Article

Perceptions and Concerns of Rural Women in Depopulated Areas on Climate Change

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Abstract

This study explores the perceptions and concerns about climate change held by rural women living in depopulated areas of Soria (Spain). A mixed approach was adopted, combining quantitative and qualitative methods to provide a descriptive and exploratory analysis of this demographic group. A structured questionnaire was administered to 26 women selected from the database of the Association for the Comprehensive Rural Development of Northeast Soria (PROYNERSO), in its Spanish acronym. Subsequently, in-depth interviews were conducted with seven women who were chosen based on their professional background, active role in the community and ability to represent diverse perspectives. The research covered a range of variables, including knowledge of climate change, perceived impacts on lifestyle, adaptation strategies, resilience and mitigation actions. The interviews, conducted after the presentation of the quantitative results, served to explore the issues discussed in greater depth. The study's findings indicate a widespread concern about the effects of climate change, particularly on agriculture and food security, and a willingness towards sustainable practices. However, the study also identified barriers to the adoption of sustainable practices, including a lack of information and the associated high costs. The study's findings underline the importance of incorporating a gender perspective into global climate policies, recognizing the strategic role of rural women in promoting more inclusive and effective strategies.

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Introduction

The objective of this research is to understand the perceptions of rural women in depopulated areas of the province of Soria on global issues, such as climate change, and the concerns and needs that arise from it. We recognize that the special circumstances and living conditions they face make them an important sample from which to obtain information that provides valuable nuances for decision-making on future action strategies. To this end, a sample of women was meticulously selected through the efforts of a local action group operating in the province of Soria. A comprehensive set of questions was designed to obtain information on awareness and knowledge of climate change, perceived impact on lifestyle, resilience and adaptation, mitigation and climate action.

Climate change and global warming, driven by the 'greenhouse effect' and the accumulation of polluting gases, result in an increase in global temperatures and extreme weather events. In this context of a 'risk society' (Gilbert, 2022), the Intergovernmental Panel on Climate Change (IPCC), created in 1980, plays a crucial role in assessing the scientific certainty of climate change and its attribution to human activity and transforming the understanding of the climate towards a systemic and global approach. Despite its role as a conduit between scientific research and policy-making (Beck & Mahony, 2018), the IPCC has been criticized for its handling of scientific evidence (InterAcademy Council, 2010), the over-representation of experts from developed countries (Miller, 2004) and the predominance of certain scientific disciplines (Corbera et al., 2016). Despite these criticisms and the challenges it faces, including those of denialism (Oreskes & Conway, 2018) and credibility crises, such as 'Climagate' in 2009 (Hulme, 2010), the IPCC remains central to the global debate. This study focuses on rural women, who are both vulnerable and key to adaptation in depopulated Spain. Ecofeminist research (Escayola, 2020) on gender and the city (Vargas, 2022) and sustainable mobility (Centeno, 2023) emphasizes the importance of incorporating a gender perspective (Ayala Carrillo et al., 2016), where inequalities are exacerbated (ONU Mujeres, 2020) and entrenched gender inequalities become even more entrenched (ONU Mujeres, 2020). In light of these considerations, it was considered imperative to undertake research into the perceptions and feelings of rural women in our geographical area. These individuals are closely associated with ecosystem services and forest components, which gives them important knowledge about the use and preservation of natural resources.

Previous Studies and Relevant Evidence

Climate change and droughts have a significant impact on agricultural income in rural areas of Spain. These extreme phenomena reduce crop productivity and increase

disparities in agricultural income, which can exacerbate economic inequality in these communities. Adaptation priorities vary by crop type and region, suggesting the need for targeted and well-informed adaptation strategies (Quiroga & Suárez, 2015).

As a Mediterranean region with water scarcity, Spain is very vulnerable to the impacts of climate change on its water resources. Droughts and the unequal distribution of water resources will exacerbate existing problems, affecting both agriculture and land management (Shafiee et al., 2023). The natural variability of the hydrological cycle and water withdrawals make it difficult to identify clear trends, but climate change is expected to exacerbate water scarcity in the country (Estrela et al., 2012).

Climate change also affects air quality, which in turn affects public health. In Spain, significant reductions in the levels of several air pollutants have been observed over the last 25 years, with the exception of ozone (O3). However, changes in weather conditions have counteracted these improvements, especially in the case of PM10 particles, leading to an increase in mortality related to air pollution (Hashem et al., 2023).

Finally, climate change is negatively affecting rural communities in Spain through lower agricultural productivity and increased income inequality, greater water scarcity and degraded air quality, which in turn affects public health. Adapting to these changes requires specific strategies and a better understanding of the risks involved. Among the triggering factors, we find that the loss of plant species due to climate change and other human activities has significant consequences for agricultural biodiversity (Rocano et al., 2025). This situation directly affects food security and rural livelihoods, where women are often responsible for agricultural production. On the other hand, López Teloxa and Monterroso (2024) pointed out that the change is associated with the decrease of organic carbon in the soil, an essential resource for agricultural biodiversity and the sustainability of production systems. This loss directly affects rural communities, especially women. Traditional knowledge and ancestral wisdom play a crucial role in the conservation of local agricultural species, as the work of Sandoval et al. (2024) shows in the case of cacao and other native crops in Bolivia. Rural women are key agents in these practices, facing the effects of climate change while preserving essential resources for their communities.

It is important to understand the coping responses of different social groups, in this case the perspectives of women living in rural areas of depopulated Spain, and to gather new knowledge about their responses to climate variability and extreme events. To carry out this work, we searched for and reviewed previous studies related to the subject of our research and found that most of the work focused on countries and regions in the Global South, such as Nigeria, Pakistan (Batool et al., 2018; Memon & Amjad, 2020; Memon et al., 2023); Ghana (Lawson et al., 2020); Ecuador (Iñiguez-Gallardo & Tzanopoulos, 2023); Mexico (Judijanto et al., 2023); Zimbabwe (Phiri et al., 2013); India (Venkatasubramanian & Ramnarain, 2018). From these studies, we will relate those that provide us with some insights into the perceptions and responses of rural women to climate change in different geographical contexts. Some of the relevant findings from these studies are presented below.

