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Social Impacts of Energy Communities: Identification, Categorization, and
Relevance to Regional Dimension

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1. Introduction and Objectives

As energy transition is gaining more attention in the eyes of the general public, energy communities (ECs) are also becoming a growing phenomenon [1]. These voluntary initiatives hold the potential to not only reshape the energy sector and address climate change issues but also transform the social fabric. As the influences of ECs have been documented, the research has primarily focused on the economic and environmental impacts [2].

The social aspects, on the other hand, receive comparatively less attention [3]. In their review, Gjorgievski et.al. emphasize the issues of only a few projects including social considerations in their design and scarcity of methodology for quantification of social benefits, and therefore point to a significant gap in understanding the social impacts of ECs [4]. They remain the ones that are the hardest to assess and are most influenced by context and culture, yet they are of utmost importance in shaping the acceptability and success of energy transition initiatives. The understanding and assessment of ECs' social impacts are crucial, as they are the ones influencing the perception and public support of energy initiatives, their long-term sustainability, the development of supportive policies and grant schemes, and facilitating informed decision-making. Motivated by this significance, this paper seeks to contribute to the field by providing valuable insights that can feed into efforts related to the region-tailored social impact assessment (SIA) of energy communities.

Therefore, the research questions of this paper are:

What are the key social impacts of energy communities? How do they relate to each other? How do their relevance and significance vary based on the region the ECs are located in?

And they translate to the following objectives:

1. Identify the social impacts of energy communities recorded by the researchers.

Contribution: By systematically identifying and compiling existing research on the social impacts of energy communities, this paper ensures a comprehensive overview of the current state of knowledge. This step is crucial to distinguishing realistic and scientifically grounded potentials of ECs from inflated expectations, avoiding duplication of efforts, and building on existing insights.

2. Create a taxonomy of social impacts.

Contribution: Categorization provides a structured framework for analysis.

It allows for a more organized presentation of social impacts, making it easier to compare findings across studies and identify common themes or patterns.

Additionally, it streamlines communication between academic and non-academic stakeholders.

3. Compare the relevance of the impacts in different microregions.

Contribution: Assessing the relevance of social impacts in different microregions contributes to the contextualization of findings. It acknowledges the inherent diversity in social impacts based on local factors and cultural nuances.

This step is crucial for tailoring energy community initiatives, and their SIA to specific regional contexts. We want to test whether certain sets of social impacts can apply to certain countries, scaling up to regions within the European Union in the future.

In summary, achieving these objectives contributes significantly to the understanding of energy communities' social impacts by providing a consolidated, organized, and contextually relevant body of knowledge on the taxonomy and relevance of the social impacts of ECs. It will allow to facilitate future research, policy development, and decision-making within the energy community sector. The paper aims to bridge the gap between researchers' and stakeholders' expectations of ECs' performance and their scientifically proven outcomes in the societal sector, empowering EC initiatives to make informed decisions and develop sustainable and socially impactful energy transition projects.

2. Literature Review for Conceptual Framework

2.1 The Definition of Energy Community

The term energy community is a broad concept containing variations in definitions and types. What researchers usually agree on is that there is little consensus on what an energy community is [5] [6] [7]. There are variations ranging from Moroni et.al.'s "groups of individuals who voluntarily accept certain rules for the purposes of shared common objectives (only or also) relating to energy" [8] to the European Commission's "citizen-driven energy actions that contribute to the clean energy transition, advancing energy efficiency within local communities" [9]. This may be attributed, among other factors, to the long history of community energy initiatives operating without a special term for them. Depending on the region, they might date back to the 1970s, like in Denmark [10] [11]. However, the EU-wide definition of citizen energy communities [12] and renewable energy communities [13] was only proposed by the European Parliament recently in the Directives 2019/944 and 2018/2001 respectively.

According to the work of Bauwens et.al., there were at least 183 definitions of community energy in 2022 [7]. The existence of numerous definitions of energy communities can be attributed to the complexity of the concept of "community," the diverse range of activities and objectives associated with energy communities, and the dynamic nature of the energy sector.

'Energy community' and 'community energy' are the most frequent terms used in the literature [7], but the definitions from both the Commission and the Directives encompass more than the entities that directly call themselves energy communities. Consequently, for this paper, we would like to clarify the definition of an EC and briefly overview the list of terms that are used to describe entities falling into the definition.

The first group of EC-related terms are the broad and closely related definitions. As mentioned earlier, the *renewable energy community* and *citizen energy community* have already been defined by the EU Directive. In summary, a renewable energy community is a legal entity that is in full control of its members, who participate in it voluntarily and develop renewable energy projects

in close proximity, thus seeking benefits to the members or broader community rather than financial gains. The members or shareholders can be natural persons, small and medium enterprises, or local authorities, including municipalities. A citizen energy community is a broader concept, as it does not have limitations in geographic proximity and employing renewable energy [12] [13].

Three terms were prominently used in literature to describe such initiatives before the aforementioned Energy Directives got into force: *local energy communities* [14], *sustainable energy communities* [15], and building on it, *clean energy communities* [5]. The first one later became a citizen energy community in the Directive. The last two did not undergo the same legal transformation, but they still fall under the EU's renewable energy community definition, and certainly under the general term energy community.

Energy cooperative is a term often used in relation to energy communities. Some argue that the definition is the same, and some see energy cooperatives as forms of energy communities [4]. In some countries, such as the Netherlands, energy communities are not defined, but energy cooperatives are a recognized form of cooperation, and they continue to spread and develop [16]. Germany, which has a long tradition of energy cooperatives and municipal (multi-) utility companies, had approximately 1700 community energy initiatives, out of which roughly 50% were energy cooperatives, in 2016, and from 2006 to 2020, a cumulative number of 896 energy cooperatives had been established [17].

REScoop.eu, the European Federation of Citizen Energy Cooperatives, uses the term “*REScoops*” to describe energy cooperatives, a business model rather than a legal form, “where citizens jointly own and participate in renewable energy or energy efficiency projects” [18]. They also add that for them REScoops and citizen or renewable energy communities are interchangeable concepts. However, a cooperative form does not limit profit-seeking activities or may be closed to inclusive public participation due to the number or the price of the cooperative's shares, which is sometimes the case in Sweden [19]. Therefore, evaluating whether an energy cooperative is an EC should happen individually case by case.

The second group of EC definitions is their technological and infrastructural variations. It includes *net zero community* [20], with variances within the term [21], *positive energy districts* [22], *smart energy community* [23]

similar to it yet distinguished *community microgrid* [24], and finally *integrated community energy systems* (ICES) [25].

Taking into consideration the aforementioned variations of ECs, we decide to construct our definition as follows: Energy Community is a citizen initiative for the collective management of energy with voluntary and open participation, which is controlled by its members and seeks non-financial benefits to itself and the local community. These initiatives are the ones that we aim our social impact framework at, and they can be inclusively found among the entities with similar names discussed above.

2.2 The Definition of Social Impact

The most prominent work on social impact assessment belongs to Vanclay et.al. In their most recent guidebook for the International Association for Impact Assessment, they define social impact as the “intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects)”, that are “experienced or felt, in a perceptual or corporeal sense at the level of an individual, social unit (family/ household/ collectivity) or community/society” [26]. Vanclay also points out the distinction between social impact and social change process, which “represent the measurable outcomes of social change processes, which may or may not cause impacts depending on the situation” [27].

