, 2008). The EU demanded a 15% reduction, but the US suggested balancing emissions and making no more reductions (Bac, 2008). Finally, developed nations reached a common compromise and agreed to reduce greenhouse gas emissions globally to 1990 levels before 2012. Nevertheless, the complex

nature of the discussions contributed to significant ambiguity over compliance because it only detailed the essential elements for cooperation and omitted to clarify the critical guidelines for how they would perform (Bac, 2008).

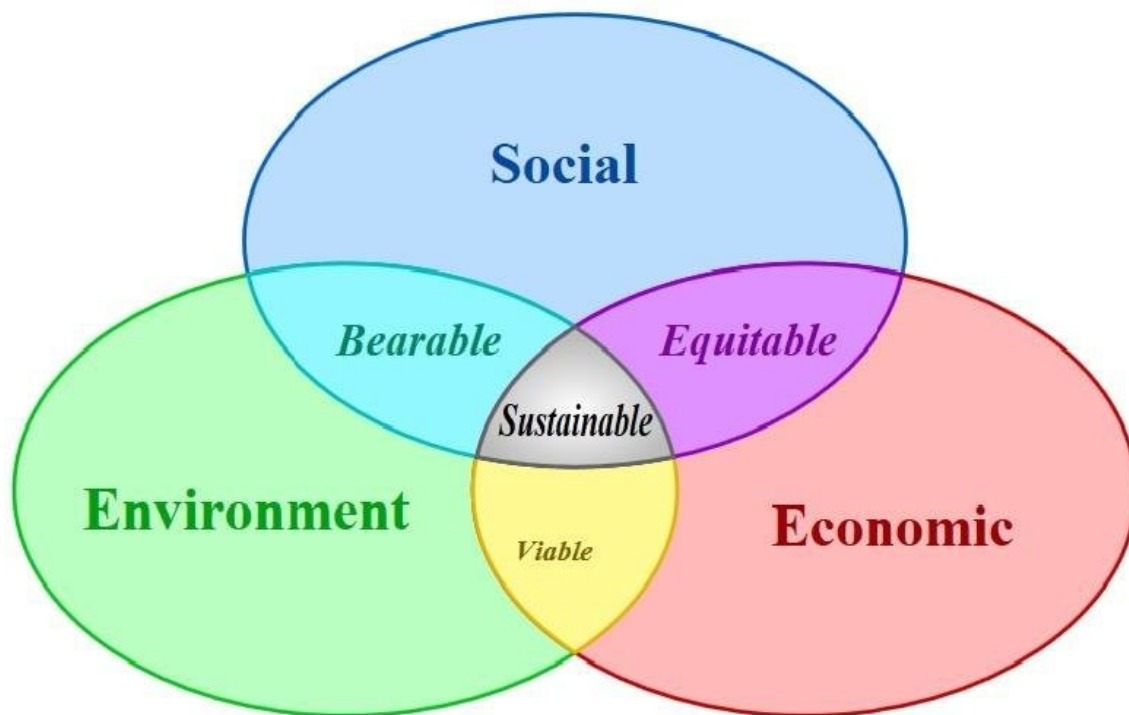
The Millennium Development Goals (MDGs) were adopted at the New York UN Millennium Summit 2000 (Bac, 2008). This summit settled 2015 as the deadline to achieve those objectives by every single UN Member-State. According to Adger and Winkels (2014), the MDGs show that the livelihoods and wellness of poor people all over the globe are now defined because of the availability of chances and the lack of instability and vulnerability they usually suffer from. They act as a more tangible form of sustainable development expression that balances the social, economic, and environmental dimensions (Bac, 2008). Following that, the 2002 World Summit on Sustainable Development (WSSD), hosted in Johannesburg, was a turning point in establishing agreements between the UN, governments, International Organisations, transnational companies, and NGOs (Bac, 2008). That cooperation at the international level was reached to pool funds for approaching global welfare, poverty, and environmental concerns.

The Rio+ 20, also known as the United Nations Conference on Sustainable Development (UNCSD), occurred in Rio de Janeiro in 2012. The conference's major sustainable development topics were the green economy and policy structure (Allen et al., 2018). Therefore, the UN Secretary-General highlighted sustainable development as a primary goal of the international agenda.

2.3.2 The Dimensions of Sustainable Development

The term “sustainability” has also become popular because of the simple framework that makes it easier for people to understand it made up of the three dimensions of sustainable development, as shown in [Figure 1](#): “environmental (conservation), economic (growth), and social (equity)” (Keiner, 2005, p. 3). These three pillars act as the main principles of sustainable development. In that way, the three core concerns of sustainable development are: “economic sustainability”, “social sustainability”, and “environmental sustainability” (Mensah, 2019, p. 9).

Figure 1. Dimensions of Sustainable Development.



Source: Ayodele and Ogunlola (2016).

Daly (1992) stated that social sustainability includes institutional stability, cultural heritage, accessibility, justice, and democracy. As development is all about humans, the idea demonstrates that individuals matter (Benaim & Raftis, 2008). It refers to the ability of a society to meet the needs of its current and future generations in a manner that preserves social and economic systems for future ones (Mensah, 2019). That includes reducing poverty and inequality, promoting social inclusion, addressing human rights and social justice issues, providing basic needs such as food, housing, and healthcare, and protecting vulnerable groups. It should seek to reduce social inequalities within the limits of the society's current economic and natural resource base (Kumar et al., 2014). To attain useful lives for human beings, sustainability at the social level requires supporting the growth of individuals, groups, and cultures while promoting equality in education and healthcare, as well as peace, democracy, and stability (Saith, 2006).

As stated by Lobo et al. (2015), economic sustainability entails a supply system that meets current consumption rates without endangering demands for the future. It refers to the ability of an economy to support and maintain economic development in a manner that

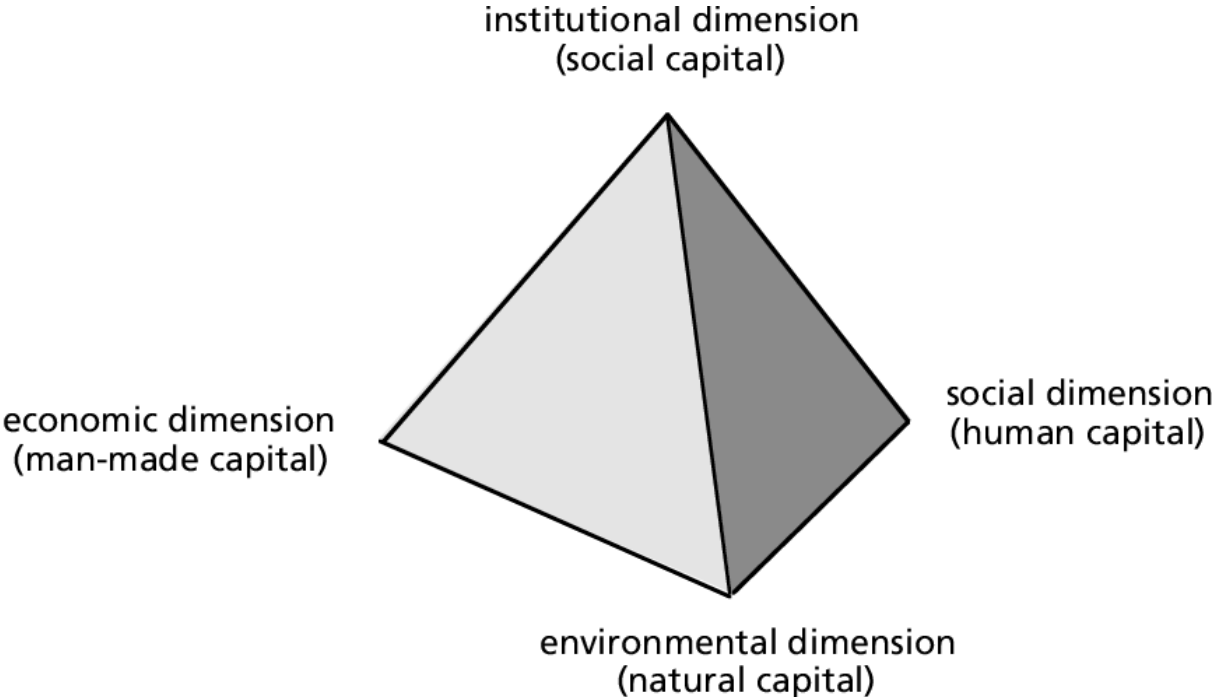
preserves natural and human resources for future generations. That can include practices such as reducing environmental impact, promoting social equality, and ensuring that economic growth is inclusive and benefits all members of society (Mensah, 2019). To ensure economic sustainability, choices must be made using the fairest and most equal sustainable manner in economic terms while also considering other sustainable factors (Zhai & Chang, 2019).

Environmental sustainability refers to how the wildlife habitat continues to be adaptable and profitable to safeguard humanity. It is also about the ability of the natural environment to support and maintain the well-being of current and future generations (Mensah, 2019). That includes the protection of biodiversity, air, water, and soil and the sustainable management of natural resources. According to Brodhag and Taliere (2006), environmental sustainability is related to ecological functions and the environment's capabilities. It calls for the sustainable use of natural assets as a way of economic commodities and a waste disposal system (Goodland & Daly, 1996).

Consequently, waste cannot be produced faster than the environment can recover from, and natural resources cannot be used faster than the Earth can regenerate them (Evers, 2018). That is to ensure preserving balance within the constraints of the earth systems' limitations or boundaries. The planetary boundary idea sought to specify the environmental bounds within which humankind may live safely. Three of the proposed nine limits – climate change, ozone layer depletion, and rising sea levels – would potentially shift the natural Earth system into a different state and significantly impact the other six if crossed (Steffen et al., 2015).

Other options for the three dimensions of sustainable development have been suggested lately, and prisms are one of the most remarkable ones (Keiner, 2005). Instead of those three traditional ones, the Wuppertal School sustainable development prism, as shown in [Figure 2](#), specifies four dimensions (Spangenberg & Bonniot, 1998; Valentin & Spangenberg, 2000). Those four dimensions of sustainable development are: 1) “the economic dimension (man-made capital)”, 2) “the environmental dimension (natural capital)”, 3) “the social dimension (human capital)”, and 4) “the institutional dimension (social capital)” (Spangenberg & Bonniot, 1998; Valentin & Spangenberg, 2000).

Figure 2. Sustainable Development Prism.



Source: Stenberg (2001, p. 42) after being adapted by Spangenberg and Bonniot (1998) and Valentin and Spangenberg (2000).

2.3.3 The Sustainable Development Goals (SDGs).

The 2030 Agenda (SDGs), a push for measures to safeguard the environment, reduce poverty, and ensure human well-being, was endorsed by the UN as a component of that new development framework (Taylor, 2016). Humans, environment, economy, security, and cooperation are the five main themes of Agenda 2030, which cover the 17 SDGs (Zhai & Chang, 2019). Their study suggests that sustainable development strives for social progress, economic prosperity, and environmental balance.

Apart from the 2030 Agenda, the Paris Agreement, a legally binding international climate change treaty adopted by the UN in 2015, was also established. The EU is a signatory party, along with nearly 200 countries. It sets a global framework for limiting global temperatures to below 2°C above pre-industrial levels and pursuing efforts to limit the increase to 1.5°C (European Commission, 2016). The EU has taken the leading role internationally in fighting climate change, and the Paris Agreement is vital to its sustainable development strategy. In line with that, the EU’s Green Deal – which sets out a plan for making Europe climate-neutral by 2050, is closely aligned with the UN SDGs (Consilium

Europa, 2022). In 2021, the EU Zero Pollution Action Plan also emerged as a comprehensive strategy to combat pollution and protect citizens' health and the environment. It aims to achieve "zero pollution" for air, water, and soil and to reduce the impact of chemicals and waste on human health and the environment (European Commission, 2021).

Sustainable development is the capacity to meet current human needs without threat to the coming generations. Hence, it is the chance for human activity to not deplete natural resources in the world to the extent of jeopardising future human generations' survival. *Sustainable development* can also be defined as the way to achieve consistency between economic development, natural resources, and society to avoid endangering current and future nature and people's livelihoods. It requires considering natural resource consumption and the social impact of green transition, such as health, human well-being, poverty, and inequalities. Thus, sustainable development promotes good-quality relationships between human beings and nature. To achieve so, there are three different "types" (dimensions) of sustainable development:

- 1) social, matters such as issues that may harm people's livelihoods,
- 2) economic, it determines how limited the distribution of resources is and managed so that natural resources are employed committed and consistently, and
- 3) environmental, it looks into natural resources, renewables and non-renewables, to employ them efficiently to improve people's livelihoods and nature.

Due to that, the importance of sustainable development relies on the fact that it is based on the idea that it has to ensure an improvement in people's livelihoods through the most efficient human activities and green transition employing just the required natural resources to develop them.

2.4 Sustainable Development Dimensions Interdependence

Globalisation has increased the interdependence of individuals and countries worldwide, impacting the social, economic, and ecological levels. Economic integration across borders would be extremely risky without efforts to prevent harmful social and environmental consequences (Paehlke, 2011). In certain circumstances, industrial centralisation and unequal economic distribution might have a negative impact on people's livelihoods and the environment. Nevertheless, global economic integration may also benefit sustainability by accelerating the adoption of technologies. The core principle of systemic

integration is that a framework's social, economic, and environmental components are usually linked and inseparable (Paehlke, 2011). The economies that keep people's livelihoods and improve their living standards affect people and their society's environment (United Nations, 2015a). Environments give industries and individuals essential and financially significant benefits. Systems thinking allows a comprehensive approach to solving assessments and prevents limiting linear approaches looking at isolated aspects of an issue (United Nations, 2015a).