Impact on Livelihoods and Vulnerability. Studies conducted in Nigeria, in particular the work of Akinbami et al. (2016), Aliyu and Sheriffdeen (2022) and Ifeanyi-obi et al. (2023), suggest that rural women in Nigeria are significantly affected by the dangers of anthropogenic climate disasters. They point out that factors such as the lack of basic infrastructure, the low capital base and the use of rudimentary agricultural methods increase their vulnerability. Rural women have developed resilient practices to cope with the ongoing impacts of climate change on their livelihoods. This study could be replicated in other rural areas to compare resilience strategies and context-specific vulnerability factors.

Perceptions and Awareness of Climate Change. Research carried out in different parts of the world has explored the awareness and knowledge of rural women about climate change. A study carried out in Sindh, Pakistan (Memon & Amjad, 2020) concluded that women, in both rural and urban areas, are aware of climate change, although their sources of information tend to be secondary and their knowledge is mainly based on personal experience. This finding highlights the need for governments to adopt strong initiatives to raise women's awareness of climate change.

Resilience and Adaptation Strategies. The resilience of rural women to climate change has been the subject of several research studies. In Indonesia, an analysis of the narratives of local women in river basin areas (Hendrastiti et al., 2023) revealed that their daily lives reflect a deep understanding of the environment and the ability to adapt to climate change. This study highlighted the importance of the links between gender relations, disaster resilience and environmental sustainability.

Gender Differences in Impacts and Adaptation. A study in Lombok, Indonesia (Memon et al., 2023) examined differences in the impacts of climate change from a gender perspective. It found that women are more vulnerable than men due to differences in access, participation, control and benefits, which are influenced by sociocultural factors. Women's lower level of education due to limited resources and access was identified as a key factor increasing their vulnerability.

Preferences for Mitigation and Adaptation Measures. Research has also analysed the preferences of farmers, including women, for mitigation and adaptation measures. A study conducted in northwestern Mexico (Judijanto et al., 2023) analysed these preferences in relation to farmers' attitudes, beliefs and environmental characteristics in the face of risk. The results showed that farmers in the region preferred actions such as 'using cleaner machinery' and 'investing in better irrigation infrastructure'.

Other research focuses on the relationship between climate change and the emotional impact it has on different groups, young people, women and the elderly. For example, Albrecht et al. (2007) coined the term 'solastalgia' to describe the sadness and emotional distress caused by the degradation of the natural environment, which particularly affects people who have strong ties to the place where they live. Solastalgia is a feeling of loss in the present, when we see that the place where we live is

deteriorating and we no longer have the sense of rootedness and belonging that we had before. Research led by Hickman (2020) shows that climate anxiety and dissatisfaction with government responses are widespread among young people, and her publication in *The Lancet* generalizes the concept of eco-anxiety popularized in recent decades to describe emotional responses to the ecological crisis, particularly climate change. Franquesa (2024) summarized these relationships in her work *Climate Change and Eco-Anxiety*, urging the production of everyday changes as part of the solution; demanding, pressuring and enabling systemic changes; promoting community projects, reducing our impact, promoting knowledge, using environmental education for sustainability; fostering commitment and hope through action.

A Review of Gender Mainstreaming in Climate Change Policies in Spain

The importance of the gender perspective in climate change is increasingly recognized, both nationally and internationally. Efforts have been made to incorporate the gender perspective into policies through initiatives such as the Action Plan for Rural Women and the Observatory for Women, Science and Information. Equal opportunities for women and men have been highlighted as a 'lever policy' for achieving the Sustainable Development Goals of the 2030 Agenda.

Despite the progress made, the incorporation of the gender perspective in climate policies is still considered timid, and it is necessary to promote the participation of women in the design, implementation and evaluation of these policies.

In the context of rural women in depopulated Spain, among the main challenges identified in the report Gender and Climate Change, a diagnosis of the situation by the Women's Institute (Instituto de la Mujer, 2020), the integration of the gender perspective in climate policies can be highlighted as an essential element to avoid the perpetuation of inequalities. To this end, it is necessary to systematically evaluate the differential impact of climate change on men and women, which implies the generation and analysis of sex-disaggregated data to measure the effectiveness of the policies implemented.

Relevance for Current Research

These previous studies provide a valuable framework for our research into rural women's perceptions of climate change in Soria. They will also provide a basis for future research into rural women's perceptions of and responses to climate change, offering different methodologies and findings that can be compared and contrasted in different geographical and cultural contexts (Figure 1).

Our research will focus on a representative sample of women selected through local action group workers, exploring key variables such as awareness and knowledge of climate change, perceived impacts on their lifestyle, perceptions, understanding, resilience and adaptation and expectations of mitigation measures.

By addressing these variables, our study aims to contribute to the understanding of how rural women in different geographical and cultural contexts perceive and respond to climate change. This information is crucial for developing more effective and

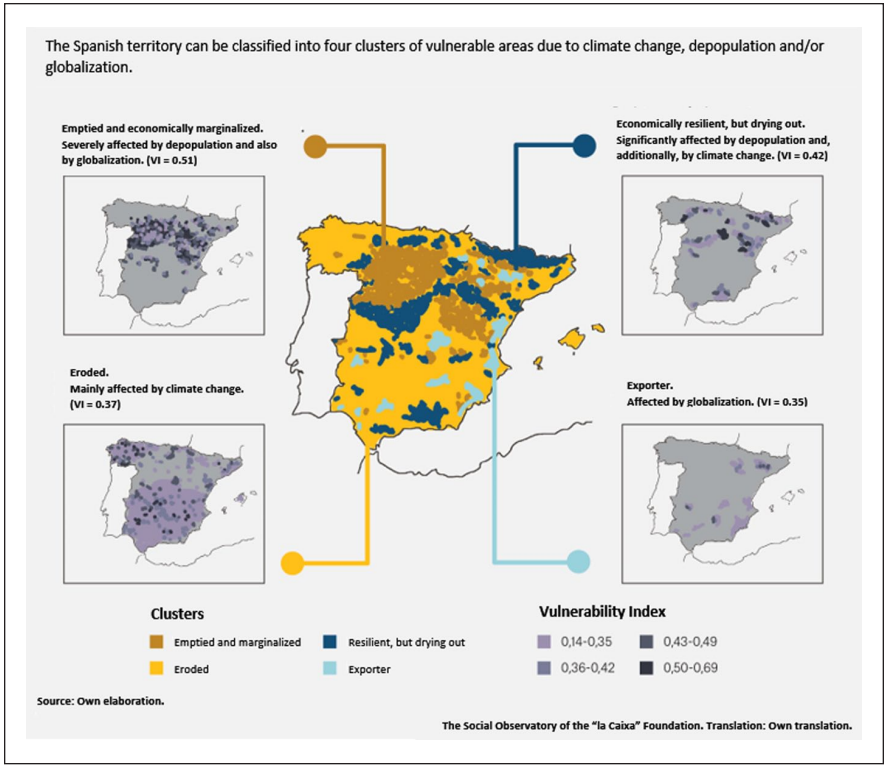

Figure 1. Classification of Spain according to vulnerable areas due to climate change, depopulation and/or globalization.
Note. Adapted from 'Más allá de la España vaciad' (Villamayor-Tomás et al., 2024). Retrieved from https://elobservatoriosocial.fundacionlacaixa.org/es/-/mas-alla-de-la-espana-vaciada.

equitable adaptation and mitigation strategies that take into account the specific perspectives and needs of rural women (Figure 2).