Another definition is given by social scientists, particularly Clark et.al. First, they put impact in the framework of the impact value chain [28]. It consists of input, activities, output, outcomes, and goal alignment. The output is a result that can be measured, and the outcome is a change to social systems. Finally, the impact is “the portion of the total outcome that happened as a result of the activity of the venture, above and beyond what would have happened anyway” [28]. This definition heavily implies that a counterfactual is needed to properly measure social impact, otherwise, the pre-existing trajectory would remain unclear.

In a paper focusing specifically on the social impacts of energy communities, Bielig et.al. attempted to describe the concept more comprehensively. They drew on Vanclay’s definition and emphasized that social impact affects both individual and communal levels and extends beyond exclusively economic benefits for communities. Additionally, social impact

“refers to broader social consequences rather than immediate effects: it concerns the direct or indirect affective change in individuals or a community from a perceptual or physical perspective, associated with social value creation” [29].

In summary, social impact is a multifaceted concept encompassing intended and unintended, positive and negative changes in individuals, communities, or societies on a physical or perceptual level. They are different from the processes of social change, the direct measurable outcomes of undertaken activities. Their assessment is complicated by a need to assume what would have happened without the intervention, and by their inherently contextual nature.

3. Methodology

In this paper, we used the principles of a systematic search with a narrative synthesis. We searched for papers that mention the social impacts of energy communities, and even though we used inclusion/exclusion criteria, it was not a full systematic literature review. Instead, we focused on a narrative synthesis by opening each source's full text and searching for specific social impacts of energy communities. While a full systematic review involves a comprehensive analysis of a large body of literature, our focus was on identifying key concepts and gaining a nuanced understanding of the social impacts mentioned in the available literature. The narrative synthesis allowed us to explore each source in-depth, extracting valuable insights and patterns that contribute directly to the development of our framework. This approach provided a more detailed and context-specific understanding of the social impacts, aligning with the immediate needs of our research objectives.

After shaping the theoretical framework, we then prepared questions to conduct pilot mixed-methods interviews with representatives of ECs in different countries to both assess the feasibility of such a data-collection method as well as refine the research approach.

3.1 Theoretical Framework Methodology

3.1.1 Eligibility Criteria and Search Strategy

Google Scholar database was used to retrieve the peer-reviewed studies, as well as the cross-references and grey literature deliverables from the main actors of the community energy field. The oldest date considered relevant was 2015, to ensure that the information is more reflective of recent developments and trends, providing a more accurate snapshot of the current landscape. As it was discussed earlier, the term energy community may have alternative names, therefore, the search included those variations: *"social impact" AND ("energy cooperative*" OR "energy coomunit*" OR "community energy" OR "collective action initiative*" OR "energy sustainable communit*" OR "community microgrid*" OR "positive energy district*" OR "net zero communit*")*. In an attempt to broaden the literature database, a search for: *"transition" AND "social impact"* was done.

However, it was shortly disregarded, as energy transition encompasses way more initiatives and policies than energy communities.

3.1.2 Study Selection

From the search results, all papers were considered based on their full text, searching mentions of ‘social impact’ or ‘social benefits’ and inspecting the surrounding text. If the paper was mainly proving that ECs create social impact, but not delving into the categories or specifics, it was dismissed, or only forwarded to enhance the literature review. If a paper mentioned only one social impact, but investigated it thoroughly, it was included in the aggregation.

When more than 10 search results in a row stopped providing any data on the social impacts of ECs, the search was considered done.

3.1.3 Data Collection Process

A matrix was created to accumulate specific social impacts against their mentions. At this step, impacts with fairly similar names were considered as one, however, variations or narrower terms were left separate until the next analytical step. The classifications of social impacts were collected in a separate table as well.

3.2 Interview Methodology

Before proceeding to the next chapter, we find it important to first discuss the methods employed in the qualitative data collection part of our study. To assess the plausibility of the developed framework and the variability in regional relevance of social impact categories, particularly Distributive Energy Justice, three pilot interviews were conducted. The interview method was chosen to gain in-depth insights and gather context-related nuances through a verbal discussion, as opposed to surveying the participants. The interviews were mixed-methods, combining Likert scale questions and open-ended questions in a semi-structured interview approach, following the universally accepted guidelines from [30].

3.2.1 Participant Selection

The people who consented to be interviewed serve as representatives of community energy-related projects in Italy, Greece, and Hungary (designated as Participants A, B, and C, respectively). They were located through energy

communities' websites affiliated with REScoop, as well as through network connections. Participant A holds a board position in a prominent Italian energy cooperative, providing support and consultancy to local community energy projects. Participant B, on the other hand, is employed by EU-wide and Greek organizations supporting community energy initiatives, while also serving as a board member of a local EC. Lastly, Participant C is affiliated with a non-profit organization dedicated to collaborative real estate development, actively engaged in establishing an Energy Community within the co-owned building.

Participants A and B possess extensive experience, not only within their respective ECs but also in collaborating with various initiatives and offering guidance. Participant C stands out as one of the few individuals in Hungary actively involved in community energy endeavors. All three participants share a common thread of focusing on social benefits. While acknowledging the potential for bias due to their emphasis on social impacts, their collective expertise proves invaluable for our study. These interviews allow us to compare the answers from an Eastern European country to the Mediterranean ones. Additionally, obtaining interviews from two countries within the same region allows us to observe the deviation in responses within the same "regional" context, and thus detect whether our original proposal of region-tailored SIA is relevant in the first place.

3.2.2 The Interview Guide

The interview guide consisted of four sections: introduction, Likert-scale rating, open-ended questions, and closing. In the introduction, we explained our research objectives and presented the participants with the definition of social impact that we used, the developed taxonomy of the social impacts of ECs, and the definition of Distributive Energy Justice. We also allowed the participants to disagree with the definitions and give comments on the taxonomy as part of collecting feedback on our framework.

Next, we asked the participants to rate how important it is for ECs to improve Distributive Energy Justice according to the opinions of various stakeholders. This was done with a Likert scale, and the description of each point from 1 to 7 is provided in Figure 3.2.2 1. The explanation of each rating ranged from not prioritizing that impact group at all to making addressing that impact group obligatory to be called an EC. Since the interviewees were representing a

whole country, they were asked about the relevance of the same category for different stakeholders, as presented in Figure 3.2.2 2. These answers served as the core of our relevance assessment and provided contextual insights into the area of Distributive Energy Justice.

How relevant is it for ECs to improve [this social impact category] for [this stakeholder]?

1. Strongly Irrelevant: For [this stakeholder], the primary focus of ECs should be on other goals, like economic viability and sustainability, not [this social impact category].
2. Irrelevant: For [this stakeholder], [this social impact category] is a lower priority compared to other goals of ECs.
3. Slightly Irrelevant: In [this stakeholder's] opinion, ECs should consider [this social impact category], but it's not a top concern.
4. Neutral: For [this stakeholder], [this social impact category] is equally important as other goals for ECs.
5. Slightly Relevant: For [this stakeholder], [this social impact category] is an important aspect of ECs even if it is not constantly in focus.
6. Relevant: In [this stakeholder's] opinion, ECs should prioritize [this social impact category] as a core value.
7. Strongly Relevant: For [this stakeholder], [this social impact category] should be the central focus of ECs, and if an EC does not improve [this social impact category], it should not be allowed to be called an EC.

Figure 3.2.2 1 Likert scale for relevance assessment at the interviews.