The term "sustainability" implies initiatives that balance human welfare, economic growth, and environmental conservation. The interdependence of the three main sustainable development dimensions – the environmental, the economic, and social, while considering the current and future generations is how sustainability is frequently defined (EPA, 2022). Thus, integrating the economic, social, and environmental dimensions – as stated in the 2030 Agenda as a worldwide responsibility, must be balanced to achieve sustainable development. Due to the growing wealth and other inequalities in societies at the international level as well as the violation of planetary boundaries, which positions human beings in danger, the integration of all three of those dimensions is an essential change in policy strategies all over the world (United Nations, 2015a). Because of that, the entire socioeconomic framework cannot be considered in isolation from the renewable energy transition, as shown in [Figure 3](#). The socioeconomic impact study by IRENA (2019) examines the effects of the transition and describes the footprint on GDP, employment, and well-being. That macroeconomic study has considered climate impacts, resulting in significant socioeconomic implications.

Figure 3. Interdependence Nest between Social, Economic, and Environmental Sustainable Development Dimensions.

Economy, Society, Environment: A Nested Relationship



Source: US Environmental Protection Agency (EPA) (2022).

2.4.1 Social Interdependence

The social interdependence level is rising quickly. It should be noted that the economy benefits from the efforts and abilities of societies, which produce trash that is recycled back into the economy or put in the environment (EPA, 2022). Thus, societies regulate the economy and the environment. The concept of interdependence appears in a variety of ways, such as cultural connection and insertion, which can be interpreted as an eventual pattern of decreasing pressure on jobs, salaries, and the circumstances of work, and, maybe, even a global civil society partial emergence (Paehlke, 2011).

The universal necessity for constantly increasing career possibilities in the context of automated manufacturing and reductions in the workforce made available by automation is another example of social interdependence (Paehlke, 2011). The 500 wealthiest global firms account for an increasing portion of the world’s economic activity, even though their employment has remained relatively stable. Reducing staff and restructuring were the keywords of this century’s progressively interconnected global economy. The reality that

resulted from that is a rise in social interdependence shown in the desire for accessibility to markets, capital, and employment opportunities on a global scale (Paehlke, 2011). That is related to the rising economic and social inequalities in most countries. As a result, the earliest phases that comprise what has been called global civil society include another element of social interdependence (Paehlke, 2011).

2.4.2 Economic Interdependence

After the digitalisation and globalisation process, and affordable transportation and shipping services, economic interdependence has diversified to include various areas of the economic cycle and developed into alternative forms, such as the global systemic integration of manufacturing and advertising (Paehlke, 2011). Since economic activities are occurring in nearly every country, transnational companies are becoming increasingly global. Cross-continental economic transactions have increased significantly since the second half of the 1990s, probably most effectively demonstrated by global media companies and large-scale “virtual” banks’ (Paehlke, 2011, p. 5). Thereby, “controlling the value chains of low-carbon energy technologies is vital for economic competitiveness, national security, and energy independence” (Van de Graaf et al., 2020, p. 4). Primary company identities are now developed internationally through increasingly global digital interaction technologies. Digitalisation is the foundation for globally integrated manufacturing and the flow of economic resources at the international level (Paehlke, 2011).

2.4.3 Environmental Interdependence

Specific elements of our reliance on the environment have always existed, but the natural environment has no political borders established by humans (Paehlke, 2011). Nevertheless, environmental interdependence is much more universal, shared, and challenging nowadays. One of the main reasons why only local authorities, or even national ones, are not effective anymore is the complicated and ongoing transfer of harmful chemicals. Challenges can only be dealt with at higher regulatory levels without geographical and legal balance between benefits and expenses (Paehlke, 2011). If not, one jurisdiction would economically profit while another would suffer ecological expenses. “Since climate change is a global problem, an effective strategy requires strong international agreements, to fully acknowledge and quantify the potential benefits in terms of GHG emission reductions” (Noussan et al., 2020, p. 20). This issue is becoming more and more multilateral and

international.

Furthermore, the economy and society also benefit from the environment. The supply of goods like fish, air, fruits and vegetables, water, wood, coal, raw materials, and petroleum, the pollination of plants, the preservation of biodiversity, the breakdown of wastes, the control of radical weather conditions, the contribution to weather stability; and the supply of free time (EPA, 2022). Then, the relationship between nature and humans is complex and reciprocal (Paehlke, 2011). Human activity in every country has an impact on biodiversity and climate change. As a result of that, people living far away from the food, air, and water that others need are also impacted (Paehlke, 2011).

Since sustainable development relies on the core interdependence between human and ecological systems, the EPA (2022) implemented a systemic strategy demonstrating the connections between the three sustainable development pillars – social, economic, and environmental, for the Report on the Environment (ROE). This system helps to interpret significant fundamental relationships between quantitative ROE indicators linked to the primary system's components and qualities and how they may be included in sustainability. The five founded topics of “air, water, land, human exposure and health, and ecological conditions” will be the ROE's focus (EPA, 2022). Most of the indicators in its current edition focus on ecological factors, but a few also deal with social, human well-being, and vulnerability circumstances.

3. Research Methodology

3.1 Methodological Framework and Search for Literature

The methodology applied to develop this research is mainly qualitative, but there are also quantitative inputs. Through documentary analysis, “the qualitative researcher is expected to draw upon multiple (at least two) sources of evidence; that is, to seek convergence and corroboration through the use of different data sources and methods” (Bowen, 2009, p. 28). Identifying, choosing, evaluating, and synthesising information gathered from documents are all parts of the analytical process. “Analysis should be interpretative, alert to context, language, and meaning, and cautious about drawing large conclusions without corroboration” (Gorsky & Mold, 2019, p. 94). By using this approach, this study aims to synthesise data related to this thesis via an in-depth review of primarily academic papers, books, dissertations

and theses, and government documents to cover the economic and environmental dimensions of sustainable development that are closely relevant to the subject concerning the impacts of EU-funded macro green transition projects on local people's livelihoods in rural areas in Western Spain.

There are several criteria for the interpretation of documents to keep transparency concerning methodology and theoretical presumptions (Gorsky & Mold, 2019). Next, the researcher must determine if additional different papers support or oppose the evolving interpretation as it is created based on a particular source or a combination of them. According to Gorsky and Mold (2019, p. 91), "this process can support the development of a comprehensive analysis, or, may be referred to as 'triangulation', suggesting that if multiple methods or independent datasets point towards the same conclusion, the explanation may be considered more plausible". Furthermore, acknowledging the writer's implicit meaning for readers to take in from the author's context presumptions is also crucial (Bowen, 2009).

3.2 In-field Research Internship and Data Collection

3.2.1 Data Collection Methods

An in-field research internship also took place to conduct semi-structured research interviews and engage in participant observation. The qualitative research interviews aimed to explain and describe the significance of key concepts in the interviewees' daily lives. The primary goal of conducting interviews is to understand the significance of the interviewees' responses (Kvale, 1994). From the qualitative approach lens, semi-structured interviews are particularly suitable for creating conversations and situations that facilitate the natural expression of perceptions and perspectives by the people who are the subjects of the investigation. That is why semi-structured interviews include several essential inquiries to help outline the topics to be covered (Gill et al., 2008). However, they also give the interviewer or respondent the freedom to go off course to dig slightly deeper into a concept or response. That adaptability, especially compared to structured interviews, enables identifying or developing data that respondents value but that the scientific community may not have first deemed relevant (Gill et al., 2008).

There are four types of semi-structured interviews: focused interview, semi-standardised interview, problem-focused interview, and expert interview (Flick, 2012). For this study, the semi-standardised semi-structured interview was the one which fit the most.

The design and implementation of the semi-standardised semi-structured interview have as its starting point that the person interviewed has some special knowledge about the research topic, which justifies them as subjects of information (Flick, 2012). That also poses the suitability of a greater standardisation of the questions to get their cultural wealth and complexity. Through this approach, subjective theories would be made up of different articulated layers: external-explicit – layers, which can be brought to light from a conversation fostered by open questions, and internal-implicit – layers, which can just be consistent and articulated with the others if they are got from a combination of different types of questions (Groeben, 1990). Through open questions, an attempt is made to get an approach to the explicit suppositions – external layer – of the subjective theory of the person interviewed. Questions guided by the theory-hypothesis scientific method support the purpose of converting the implicit knowledge of the interviewee more explicitly. And confrontation questions seek to release contrast points between the interviewee's initial statements – corresponding to the explicit assumptions of its subjective theory and those that respond to its more internal and implicit assumptions (Flick, 2012).

At the very beginning, when the researcher arrived and started to work with the Research Institute of Science and Technology Studies at the University of Salamanca, several meetings with people from different research areas such as economy, biology, and sociology... took place. After having all of them, it was agreed to record the interviews, which would be developed during the fieldwork, to analyse the transcripts and get the results from that analysis. Thus, the researcher started to carry that method out. Nevertheless, they did not seem comfortable speaking when recording the interviews. Hence, that method was adapted to get the most reliable data.

The idea from the beginning was to develop the interviews while the researcher was writing quotes down in his notebook. Afterwards, the researcher also recorded himself explaining every conversation to have quotes to cite and the overall ideas of every interview. Ultimately, that method was used as it was easier to reach more citizens and have a larger and broader picture.

Along that line, participant observation is a research approach in which the researcher actively participates in the participants' daily routines. It has been widely used in different disciplines and research areas in the academic world (Musante & DeWalt, 2010). Participant observation is particularly a qualitative research methodology in which the researcher studies

a group of people through observation and by participating in mundane activities (Kawulich, 2005). Thus, the researcher immerses himself in the participants' daily activities to record their behaviour in the most significant number of possible settings. Through immersion in the study site, researchers can observe the daily life of the participants: their exchanges with each other, their formal and informal conversations, habits, and hobbies. That allows the researcher to understand better what is happening in a given group and its cultural environment, providing more reliability and plausibility to the researcher's interpretations of the observation (Musante & DeWalt, 2010).

Furthermore, participant observation allows the researcher to collect qualitative data through various types of interviews and quantitative data through surveys and different quantitative observation methods. The participant observation method aims to capture behaviour in as many diverse environments as possible (Kawulich, 2005). Direct observation does not entail contact between the researcher and respondents, which is how participant observation varies. Participant observation connected to the research when the researcher spent much time living in a small town. However, it is currently applied in various contexts and for varying lengths, ranging from a single contact to several years (Musante & DeWalt, 2010).

3.2.2 Sample Identification and Data Inclusion and Exclusion Criteria

The profile of those interviewed is particular because, for this study, it was required that most of them were ordinary people from the region. They needed to have been living in the surrounding areas where the Francisco Pizarro solar plant was for a few years, at least 5. They also had to have been living there before the Covid-19 pandemic outbreak to be able to have gone through the installation process of the solar plant, some years before, and the current situation. In that way, the age group of the respondents was older than 30 years old, and there were two different participant groups according to their age: young (≤ 45) and old (> 45) people. Apart from that, people from every background wanted to be selected. That is why some respondents also belonged to Iberdrola or any outsourced company, such as cleaning or security companies. Also, a few others who could be included within the villages' "elites" – politicians, doctors and nurses, and the principal traditional local bar/restaurant owners, were interviewed to get a broader contextualisation of the villages' situations before and after the solar plant installation.

3.3 Data Analysis and Research Process Rigour

The collected data through the in-field research internship were interpreted through narrative analysis. Stories are used in narrative analysis to explain life experiences and behaviour (Earthy & Cronin, 2008). That is why an essential component of narrative research is storytelling. Dialogue occurs throughout the narrative interview. Both individuals can experience extreme feelings throughout this process, which may be highly personal (Earthy & Cronin, 2008). As a result, only some people should conduct qualitative research this way. The interviewer must have excellent listening skills and be familiar with the interview procedure. To give honest narratives, the interviewee must also feel at ease. After collecting the stories, scholars examine and analyse the interview content to identify recurring themes and patterns (Earthy & Cronin, 2008). They note them, contrast them with other studies on the same topic, determine how everything fits together, and develop a theory that can account for these results. Narrative research has been a useful method for many social scientists to investigate their hypotheses and ideas (Earthy & Cronin, 2008). The fundamental reason is that narrative analysis is more extensive and in-depth. It aids scholars in developing a deeper comprehension of their field of research and understanding why individuals behave in certain ways (Oliver, 1998).

In conducting narrative analysis, researchers need to be aware of the social, cultural, and historical background of their study participants (Oliver, 1998). That helps researchers understand what their participants' anecdotes are attempting to say. It would seem natural for individuals who research human experience to employ a methodological approach that relates to how people build the interpretations of personal experiences since people give significance to their lives via the stories they narrate (Oliver, 1998). Scholars then use narratives to interpret and provide meaning to their experiences. Studying their stories is possible to acquire knowledge about other people's cultures, ethics, and ideals. In context-rich studies, that is also especially true since there are a lot of undiscovered significance levels that can only be discovered by having an in-depth awareness of the society or environment (Oliver, 1998).