Finally, to contextualize the territory in which we have carried out our work, we rely on the socio-environmental index of vulnerability to climate change, depopulation and agricultural globalization developed by Villamayor-Tomas et al. (2024), which, based on data from 27 social and environmental variables, has allowed them to classify the more than 8,000 Spanish municipalities into 4 territorial clusters: economically empty and marginalized Spain; economically resilient Spain but in the process of drying up; eroded Spain and exporting Spain. (Villamayor-Tomas et al., 2024), which is transferred to the attached graphs.

The distribution of vulnerability is not homogeneous across all rural areas in Spain. The most vulnerable regions are found in Castile and León (in this autonomous community, 77% of the regions are highly vulnerable compared to the rest of Spain).

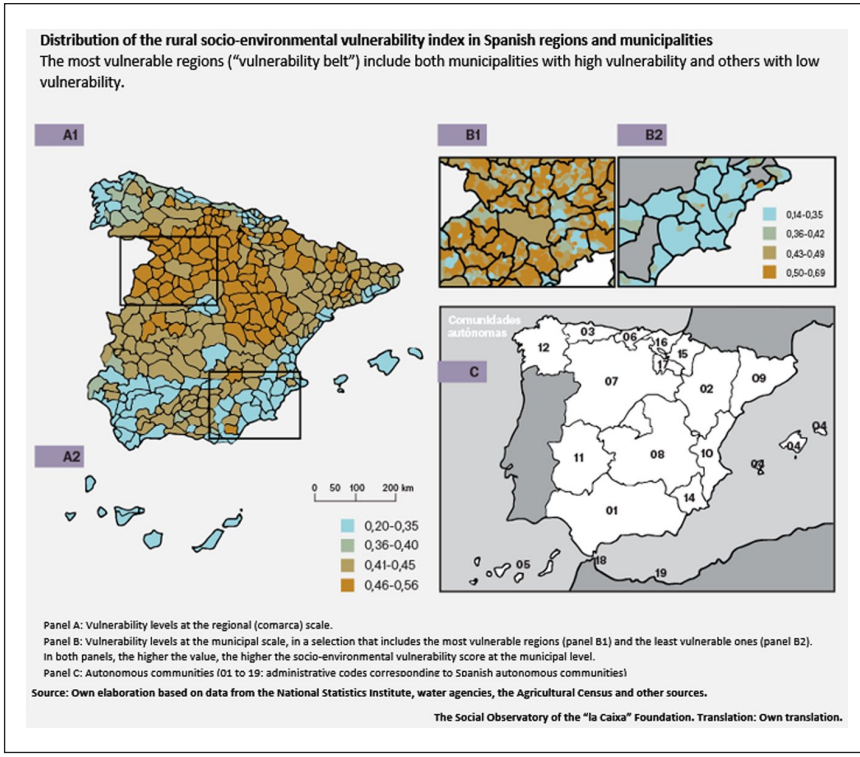

Figure 2. Distribution of socio-environmental vulnerability.
Note. Adapted from 'Más allá de la España vaciad' (Villamayor-Tomas et al., 2024). Retrieved from https://elobservatoriosocial.fundacionlacaixa.org/es/-/mas-alla-de-la-espana-vaciada.

Vulnerability to depopulation is particularly significant in Castile and León and in Cantabria (more than half of the regions are highly affected). This vulnerability is attributed to several factors, including the ageing of the population, the negative natural population growth rate, the poor road connectivity of the municipalities and the limited diversification of the local economies (Villamayor-Tomas et al., 2024). Our province, together with the women who have participated in this study, is part of a group of depopulated and economically marginalized regions in Spain. This territory has experienced a significant decline in its natural growth rate and a high proportion of older residents in relation to young people. It is characterized by a substantial number of very small population centres, with populations of less than 100 inhabitants. From an economic point of view, these regions are particularly vulnerable to the fall in prices received by agricultural producers, the limited concentration of registered companies and the insufficiency of social and road infrastructures.

Methodology

To achieve the proposed objectives, a mixed methodological approach was adopted, combining quantitative and qualitative techniques, with a descriptive and exploratory focus. A structured questionnaire was designed and distributed to a sample of rural women belonging to the database of the local action group PROYNERSO, in order to explore key dimensions such as awareness and knowledge of climate change, perception of its impact on lifestyle, resilience and adaptation strategies, as well as mitigation actions implemented and the gender perspective in relation to climate change. Seven women were then selected on the basis of their active role in the community, their profession and their ability to represent diverse perspectives. Semi-structured interviews were conducted with these women, using the results of the initial questionnaire as a starting point to generate a deeper conversation about their experiences and concerns.

The study was carried out in two phases. For the first phase, the quantitative one, a questionnaire with 23 questions divided into 7 sections was distributed, with a sample group size of $n=26$. As for the profile of these 26 women, 17 live in a rural centre ($<10{,}000$ inhabitants) or are linked to the agricultural sector, education, etc., in this environment. Their age is distributed as follows: 34% are between 51 and 60, 17% are between 31 and 40, 41 and 50 and 61 and 70; leaving 14% for the group of women between 21 and 30 years old. In terms of their marital status, 15 are married, 9 are single and 2 are widowed. About 70% are active workers, of which 21% are self-employed (agriculture and services), 25% are public employees (and civil servants) in the service sector: education, health, local administration, etc.; another 25% are employed in the private sector, in factories and services and finally, 29% did not fit into any of these categories.