Stakeholders:

- a. you personally
- b. your EC
- c. your local/regional government
- d. your national government
- e. the citizens of your country

Figure 3.2.2 2 The stakeholders whose perspectives the interviewees were asked to assess.

In the open-ended section of the interview, participants were invited to share their perspectives on Distributive Energy Justice within the context of energy communities. The questions presented to the interviewees are displayed in Figure 3.2.2 3. They were designed to explore the following topics. First, the practical aspects of Distributive Energy Justice. Participants were asked to describe the specific actions or initiatives undertaken in that direction by their EC or considered best practices in their country. This was done to move beyond a broad discussion of a social impact category and gain information on the concrete strategies used in the field.

Second, the factors enabling ECs to address Distributive Energy Justice, such as legal frameworks, government incentives, or collaborative efforts. They provided an outline of contextual factors that influence the development of ECs and their progress in the social impact area.

Third, the importance, and rationale of addressing Distributive Energy Justice. Understanding the underlying motivations and values of ECs would allow us to adjust our framework and incorporate considerations that were not initially apparent.

Lastly, we discussed the measurable indicators of ECs' active engagement in developing Distributive Energy Justice, and the implications of the results of these principles into policies or laws governing ECs. This was mainly done to inform the further stages of developing our framework.

By exploring these dimensions, the open-ended questions aimed to capture a comprehensive understanding of distributive energy justice as perceived and practiced within ECs.

What does your EC, or any best practice EC in my country do to improve distributive energy justice?

What makes it possible for ECs to address distributive energy justice?

Why is it important for ECs to address distributive energy justice?

How can someone tell if an EC is actively working to improve distributive justice?
How can one measure success? How can one prescribe in a policy or law that ECs have to improve distributive justice?

Figure 3.2.2 3 Open-ended questions used in the interviews.

In the closing part of our interview, we invited the interviewees to share any additional thoughts on topics that we may not have covered but that they found relevant. Then we concluded the interview and expressed our gratitude for the shared time and insights.

3.2.3 Interview Procedure and Data Collection

The interviews were conducted individually with each participant online, using MS Teams for 2 interviews, and Google Meet for one, for the participants' convenience. This not only ensured flexibility but also aimed to facilitate participation and capture insights from individuals actively engaged in EC projects. To maintain consistency, all interviews were conducted in English. The average duration of each interview was approximately 45 minutes. The interviews were transcribed, and detailed notes were taken during the interviews to capture the key points of discussion.

A constraint encountered during the data collection process is related to the time limit of each interview, circumscribed by the need to maintain participants' engagement and attentiveness. Therefore, these pilot interviews focused on only one social impact category, Distributive Energy Justice. This allowed an in-depth discussion of various aspects of the social impacts attributable to the category, and an overall trial of our framework. For a more comprehensible and complete exploration of all six social impact categories,

future research may undertake interviews of extended duration or select alternative data collection methods.

3.2.4 Data Analysis

The data analysis can be described as iterative, as we applied the pre-developed framework to the dataset but drew new conclusions from it and came to the readjustment of the methodology. As we aimed for thematic analysis, we went through rounds of process and axial coding before drawing our conclusions, discussed in the next chapter.

4. Results and Discussion

This chapter presents the formation of the set of the social impacts of ECs, the developed categories, and the findings from the relevance assessment obtained through pilot interviews. The section dedicated to the social impact framework elaborates on the process of categorization, including defining the categories and assigning category labels to the social impacts included in the framework. The section on interview results presents the findings gained from the three pilot interviews, including the evaluation of the framework, and insights into the relevance assessment.

4.1 The Developed Framework of Social Impacts

4.1.1 Social Impacts Extraction

The initial matrix consisted of 78 impacts extracted from 39 recourses, 29 being peer-reviewed scientific papers, and 10 reports and project deliverables from entities involved in the energy community scene. 2 of those project deliverables were translated into English. At this stage, the highest number of mentions was 20 for ‘energy consciousness’, and 34 impacts (or impact ‘names’) were only mentioned once or twice, constituting 43% of the whole list (see Fig.4.1.1 1).

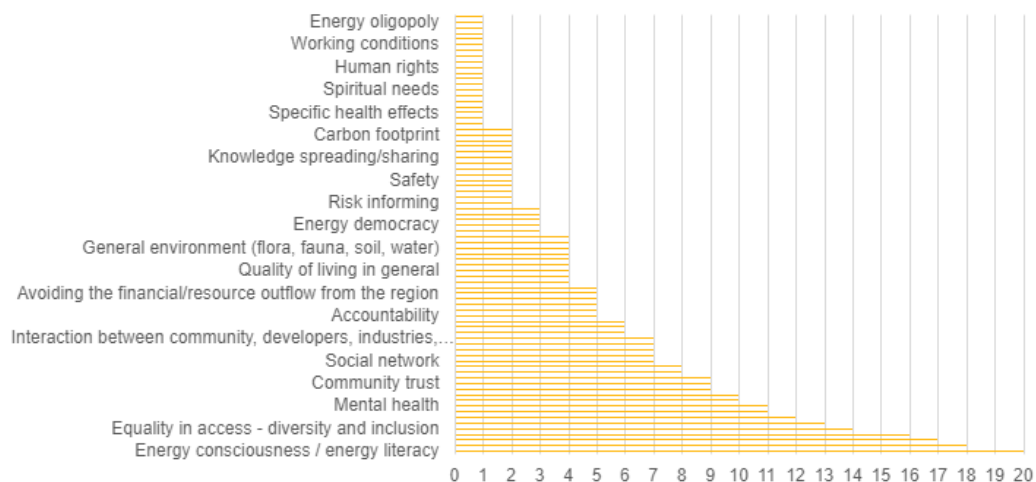


Figure 4.1.1 1 Mentions frequency of initially extracted social impacts of ECs.

This data leads to two opposing conclusions. The first is that there is little consensus on the social impacts of ECs. On the contrary, the number of impacts mentioned only once or twice illustrates the diversity of effects of ECs on societies, beyond the ones commonly discussed. This also suggests that there

might be underreported impacts that could be significant for understanding the full scope of energy communities' effects. Therefore, we aim for a framework that is not only concise but also comprehensive and inclusive of more specific, even yet unexplored variations of impacts.

4.1.2 Social Impact Categories Extraction

To help with the categorization of identified impacts, examples of other grouping methods were collected. It was extracted from the studies, reports, and project deliverables mentioning specific impacts, or from the ones that only provided a general overview of the categories.

Following the work of aforementioned Vanclay et.al. [26], the studies of social impact relevant to the transition to the circular economy [31] and wind farms [32] categorized them into eight impact areas or domains: people's way of life, people's culture, people's community, political systems, people's environment, people's health and wellbeing, people's personal and property rights, and people's fears and aspirations.

From wider research on social impact assessment, a paper investigating them in the context of deep open-pit mines is worth mentioning. Even though the impacts listed in that study are for the most part not applicable to energy communities, the grouping of social impacts is considered here, and the methodology for relevance analysis is considered further in the research. The categories are as follows: quality of life, workplace safety, employment, stakeholder's life expectancy, skill, and knowledge development, availability of skilled labor, safety and health of local community, revenue generation, cultural heritage/archaeology, landscape and visual [33].

Energy community initiatives are often considered in connection with energy justice, which is the pursuit of “a global energy system that fairly distributes both the benefits and burdens of energy services and one that contributes to more representative and inclusive energy decision-making” [34]. It encompasses various dimensions of justice, including distributive, procedural, restorative, recognition, and cosmopolitan justice [35].