4. Geographical Contextual Framework

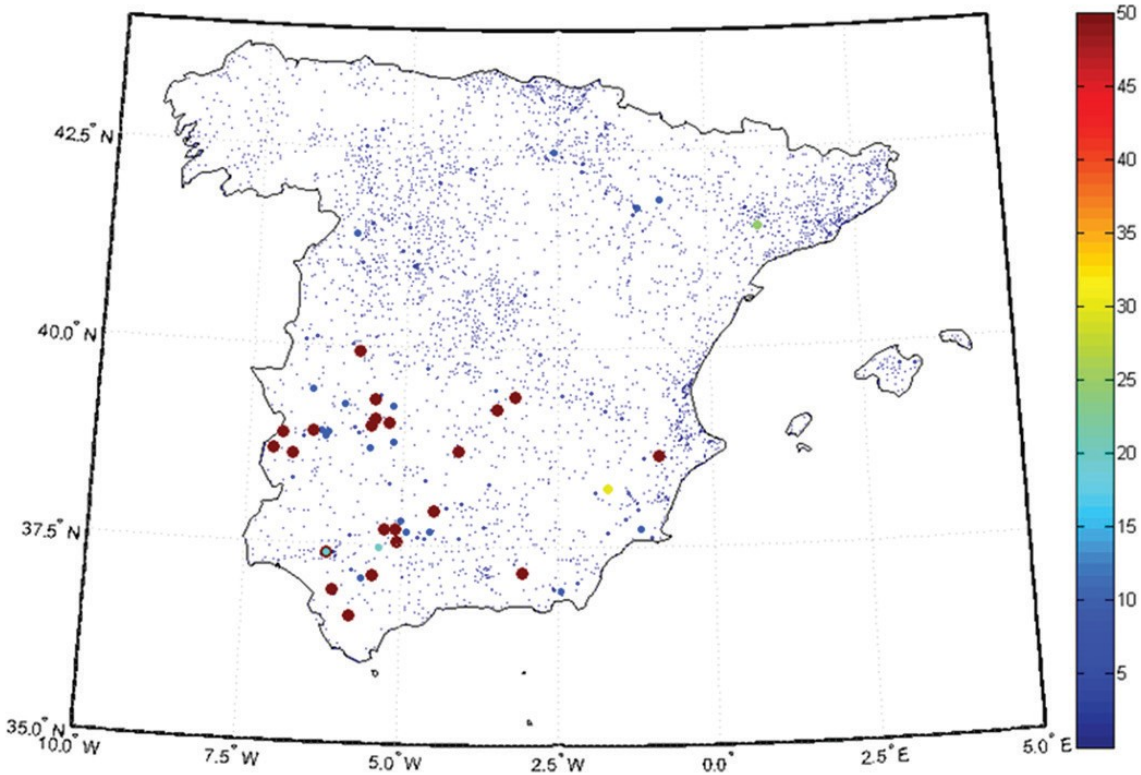
4.1 *The EU Green Bonds and the Francisco Pizarro Solar Plant*

The European Investment Bank (EIB) and Iberdrola, the most prominent Spanish green energy company, are developing renewable energy projects to foster sustainable development in rural areas in Spain. The EU bank is the largest multilateral funder of projects that contribute to the fight against climate change. The EIB is granting a 550-million-euro green loan for Iberdrola for a 1,800 MW project with an annual production of more than 1,000 GWh. Iberdrola is a world leader concerning sustainable and green funding, which has established itself as a global reference – the transnational company in the world to issue green bonds (Iberdrola, 2022a). Iberdrola has a renewable energy monopoly in Spain with an annual production of more than 19,300 MW. Due to its investment strategy, the operational market is expected to increase to 25,000 MW in the upcoming years. By 2025, the corporation aims to invest 14,300 million euros in implementing a comprehensive renewable energy and smart grid strategy (Iberdrola, 2022a). In addition, Iberdrola signed many long-term power purchase agreements (PPAs) with major industries across several sectors to ensure the project's sustainability. To meet the energy demands of their installations in Spain, PepsiCo, Danone, and Bayer will be provided with 100% renewable energy from this station (Iberdrola, 2022a). Shortly, Iberdrola will be a global key driver for the solar energy industry, which – apart from lowering the energy prices- provides security against possible future changes in the energy price levels and allows the production of low-carbon energy. Indeed, Iberdrola already monitors 40% of the self-consumption facilities in Spain (Iberdrola, 2022a).

Extremadura has been one of the regions in Europe that are promoting the development and implementation of sustainable development the most lately through innovative projects (Iberdrola, 2023). That can be realised in [Figure 4](#), in which it can be proved that several of the largest solar installations in Spain are in this region. It facilitates the increase of interest and the inclusion of companies and investments directly impacting society by creating employment in the project's area. Extremadura has become the Iberdrola's spearhead for the commitment of the company to foster and develop sustainable development and the renewable energy industry in Spain. The company invested 518 million euros, which several local businesses and suppliers benefited from. Due to that reason, the European Union is launching recommendations and improvements to boost the administrative processes

required by some of the 27 EU Member States and make it easier and faster for companies to develop these kinds of projects.

Figure 4. Solar Plants Map by Power in Spain (2018).



Source: Perez-Mora et al. (2018).

The Iberdrola’s “Francisco Pizarro” project, the largest solar plant in Europe and the most extraordinary station the company runs globally, currently operates in Extremadura. A total of 1.5 million solar cells make up the Francisco Pizarro solar plant, which will directly provide renewable electricity to supply over 334,000 households, more than the total inhabitants of Badajoz, Cáceres, Plasencia, and Don Benito – the largest cities in the region (Iberdrola, 2022a). It will be the largest solar plant in Europe, with more than 1,300 hectares. This investment is also strategic from the EU point of view since it is aimed at strengthening the EU energy self-sufficiency, security, and SDG achievement. It will directly or indirectly provide green and sustainable energy to about 1 million households in the region and compete with fossil fuels. It has also created about 2,100 jobs in its first construction year (Iberdrola, 2022a). 60% of those jobs are local workers from those rural areas. It also implied that all the jobs created in the short-term exploitation phase, plus those in all the other related sectors and

will prevent the emission of 215,000 tons of CO₂ annually (Iberdrola, 2022a). Decreasing carbon emissions and air pollution reduces the negative impact on people's health and electricity is generated from low-carbon resources (solar PV). That will also solve the market failure of unfavourable climatic and environmental consequences (European Investment Bank, 2022a).

4.2 Iberdrola's Sustainability Commitment in the Region

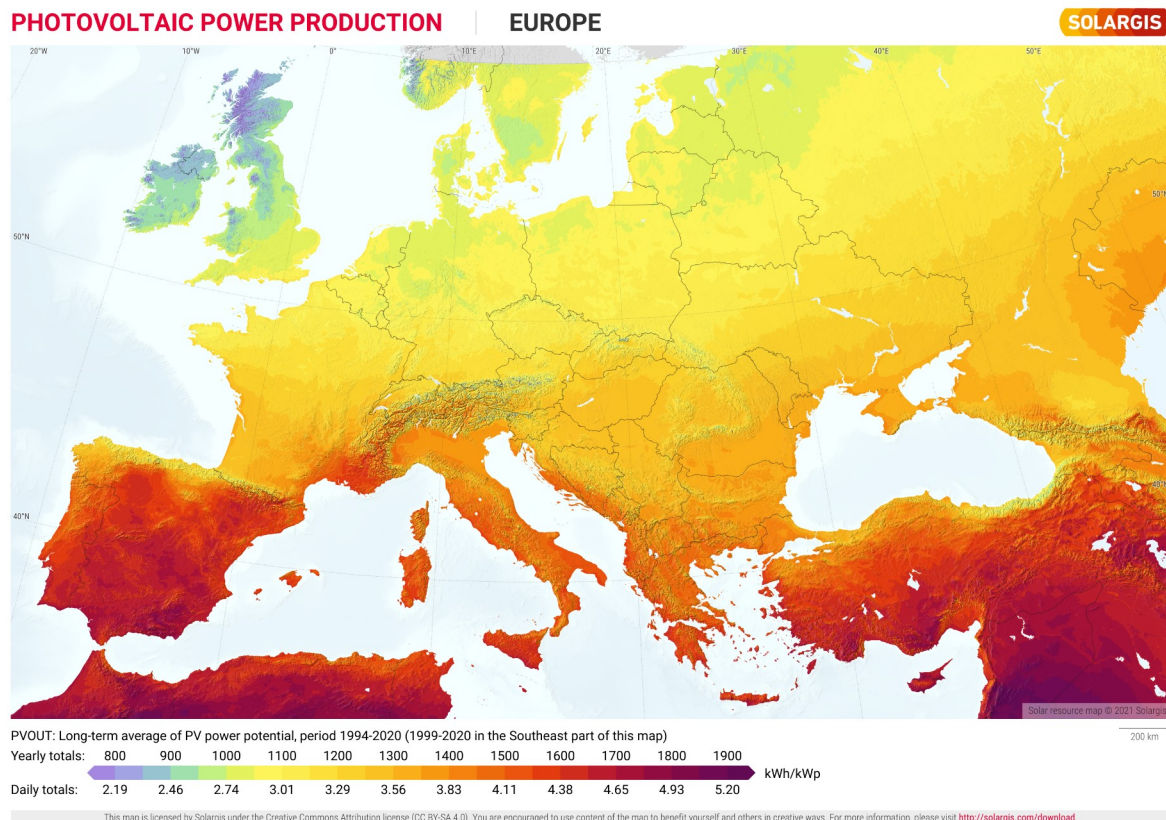
Iberdrola is working on establishing the first “solar community” in Spain in Cedillo, a village in Extremadura. In that way, every single inhabitant of that town could take advantage of saving from 30% to 50% of the money on their electricity bills (Agencias, 2022; Canal Extremadura, 2023; El Periódico Extremadura, 2022; Europa Press, 2022; Iberdrola, 2022b; La Razón, 2022; Palacín, 2022a; Región Digital, 2023; RTVE, 2023; SolarNews, 2023). To do that, the company is installing small photovoltaic plants with a combined power of 340 kW on the roofs of municipal buildings and land given by the city council. From its side, Iberdrola is undertaking the installation and management expenses of this collective self-consumption system, which has been put into operation this year. In undertaking this initiative, the company purports to contribute to the rural development of the town, copying with the rural depopulation in the “Empty Spain” and attracting new citizens to the town (Iberdrola, 2022b).

The Iberdrola Biodiversity Strategy establishes three main work lines: 1) an accounting reference framework for quantifying the positive and negative impacts on ecosystems caused by the installation of renewable energy projects, 2) the need to strengthen initiatives for biodiversity protection and restoration to achieve the sustainable development ambitious goals, and 3) the need to boost a systemic change through biodiversity initiatives, the promotion of protection and restoration research, and the sustainability education required to achieve sustainable development (Iberdrola, n.d.-a). According to the first one, the company will be able to properly monitor the fulfilment of its objective and look through its initiatives to ensure its achievement. Following the second line of the strategy, Iberdrola has set an ambitious target to assess and check the assets initiatives of all its innovative technologies in 2025 (Iberdrola, n.d.-a). The goal for 2030 considers reviewing and developing strategies for all of its renewable energy projects worldwide.

4.3 Geographical Justification

The EIB is financing solar plants and wind farms in several cities in Western Spain, mainly in rural areas of Extremadura and Castilla y León. It should be noted that it is like that because the Mediterranean region, mainly Spain, is, by far, the one with the largest photovoltaic power potential in Europe, as shown in [Figure 5](#). These investments will produce and increase sustainable green energy, but the security of supply and availability will also be improved. Because of their outstanding social benefits, equitable employment generation, and effective governance structure, these projects should produce assets of very high quality (European Investment Bank, 2022a). Indeed, the Francisco Pizarro solar energy plant directly contributes to the EU 32% renewable energy consumption objective by 2030 and enforces the achievement of the Spanish objectives regarding using 42% of renewable energies by 2030. Nevertheless, it also has an impact on about 725,000 citizens. Hence it is critical to study how these investments affect people's lives.

Figure 5. Photovoltaic Power Potential Map in Europe (2020).



Source: SOLARGIS (2020).

Rural areas in Europe, since the 1950s, have experienced a process of social and economic decline due to significant economic transformations and, mainly, restructuring in the agricultural sector (Masot, 2009). These regions have moved from subsistence farming to a more competitive one, entering a development dynamic based on investment and modernisation that just a few people could keep up with. There was a radical decrease in agricultural assets in these rural areas, which were moved to industrial and urban ones (Masot, 2009). As a result, in the last few years, there has been severe demographic regression and population ageing in EU rural areas. By contrast, in those areas, an industrial and service economy has been developed lately, provoking significant socioeconomic gaps between the rural and urban areas of the EU (Masot, 2009). Those are why politicians from these areas in Spain are taking risks and installing renewable energy projects. Regions such as Extremadura, Andalucía, Castilla y León, and Castilla-La Mancha had never even considered industrialisation. Spain never was at a vantage point regarding industries and even less regarding energy. Nevertheless, the climate crisis has positioned it there due to solar energy. Neither the country nor its rural regions want to lose the chance of having a significant role in the EU energy market and industry.