The questionnaire was designed to be completed in approximately 15 to 20 min and comprised 23 questions divided into 7 sections, each with a specific topic. The questionnaire incorporated a variety of question types, including single and multiple choice closed options, 5-point Likert scales to assess levels of concern, capacity, willingness and importance and open-ended questions that allowed for more detailed and personal responses. The sections of the questionnaire addressed the eight dimensions that are listed as categories in the results table: demographic profile, sources of information, observed impacts, concerns, level of concern, adaptation strategies, barriers and gender perspective. This comprehensive structure was designed to provide a broad and detailed view of the perceptions and actions of participants in relation to climate change. It can be consulted for the replicability of the study at: https://forms.office.com/e/E5cNhJVnBy?origin=lprLink.

In the second, qualitative phase, a sample of seven women from the local community was selected, affiliated with the local action group PROYNERSO and chosen for their active role in the community, their profession and their ability to represent diverse perspectives. Semi-structured interviews were conducted with the participants, allowing for a deeper exploration of the issues addressed in the questionnaire. The personal

Table 1. Presentation of the Profiles of the Participants in the Interview Phase.

Age	Profession	Years of experience	Education	Interview ID
55	Economic development technician	25	Degree in Business Administration	1DL
56	Environmental law technician	27	PhD in Law	2DM
58	Local development technician	20	Degree in Geology	3G
47	Local development technician	2	Bachelor's in Education	4E
30	Local development technician	3	Bachelor's in Art History	5HA
54	Local development technician	27	Degree in Economics	6EC
55	Local development technician	20	Bachelor's in Social Work	7TS

narratives, experiences and perceptions of the participants were explored in a more detailed and contextualized way.

The profiles of the participants in question are shown in the following table (Table 1):

The data analysis combined quantitative methods for the questionnaire responses (descriptive statistical analysis) and qualitative methods for the interviews (thematic analysis), using AtlasTi summaries and artificial intelligence, in order to achieve a more comprehensive and nuanced understanding of rural women's perceptions and concerns regarding climate change.

The interviews were conducted with the aim of obtaining, in the form of open and free discourse, the ideas suggested to them by reading the variables. Participants were asked to elaborate on four issues: impact on daily life, vulnerability and inequality, organizational responsibilities and concern for the vulnerability of women in situations of climate crisis. In relation to these questions, respondents were invited to consider the following issues: their opinion on the subject, their opinion based on what they know about their work, whether they agree or disagree with the four variables and, finally, to make two proposals for the future to prevent/correct the negative repercussions of climate change on which to establish an action plan.

The Results

As illustrated in Table 2, the questionnaire covers a general overview of the demographic profile of the respondents, their sources of information, the observed impacts,

Table 2. Summary of the Questionnaire on Women and Climate Change.

Category	Subcategory	Results
Demographic profile	Residence	Majority in the province of Soria (17)
	Age group	51–60 years (10), 61–70 (5)
Information sources	Main sources	Internet (22), television (18)
Observed impacts	Most noticeable changes	Increase in temperature (23), more frequent droughts (17), more frequent extreme weather events (14)
Concerns	Agriculture and food security	Crop loss due to droughts (17), scarcity of water for irrigation (15), increase in food prices (15)
Level of concern	General	Most are quite concerned
Adaptation strategies	Most common	Improving home energy efficiency (18), use of renewable energy (12)
Barriers	Sustainable practices	Lack of knowledge/information (14), high costs (14), resistance to change (12)
Gender perspective	Participation in climate policies	Most consider women's participation important/very important
	Perception of impact differences	Yes (17%), no (38%), not sure (45%)

concerns, the level of concern, adaptation strategies, barriers and the perspective on women's participation in climate policies.

The results of the questionnaire are then developed according to eight variables:

Demographic Profile and Sources of Information

The majority of respondents (17) reside in the province of Soria, with a predominance of respondents in the 51 to 60 (10) and 61 to 70 (5) age groups. Internet (22) and television (18) are the main sources of information on climate change, surpassing radio and newspapers. This finding suggests a dependence on both digital and traditional media for information purposes.

Regarding the Impacts and Concerns Observed

Respondents highlighted rising temperatures (23), more frequent droughts (17) and extreme weather events (14) as the most notable changes in their region. These observations give rise to concerns regarding agriculture and food security, including crop losses due to drought (17), water shortages for irrigation (15) and rising food prices (15). This finding is consistent with studies that highlight the vulnerability of agriculture to the effects of climate change (Quiroga & Suárez, 2015).

Level of Concern and Adaptation Strategies:

The majority of those surveyed expressed a high level of concern about climate change, with the most common adaptation strategies being improving energy efficiency at home (18) and using renewable energy (12). However, the implementation of sustainable practices faces barriers such as lack of knowledge or information (14), high costs (14) and resistance to change (12).

Understanding Climate Change

The answers to the question 'What do you understand by climate change?' indicate a broad spectrum of understanding, as some respondents associate the phenomenon with global climate alterations attributable mainly to human activity, such as pollution and the accumulation of greenhouse gases. Others cite the observable consequences, including heat waves and deteriorating air quality. This widespread understanding of climate change as a multifaceted problem is consistent with the scientific literature (IPCC).

Impacts on Everyday Life

The answers to the question 'How do you think climate change will affect your daily life and your livelihood?' indicate concern for food security, water availability and the increased frequency of extreme weather events. Some respondents foresee restrictions on water use and supply problems, which could affect both domestic consumption and agriculture.

Gender Perspective

The majority of those surveyed consider the participation of women in decision-making on climate policies to be important or very important. However, the results of the survey on the perception of the differences in how climate change affects men and women reveal uncertainty, as 45% answered 'I'm not sure'. Some 38% do not perceive any differences and 17% do identify them, citing greater exposure to skin problems due to sun exposure in men who work in the fields and the fact that women's work in agriculture and domestic chores are affected by droughts.

Traditional Knowledge and Adaptation

The answers to the question 'How do you think your traditional knowledge can contribute to adaptation to climate change?' indicate a general recognition that past practices can offer valuable solutions, and several participants highlighted the importance of returning to traditional methods of reuse, recycling and waste reduction.

Desired Government Actions

In response to the question 'What specific actions would you like the government to take to address climate change in your region?', respondents raised a wide range of expectations, including the promotion of renewable energy, sustainable transport, organic agriculture and the protection of ecosystems.