In direct relation to ECs, Bielig et.al. identified four constructs of social impact: energy justice, energy democracy, community empowerment, and social capital [29]. Their subcategories, or indicators, “lack conceptual clarity” and

cause overlap between the broader categories, which in this case considered as an obstacle to timely and efficient social impact assessment of ECs.

Energie Partagee, a French non-profit organization, has already undertaken work similar to this paper's and created a self-assessment kit for the social impact of citizen renewable energy projects. It is only available to their members, and the sources used to create the kit and its details remain unknown to the public. However, there is a webinar recording available (in French), describing the kit, and giving an overview of the categories of the social impacts they use. They can be roughly translated as active citizenship, local energy reappropriation, community resilience, local economic benefits, and transversal cooperation [36]. These categories extend beyond the "social" category, which is controversial for a social impact assessment kit, but it was mentioned as purposeful during the webinar. But no further assumptions can be drawn about this classification as the information is not public.

In an evaluation report of the Next Generation program for Community Energy, seven social impact priority areas were identified: reduced social isolation, improved health and wellbeing, increased employability, better access to services, greater community pride and empowerment, improved local environment, and greater community cohesion [37]. These came as part of their research question and were used to assess the project and program outcomes.

Describing an application of the social impact assessment framework, Buchmayr et.al. identified six social impact categories as relevant and put them in two spatial dimensions, local and global, and assessed whether an impact can be considered in only one of them or both. As a result, they included the following categories in their framework: human health and safety quality, human rights (only global), working conditions, job creation (only local), quality of residential life (only local), and landscape quality (only local) [38].

Additionally, from [39], a categorization based on what influences the emergence of an impact can be drawn. "Certain impacts, such as socio-economic regeneration of the community, - are linked to the project's outcome. Other impacts, arguably less tangible, such as social capital, knowledge and skills development, and increased support for renewable energy, - are linked to the methods the project is realized (like the participation levels in the community)."

While the latter categorization only splits the impacts into two groups, the others propose a more nuanced separation. Excluding the dual categorization of [39], there are 8 other identified sources, two of which refer to the same existing categorization, which leaves us with 7 distinct systems. The overview of groups and their mentions is presented in Table 3.4.2.1. The terms easily interchangeable with each other were counted as one mention. This way, the most agreement among researchers is reached on the ‘people’s environment’ and ‘people’s health and well-being’ categories, with 5 mentions. ‘Community empowerment’ and ‘energy democracy’ were both mentioned in 4 sources, and ‘people’s culture’, ‘employment’, and ‘social capital’ – were in 3. However, as to the other categories, some of them seem to be either too specific and almost referring to a certain impact, or too broad with a risk of including the other categories or being in strong connection to them. This calls for a determined and conscious choice of a categorization system before merging the groups, as, for example, distributive energy justice may encompass the equitable distribution of those benefits and burdens that later influence both the environment (in an ecological and social sense) and people’s health and wellbeing.

Social Impact Categories	Number of Mentions	References
people's environment	5	[31], [32], [33], [37], [38]
people's health and wellbeing	5	[31], [32], [33], [37], [38]
community empowerment	4	[31], [32], [29], [37]
energy democracy	4	[31], [32], [29], [36]
people's culture	3	[31], [32], [33]
employment	3	[33], [37], [38]
social capital	3	[29], [36], [37]
people's way of life	2	[31], [32]
people's personal and property rights	2	[31], [32]
people's fears and aspirations	2	[31], [32]
quality of life	2	[33], [38]
working conditions	2	[33], [38]
skill and knowledge development	2	[33], [36]
distributive justice	2	[35], [29]*
procedural justice	2	[35], [29]*
restorative justice	2	[35], [29]*
recognitional justice	2	[35], [29]*

cosmopolitan justice	2	[35], [29]*
energy justice	2	[35]*, [29]
stakeholder's life expectancy	1	[33]
availability of skilled labor	1	[33]
revenue generation	1	[33]
community resilience	1	[36]
local economic benefits	1	[36]
better access to (energy) services	1	[37]
community cohesion	1	[37]
human rights	1	[38]
impacts linked to the project's outcome	1	[39]
impacts linked to the project's methods	1	[39]

Table 4.1.2 1 Social impact groups/categories and their mentions in literature.

4.1.3 Evaluation of the Categories

The first group of categories came directly from the ones extracted from the literature. Considering the significance of the just transition movement in advocating for equity and ensuring long-term sustainability, we decided to include energy justice as a main category. It encompasses a broad range of activities, and it is usually considered in 3 or even 5 dimensions, each of them having a substantial list of concrete impact examples. Therefore, for the purpose of this paper, all three main categories of energy justice – distributive, procedural, and recognitional – are considered separate social impact categories. Restorative energy justice, while being derivative of the three, still encompasses a unique range of activities, and aims to mitigate the damage made to nature by future and previous actions [40], and is therefore considered a separate category.

However, as we come to view the commonly distinguished category of cosmopolitan energy justice, we may find that it can fit into previously described ones. In essence, it “refers to the principle that everyone is a citizen of the world and that the energy sector has cross-border effects and impacts” [35]. It recognizes that energy activities in one part of the world can create injustices in other parts of the world and emphasizes that restrictions on energy activities on the global scene should not be biased. Therefore, it comes as a special case of all distributive, procedural, and recognitional justice combined, and is further viewed as an impact existing on their intersection.

As the extracted community-related categories exhibited variability in nomenclature and, consequently, posed challenges in clarity and comprehension, to complete our framework, we turned to examining the impacts in our matrix, specifically looking at those that did not fit the four justice-related categories. Figure 4.1.3 1 summarizes our understanding of relationships between the society/community-related impacts.

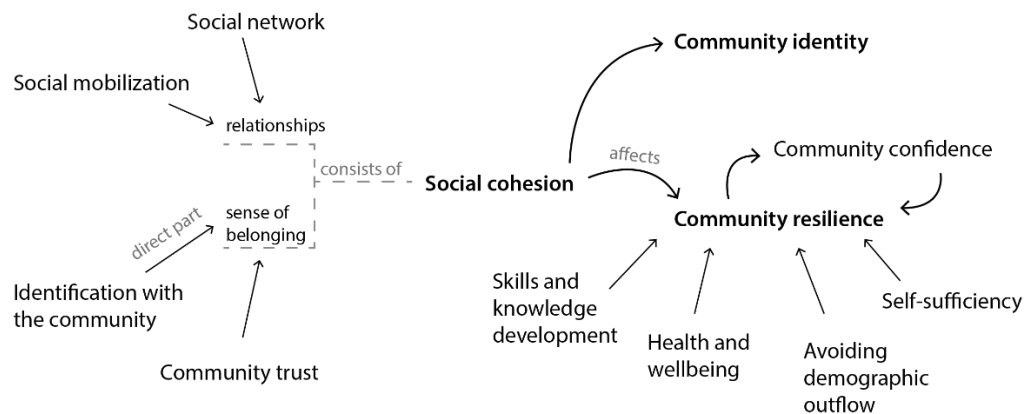


Figure 4.1.3 1 Relationships between identified social-related impacts.