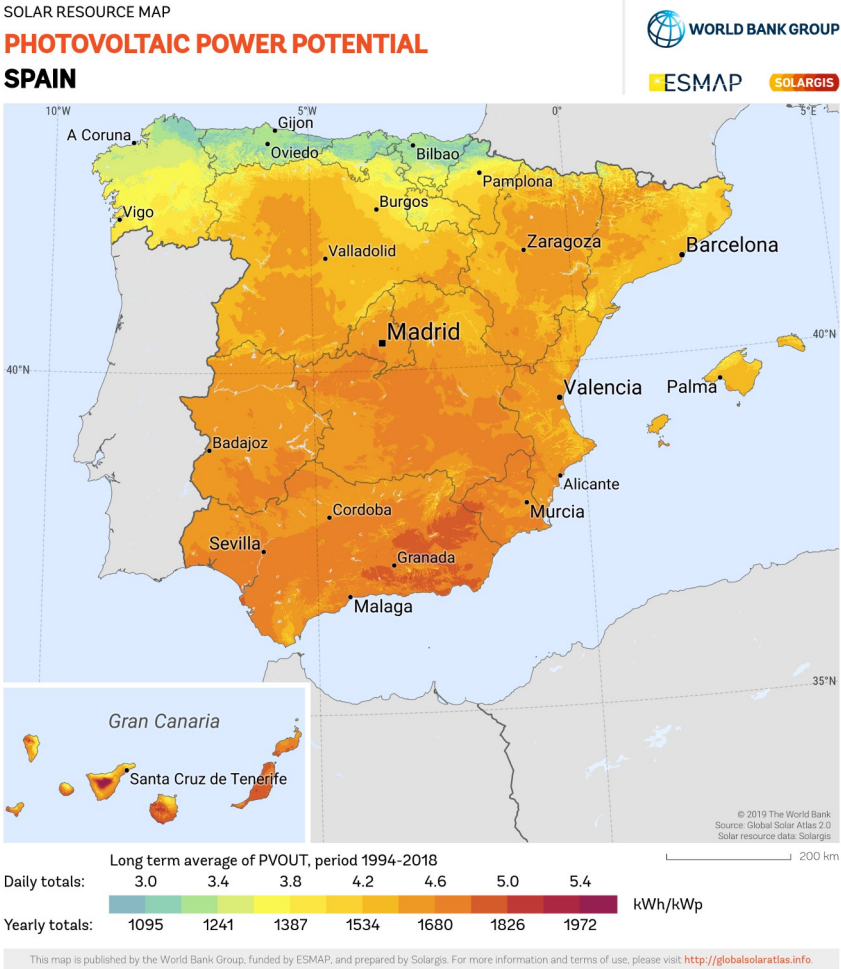
Beyond the aforementioned, Extremadura has been experiencing underdevelopment for a long time as, since the 19th century, despotism has been the main political trend in this region (Franco, 2015). That is due to the underdevelopment central planning model established by the economic and political elites benefiting from the people's region. In addition, that is the fact that has made Extremadura is still suffering from underdevelopment nowadays (Franco, 2015). The underdevelopment foundation is the rural migration and depopulation, alongside feudal times from which most of the lands are still owned just by a few large landowners. That is demonstrated by the EU socioeconomic indicators, especially from the data collected in the second half of the last century. This region has been going through a period of crisis in the last decades, but it did not go through many changes during the 2007-08 financial crisis, even though Spain was one of the most impacted countries in the world (Franco, 2015). Apart from that, underdevelopment in this region is a set of structural factors that prevent the people and society from developing, which is usually related to several similar definitions of poverty. In that way, underdevelopment is a set of barriers that challenge people's livelihoods and life quality in rural areas (Franco, 2015). Those obstacles are one of the main consequences of unequal social class relations. The reality is that

underdevelopment tends to perpetuate itself, ending up in the “underdevelopment trap” – more appropriately known as the poverty trap, which tends to be transmitted across generations (Franco, 2015, p. 139). That makes it increasingly difficult to overcome underdevelopment.

It is no wonder that suffering that much from young people leaving the region has impacted the population pyramid due to the ageing effect. Many workers between 20 and 40 years old moved to an urban area (Rosado, 2006). Hence, it was not only the ageing issue but also the future situation of the region. If young workers move out of the region and develop their lives somewhere else, their children would be born in that place, and most of them would grow up in an urban area and go to the rural one on holiday to visit family (Rosado, 2006). Thus, the population’s average age would increase, and the working lives of those rural areas would die. Notwithstanding all the difficulties that migratory movement implied, such as rootlessness, family separations and issues, loneliness, and abuses concerning the sense of belonging among young people, rural areas’ socioeconomic situation has still been challenging and complex (Rosado, 2006).

For the previously mentioned reasons, the project case study was the development of a powerful photovoltaic system in the region of Extremadura in Spain. There are also studies on similar topics in that region, such as the one developed by Díaz-Vázquez and Caldés-Gómez (2018). Besides possessing abundant solar resources, this region is exceptionally devoted to renewable energy. For instance, solar energy accounts for 65% of Extremadura’s energy consumption (Díaz-Vázquez & Caldés-Gómez, 2018). Extremadura is a world pioneer in solar energy, ranking first worldwide for solar-generated electricity per citizen and photovoltaic coverage of total energy consumption. It is that way because it is one of the regions in Spain with the largest photovoltaic power potential, as [Figure 6](#) demonstrates.

Figure 6. Photovoltaic Power Potential Map in Spain (2019).



Source: SOLARGIS (2019).

This region is going to be essential for Iberdrola’s renewable energy plan. With more than 1,700 million euros, Iberdrola will establish more than 2,800 MW of renewable energy in the area between 2020-2025, creating about 7,400 jobs (Iberdrola, 2022a). A third of the installed PV potential and more than 40% of the total CSP capability in Spain are in that region (Díaz-Vázquez & Caldés-Gómez, 2018). That initiative was a pilot project to demonstrate why solar production technical and financial facilities in Southern Europe would be suitable for exporting renewable power to Central and Northern European nations. To illustrate the synergy and additional value that innovations may offer when used in the same installation, the project would combine a hybridised CSP plant with a PV plant (Díaz-Vázquez & Caldés-Gómez, 2018). A storage system would also make the power supply more flexible and stable. That initiative would also contain a unique research centre of international

significance. Such a network would offer a range of opportunities for worldwide use, including public and commercial partnerships, combining funding from regional, national, and international agencies, and offering a framework for collaboration to any actor involved in photovoltaic research (Díaz-Vázquez & Caldés-Gómez, 2018).

5. Results

To analyse the collected data from the internship fieldwork, the data were initially categorised into three main groups – as shown in [Table 1](#), [Table 2](#), and [Table 3](#), corresponding to each village in the case study: 1) Almaraz, 2) Torrecillas de la Tiesa, and 3) Aldeacentenera. Subsequently, within these groups, further subdivisions were made based on the three dimensions of sustainable development: 1) social, 2) economic, and 3) environmental.

Table 1. Participant Information (Almaraz village).

Participant Code	Town	Gender	Age Group	Social Class Group	General Perception	Economic	Social	Environment	Length of Stay (years)
1-MO	Almaraz	Man	Old	Retired	Neutral	Neutral	Neutral	Neutral	69
2-MO	Almaraz	Man	Old	Retired	Neutral	Neutral	Neutral	Neutral	65
3-MO	Almaraz	Man	Old	Retired	Neutral	Neutral	Neutral	Neutral	75
4-YO	Almaraz	Man	Young	Iberdrola	Positive	Positive	Neutral	Positive	8
5-WO	Almaraz	Woman	Old	Worker	Neutral	Neutral	Neutral	Neutral	56
6-MY	Almaraz	Man	Young	Politician	Neutral	Neutral	Neutral	Neutral	41
7-MO	Almaraz	Man	Old	Politician	Neutral	Neutral	Neutral	Neutral	49
8-WY	Almaraz	Woman	Young	Politician	Neutral	Neutral	Neutral	Neutral	33
9-WO	Almaraz	Woman	Old	Worker	Neutral	Neutral	Neutral	Neutral	61
10-MY	Almaraz	Man	Young	Worker	Neutral	Neutral	Neutral	Neutral	37

Source: Author's Elaboration.

Table 2. Participant Information (Torrecillas de la Tiesa village).

Participant Code	Town	Gender	Age Group	Social Class Group	General Perception	Economic	Social	Environment	Length of Stay (years)
11-WY	Torrecillas de la Tiesa	Woman	Young	Bar Worker	Positive	Positive	Positive	Neutral	6
12-WO	Torrecillas de la Tiesa	Woman	Old	Worker	Positive	Positive	Positive	Neutral	54
13-WO	Torrecillas de la Tiesa	Woman	Old	Worker	Positive	Positive	Positive	Neutral	58
14-WO	Torrecillas de la Tiesa	Woman	Old	Politician	Positive	Positive	Positive	Neutral	63
15-MY	Torrecillas de la Tiesa	Man	Young	Worker	Positive	Positive	Positive	Neutral	7
16-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	48
17-MO	Torrecillas de la Tiesa	Man	Old	Worker	Positive	Positive	Positive	Neutral	56
18-MY	Torrecillas de la Tiesa	Man	Young	Iberdrola	Positive	Positive	Positive	Neutral	41
19-MY	Torrecillas de la Tiesa	Man	Young	Iberdrola	Positive	Positive	Positive	Neutral	37
32-MY	Torrecillas de la Tiesa	Man	Young	Bar Worker	Positive	Positive	Positive	Neutral	26
33-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	75
34-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	71
35-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	74
36-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	72
37-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	68
38-MO	Torrecillas de la Tiesa	Man	Old	Retired	Positive	Positive	Positive	Neutral	78
39-WO	Torrecillas de la Tiesa	Woman	Old	Retired	Positive	Positive	Positive	Neutral	81
40-WY	Torrecillas de la Tiesa	Woman	Young	Worker	Positive	Positive	Positive	Neutral	22
41-MO	Torrecillas de la Tiesa	Man	Old	Worker	Positive	Positive	Positive	Neutral	41
42-WO	Torrecillas de la Tiesa	Woman	Old	Worker	Positive	Positive	Positive	Neutral	58

43-MO	Torrecillas de la Tiesa	Man	Old	Politician	Positive	Positive	Positive	Positive	60
60-MY	Online	Man	Young	Iberdrola	Positive	Positive	Positive	Positive	14
61-MO	Online	Man	Old	Iberdrola	Positive	Positive	Positive	Positive	8
62-MY	Online	Man	Young	Iberdrola	Positive	Positive	Positive	Positive	11
63-MY	Online	Man	Young	Iberdrola	Positive	Positive	Positive	Positive	7

Source: Author's Elaboration.

Table 3. Participant Information (Aldeacentenera village).

Participant Code	Town	Gender	Age Group	Social Class Group	General Perception	Economic	Social	Environment	Length of Stay (years)
20-MO	Aldeacentenera	Man	Old	Worker	Positive	Positive	Positive	Neutral	65
21-WO	Aldeacentenera	Woman	Old	Bar Worker	Positive	Positive	Positive	Neutral	49
22-WO	Aldeacentenera	Woman	Old	Retired	Positive	Positive	Positive	Neutral	70
23-WO	Aldeacentenera	Woman	Old	Worker	Positive	Positive	Positive	Neutral	56
24-MO	Aldeacentenera	Man	Old	Worker	Positive	Positive	Positive	Neutral	59
25-WO	Aldeacentenera	Woman	Old	Worker	Positive	Positive	Positive	Neutral	53
26-WO	Aldeacentenera	Woman	Old	Worker	Positive	Positive	Positive	Neutral	46
27-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	16
28-WO	Aldeacentenera	Woman	Old	Worker	Positive	Positive	Positive	Neutral	61
29-MY	Aldeacentenera	Man	Young	Bar Worker	Positive	Positive	Positive	Neutral	31
30-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	22
31-WO	Aldeacentenera	Woman	Old	Worker	Positive	Positive	Positive	Neutral	48
44-MO	Aldeacentenera	Man	Old	Bar	Positive	Positive	Positive	Neutral	50

	tenera			Worker					
45-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	30
46-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	24
47-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	39
48-MY	Aldeacentenera	Man	Young	Worker	Positive	Positive	Positive	Neutral	23
49-WO	Aldeacentenera	Woman	Old	Retired	Positive	Positive	Positive	Neutral	75
50-MO	Aldeacentenera	Man	Old	Worker	Positive	Positive	Positive	Neutral	51
51-WO	Aldeacentenera	Woman	Old	Retired	Positive	Positive	Positive	Neutral	77
52-WO	Aldeacentenera	Woman	Old	Retired	Positive	Positive	Positive	Neutral	65
53-WO	Aldeacentenera	Woman	Old	Retired	Positive	Positive	Positive	Neutral	75
54-MO	Aldeacentenera	Man	Old	Retired	Positive	Positive	Positive	Neutral	69
55-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	36
56-MY	Aldeacentenera	Man	Young	Worker	Positive	Positive	Positive	Neutral	44
57-WY	Aldeacentenera	Woman	Young	Worker	Positive	Positive	Positive	Neutral	20
58-MY	Aldeacentenera	Man	Young	Politician	Positive	Positive	Positive	Neutral	38
59-WO	Aldeacentenera	Woman	Old	Politician	Positive	Positive	Positive	Neutral	53

Source: Author's Elaboration.

5.1 Almaraz

In the case of Almaraz, the village has no solar panel installed but it hosts the electrical substation that distributes the power all over the region and the country. The overall local perception of the solar plant's impact on their livelihoods is neutral. It is important to remark that this village only enjoys a few of the benefits of the solar plant of the study because the fields used to install it do not belong to this village. According to Participant 7-MO:

“This village has just one of the largest power substations in the region, created 44 years ago when the nuclear plant was installed in the same village, and which nowadays is being dismantled due to the rejection of the Spanish government to the suggestion from the EU about including nuclear energy as green energy”.