Semi-Structured Interviews

The experts, with different backgrounds and experience in the field of rural development, responded to the four variables proposed in the semi-structured interview, using different formats (questionnaires, semi-structured interviews, audio recordings, written notes). The responses of each expert are analysed individually and comparatively to identify points of convergence, divergence and relevant nuances (Table 3).

Considerable concern has been expressed about the possible repercussions on everyday life, particularly in sectors such as agriculture and livestock farming, which play a fundamental role in the rural economy. The emotional impact of this concern is also evident, and the existence of 'eco-anxiety' or 'solastalgia' (Albrecht et al., 2007; Franquesa, 2024) in rural areas is recognized by 2DM experts, due to the perception of negative environmental changes and uncertainty about the future (1:9 ¶ 24 in Interview results).

As illustrated in interviews 1DL, 4E and 6EC, climate change is identified as a factor affecting rural communities. However, other socio-economic factors, such as the lack of job opportunities and limited access to public services, are highlighted as key elements in the vulnerability of rural women (Interview 4E). In this sense, interview 4E mentions the limited access to road training, which further affects women in rural areas. In contrast, interview 2DM presents a more nuanced perspective, recognizing the need to adapt to climate change, which imposes financial burdens and challenges on rural women, while also influencing issues such as depopulation and mental health. This expert emphasizes the importance of digitalization and policies that promote women's well-being and economic independence. In contrast, the 3G interview takes a sceptical stance on the perceived importance of climate change as a central concern for rural women, proposing that their vulnerabilities and inequalities are rooted in historical and social factors that are distinct from the climate. The 4E and 7TS interviews emphasize that this situation not only destabilizes the family economy but also has a cascading effect on aspects such as quality of life, food security and the preservation of rural traditions. The interviews also highlight the overwhelming responsibilities within the home that prevent the full development of community work and impact physical and emotional well-being. This aligns with the concept of solastalgia, as proposed by Albrecht et al. (2007) and Franquesa (2024).

The consequences for the lifestyle are emphasized by the interviewees, who point to notable changes in agricultural patterns, such as bringing forward harvests, and problems in beekeeping due to bee mortality caused by new pests. They also mention alterations in the flowering of trees and crops, as well as more intense heat waves.

Table 3. Summary of the Semi-Structured Interviews.

	Codes identification interviews			
Variable	1DL, 4E and 7TS	2DM	3G	5HA and 6EC
1. Impact on daily life	Climate conditions affect agriculture, but there is no perceived increase in domestic workload.	Climate change demands adaptation, which implies costs. It also highlights the importance of digitization.	It is not seen as a dominant concern.	Extreme weather conditions affect employment (agriculture) and food. There is a greater burden on women in seeking solutions and adapting. They are actively seeking solutions to mitigate the heat.
2. Vulnerability and inequality	Vulnerability due to a lack of job opportunities and reduced access to public services.	Climate crisis and renewable energy may exacerbate the situation.	Rural women face pre-existing disadvantages. It highlights the importance of the CAP and women's well-being.	Vulnerability is independent of climate change, with historical and social roots. There is no perceived increase in vulnerability due to climate change. Concern about climate change is higher among women than men, causing fatigue and affecting health. It affects the economy and household responsibilities. It also highlights the vulnerability of migrant women. It reflects on its initial view.
3. Organizational responsibilities	Need for deep knowledge and diverse perspectives for local action plans. Importance of a gender perspective and technical assistance.	Does not directly address this variable.	Does not observe significant changes.	Women are more involved in implementing solutions, initiatives and in training, which creates an additional burden.
4. Concern about vulnerability	Need for a gender perspective in policies. Requires strengthening support services and promoting equality. Supports collective action.	Climate change may affect mental health and well-being, generating discouragement. Emphasizes the importance of supporting rural women entrepreneurs.	Does not believe that women are more vulnerable. Expresses cynicism and distrust towards climate policies.	It is essential to integrate the gender perspective into local development strategies, bills or policies.
Proposed solutions	Inventory of existing actions and an awareness plan with practical measures.	Focus on carbon certification and the sustainable use of forest resources.	Not specified.	Facilitation and training (especially for women). Visit successful initiatives for inspiration. Integrate the gender perspective.

Note. CAP = Common Agricultural Policy.

These changes are raising concerns about the sustainability of traditional agricultural and livestock practices, which could lead to a significant transformation of the rural way of life. As an example, experts 1DL and 6EC recognize that climate change requires adaptation, a process that imposes financial burdens on rural women. Early harvests necessitated by extreme heat and the impact of pests on bees serve as concrete illustrations of how climate change is altering traditional agricultural practices (1:7 ¶ 21–22 in Interview results).

Adaptation and prevention strategies: Interviewee 2DM highlights the need to adapt to new technologies and digitalization in the agricultural sector, emphasizing the importance of training in new agricultural tools and methods, as well as the potential for the development of small local businesses. However, she also points out the lack of adequate institutional support for rural women entrepreneurs and the need for more effective policies to retain people in rural areas. The impact of unfavourable news about climate change on the mental health and well-being of rural women is also emphasized, as are the negative consequences of discouragement and the perception of a lack of recognition for their efforts. This point of view coincides with the findings of Albrecht et al. (2007) and Franquesa (2024).

In terms of recommendations and solutions, interviewee 2DM suggests the idea of a greater focus on carbon certification and the sustainable use of forest resources as opportunities for rural development. 1DL, 4E and 7TS emphasize the importance of addressing not only the environmental aspects of climate change but also its social and economic dimensions. They emphasize the need for policies that specifically support rural women in adapting to climate change and in maintaining rural communities. The importance of the happiness and economic independence of rural women as key to facing the challenges of climate change is also mentioned. 5HA and 6EC point to the revitalization, training and dissemination of good practices.

Discussion

In the section entitled ‘Previous studies and relevant evidence’, it is argued that climate change has multiple adverse effects on rural communities in Spain, mainly affecting agriculture, water resources and air quality. Droughts have been observed to negatively affect agricultural incomes in rural areas of Spain (17 women surveyed). The impact of drought on crop productivity is well documented, with disparities in adaptation priorities observed depending on the type of crop, affecting those with fewer resources to adapt to changing conditions (Quiroga & Suárez, 2015).