Social cohesion was understood as one of the bigger concepts, encompassing smaller aspects, such as social network and mobilization, and identification with the community and community trust. Thus, it plays a central role in shaping the social fabric of a community. However, it was not found as the endpoint of influence, as it affects both collective community identity and community resilience. In that case, community identity is seen as a direct consequence of social cohesion and is left within that category. On the other hand, community resilience encompasses other impacts that are a direct part of it, such as skills and knowledge development, health and wellbeing, self-sufficiency, and others. However, we decided not to merge social cohesion into community resilience, to allow for granularity and keep the distinction of what specific impacts are attributed to. We acknowledge the complexity of the concepts and their interactions, and these relations, as demonstrated in Figure 4.1.3 2, are embedded in the framework.



Figure 4.1.3 2 Interconnectedness of selected social impact categories.

Lastly, we should recognize that “people’s way of life” and “quality of life” were mentioned as categories 2 times each, however, they are more comprehensive concepts that encompass not only social but also economic and environmental factors. As we aim this study at the social impacts of ECs, these categories lay beyond our framework.

4.1.4 Defining the Social Impact Categories

Distributive Energy Justice refers to the equitable and fair allocation of benefits and burdens within and among ECs. It includes considerations of access to affordable and reliable energy services, the allocation of financial costs and benefits, and equitable distribution of environmental impacts and risks [35]. As further examples, it also includes ensuring that energy infrastructure is sited without unjustly burdening specific groups, that energy initiatives foster both the quantity and quality of employment opportunities, and that social justice principles guide decision-making to address disparities and promote inclusivity in the energy sector and extend beyond resource allocation.

Procedural Energy Justice refers to the fair and equitable processes and mechanisms employed in energy-related decision-making and governance. It entails ensuring meaningful participation of community members in energy-related decisions, promoting transparency and openness in the decision-making process, fostering diversity and inclusivity in access to information and opportunities, leveraging local knowledge for informed choices, guaranteeing access to legal counsel when needed, adhering to upper-level legislation and regulations, and upholding the fundamental personal and property rights of all stakeholders [35].

Recognitional Energy Justice encompasses the continuous affirmation and respect for the rights, values, practices, and institutions of vulnerable populations within the process of developing ECs. It entails both recognizing those often marginalized in decision-making processes (evaluative dimension) and establishing normative principles for their recognition (normative dimension) [35].

Restorative justice in the energy sector refers to a proactive policy approach that focuses on the needs of the victims, such as nations, citizens, and nature, and aims to restore them to their original position before any damaging activity. It views harm and conflict within the energy sector as violations of relationships and emphasizes the responsibility of offenders to repair the harm caused. The concept of restorative justice in the energy sector involves addressing the impacts of energy projects or activities and preventing harm through early intervention and accountability. This approach also tries to not only mitigate the harm of the decision in question, but also the harms done to the victims by prior actions [40].

Social cohesion refers to the extent of connectedness and solidarity among groups in society. It identifies two main dimensions: the sense of belonging to a community and the relationships among members within the community itself [41].

Community resilience is a dynamic and multifaceted construct, involving the capacity of a community to adapt, self-organize, and exercise agency in the face of adversity and challenges. This includes both social-ecological resilience and health and development resilience. Community strengths are drawn into combined influence through agency and self-organizing and thus assist the development of resilience [42].

4.1.5 Evaluation of the Social Impacts

The list of specific social impacts was limited from 78 to 42. Firstly, some of the impacts were found to relate more to the environmental ('climate change resilience', 'carbon footprint', 'environment (flora, fauna, soil, water)', etc.) and economic areas ('reinvestment into the community', 'provision of local grants', 'local impact mobilization', 'energy efficiency', etc.), not the social one, and were disregarded. While it is crucial to acknowledge that impacts can have far-reaching

effects across multiple aspects of individuals' lives, our focus is on identifying those that have a direct or predominant influence on the social sphere. We aim to pinpoint impacts that are best assessed through SIA tools due to their inherently social and context-dependent nature.

Secondly, many impacts were merged into broader concepts. 'Energy poverty mitigation', 'fuel poverty mitigation', and 'better access to (energy) services' are considered as part of 'affordability of energy' to exclude duplicates. While those are not exactly interchangeable, 'affordability of energy' avoids focus fragmentation, and encompasses more activities, not only mitigation of energy poverty but also other aspects, such as making energy more accessible to a broader population, which provides a holistic perspective on affordability.

'Employment/job creation' aims to encompass both quantitative and qualitative changes in the job market, therefore, if there is an effect on job quality, working conditions, or an increase in employability, it is still considered to belong to this social impact.

Both 'affordability of energy' and 'employment/ job creation' are related to the economic sector, however, they are closely connected to distributive energy justice, a dominantly social concept. Affordability of energy has significant social implications, since the opposite, unaffordability of energy, can lead to energy poverty, disproportionately affecting vulnerable populations. And job creation within the energy sector provides employment opportunities that benefit local communities. Therefore, aiming at improving energy affordability and employment can have a direct positive impact on social equity and well-being within communities.

'Change in power structures', 'political systems', as well as one mention of 'reducing energy oligopoly' were decided to be considered a part of 'energy democracy'. Something described as 'wider political aspirations' was considered part of 'active political citizenship'. Sometimes 'interaction between different stakeholders, like municipalities, industries, developers, individuals' was mentioned separately, but here it is viewed as a part of 'social network'. Once, 'reciprocity' was considered as a separate indicator, but we see no point in separating it from 'shared ownership' for the purpose of easier SIA. Wording like 'fostering local circular economy' is considered equal to 'citizen involvement in

sustainable economic processes’. It is viewed not as a direct economic impact, as it focuses on involvement and participation rather than financial outcomes.

‘Community pride and empowerment’ was merged with ‘community confidence’. ‘Amenity and aesthetic value creation’, apart from economic and environmental, also holds the potential to influence social cohesion and was therefore left in the framework. Mentions of ‘landscape quality’ were considered as part of this impact.

‘Community engagement’ was attributed as part of ‘social mobilization’. ‘Civic empowerment’ is considered a contributing aspect to ‘community confidence’ and ‘active political citizenship’ simultaneously.

Thirdly, although most of the impacts with only one mention were merged with other ones at this point, two of them were considered worth leaving in the framework. They are ‘handling the social cost of fossil fuels’, the social cost meaning the degradation of mining areas, air pollution, and geopolitical tension around fossil fuels, and ‘avoiding demographic outflow’ both mentioned in [43], a REScoop’s report analyzing ECs’ social impacts in Greece. The first represents dimensions of distributive and restorative energy justice and the second – is community resilience. Additionally, they both come from practice analysis and are thus seen as important to consider.

Fourthly, we encountered mentions of social impacts coinciding with our selected groups in papers that were not related to categorization. This way, ‘social cohesion’ was mentioned 16 times, ‘community identity’ (that we view as a direct and inseparable consequence of social cohesion) – 5 times, and ‘community resilience’ – 5 times. These were not considered as separate social impacts.

Finally, due to aggregation, the maximum number of mentions increased to 25 (for ‘affordability of energy’), and there are at least 4 other impacts with a similar citation frequency – ‘energy consciousness/literacy’, ‘employment/job creation’, ‘participatory governance’, and ‘equality in access - diversity and inclusion’. 22 out of 42 impacts have 5-11 mentions, and the less frequently mentioned impacts constitute only 26% of the framework. Their contribution was considered case by case and proven valuable to avoid redundancy. These findings are illustrated by Figure 4.1.5 1, and the full list of social impacts is presented in Table 4.1.5 1.