In that way, *“people in this village are not objective concerning the solar plant was acknowledged because they have something “much better that provides the village much more energy, money, and benefits than any solar plant in Spain” (6-MY).*

It has to be emphasised as well that this town has the “Almaraz I” and “Almaraz II” solar plants, also run by Iberdrola, and participant 7-MO stated:

“We are working on establishing a solar energy cooperative in the village, quite similar to the solar energy community Cedillo has after the instalment of another Iberdrola solar plant, but we need the company to be interested in it and assign one of its workers to be the direct contact person between the city council and Iberdrola”.

That would consist of installing solar panels on top of public buildings such as the city council, the library, the school, the health centre, and the kindergarten to produce electricity directly for the town and avoid energy transport and taxes. In that way, the local government would be able to remove the taxes on electricity and, consequently, reduce the electric bill of every single citizen from 25% to 40%, which is nowadays rather crucial for the people's livelihoods as everyone is quite worried about the energy prices.

5.1.1 Social Dimension

From the social perspective, *“Iberdrola has always tried to collaborate and help associations and NGOs of the village when they ask for help to carry their activities out” (5-WO).*

“The company has also delivered several training courses in the village and all over the area in public libraries and Cultural Centres for local people to take part in them and be able to work in the company” (4-MY).

In that way, locals could work at Iberdrola as it has installed several solar plants in the region, especially in that area. Hence, these workers could live in their villages and commute to the surrounding ones to work improving the situation of all those villages.

“Once the installation process of the solar plants is over, there are not many people required to work on it, so several people from the village were interested in keep working in that job and are currently doing so in different plants of the region and that is their source of income” (4-MY).

“Iberdrola’s initiative to keep local workers to work in the region provoked some young people from the village to stay to live here instead of moving somewhere else because they had the chance to access an unlimited working position with decent working conditions and a slightly better salary than the average in Spain” (5-WO).

Nevertheless, these days after the energy crisis outbreak, that might not be a chance to earn just the average income in Spain if travel expenses are not covered, something barely seen in the country. Since petrol prices have significantly increased, adding to the overall price increases all over Europe, an average income in Spain nowadays would not be sufficient to commute by car every single day and still save some money.

5.1.2 Economic Dimension

From the economic dimension lens, every participant said that the Francisco Pizarro solar plant, and the other solar plants installed in that village, do not contribute much to the people’s and the village’s economic situation. However, it is also essential to highlight the fact that, in the case of this village, the grounds in which the solar plants – not the Francisco Pizarro – were installed belong to four former large landowners from the feudal time in Spain. That means there were not so many people who could benefit in that sense because Iberdrola is not renting their lands yearly, and just a few people were enjoying that passive extra income. In general terms, the citizens know that the primary source and livelihood of their economy is the nuclear plant, which will be completely dismantled by 2028. It provides them with many jobs, new citizens, and people commuting daily. That allows the village to be alive and have economic activity from people living in the village’s surroundings during working days. In addition, the nuclear plant has allowed the local government to remove taxes on circulation and roads, water, garbage collection, and properties and to build a free public gym, swimming pool, kindergarten, and elderly care facility. According to Participant 7-MO:

“For us, the solar plants in the area and the power distribution we carry out from the Francisco Pizarro one is nothing more than an extra income that makes no difference for the city council and, taking into consideration that our main source of income (the nuclear plant) is coming to an end in 2028, it is not our main concern nowadays as long as they respect tourist areas and routes”.

5.1.3 Environmental Dimension

Concerning the environment, as these kinds of projects must go through so many studies and bureaucracy at the local, regional, national and European levels, *“it is hard to find any strong argument to criticise them”* (8-WY). In that way, there were no inhabitants of this village that stated that these kinds of projects have a negative direct impact on the environment because *“the few ones which appeared at the very beginning, mainly high temperatures for beekeeping and livestock farming disturbances, were already dealt with by the company”* (8-WY). The main negative impact everyone stated was the landscape because they are used to seeing all that area without any form of industrialisation. For the population there, it makes them very nostalgic to look at the countryside nowadays and be unable to recognise where they grew up. In the same way, many also acknowledge that the region has no other industrialisation way and resigns themselves to live with that landscape.

“These projects are always installed in areas in which there was not so much flora and there are no irrigated lands to cultivate crops as those fields are, on the one hand, the ones adapted and taken care of by the city council for trekking and hiking routes to improve tourism in the village and, on the other hand, not very common in that area of the region as it happens in La Vera and El Valle on the other side of Cáceres” (8-WY).

In addition, the panels were adjusted to live together with the area’s local livestock and wild animals to prevent disruption.

5.2 Torrecillas de la Tiesa

5.2.1 Social Dimension

When we look at the situation of Torrecillas de la Tiesa, one of the two main villages hosting the Francisco Pizarro solar plant, the primary perception of the population regarding its impact is positive. It is like that because every single participant stated that the village's

situation, in general terms, has improved very much since its installation due to the extra budget the city council has now to invest in social and economic initiatives. In economic and social terms, they stated that, during the construction process, everything in the village improved, but once its construction was over, it returned to the same situation.

“Quite a few more than a third of the 1,000 people that permanently worked for two years in the construction of the Francisco Pizarro solar plant were locals, but that amount has dropped nowadays to just a few maintenance technicians, security guards, and cleaners when the plant was put into operation” (43-MO).

“That is the negative point those huge renewable energy projects imply, they require a lot of labour force at the very beginning during the construction and installation steps, but very few workers when the solar plant has already been put into operation at full capacity and only requires maintenance” (63-MY).

Furthermore, everything is also getting better again because the Covid-19 pandemic crisis is over, and everything is recovering.

One of the main points was that so many farming lands were not used because there was little agriculture in that area and livestock farming can live together with the panels. In that way, according to Participant 16-MO: *“Lands are rented to some citizens from the village and are nowadays a passive income for them”*. In addition, Participant 17-MO stated:

“Before, when I was cultivating the lands, I was earning about 200 euros a month per ha, while now that I am renting them, I am earning not much less than 2000 euros a month per ha”.

“The landscape is going to change a lot but considering my age and how much I have worked so many years, that money is worthier than keeping those lands for farming”.

In this village, as it happened in the one before, Iberdrola also arranged and organised relatively affordable training courses for local people to be able to work with them during the solar plant construction and after, if they developed their work correctly, to keep working with them in other projects in the area.

“It gives young people a chance to learn new work and abilities that open the door to other employment opportunities in similar projects in the area” (43-MO).

“It is true that, at first, it was a working opportunity that in most cases it was just for a few months, but it is also another chance for the future as, whoever can move and

commute to other close areas of Extremadura, is not going to face so many issues to be employed” (63-MY).

They first offered those training courses in the two villages where the solar plant was installed. If they still needed more workers, they also offered it in the surrounding villages, and especially in the population centres of the two larger towns in that zone to allow the most people to participate in them. Nevertheless, that made local subcontracted companies teach those courses without proper monitoring from Iberdrola, and some needed to respect the supposed syllabus. In that way, Participant 15-MY stated:

“Some training courses were not enough to be prepared to develop the required work as later the company was too strict during the construction process”.

“Those training courses were imparted in the village’s Culture Centre, and that provoked that there were so many more people involved and going every week there. Hence there was the chance to arrange so many freer cultural activities for the citizens such as writing and drawing competitions, digital training courses not to feel excluded from the current society, women’s activities for old people in rural areas, an employment office, and a library” (13-WO).

It must be taken into consideration that all these services and activities are funded and provided by the city council of a village of a few more than 1000 inhabitants.

“In contrast to Aldeacentenera, the core services of this village were already fixed before the Francisco Pizarro solar plant was installed, and after its construction, it just meant that the city council does not have to worry much about the budget because we have enough to develop other social initiatives and public events for the citizens” (43-MO).

Due to that, people in the village, mainly older people, had the chance to improve their social life – due to the new day centre for the elderly, and keep up to date with the news and new technologies. At the same time, young people also had the chance to do several sports and enjoy cultural activities.

Participant 11-WY replied: *“The number of monthly customers the bar has on average has increased since the solar plant was installed because there is much more commuting in the area to other villages”.* She also had friends and knew about people who had worked in solar plant construction. Hence, she was aware that all those people had the chance to work in the company, and even though they would have to commute to different projects in the region,

they could stay living in their hometown. It should be noted the fact that it is, on the one hand, dangerous as in rural areas in Spain public transport is neither efficient nor developed and, on the other hand, nowadays it is not suitable unless the income is higher than average for young people in the country.

In the same way, Participant 42-WO also emphasised some young people from her family, and she said: *“Nowadays they have a permanent employment contract, not with Iberdrola but with a subcontracted company of the region, and that was due to the Francisco Pizarro solar plant and the chance they had to learn that work”*. Furthermore, that also allowed them to stay working on other projects in the area or move somewhere else in Spain to work on other similar projects.

“Before these large solar projects took place in this area of the region, young people had no other chance than moving to large cities either to study or to work in the construction industry, but now some of us can think about staying here” (18-MY).

In that way, they could have a chance to decide what to do in their professional lives and careers, even though they probably needed to choose in which area of expertise as it just came randomly to them. They could even think in the long-term, something quite difficult for young people in Spain, as it is tough to gain initial work experience through unpaid internships or trainees in any company. A few years ago in Spain, it was pretty standard that someone could do so in the company he/she did his/her mandatory internship while studying for a Bachelor’s degree, but that is much more difficult in the country these days. However, through these training courses, Iberdrola is still offering something similar after two other economic crises in the country.

5.2.2 Economic Dimension

Apart from that, the participants also highlighted that the local government receives so much money – about 800,000 euros/year – and it has a 5 million euros budget surplus from the solar plant nowadays. That implied so many public initiatives at the social and economic level that the city council can carry out to improve the people’s lives, such as removing taxes on garbage collection, water supply, circulation and roads. According to Participant 14-WO: *“It was also possible to offer and created several free public services such as scholarships for schools, kindergartens, an old people’s home, a gym, a swimming pool, a sports centre, a theatre and a cinema, and a cultural centre”* In addition,

“All those new infrastructures have also provoked people from surrounding villages to go to Torrecillas de la Tiesa instead of staying in theirs because either they do not have some services their home villages or these are better than the ones they can enjoy in their villages for a similar price” (43-MO).

That also contributed to improving the village’s overall situation as so many people often go to it and spend money. It can be proved through Participant’s 14-WO statement:

“After the pandemic, a restaurant had to close, but when the Francisco Pizarro solar plant continued to be built, it was able to open again – only for lunch hour though, and now it is still working like that”.

Thus, from the economic perspective, it has to be remarked that the livelihood of most of the inhabitants has not been directly affected either negatively or positively. However, through tax reductions, it has improved as people do not spend that much money on them. Looking at it through the social dimension, thanks to the budget surplus of the local government, it has also improved because now they have some free public social services and infrastructure for social activities.

Nevertheless, the main current worry of the local people from this village is the food and energy prices. That is the main reason why, even though they support the solar plant in their village and consider it to improve their livelihoods, they still complain about the situation because they got no reduction in electricity prices, and they think they deserve so. It is that way because, for the citizens, Iberdrola is taking advantage of their land to earn so much money, and it does not give direct profit to the people’s livelihoods. The lack of trust in politicians in Spain is probably a fact that also strengthens that thought. To solve that popular demand, the city council is already working on establishing a solar energy community. According to participant 14-WO: *“It is something the local government has to arrange because that price reduction on the citizen’s electricity would just come from taxes”.*

Nonetheless,

“As other villages in the region, we are also working on establishing a solar energy cooperative in the village, either using public buildings or lands, Iberdrola has told us a few times, but it does not look very likely to do so as communication is complex and there is no worker in charge of being the direct contact between local authorities and the company” (43-MO).

Participant 32-MY also stated:

“For local businesses like bars, it has been quite beneficial that they implemented a reduction on the Water Use Tax. For us, it was already quite expensive because of the extensive use and, after the Covid-19 pandemic and the energy crisis lately, it would have been much more complex to square accounts in economic terms and be able to keep our local businesses profitably working”.

Rural areas can reduce their energy costs because of renewable energy projects. They could be allowed to produce their energy using the infrastructure installed in the projects they allowed energy companies to build for their projects instead of importing fossil fuels and depending on either other regions or countries (OECD, 2012). Providing rural communities access to secure and affordable electricity may promote economic development. Thus, a comprehensive energy system that relies on small grids suitable for supporting manufacturing operations should be implemented through public policies at the local and regional levels (OECD, 2012). Due to all of that, if the village allows the company to install solar panels on the public buildings, there would be a significant reduction in the energy price for the whole population because taxes could reduce from 21% to 5% and in case any day there is an extra energy production they cannot store, the energy company would be allowed and responsible for that energy.

Participant 32-MY also remarked that more people live in the village, and the population density was controlled – something quite complex for a village in a rural area. He was able to work in the construction of the solar plant at the very beginning, as the bar in which he was working was a family business. Once the construction process was over, he decided to quit and go back to his waiter’s work because:

“The subcontracted company by Iberdrola was not paying the wages on time. It often took them more than one month to pay me, and there was no proper supervision from the main company. Furthermore, the future work was working in the entire region, implying having to travel all over the region and spending much time commuting” (32-MY).