Water resource management is further complicated by droughts and the variability of the water cycle, which can lead to conflicts between different regions and sectors (Estrela et al., 2012; Shafiee et al., 2023). In the survey, 15 of the women highlighted the scarcity of water for irrigation. The use of hydrological simulation models could facilitate the prediction of the implications in river basins and the development of more effective adaptation policies (Estrela et al., 2012). Spain, as a Mediterranean region, faces high vulnerability due to water scarcity and demand imbalance, which is aggravated by climate change (Estrela et al., 2012; Vargas, 2022).

Climate change has been shown to have a significant impact on air quality, which in turn has implications for public health. In Spain, a decrease in the levels of several air pollutants has been observed; however, ozone (O_3) levels have shown an upward trend. Changing climatic conditions have been identified as a contributing factor to these trends, and it is estimated that air quality could have improved even further if climatic conditions had remained constant (Shafiee et al., 2023). These climate-related changes in air quality have had a significant impact on mortality, with seasonal penalties that could have prevented approximately 3,200 deaths over a 25-year period if weather conditions had not changed (Shafiee et al., 2023). However, the findings of the present study suggest that the women surveyed saw little relationship between climate change, air quality and its consequences for public health.

It has been shown that the depopulation of rural areas weakens resources, which encourages desertification and increases the risk of forest fires, making these communities more vulnerable to extreme natural phenomena (Graus et al., 2024). This risk of fire due to rising temperatures and drought was a factor highlighted by 2DM interviewee. Also noteworthy is the willingness of respondents to adopt sustainable practices, especially in the domestic sphere. However, the barriers identified, including lack of knowledge and high costs, underline the need for policy interventions and personalized educational programmes to facilitate this transition. Initiatives such as WOCA, which presents case studies from around the world (Brown, 2007), have the potential to improve understanding of equitable mitigation strategies and the importance of female participation.

The experts' responses show that their perception of the impact of climate change is influenced by their respective training and professional experience. For example, the expert in environmental law (2DM) perceives climate change as a factor that aggravates existing challenges, emphasizing the importance of factors such as the Common Agricultural Policy and women's well-being. In contrast, the local development expert (3G) questions the relevance of climate change in comparison with structural and socio-economic problems. Experts with extensive experience in local development (1DL and 6EC) adopt an intermediate position, recognizing the importance of climate change but emphasizing the need for a holistic approach that takes other factors into account. By way of example, the sense of community, related to attachment to place, is a critical factor for quality of life in rural contexts, in contrast to urban social fragmentation (Mikulic, 2002). Various studies have pointed out that attachment to place tends to be lower in urban environments, where mobility, population density and social fragmentation make it difficult to build meaningful links with the territory (Tenbrink & Willcock, 2023). This difference supports the claim that rootedness is stronger in rural contexts, as reflected in our study. Experts 1DL, 4E and 7; 2DM and 5HA 6EC, while recognizing the complexity of the situation, show greater concern for the effects of climate change on rural women. Expert 2DM, while experts 5HA and 7TS, highlight the role of migrant women and the importance of integrating their specific needs. Expert 1DL highlights the need for technical assistance and local action plans, while expert 2DM highlights the need for digitalization. Experts 5HA

and 7TS offer a more emotional vision, talking about the 'continuous rumour' of climate change and the overload it generates in women.

It is important to emphasize that the scepticism expressed in interview 3G may be indicative of a distrust of climate policies that are perceived as ineffective or having hidden agendas, as well as a lack of awareness of the concrete actions that can be implemented at the local level. On the other hand, the high average age of women living in the rural areas of this territory makes it necessary to develop adapted communication strategies. Internet and television have been identified as fundamental channels for this purpose. However, it is essential to emphasize the promotion of women's active participation and the improvement of their capacities.

To understand the uncertainty about gender, it is necessary to investigate the social dimensions of climate change. As Escayola (2020) and Vargas (2022) suggest, climate change is a social and gender issue that requires a holistic approach. These findings have important implications for the design of public policies and climate action programmes in the region. It is imperative to allocate resources to improve awareness and educational initiatives on climate change, facilitate access to technologies and resources that can aid in adaptation and mitigation efforts and ensure the active participation of women in decision-making processes at all levels. Furthermore, there is a need to increase research efforts on the gender dimensions of climate change in rural contexts. This will facilitate a deeper understanding of the particular vulnerabilities and needs of women, enabling the formulation of more effective adaptation and mitigation strategies, as proposed by the Instituto de la Mujer (2020).

Conclusion

Rural dwellers show higher levels of place attachment (i.e. the attribution of meaning to a specific place) compared to their urban counterparts. This phenomenon can be attributed to the rural population's greater dependence on their local environment. This dependence can influence perceptions and behaviours, as well as fostering a greater inclination to participate in landscape conservation.

In the depopulated regions of Spain, rural women perceive climate change as a significant threat to their future lifestyles, which exacerbates difficulties and vulnerability in crisis situations. To effectively address the challenges posed by climate change in these communities, it is essential to take into account the diversity of perspectives, adopt a holistic approach and promote policies that foster adaptation, economic independence and the well-being of rural women. A specific contribution presents a critical view of the relevance of climate change for rural women, highlighting the importance of addressing socio-economic, political and psychological factors in policies and actions to promote adaptation, equality, well-being and environmental sustainability.

It is imperative to recognize the importance of collective action and the implementation of specific policies to mitigate these impacts and build resilience to climate change. This is particularly crucial to ensure that the rural environment and its inhabitants are not left behind in the global effort to combat climate change.

Recognizing and valuing the knowledge and experiences of rural women is critical to the development of effective, fair and inclusive climate change adaptation and mitigation strategies. This approach will not only benefit rural communities but will also contribute to a more equitable transition towards sustainability on a global scale. Although progress has been made in the design of institutional options and policy adjustments to promote the transition to climate-smart agriculture, these experiences must be shared and the lessons learned must be analysed and applied in other contexts and realities.

The study also highlights the importance of adapting communication and climate action strategies to the characteristics of the rural population, particularly older women, using information channels to which they have access, such as training, television and the internet. It is also essential to address the barriers that prevent the adoption of sustainable practices, such as lack of knowledge, high costs and resistance to change. This can be achieved through the promotion of education, training, advice on accessing resources and community support.