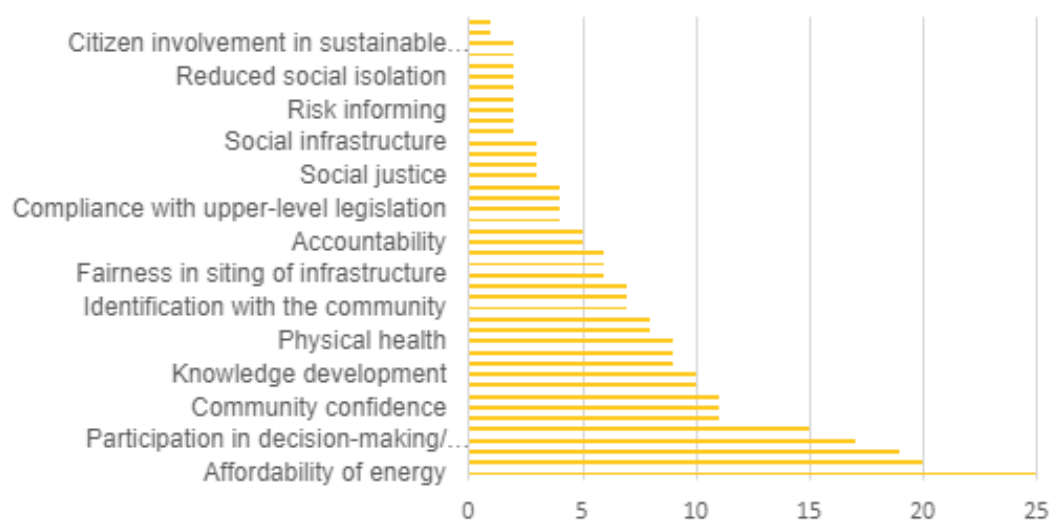


Figure 4.1.5 1 Mentions frequency of merged and aggregated social impacts of ECs.

Impact	M	Impact	M	Impact	M
Affordability of energy	25	Active political citizenship	8	Cosmopolitan justice	3
Energy consciousness/literacy	20	Identification with the community	7	Public satisfaction with local decision-making	3
Employment/job creation	19	Shared ownership	7	Social infrastructure	3
Participatory governance	17	Self-sufficiency	7	Access to legal counsel	2
Equality in access - diversity and inclusion	15	Fairness in the siting of infrastructure	6	General personal and property rights	2
Social network	11	Mobilization of local knowledge	6	Risk informing	2
Community confidence	11	Social capital	6	Social mobilization	2
Mental health	11	Accountability	5	General culture and history	2
Skill development	10	Energy democracy	5	Reduced social isolation	2
Knowledge development	10	Energy security	4	Thermal comfort	2
Recognition of and engaging with marginalized groups	9	Compliance with upper-level legislation	4	Knowledge spreading/sharing	2
Community trust	9	Lifestyle changes	4	Citizen involvement in sustainable economic processes	2
Physical health	9	Amenity and aesthetic value creation	4	Handling the social cost of fossil fuels	1
Transparency of decision-making	8	Social justice	3	Avoiding demographic outflow	1

Table 4.1.5 2 Mentions count of merged and aggregated social impacts of ECs.

4.1.6 The Taxonomy of Social Impacts

Finally, the category labels were assigned to each social impact indicator. It is important to note that instead of groups with strict boundaries, we opted for a more flexible and versatile ‘tagging’ system. This approach allows each indicator to be associated with multiple relevant categories simultaneously, accommodating the nuanced and multifaceted nature of social impacts, allowing to track a broader scope of each impact’s influence. Moreover, it encourages overlap between categories where applicable, facilitating the understanding of the complex relationships between different impacts.

The full labeling table is available in Appendix 9.1, and a more concise representation of the final grouping is shown here in Figure 4.1.6 1.

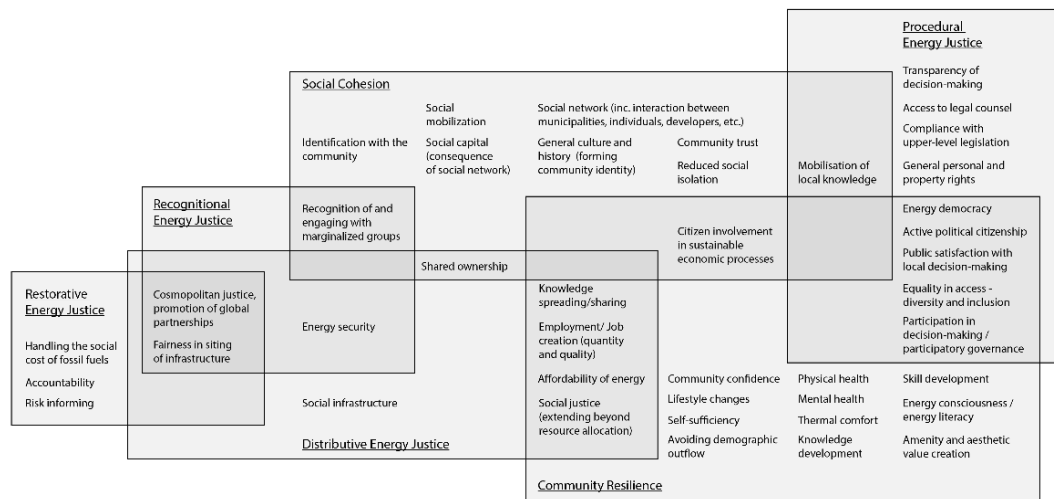


Figure 4.1.6 1 The social impact categories, their intersections, and impact examples.

In the process of categorizing and labeling the 42 social impact indicators, we followed a rigorous and systematic approach. While providing a comprehensive description for each indicator is beyond the scope of this paper, we can offer an overview of our methodology. The first step was covered previously, as we examined the applicability of those indicators based on their prior mentions and citations in literature, confirming their significance within the context of energy communities. Second, we traced back how specific indicators had been categorized through those references in the literature. For many impacts, especially in the case of energy justice, we identified predefined categories that aligned with the indicators' characteristics. The final phase consisted of comparing the categories' definitions to each social impact indicator, allowing us to assign

relevant categories to indicators that demonstrated a direct contribution to the specific group of impacts.

4.2 The Relevance Rating

Following the established methodology, this section presents the key findings derived from our interviews with stakeholders involved in energy communities in Hungary, Greece, and Italy.

4.2.1 Relevance Rating Findings

Presenting the interviewees with a Likert scale to evaluate the relevance of Distributive Energy Justice provided a unique opportunity to discuss the reasons behind the participants’ decisions and gain insights into country-specific circumstances non-accessible otherwise. The table of relevance rating with participants’ brief remarks is presented in Appendix 9.2, and here we provide a visual representation of the rating in Figure 4.2.1 1.

However, this remark on the varying scope of activities and scale of initiatives, leading to distinct core values and objectives, prompted us to reconsider whether geographical location is the sole factor contributing to the contrast in relevant subsets of social impacts we were creating. In light of this realization, we propose a revision of our framework to incorporate a two-dimensional assessment of social impacts, considering not only the initiatives’ geographical location but also their scale, or size. We acknowledge that this is a valuable revelation derived from the pilot interviews. It suggests a strong direction for future research to explore and validate the proposed two-dimensional framework comprehensively.

How relevant is it for EC to improve Distributive Energy Justice for you personally?