5.2.3 Environmental Dimension

As was already stated before, the environmental impact was good because the solar panels were adapted to meet all the environmental requirements at the local, regional, and European levels. In this village, according to Participant 13-WO:

“The main negative impact of the solar plant is the landscape because now there are so many hectares that before were wild nature and natural landscape, while nowadays there is a huge proportion just full of solar panels and it is so sad to see how the lands where our family and we grew up has ended up”.

Nevertheless, every single participant in this village also acknowledged that their area, and the region in general terms, has no other possible industry to develop and take advantage of, as can be the case of other regions. Thus, Participant 42-WO stated:

“Even though I have to say that the landscape impact is not very nice, and I do not like the solar plant, I support the idea of installing solar plants because it is a collateral damage this village accepted and resigned about to improve and take our means of livelihood to the next level”.

In that way, if a solar plant like the one, in this case, study had not been built in the lands of this village, it would probably have still suffered from an economic deficit. It would keep dying because older people would have died, and the young would have moved from the village to a larger town or city. Nevertheless, it should also be noted that this village, considering its size, has always had so many construction companies based on it compared to similar villages in the region.

In addition, according to the local authorities where the fieldwork was developed: *“56 regional companies from Extremadura have taken part in the construction of the Francisco Pizarro Solar Plant”* (43-MO). In that way, according to Participant 43-MO:

“Iberdrola has trusted local companies. We also have to highlight that it was cheaper for them in several cases, and the economic development of Extremadura, mainly in one of the supply networks for green energy projects”.

Thus, it somehow relies on regional suppliers to develop the region. Furthermore,

“Iberdrola has tried to promote the coexistence of solar plants with agriculture, farming, and livestock lately to improve the efficiency and competitiveness of these kinds of installations, such as land use and biodiversity protection” (63-MY).

On the one hand, during the interviews with several Iberdrola local workers – Participants 18-MY and 19-MY, it was also found out that Iberdrola is nowadays taking further steps in the development of its measures to protect the biodiversity of the environment, mainly focusing on animals living together with the solar plant. The Francisco Pizarro solar

plant would be one example as it was adapted, and now sheep are grazing daily and honeycombs in some areas of the solar plant, which would not have been possible some years ago. On the other hand, according to Participant 16-MO:

“Those areas in which the solar plant is installed are just as public lands, and cattle can stay during the day to graze but, at night, they have to be taken somewhere else, which is a large disturbance and much work every day for local farmers”.

5.3 Aldeacentenera

5.3.1 Social Dimension

Concerning the social dimension, Participant 25-WO stated:

“I do not like the landscape impact of the solar plant, but, as the area did not develop any industry in due course and has no other possible industry to develop in these days, it is what it is, and we need to take advantage of it”.

A few years ago, there were few jobs apart from the ones directly related to agriculture and farming, as well as those in bars and supermarkets or trying to open your own business. In that way, young people were not even trying to stay in the village, and they preferred to move somewhere else to live and work because they would have a much better life. That was also an effect of underdevelopment in Extremadura, the least developed in Spain (Leal-Solís & Robina-Ramírez, 2022) because nowadays so many more people can afford to study at university, and the quality, BA, and course offering of the University of Extremadura is relatively poor. That is why young people are obliged to move to a larger city or region to study, and they end up not coming home after finishing their studies because of the lack of job offers in their area of expertise. It should be noted that it is not only something occurring nowadays in these villages, areas of the region or the whole region, but also a fact that several regions in Spain are currently dealing with.

Following the same line of the statement, Participant 21-WO said:

“There are also many social initiatives such as creating a kindergarten, elderly care facilities, gym, sports centre and swimming pool... All those infrastructures are free or affordable, and they require different profiles of workers from the village such as nurses, gardeners, lifeguards, sports coaches, and cleaning staff”.

Participants 45-WY, 46-WY, 47-WY, and 56-MY stated and emphasised the fact that the number of kids in the village studying in schools and the construction of the kindergarten lately is essential for the village to keep the economic life and improve the population ageing issues of rural areas. Due to those reasons, they said they decided to have kids lately. If not, it would have been so much trouble and complex if they did not have the means and the necessary facilities to raise and educate them in the village during their childhood until they became teenagers.

In the same way, Participants 58-MY and 59-WO stated:

“We are working rather hard on carrying more socioeconomic initiatives out, but, in many cases, these kinds of projects also have to be approved by the regional government. That makes it take way longer than if it only depended on the local authorities”.

In addition,

“The regional government is, in many cases, in charge of monitoring and approving some of these projects, we would like to develop because we have to prove we can afford them, pay all the required taxes, and still keep working on our daily issues and the other projects we have planned” (58-MY).

That is why the local authorities are trying to do as many projects as possible to improve people’s livelihoods. However, due to bureaucratic processes, it is not as easy as it seems. Apart from that, Participants 58-MY also highlighted that:

“The regional government has granted a subsidy to the city council to install solar panels on top of the roofs of our public buildings for the solar community we would like to establish after installing the solar plant”.

In this case, they recognised to the researcher that they did not need it that much. However, the regional government is promoting the green transition and granting these subsidies for these projects. That would allow local authorities to develop projects in other areas to improve people’s livelihoods.

5.3.2 Economic Dimension

Regarding the Aldeacentenera village, from an economic, it is close to the observations got and collected in the locality right before this one in the case study. Participant 21-WO stated:

“There is no direct impact on the people’s livelihoods coming from either Iberdrola or the EU because all the direct benefits are given to the local authorities, and it is their responsibility to make them reach us”.

In that way, the village’s mayor must be the right one because, if not, these kinds of projects, either funded or not by the EU, focused on improving sustainable development, would have no positive impact on the people’s livelihoods. It should also be noted that, in the case of this village, *“the census registration has increased by 83 people in the last three years, even though the pandemic took place at the same time”* (25-WO). That is something the administrative staff of the village in charge of that acknowledge as impressive for any village in the region because it is rather challenging to keep the same number of citizens in the census register, considering the average age of the population. Participants 25-WO, 26-WO, 29-MY, and 30-WY perceived that the citizen increase in the village registration is in some way a direct effect of the installation of the Francisco Pizarro solar plant. According to Participant 58-MY:

“The improvement in the number of citizens officially registered to live in the village is a cause provoked by all the investments done by local authorities on promoting that by offering services to make people’s lives easier and more comfortable in the village”.

That means that these kinds of renewable energy projects impact people’s lives indirectly and depend on local authorities.

In addition, on the one hand, in this village, there were Participants such as the 20-MO, the 21-WO, and the 31-WO that also recognised that, if it were not because the current mayor was investing properly all the extra budget coming from the Francisco Pizarro solar plant, the village’s situation would not have improved that much in general terms. Participant 21-WO:

“The former mayor did in thirty years half of what the current mayor of the village has done in three years. He is fixing the village’s electricity, water, and sewage systems, roads, and optical fibre”.

On the other hand, they also thought that the former mayor would have needed to invest the extra budget properly, and the village situation would be similar to before its installation. Hence, in that hypothetical example, they stated that due to the experience they had gone through during thirty years with the former mayor, the people’s livelihoods would not have had any impact in general terms, implying that the actual impact citizens can have from these

renewable energy projects has to be managed adequately by politicians and local authorities to make it positive. It has to be remarked that, according to the participants mentioned in the paragraph above and 29-MY, 30-WY, and 31-WO, the current mayor of the village has invested that money the city council now has in repairing and improving the water and electricity systems of the whole village as well as most of the roads in just a couple of years.

Following that line, there were also several economic initiatives to remove taxes on water supply, garbage collection, and roads and circulation. The city council, as happens with most villages in the area, is also working hard on establishing a solar cooperative and taking advantage of the solar plant to remove taxes on electricity. Nevertheless, Participant 58-MY stated:

“We are in contact with Iberdrola to develop that project. Indeed, yesterday I talked to the second in command of the solar plant, but we lack a proper contact in charge of this topic to have some guidance and discuss what could be done, and under which conditions, to start working on it”.

All of that would significantly improve the citizens' livelihoods as they could save between 20% and 30% more money than they used to do before the solar plant was installed in their area.

5.3.3 Environmental Dimension

Through the environmental dimension, every interviewee said the same as it was in the case of Torrecillas de la Tiesa, they do not like the landscape impact of the solar plant because it was sad for them to see the lands where they grew up completely different from what they were when they were kids and adolescents. Apart from that, Participant 31-WO was also worried about what will happen and how those lands will end up shortly when the solar plant is not in operation anymore.

“I do not like the solar plant because of the landscape, but I know of the money the city council has now come from it and how we have benefited from its installation. Nevertheless, I am worried about what will happen once its lifespan is over and if it would be left there as scrap, as is currently happening in Almaraz with the nuclear plant, or if they would take responsibility for it and remove it for recycling” (31-WO).

It should be noted that the other participants did not mention that fact. However, it was also probable that they did not even think about it, even though it is a mainstream topic in the area because of the dismantling of the nuclear plant in Almaraz. Nevertheless, they were also

aware that it was a matter of time before their area and the entire region would decline if no measures were taken to industrialise it, as it happened with other regions in Spain.

In addition, nowadays, all those lands that were not used as much as so many years ago because farming is not as common were also rented to citizens from the village who now receive that extra passive income. In that way, in that situation, the main asset the region can take advantage of is the sun, as well as the Castilla y León region must take as much advantage as possible of the wind. That is why local people from these areas do not like solar plants because of the landscape impact, but they usually also support their installation. They know that it is their best chance to try to deal with the depopulation issue they have been suffering from since the 1960s. They assume, accept, and resign the situation as it is, and even more now that livestock, farmers, and beekeepers can still develop their work along with the solar panels.

Due to those mentioned above, to comply in some way with the local environmental citizens' demands, Iberdrola is fully aware of the requirement of coexistence that renewable energy plants must have in the ecosystems in which they are installed. That is why *“the company has launched a coexistence plan to achieve perfect harmony between the society, nature, and economy of that environment”* (63-MY). That has also led the company to implement initiatives to *“use solar plants as livestock farms, take care of hives of local bees to collect honey that can be sold by beekeepers afterwards, or cultivate different fruits and vegetables in the solar plant's areas”* (63-MY).

5.4 Responsibility for the Francisco Pizarro Solar Plant Impact

Because of all the cases mentioned above, it must be emphasised that these kinds of substantial renewable projects funded by the EU do not directly impact people's livelihoods. It depends on the local governments of the villages and towns they are installed. The best example of that is the case of Aldeacentenera as, according to participants 21-WO and 31-WO:

“The former mayor of the village had done almost nothing for the village in the last 30 years, while the current one, in 3 years, has fixed the electric and water systems, the optical fibre, and the road system”.

In that way, as the regional and national governments are the ones in charge of checking the environmental impact to approve and allow these projects to take place, it must be required to

them keep track as well of everything the local governments are doing to transform these renewable energy projects' impacts on positive socioeconomic ones too. That would imply complying with the country's and the EU's green transition goals and the sustainable transition ones, as it will ensure that these projects are accomplishing the three sustainable development dimensions. Apart from that, the EU should also be in charge of checking that the impact on the people's livelihoods at the socioeconomic level of these projects, which are co-funded by it, is positive instead of just focusing on the environmental one. In addition, considering all the villages, it can be realised that it is similar in all of them as the citizens' main social-economic benefits are not from a direct impact of the solar plant. They are an indirect impact as it comes from the money paid by Iberdrola to the city council, which is responsible for developing projects and initiatives to improve its people's livelihoods.

Along the same line, local governments must have some proper advisor, consultant or anyone who knows how to manage the situation to help the villages increase and improve the existing industries. If not, it will happen the same as it is currently taking place in Almaraz with the nuclear plant, and the village would trust too much on that source of income and not diversify its economy. In the case of that village, everyone there stated that whenever the nuclear plant is not working anymore, the village will not be able to keep up with its current lifestyle. It will die sooner or later, as is happening with most other villages in the area. On the other hand, if the village can boost its industries, even if the solar plant is dismantled at any point, it will survive economically. That is mainly what Torrecillas de la Tiesa and Aldeacentenera have to do in case there is any problem with the Francisco Pizarro solar plant and the city council does not have and cannot take advantage of that budget surplus anymore.

6. Discussion

The results stated in the section above demonstrate that the impact of the largest solar plant in Europe on local people's livelihoods in rural areas in Western Spain mostly depends on local authorities and the initiatives at the social level they decide to implement. In that way, in connection with the main research question of this study: "*What are the impacts on the livelihoods of local people in Western Spain as a result of the EU-funded Green Transition investments, as viewed through the lens of the three dimensions of sustainable development?*",

the investigation and results evidenced that the impacts are indirect and, overall, positive. Concerning its impact through the sustainable development dimensions lens:

- 1) In Almaraz, as the results demonstrate, the solar plant impact on each of the sustainable development dimensions is neutral.
- 2) In Torrecillas de la Tiesa, according to section 5, 100% of the participants stated that the impact on the social and economic dimensions is positive, while only 20% thought alike on the environmental one.
- 3) In Aldeacentenera, it is a similar case, 100% considers the social and economic impact is positive and the environmental one neutral.

Consequently, the overall impact on the social and economic dimensions is positive (84%), while on the environmental one is neutral (92%). That goes along with the EPA (2022) statement about how economies and societies always take advantage of the environment, in one form or another.