The ambiguity in the perception of the differences in the impact of climate change between men and women, as evidenced in the responses to the questionnaires, underlines the need for more in-depth research on the gender dimensions of climate change in the rural context. A comprehensive analysis is imperative to elucidate the influence of social norms, gender roles and economic inequalities on the vulnerability and adaptive capacity of both men and women. A comparative analysis of the responses provided by the experts reveals a general consensus on the severity of the problem and the need to incorporate a gender perspective. However, the priorities and solutions proposed vary according to the background and experience of each expert.

This analysis highlights the need to adopt a holistic and participatory approach to address the challenges posed by climate change in rural areas, taking into account the diversity of voices and perspectives and promoting solutions adapted to the specific needs and realities of each community.

In summary, this work can contribute to a better understanding of the perceptions and experiences of rural women in relation to climate change, providing valuable information for the design of more effective, equitable public policies that are more sensitive to the needs of rural communities.

This study has certain limitations that should be taken into account when interpreting the results. Firstly, the sample size is relatively small, and it is centred on a single province, which restricts the generalization of the results to other regions. Secondly, the questionnaire is based on the subjective perception of the participants, which may be influenced by biases and subjectivities.

Therefore, future research should focus on expanding the sample and using mixed methods to obtain a more complete and in-depth understanding of the experiences and perceptions of rural women with regard to climate change. It is also necessary to investigate how traditional practices and local knowledge can contribute to the adaptation to and mitigation of climate change in the rural context.

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Author Contributions

Lidia Sanz Molina, professor at the University of Valladolid, was responsible for creating the questionnaire, the semi-structured interview script and the qualitative analysis of the interviews using AtlasTi. She was also responsible for writing the article. Raúl Maján Navalón (doctoral student at the University of Valladolid and manager of the Tierra sin Males Association) was responsible for the review of the article, writing, implementation and translation. María García Lázaro (Local Development Technician at PROYNERSO) was responsible for the selection of participants, the distribution of the questionnaire and the conducting of the interviews, as well as the review of the article. The authors' interest in promoting research and the generation of opportunities in the territory stems from their experience of working in the field of local development in the province, which led them to carry out this work.

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References

Akinbami, C. A. O., Olawoye, J. E., & Adesina, F. A. (2016). Rural women belief system and attitude toward climate change mitigation and adaptation strategies in Nigeria. In W. Leal Filho, H. Musa, G. Cavan, P. O'Hare, & J. Seixas (Eds.), *Climate change adaptation, resilience and hazards* (pp. 49–69). Springer.

Albrecht, G., Sartore, G. M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., Stain, H., Tonna, A., & Pollard, G. (2007). Solastalgia: The distress caused by environmental change. *Australasian Psychiatry*, *15*(1 Suppl), S95–S98. https://doi.org/10.1080/10398560701701288

Aliyu, H. K. A., & Sheriffdeen, M. (2022, November). Climate risk perception among women farmers in Kwara North, Nigeria. *IOP Conference Series: Earth and Environmental Science*, *1109*(1), 012012). https://doi.org10.1088/1755-1315/1109/1/012012

Ayala Carrillo, M. D. R., Gutiérrez Villalpando, V., & Zapata Martelo, E. (2016). Género, cambio climático y REDD+: Experiencias en el tiempo. *Terra Latinoamericana*, *34*(1), 139–153.

Batool, H., Ali, W., Manzoor, R., & Mahmood, N. (2018). Women's perception of climate change and coping strategies in Pakistan: An empirical evidence. *Earth Systems and Environment*, *2*, 609–619. https://doi.org/10.1007/s41748-018-0073-7

Beck, S., & Mahony, M. (2018). The politics of anticipation: The IPCC and the negative emissions technologies experience. *Global Sustainability*, *1*, e8. https://doi.org/10.1017/sus.2018.7

Brown, S. (2007). Where the land is greener: case studies and analysis of soil and water conservation initiatives worldwide. *Mountain Research and Development*, *28*(2), 180–181.

Centeno, E. F. (2023). Movilidad sostenible ante el cambio climático. Propuestas desde la ecopolítica feminista. *Sociedad y Ambiente*, (26), 1–29. https://doi.org/10.31840/sya.vi26.2755

Corbera, E., Calvet-Mir, L., Hughes, H., & Paterson, M. (2016). Patterns of authorship in the IPCC Working Group III report. *Nature Climate Change*, *6*(1), 94–99. https://doi.org/10.1038/nclimate2782

Escayola, M. B. (2020). El cambio climático desde una mirada (eco) feminista. *Voces jóvenes frente a la emergéncia ecológica*, pp. 41–50. https://xuventude.xunta.es/images/Observatorio_Galego_da_Xuventude/ano_2021/Voces_j%C3%B3venes_frente_a_la_emergencia_ecol%C3%B3gica.pdf#page=41

Estrela, T., Pérez-Martin, M. A., & Vargas, E. (2012). Impacts of climate change on water resources in Spain. *Hydrological Sciences Journal*, *57*(6), 1154–1167. https://doi.org/10.1080/02626667.2012.702213

Franquesa, T. (2024). *Cambio climático y ecoansiedad. De la preocupación a la acción*. Ediciones Oberon.

Gilbert, J. M. D. F. (2022). El derecho ante los desastres naturales y el cambio climático. *Revista Estudios Jurídicos*, *22*, 7512. https://doi.org/10.17561/rej.n22.7512

Graus, S., Ferreira, T. M., Vasconcelos, G., & Ortega, J. (2024). Changing conditions: Global warming-related hazards and vulnerable rural populations in Mediterranean Europe. *Urban Science*, *8*(2), 42. https://doi.org/10.3390/urbansci8020042

Hashem, N. M., Martinez-Ros, P., Gonzalez-Bulnes, A., & El-Raghi, A. A. (2023). Case studies on impacts of climate change on smallholder livestock production in Egypt and Spain. *Sustainability*, *15*(18), 13975. https://doi.org/10.3390/su151813975

Hendrastiti, T. K., Kusujiarti, S., & Sasongko, R. N. (2023). The narratives of local women's resilience in disaster and climate change: The voices of indonesian women in the watershed areas. *The Indonesian Journal of Socio-Legal Studies*, *3*(1), 4.