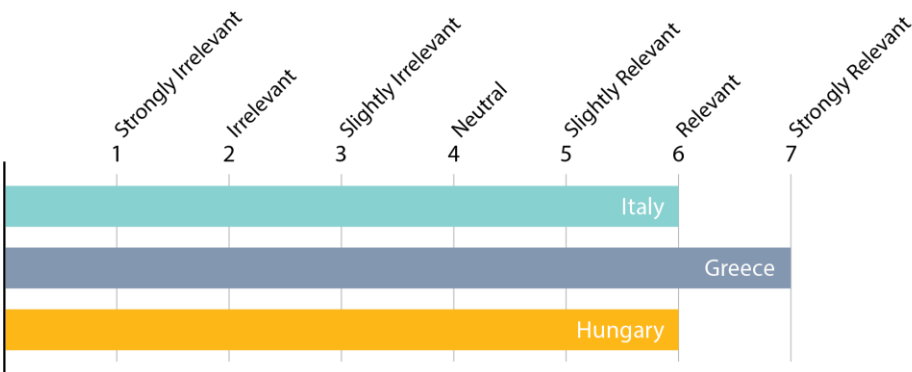
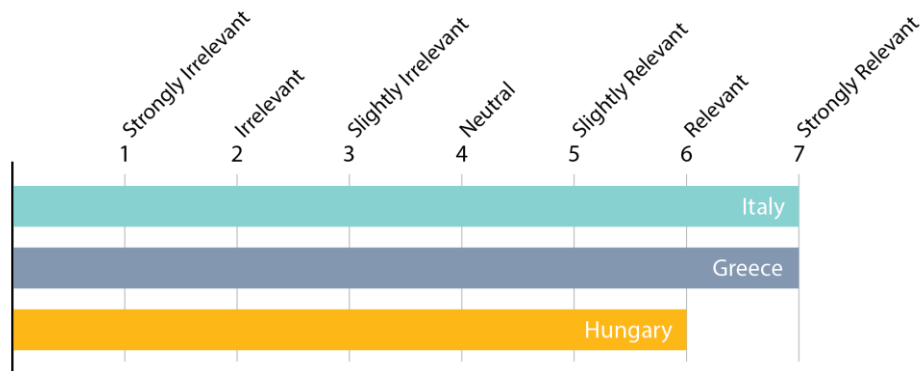
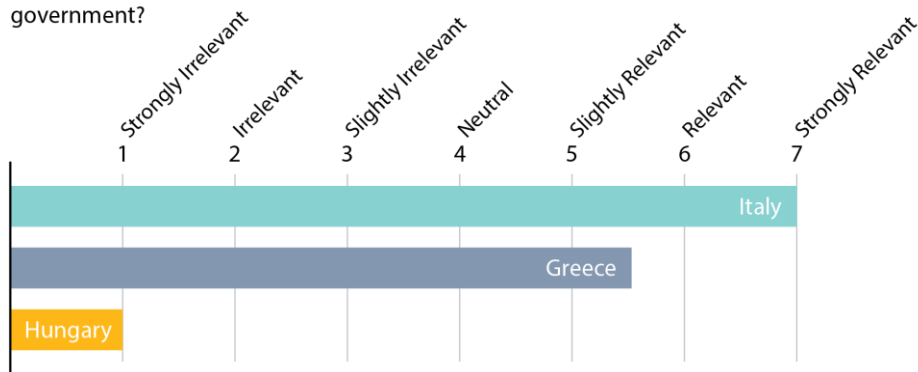


Figure 4.2.1 2 Relevance rating of Distributive Energy Justice for ECs, the interviewee’s perception of the opinions of varying stakeholders (part.).

How relevant is it for EC to improve Distributive Energy Justice for your EC?



How relevant is it for EC to improve Distributive Energy Justice for your local government?



How relevant is it for EC to improve Distributive Energy Justice for your regional government?

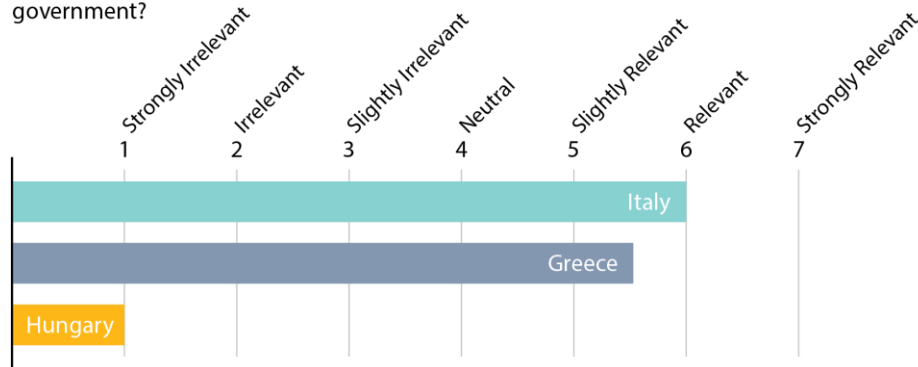


Figure 4.2.1 3 Relevance rating of Distributive Energy Justice for ECs, the interviewee's perception of the opinions of varying stakeholders (cont.).

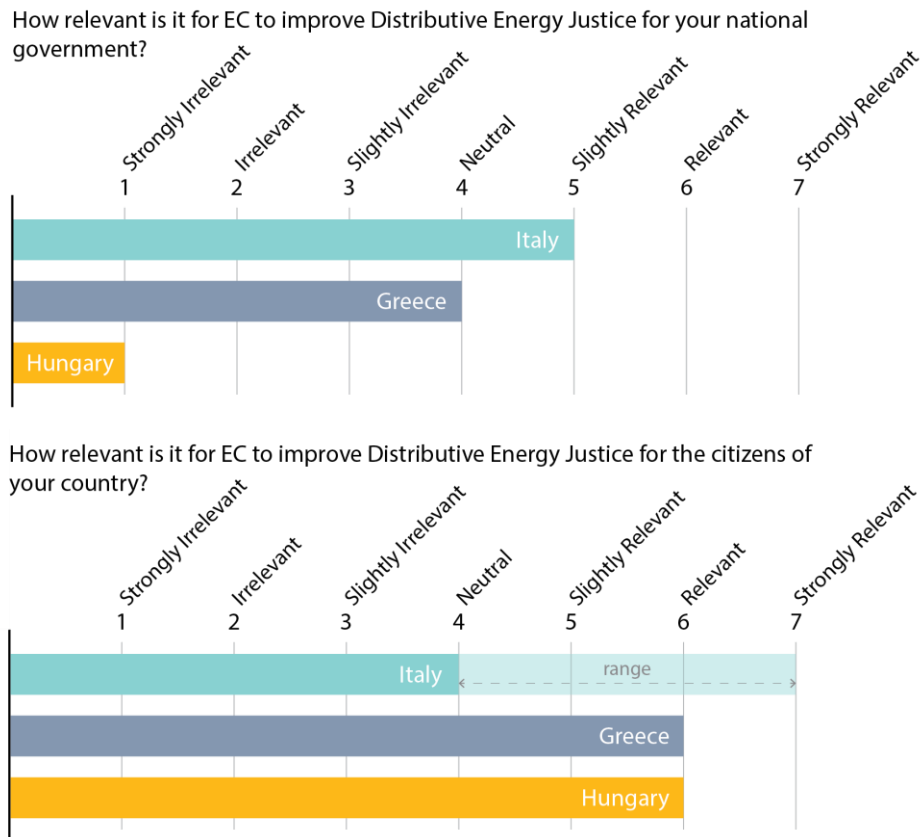


Figure 4.2.1 4 Relevance rating of Distributive Energy Justice for ECs, the interviewee's perception of the opinions of varying stakeholders (end.).