This specific case study broad impact is positive because local authorities were highly committed to that task and invested most of the extra funds from the solar plant installation in social initiatives. That could also be related to the OECD (2012) argument about the essential role of the regional system of institutions in how renewable energy projects and networks arise in each region. Thus, governments and public authorities are vital for positively impacting local people's livelihoods from these projects and, through a bottom-up approach, applicable at different levels. Political stability and consensus, transparency, and lack of populism and polarisation – a combination of existing characteristics in the local authorities from the three case study villages, are essential for a fair transition in any village, town, city, region, or nation.

From the local authorities' statements in this study, there is a lack of monitoring from the regional government and Iberdrola regarding the sustainable development social dimension and the impact on local people's livelihoods. Both institutions keep proper track of the economic and environmental ones to deal with any issue which might come up. However, they trust local authorities to take care and responsibility for the social one. Until now, it seems that this system has worked properly for the Francisco Pizarro solar plant, but it is not trustworthy to apply everywhere. That goes along with the described earlier as regional authorities must be free to use different actions, including creating regional environmental policies and reacting to the national (OECD, 2012) and EU ones.

Nonetheless, that is not viable in highly centralised societies with a top-down governance approach. It is also not a possible option in countries with a high level of corruption. Corruption in Spain takes place mostly at the local level and it is usually related to the real estate industry. That strongly reduces the number of countries it may be effective as most countries in Latin America, South-East Asia, Eastern Europe, Africa, and the Middle East deal with institutionalised corruption. Being aware of the cultural-based bias in corruption studies, it should be avoided and focus on the key aspects, such as having solid institutions to ensure the rule of law to work effectively on monitoring and demanding accountability to every citizen for their actions. Besides, those are developing countries and could take the most advantage of these macro renewable energy projects and the interdependence between the sustainable development dimensions to improve local people's livelihoods through them. However, as the results show, there is not enough monitoring at different levels for these projects, hence they cannot enjoy the benefits from them. Although, these projects are also being carried out in many developing countries from those regions. As it may not work for every project, it is not a suitable solution to ensure taking care of local people's livelihoods while developing these projects. In those cases, it requires monitoring and supervision from several institutions and entities at different levels to ensure, from different perspectives, that the entire process of planning, developing, installing, and implementing these projects is transparent and highly reliable with a fair transition.

The results of this study also serve as proof of the sustainable development dimensions interdependence. Since February 2022, when the outbreak of the Russia-Ukraine war took place, Europe has proved that the economic system, and indirectly local people's livelihoods, depend mainly on the energy market and its shifts (IRENA, 2019). The current situation provoked by the energy crisis is a unique opportunity for Spain, especially for rural areas, to develop a new industry. That could be related to the need stated by Paehlke (2011) to establish world-scale basic environmental and social standards to reduce global economic competitiveness and enhance green transition's beneficial social impacts while minimising its negative consequences from the local level to the global one.

One of the main issues rural areas, at large, in Spain experience is temporary and precarious employment and youth unemployment. Furthermore, in section 5.2.2, food and energy prices are, by far, the main worries of local people in the villages of this study. However, energy prices are also the main worries of companies and industries. Thus, the

national plan which came up from analysing different research projects on renewable energy projects, like this master's thesis, was to make Spain the leading renewable energy and natural gas manufacturer and distributor. Spain is one of the most suitable countries in the EU to produce renewable energies and to get liquefied natural gas for its gasification and subsequent distribution. Due to that, renewable energy projects in rural areas in Spain, such as the case study, are directly connected with Madrid through electrical substations – the one in Almaraz. There is also an ongoing network project of pipelines from Madrid to the Vasque Country and Catalunya to distribute natural gas and hydrogen to Central Europe. That would create the Southern-Central EU energy market as stated by Díaz-Vázquez and Caldés-Gómez (2018). It would also provide the EU with energy security and independence, while improving people's livelihoods (Contreras, 1999) in rural areas and enhancing sustainable rural development in Spain.

In line with the discussed above, the EU's sustainable rural development strategies should strengthen the rural areas' territorial cohesion to promote socioeconomic development and create employment (Masot, 2009). That would not only deal with one of the main issues in this study by which locals do not feel the solar plant belongs to them. Citizens from rural areas would also have more similar job opportunities, services, and resources as urban ones. Thus, in general terms, the development of any area – not only rural ones, depends on an innovative and competitive industry, and most people's livelihoods rely on them. Due to that, public investments in development, innovation, and education are vital at all levels, which was happening in none of this study villages. Accessibility of local/regional business people to those investments in rural areas is also crucial to sustainable rural development. That would positively impact local people's livelihoods through renewable energy projects because of technological development and new industries in rural areas. In addition, the results obtained indirectly imply that small and medium-sized enterprises are the leading financial network sustaining any geographical area's economic system. Those companies are also the primary sources of people's livelihoods, being Almaraz and the nuclear plant the best example. Furthermore, if local authorities from Torrecillas de la Tiesa and Aldeacentenera do not work on avoiding that, those villages will end up with an economic system entirely dependent on the Francisco Pizarro solar plant and face severe issues sooner or later.

It is also worth noting that, in this study, no direct hypotheses were clearly stated. However, the company was the one thought and expected to be responsible for most of the

impact, either positive or negative, on local people's livelihoods. There have already been several similar cases, as studied in the Development Themes course in this master's degree, such as the Noor Ouarzazate Solar Complex in Morocco, in which thousands of people living in rural areas in the desert feared and lost their livelihoods due to that. Thus, even being highly unlikely, it could have been similar in Europe, as it has already happened. Nevertheless, the results demonstrate that the company does not have as much responsibility as presupposed. It fulfils public authorities' rules and laws concerning the environmental dimension and must also be responsible for the money to buy or rent the installation lands. But, apart from that money and some initiatives to sponsor, promote and boost initiatives developed by NGOs and non-profit associations, companies running these projects can do little more to improve local people's livelihoods. Public authorities are the ones responsible for the socioeconomic impact of these projects on local people's livelihoods in rural areas in Spain. As that was unexpected, it was deeply covered neither in the theoretical nor in the geographical framework, and it turned out to be a vital point of this study.

6.1 Policy Recommendations

This research states the idea that renewable energy projects, responsibly managed, may boost sustainable development in rural areas and improve local people's livelihoods. To do that, as sections 5.1.1 and 5.2.1 show, it requires the implementation of a comprehensive labour policy to educate and include people of working age – mainly young people, in the new industry (United Nations, 2015a). IRENA (2019) also remarked on the need for comprehensive employment and fair transition policies, as the results highlight, after analysing the consequences of the green transition in jobs throughout the economic system and the energy industry. Furthermore, some improvement indicators have been coming to light in rural areas in Europe since the end of the 20th century (Rosado, 2006), when renewable energy projects started to spread over Europe. That is why this study shows that public policies must work on keeping that development path while caring for those villages' citizens. In addition, the results also tie in with the OECD (2012) study because those policies must also invest in local development to support rural communities in adopting green energy projects under their specific needs, demands, and strengths.

To keep improving these impacts, as this research proves, there is a need for new – well-adapted to each case, policy initiatives. They have to be implemented at all levels to

ensure the proper evolution of the three sustainable development dimensions on the same path. That relates to the Pardo Buendía (2007) study, which shows that partial solutions address issues in the short-term but, nowadays, there is a global society, and a total solution is required to minimise negative climate change impacts on people's livelihoods. Looking for short-term results is one of the main issues of these projects often discussed with Fernando Prieto del Campo – Sustainability Observatory CEO in Spain. Besides, according to IRENA (2019), the policy structure and several additional factors can have a significant influence on the green transition socioeconomic footprint, which is why it proposes and applies a comprehensive Energy-Economy-Environment framework that would keep a proper balance.

For those reasons, the study of the impact of EU-funded macro green transition projects on local people's livelihoods in rural areas in Western Spain has come out with four new policy ideas to solve the issue of ensuring a positive impact while developing these renewable energy projects:

1. Political Transparency and Commitment: Comprehensive Monitoring.

First of all, it has to be highlighted that Spain is a developed country belonging to the EU, even though Extremadura is the least developed region in the country (Leal-Solís & Robina-Ramírez, 2022). In that way, if local authorities want to implement any initiative, they must pass a regional check in economic terms to prove they have sufficient funds. However, if a similar project was carried out in a developing country which suffers more from corruption, trusting local authorities for the social dimension may not work. It would negatively impact local people's livelihoods, and local authorities and any company would probably look more for their profit than for pursuing sustainable development. Political transparency and commitment to improving the livelihoods of citizens often imply political and economic stability too. That is a crucial common feature most developed countries share while boosting their development. As mentioned above, developing ones usually experience so much corruption, violence, and illegal activities, which limits their development – at all dimensions, and chances.

Due to that, comprehensive monitoring of the impacts of local social initiatives carried out by regional authorities in cooperation with the company would help to prevent an unfair energy transition. As argued with Fernando Prieto del Campo when analysing and discussing the results, that would be key, especially for the current macro project trend. As already stated in the sections above, regions such as Extremadura, Castilla-La Mancha, and Andalucía host

most of the macro solar plants in Spain because there are so many available lands. Along with that, the country's ongoing green transition plans are seeking short-term benefits without implementing effective initiatives to keep proper track of the impact on local people's livelihoods and social dimensions in the long-term.

2. Feeling of Belonging: Solar Communities.

For the previously mentioned reasons and "survival" purposes, humans must meet a fair transition in all dimensions from the side of developing regions, Spain, and the Earth. That was one of the main discussion topics between the researcher and the villages' authorities because citizens from those villages neither believe nor consider that the solar plant belongs to them. That may be a significant obstacle for renewable energy projects that requires to be tackled for the proper integration and development of the sustainable development dimensions. They take it as an industry that a multinational company brought and installed in their lands to take advantage of their situation and benefit and profit from that while not worsening their lives. That is the main reason why every person from the two main villages stated that they do not like the solar plant. However, they acknowledge the positive impact it has had on the overall situation of their villages. In that way, it is a crucial factor and a company's responsibility to make those citizens feel the solar plant also belongs to them and impact their livelihoods through different policies and initiatives to make the impact direct instead of the current indirect one.

According to local authorities, that could be done in two ways:

- 1) by offering more long-term job positions in the solar plant to hire citizens from those villages, hence, a few families would have the feeling that they were able to improve their livelihoods due to the solar plant installation, and
- 2) by reducing a percentage of the electricity taxes to make these citizens feel that they use some of the electricity produced in the solar plant, the historical owners of those lands, and provide them with some support for one of their main worries.

It should be noted that those two possibilities coincide with the previously OECD (2012) mentioned idea of engaging an enormous number of regional players in renewable energy projects by integrating them into already-existing, prosperous, rural industries or by including several small and medium-sized companies in the area. Citizens would consider the last option directly impacting their livelihoods from the solar plant because it is related to

electricity. However, the reality is that it would still depend on local authorities because it is about taxes. As the company would provide free electricity to local authorities during a specific time every day, they would be able to reduce, or even remove, monthly electricity taxes for citizens.

Then, the only possible way at this moment would be to apply the same policy in Cedillo to create a solar community for the village. That is an example of the OECD (2012) in its study, as renewable energy policies have also encouraged public involvement. Furthermore, it showed that it has occurred in areas where citizens actively embrace adopting renewable energy projects and where the population firmly rejects them because of the risk of hazard to their livelihoods or valuable assets. Installing renewable energy projects in rural areas may supply them with extra funds for their annual budget, which might support local and regional infrastructure and public services. That would also positively impact local people's livelihoods.

According to the OECD (2012) statement, the company in charge of developing the project in those areas must pay taxes to local authorities. That is precisely the same as in the Francisco Pizarro solar plant. As explained by local authorities, in these projects in the region, some of those taxes were paid before the installation, others when the project was almost fully implemented and put into operation, and others are paid annually. It depends on the laws, regulations, and bureaucratic processes of each region in Spain. Those taxes are another funding source for the host town and may positively impact local people's livelihoods and public service quality. Likewise, this study demonstrates that local authorities may opt to install a "part" of the renewable energy project in public areas to produce their energy and reduce their citizens' energy bills (OECD, 2012). Thus, for this case study, as Iberdrola has installed a solar plant in most of the village's lands, it would also be in charge of the investment to install a few more solar panels on villages' public buildings. That would allow local authorities to reduce or eliminate electricity taxes as a social initiative to contribute to the village's social development and local people's livelihoods, as it happened in Cedillo in the same region.

3. Economic Diversification: New Services & Industries.

Several political initiatives co-financed by national administrations and local actors have been implemented in the region to develop renewable energy projects in different

economic areas (OECD, 2012). As in Almaraz, that is a fundamental fact because these small villages usually tend to make a living from these macro renewable energy projects. They need neither other source of income nor to diversify their economies because they can cover all their expenses with these projects. Nevertheless, they have a lifespan, and these villages also need to create different industries to have an ongoing economic cycle once those projects are dismantled. If not, the situation would end up as in Almaraz, the village where every interviewee acknowledged it was their fault. The village's life will also disappear once the nuclear plant is not in operation anymore. Local authorities and citizens should have taken advantage of having a nuclear plant installed in their village to foster, facilitate, and develop other related industries such as technological, electronics, electrical, chemical, mechanical, and recycling. Those industries could have gained an immense field experience and renown in the area, region or even country to survive in the long-term without the nuclear plant.

That goes along with the OECD (2012) study in which an additional economic impact resulted in several case studies from having an affordable and secure energy supply in rural areas, which allowed for the establishment of a variety of new services such as bars and restaurants, stores, residences, grocery shops... However, political transparency, stability, and commitment are essential to achieve that and properly develop more profitable industries. That would also promote the region's development and reduce the citizens' socioeconomic disparities compared to the ones in developed regions of Spain (Masot, 2009).