Hickman, C. (2020). We need to (find a way to) talk about . . . Eco-anxiety. *Journal of Social Work Practice*, *34*(4), 411–424. https://doi.org/10.1080/02650533.2020.1844166

Hulme, M. (2010). The IPCC on trial: experimentation continues. *Environmental Research Web Talking Point*, *21*. https://mikehulme.org/the-experimental-nature-of-the-ipcc/

Ifeanyi-Obi, C. C., Wigwe, C. C., Adesope, O. M., & Obafemi, A. (2023). Traditional perceptions of climate change phenomenon influencing adaptation decisions among women crop farmers in Southern Nigeria. *Journal of Agricultural Extension*, *27*(2), 15–27. https://doi.org/10.4314/jae.v27i2.2

Iñiguez-Gallardo, V., & Tzanopoulos, J. (2023). Percepciones de adaptación y mitigación climática: Una aproximación desde las sociedades de los Andes del sur de Ecuador. *Sustentabilidad*, *15*(2), 1086. https://doi.org/10.3390/su15021086.

Instituto de la Mujer. (2020). Informe Género y Cambio Climático, un diagnóstico de situación. https://www.inmujeres.gob.es/diseno/novedades/Informe_GeneroyCambioClimatico2020.pdf

InterAcademy Council. (2010). *Climate change assessment. Review of the process and procedures of the IPCC*. IAC https://www.ipcc.ch/site/assets/uploads/2018/03/inf05_p32_review_ipcc_processes_Procedures.pdf

Judijanto, L., Machzumy, M., Rahayu, S., & Suryaningrum, D. A. (2023). El efecto del cambio climático y las prácticas agrícolas sostenibles en la productividad y la seguridad alimentaria en las zonas rurales de Java Oriental. *Estudios Interdisciplinarios de la Ciencia del Oeste*, *1*(12), 1461–1470. https://doi.org/10.58812/wsis.v1i12.475

Lawson, E. T., Alare, R. S., Salifu, A. R. Z., & Thompson-Hall, M. (2020). Dealing with climate change in semi-arid Ghana: Understanding intersectional perceptions and adaptation strategies of women farmers. *GeoJournal*, *85*(2), 439–452. https://doi.org/10.1007/s10708-019-09974-4

López Teloxa, L., & Monterroso, A. I. (2024). Pérdida de carbono orgánico del suelo en sistemas agrícolas de México por cambio climático. *Current Topics in Agronomic Science*, *4*(2), 1–11. https://doi.org/10.5154/r.ctas.2024.04.04

Memon, F. S., Abdullah, F. B., Iqbal, R., Ahmad, S., Hussain, I., & Abdullah, M. (2023). Addressing women's climate change awareness in Sindh, Pakistan: an empirical study of rural and urban women. *Climate and Development*, *15*(7), 565–577. https://doi.org/10.1080/17565529.2022.2125784.

Memon, F. S., & Amjad, S. (2020). Understanding women's perceptions of promoting education and policy initiatives about climate change in rural areas of Sindh, Pakistan. *Journal of Education and Educational Development*, *7*(1), 140–156. https://doi.org/10.22555/joeed.v7i1.3223

Mikulic, I. M. (2002). Calidad de vida en contexto urbano y rural desde el enfoque de la Psicología Comunitaria. *Anuario de Investigaciones*, *IX*, 127–135.

Miller, C. A. (2004). Climate science and the making of a global political order. In *States of knowledge* (pp. 46–66). Routledge.

Oreskes, N., & Conway, E. (2018). *Mercaderes de la duda. Cómo un puñado de científicos ocultaron la verdad sobre el calentamiento global*. Capitán Swing.

Phiri, K., Ndlovu, S., & Chiname, T. (2013). Climate change impacts on rural based women: Emerging evidence on coping and adaptation strategies in Tsholotsho, Zimbabwe. *Mediterranean Journal of Social Sciences*, *5*(23), V5N23P2545. https://doi.org/10.5901/MJSS.2014.V5N23P2545

Quiroga, S., & Suárez, C. (2015). Efectos del cambio climático y la sequía en la distribución de la renta rural en el Mediterráneo: un estudio de caso para España. *Natural Hazards and Earth System Sciences*, *16*, 1369–1385. https://doi.org/10.5194/NHESS-16-1369-2016

Rocano, C., Noé Salas, E., Calderon, J., Leon, G., Cruz, D. y Ponciano, F. (2025). Pérdida de Especies Vegetales, un escenario actual y proyección. *Revista Investigación Agraria*, *6*(3), 43–54. https://doi.org/10.47840/ReInA.6.3.2214

Sandoval, Y., Nuñez, J., Machicado, C., & Cabrera, L. (2024). Saberes forestales y cambio climático en cacao *(Theobroma cacao)*, majo *(Oenocarpus bataua)* y asaí *(Euterpe precatoria)*, en el norte de La Paz. *Revista De Investigación E Innovación Agropecuaria Y De Recursos Naturales*, *11*(3), 98–110. https://doi.org/10.53287/utcb5946so64b

Shafiee, M., Longworth, Z., Gizaw, Z., & Vatanparast, H. (2023). How does climate change affect biomass production and rural poverty?. *Biofuel Research Journal*, *10*(4), 1948–1965. https://doi.org/10.18331/brj2023.10.4.2.(2)

Tenbrink, T., & Willcock, S. (2023). Place attachment and perception of climate change as a threat in rural and urban areas. *PLoS One*, *18*(9), e0290354. https://doi.org/10.1371/journal.pone.0290354

UN Women. (2020). El cambio climático exacerba la desigualdad de las mujeres. https://conexioncop.com/el-cambio-climatico-exacerba-la-desigualdad-de-las-mujeres/

Vargas, M. I. (2022). Reflexiones feministas sobre la trama ciudad, género y cambio climático. *Revista Tramas y Redes*, *2022*(3), 75–89.

Venkatasubramanian, K., & Ramnarain, S. (2018), Gender and adaptation to climate change: Perspectives from a pastoral community in Gujarat, India. *Development and Change*, *49*, 1580–1604. https://doi.org/10.1111/dech.12448

Villamayor-Tomas, S., Gaitán Cremaschi, D., Pierri-Daunt, B., Santos de Lima, L., & Corbera, E. (2024, octubre). Más allá de la 'España vaciada': cambio climático, despoblación y globalización en las zonas rurales. Observatorio Social La Caixa. Institut de Ciència i Tecnologia Ambientals (ICTA-UAB); Esteve Corbera, ICTA-UAB e Institució Catalana de Recerca i Estudis Avancats (ICREA). [Artículo]. https://elobservatoriosocial.fundacionlacaixa.org/es/-/mas-alla-de-la-espana-vaciada

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