4. A Circular Economy: Recycling & Reusing.

Nowadays, a severe issue countries implementing renewable energy projects, at any scale, have to face is recycling the employed materials, in this case solar photovoltaic panels. Participant 31-WO remarked it (section 5.3.3) for its development and installation once they are dismantled. It is a crucial and worrying issue for citizens, especially in Almaraz. In their case, it is not a solar plant; it is a nuclear plant, making it way more dangerous and worrying. Hence, after the significant proven negative impacts nuclear radiation has on people's health due to the few accidents which have taken place in history, locals do not feel very safe having a nuclear plant and waste storage 2 km away from their homes. However, in the project for this study, through public policies and initiatives, those materials may always be reused or recycled in the same or a related industry sector and do not have to use more limited raw materials. That would depend on regional authorities and the company instead of local ones.

This process must also be well monitored and planned by companies and public authorities (public-private) to ensure fair and suitable procedures, as it is done by national inspectors in Spain in other areas such as education, health, and food. Furthermore, that practice would create a circular economic system to avoid pollution and other negative social impacts in rural areas in Spain.

6.2 Research Limitations

According to Santiago López García, Director of the University of Salamanca Research Institute of Science and Technology Studies, it is essential to know that these results come from a case study based on Europe's largest macro solar plant. In that way, for these vast renewable energy projects, there is much more monitoring from local, regional, national, and EU authorities, and companies are aware of that fact. Then, it is much more likely that the impacts of these projects, overall, are positive, but the ones of smaller solar plants should also be studied to check if that is a typical pattern. That is why, because of its specific situation in a developed country in the EU, it was essential to prove that in this case study, even if some results could be foreseen.

It should also be noted that public opinion in Spain also greatly influences current politics, and if mass protests occur because of social injustices, politicians would probably comply with them to keep public support for future votes. There are already some examples of that in the country. That is why this company, at least in Spain, has adopted the idea of making the most profit possible for everyone – itself, the villages, and their citizens. It is the most suitable option for them because the ruling political party in those villages may be re-elected shortly, keeping the same conditions and treatment for the solar plant and the company. In addition, they also need to keep citizens from the villages where they install their projects quite satisfied because, if not, they can challenge many of the company's interests and purposes. Apart from political pressure and civil mobilisations, some inhabitants renting their lands for the solar plant can raise the rent per hectare to the company once the contract expires. Due to those reasons, the results from this study cannot be extrapolated to other macro renewable energy projects that do not meet the same situation and features. Then, there is a need for further research on this topic to find a correlation and standard features of variables through econometrics to demonstrate the impact of EU-funded macro renewable energy projects in rural areas.

7. Conclusion

EU-funded green energy projects pursuing sustainable development significantly impact local people's livelihoods in rural areas. As it is about sustainable development, they are supposed to be positive, but that is not the case in many situations. The Francisco Pizarro solar plant, the largest in Europe, is an essential first step to start addressing this issue. Since climate change has started to have visible negative impacts on people's livelihoods, not only in developing countries but also in developed ones, macro renewable energy projects have been developed to counteract them in the short-term. The EU has fully or partially funded several of these as part of its plan to fight climate change. Notwithstanding the better performance at the social level, through these projects, the EU has shown to be more focused on renewable energy projects for the green transition than on policymaking support to ensure the success of these projects at all levels.

These projects are key concerning the environmental dimension of sustainable development and the economic and social dimensions due to the interdependence between these three. Other studies have also demonstrated that these projects, well-developed, are very likely to have a positive impact on the livelihoods of local people. In addition, Iberdrola, one of the world's largest multinational renewable energy companies, runs the project. It was installed in a rural area in Western Spain. The region which hosts it is Extremadura, the least developed in the country and the one in which the renewable energy industry is investing the most to install solar plants. Those conditions imply that the process for the case study is always carefully monitored to ensure a positive impact at all sustainable development levels. That wanted to be proved because, if it was not that way, there might be so many chances that smaller and non-mainstream solar plants in rural areas in Spain and the EU are not pursuing full sustainable development.

The impact of the Francisco Pizarro solar plant on the villages in which it was installed is overall positive. On the one hand, its significant positive impact was the large budget those small villages had now compared to before. That allowed them to be reassured about the social initiatives they planned and proposed to develop. As they have a budget surplus, the regional government will allow them to implement many more social initiatives because they can still cover all their expenses. On the other hand, the significant negative impact was the landscape, which is not anymore a lovely, wild landscape as it used to be. The impact on the livelihoods of local people is not direct because it does not depend on the

company as it partly does on environmental terms. In this case, local authorities are responsible for the impact of the solar plant on the livelihoods of local people. The overconfidence of regional authorities and the company in local authorities has worked in this solar plant. However, it is not a policy adaptable to be applied to most projects.

Those are why comprehensive monitoring of these projects, through the lens of the three sustainable development dimensions, will imply a significant step on the development transition path for Spain and the EU. Since the Russia-Ukraine war, it has been demonstrated in Europe that the economic system depends largely on the energy market. Through the responsible implementation of renewable energy projects, the livelihoods of people in rural areas would be protected while affordable, accessible, and available energy is produced. It could be more important for rural areas to increase the flow of goods and diversify their economies. They would also positively impact the economic and environmentally sustainable development dimensions. At the economic level, they help reduce energy prices because of the production stability it provides to the system. In environmental terms, they would help control climate change and global temperature. To that effect, new policies should be implemented at the public and private (public-private) levels to ensure a fair and responsible sustainable development transition. These policies should address:

1. the monitoring of the projects,
2. the implementation of initiatives for citizens to feel they also benefit directly,
3. the promotion of new industries and services, and
4. the creation of a circular economy to recycle and reuse materials.

For future research, it is substantial to remember that every project based on qualitative methods carried out through research interviews developed in a short period, as it happened in this case, is limited to the sample and the number of interviews able to develop. Nonetheless, that allows the research to continue through more interviews and case studies. In that case, further quantitative research methods, such as linear regression, would also be suitable to predict any possible relationship among the samples of the different case studies. That would provide substantial support and reliability to the research. In addition, Fernando Prieto highlighted during the researcher's fieldwork that it would be rather interesting to keep working on the same research, turning this master's thesis into a PhD to include more case studies, maybe not only in Spain but all over the EU. They could still be similar EU-funded

renewable energy projects, not necessarily solar plants, installed in rural areas of different EU countries, but not as mainstream as this one, to compare the differences and similarities of the impacts on the livelihoods of local people. It would be helpful to research and compare the responsible one for a positive impact and keep supporting and providing evidence about the level of interdependence between sustainable development dimensions. That would mean a highly recommended improvement to complement this study, conveniently keeping first with Spain and then moving to a few other countries of each of the central four EU broad regions – Eastern, Western, Northern and Southern. A study like that one would provide an in-depth view of the impacts of the EU green transition initiatives on the livelihoods of local people in rural areas in the whole EU area, including developed and developing regions within those countries.

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Appendices

Interviews Guide

- **Opening Questions** (age, origin, working situation, and hobbies)

- How old are you? (classification: old/young and man/woman)

- ¿Cuál es su edad? (clasificación: mayor/joven y hombre/mujer)*

- Where do you come from? How long have you been living there?

- ¿De dónde es? ¿Cuánto tiempo ha vivido allí?*

- Where do you live? How long have you been living there?

- ¿Dónde vive? ¿Cuánto tiempo lleva viviendo ahí?*

- Which is your job at the moment? Which sector does your job belong to? How long have you been working in that job? Where do you develop your work?

- ¿Cuál es su empleo en este momento? ¿A qué sector pertenece? ¿Cuánto tiempo lleva dedicándose a ese mismo trabajo? ¿En qué pueblo/ciudad trabajas?*

- **Key Questions** (working situation, financial situation, social life, and worries)

- Working Situation:

- How would you say your life has changed after the establishment of the Solar Plant in your area? Would you say it was a positive or a negative change?

- ¿Cómo considera que ha cambiado su vida en general tras la instalación de la Planta Solar en su zona? ¿Diría que ha sido un cambio a mejor o a peor?*

- Do you feel happier and more satisfied in this job in comparison to the one you had before?

- ¿Se encuentra más contento y satisfecho con este trabajo que el anterior que tuvo?*

- *Traditional Local Bar/Restaurant owners and Politicians.*

- Would you say that the working life of the local families' has improved and increased since the Iberdrola solar plant was installed in the area?

¿Diría que la vida laboral del pueblo ha mejorado e incrementado desde la implantación de la planta solar de Iberdrola?

– Financial Situation:

- In which income range do you fit: <11395 € gross income / year (low), < 30386 € gross income / year (middle), > 30386 € gross income / year (high).

¿A qué franja de sueldo pertenece: <11395 € brutos / año (baja), < 30386 € brutos / año (media), > 30386 € brutos / año (alta)?

- How long have you been belonging to this social class?

¿Cuánto tiempo lleva dentro de ese rango de sueldos?

- How would you say your economic situation has evolved since the installation of the Solar Plant? Does it have any kind of relationship to the solar plant? Do you consider it an improvement or a deterioration then?

¿Cómo diría que ha cambiado su situación económica tras la instalación de la Planta Solar?

¿Ha tenido alguna relación con la instalación de la Planta Solar? ¿Entonces lo considera un cambio positivo o negativo?

Traditional Local Bar/Restaurant owners and Politicians.

- Would you say that the economic situation of the local families' has improved and increased since the Iberdrola solar plant was installed in the area?

¿Diría que la situación económica del pueblo ha mejorado e incrementado desde la implantación de la planta solar de Iberdrola?

- Have you realised an improvement of people coming to your bar/restaurant in the last 5 years?

¿Ha notado un incremento de los clientes del bar/restaurante en los últimos 5 años?

– Social Life:

- Which are your main hobbies? Are they the same ones they used to be 5 years ago?

¿Cómo disfruta de su tiempo libre? ¿Qué le gusta hacer? ¿Sigue haciendo lo mismo que hace 5 años?

- Do you have more free time? Do you enjoy them more than before? Do you spend more money on them?

¿Tiene más tiempo libre para ellos? ¿Los disfruta? ¿Invierte más dinero en ellos ahora que hace unos años?

- Would you say you spend more free time with your family now than 5/10 years ago?

¿Diría que pasa más tiempo con su familia que hace 5/10 años?

Traditional Local Bar/Restaurant owners.

- Have you realised that people spend more time now in the bar than 5 years ago?

¿Ha notado que la gente pasa más tiempo en el bar ahora que hace 5 años?

– Worries:

- Would you say you have more or less worries nowadays than 5 years ago?

¿Diría que tiene más o menos preocupaciones en su vida a día de hoy que hace 5 años?

- Would you say that any of those worries are directly related or caused by the installation of the Iberdrola's solar plant?

¿Considera que alguna de esas preocupaciones están directamente relacionadas/causadas por la instalación de la planta solar de Iberdrola?

Doctor and Nurse

- Have you realised the increase of suffering from any kind of disease in the last 5 years? Would you say any of those diseases was provoked by the installation of the solar plant?

¿Ha notado el aumento de algún tipo de enfermedad en sus pacientes del pueblo en los últimos 5 años? ¿Considera que esas enfermedades pueden haber sido causadas a raíz de la instalación de la planta solar?

- How would you say the mental health of the town's inhabitants has evolved in the last 5 years? Could that be caused by the installation of the solar plant in this area?

¿Cómo diría que ha evolucionado la salud mental en los habitantes del pueblo en los últimos 5 años? ¿Podría eso deberse a la instalación de la planta solar en la zona?

Politicians:

- What strategies and plans do you have in place to improve people's lives in your municipality? Can you give some examples?

¿Qué iniciativas están llevando a cabo para mejorar la vida de la gente en su localidad? ¿Podría darme algún ejemplo?

- Do you receive support from the national/regional/provincial governments on how to make use of the extra revenues from the solar plant to foster development and improve citizen's life? How is this support? Is it effective?

¿Recibe apoyo por parte del gobierno provincial/regional/nacional para usar los ingresos extra de planta solar para desarrollar más su localidad y mejorar la vida de la población?

¿Cómo se lleva a cabo este apoyo? ¿Es efectivo?

- How has the population density evolved in the last 5 years? How many jobs have been created? Are local people employed?

¿Cómo ha evolucionado la densidad de población en los últimos 5 años? ¿Cuántos trabajos se han creado? ¿Es principalmente gente de la zona la contratada para esos empleos?

- In what sectors job have been created?

¿En qué sectores se han creado los trabajos principalmente?

- Are NGOs involved in supporting local development? What kind of support and how is it done?

¿Hay ONGs también encargadas de apoyar el desarrollo de la localidad? ¿De qué forma?

• **Closing Questions**

- Are there any more things you'd like to discuss about this topic?

¿Le gustaría añadir algo más?

- Do you have any questions for me, either personal or professional?

¿Tiene cualquier pregunta para mí, ya sea a nivel personal o profesional?

• **Thanking the Participant**

- Thank you for your time!

¡Muchas gracias por su tiempo!

- If you'd like, we could of course send you the final product

Si le gustaría, podría enviarle el resultado final de mi estudio.

- If you have any doubts later on about things you said, or you have any more questions, just let me know!

Si tiene cualquier duda posteriormente sobre lo que ha dicho o cualquier otra pregunta, ¡no dude en hacerme saber!

Source: Author's Elaboration.