The gathered data still allowed us to assess the regional dimension of our framework and draw the following conclusions. We could observe the relative alignment of the interviewees on the importance of Distributive Energy Justice for them personally and for their ECs. It could be suggested that this may stem from the participants' affiliation with relatively community-oriented projects. However, as Participant B has reminded us, "the European definitions actually state that energy communities should not prioritize profit. They should prioritize social and environmental outcomes", which for them translated to ECs having an inherent distributive justice nature. For this paper this would mean that the discussed social impact category should be included in every developed subset, however, the relevance of specific social impact examples needs to undergo dimensional tailoring.

Regardless of personal and organizational agreement on the importance of Distributive Energy Justice, we could observe that the country contexts showed more variation. Within the Mediterranean region, there is some misalignment, but the rating remains on the positive side of the spectrum, which may suggest that

generalizing countries up to regions might indeed work. In contrast, Participant C perceives the governmental support of EC initiatives in Hungary as hostile. In our opinion, such a drastic difference supports the need for variances in SIA approaches.

The relevance of the social impact category in the eyes of the general public was the hardest for the respondents to identify every context encompassed varying awareness of energy transition among the citizens.

During the discussion of Distributive Energy Justice, we also met with mentions of other social impact categories. This way, Participant C mentioned that Social Cohesion is of equal importance for their initiative, and that is why they would not rate it as Strongly Relevant, excluding other goals from their activities. Additionally, Participant B noted the influence of Distributive Energy Justice on energy independence, which in our framework translates to self-sufficiency, and further to Community Resilience. These instances bring us to the conclusion that, first, the interviewee's spontaneous mention of these social impact categories implies a perceived relationship between them and Distributive Energy Justice. Second, such unprompted inclusion can suggest that these categories hold significance in the participants' perspectives.

4.2.2 Open-ended Questions Findings

To address the priority of Distributive Energy Justice, participants were asked to provide examples of actions taken by ECs addressing this goal. The responses were diverse but revealed common themes. Here, we categorize the examples into "most mentioned" strategies, highlighted by all participants, and "more specific" approaches that were mentioned by one participant each. The first most mentioned strategy is energy redistribution. All participants emphasized the equitable distribution of energy among EC members. Two participants specifically highlighted the intentional allocation of either energy for free or a portion of financial gains to support vulnerable consumers, community spaces (such as schools), and local environmental and social projects. Then, two participants cited the importance of sharing knowledge. This included internal knowledge exchange within the EC, such as staff training, and external efforts to raise public awareness about energy-related issues.

As for the more specific approaches, the first is employing a particular cooperative share system during the creation of energy projects. This involves setting a minimum share price of 100 euros to enable lower-income households to participate and receive returns on their investment. The second is prioritizing vulnerable consumers. Another participant provided examples of structuring project stages to ensure that vulnerable consumers are the first to receive direct benefits. And lastly, we were introduced to an “energy solidarity” levy applied to energy bills. The funds collected through this levy are then redistributed for initiatives aimed at reducing energy poverty, including examples of housing renovations, awareness campaigns, and providing energy-efficient equipment.

The next topic we have discussed is enabling Distributive Energy Justice in energy communities, contingent on various interconnected aspects. Firstly, the national legislative framework and governmental support emerge as pivotal elements. These not only empower ECs but also influence the legal forms they can adopt, impacting how benefits are allocated following national regulations. Financial and regulatory support, specifically directed toward projects emphasizing social outcomes, catalyzes Distributive Energy Justice-oriented initiatives. A complementary facet of support is the establishment of knowledge-sharing offices, often termed “energy transition public offices”. These entities provide accessible information to citizens, fostering informed decision-making regarding energy-related matters, underscoring the role of information dissemination in achieving Distributive Energy Justice goals.

The second critical aspect revolves around the inherent nature of energy communities. Embracing local production and decentralization challenges traditional fuel-based resource allocation systems, relating to the principles of Distributive Energy Justice. Moreover, the technological complexities and organizational novelty of EC solutions inevitably require collaboration, both in terms of knowledge and funds. The ensuing discussions on returns from such investments and the subsequent knowledge-sharing and development initiatives further contribute to the principles of Distributive Energy Justice.

In essence, the confluence of legislative support, financial incentives, knowledge-sharing mechanisms, and the transformative nature of ECs collectively establishes a foundation for the pursuit of Distributive Energy Justice.

Discussing the questions of *why* ECs need to address this issue, all interviewees expressed their strong belief in the necessity of a just system. However, a very powerful quote came from Participant B: “It's important to showcase the social justice dimension of these <energy> policies because if citizens feel that it's *unfair*... <that the> super-rich will get to fly their private jets, ... and then you go to a poor person and you tell them: “oh, you need to install a heat pump”, and the heat pump costs, like, I don't know, 20,000 Euros, it has to make sense... because if it doesn't then there's going to be a lot of backlash”. The public’s resistance poses danger to any initiative, that is why “it is super important to make sure that all climate policies, not just energy communities, that they're inherently re-distributive”.

While the information on Distributive Energy Justice-related strategies, enabling factors, and motivations have enriched our understanding of its relevance, the pilot interviews also served as a valuable source for exploring methods of measuring associated social impacts. These insights may guide the SIA strategy suggestions in further research.

The suggestions on measuring the ECs’ impacts within the Distributive Energy Justice category ranged from concerns about the complexity of such a task to reflecting on ways to make it possible. Participant C highlighted quantitative measurement, proposing an evaluation based on the proportion of members' expenditure on energy before and after establishing an EC, with a possibility of expanding the assessment with the inclusion of non-financial dimensions. The qualitative approach would acquire and evaluate the members’ perceptions of a given impact.

Overall, the information gained from the interviews served as an invaluable contribution to this research. While these served as preliminary assessments, they still allowed us to refine the data collection format and assess the framework's general applicability. Some of our assumptions were not disproven, however, given the limited dataset, definitive conclusions remain elusive, and further research is encouraged. In the end, we find that the most crucial takeaway is the need to revise the framework and make it two-dimensional, including both region and size-related parameters.

5. Conclusion

In summary, the main outcomes of this study are as follows. First, the revised categorizations of the main recorded social impacts of energy communities. Second, the demonstration, on limited sample size, of regional contexts, shaping the perception of the relevance of Distributive Energy Justice mainly on the governmental levels, while individual and EC interest in them might remain universal. Third, the suggested correctness of the interconnectedness of social impact categories concluded from respondents' unprompted mentions. Fourth, the importance of real-time discussion of the reasoning behind the Likert-scale relevance rating in the preliminary stages of this research. Lastly, and most importantly, the need to reevaluate the proposed region-based approach to SIA and instead develop a two-dimensional framework, encompassing both EC's location and its size.

It is important to emphasize the role of both the preliminary and the in-depth literature reviews. The initial review provided the foundational knowledge of energy communities and the various definitions of the term. The data extraction from the proceeding scoping review with a narrative synthesis served as a pillar to crafting the proposed social impact framework. Defining the social impact categories precisely but using them as tags instead of exclusive groups allowed for a system that reflects the interconnected nature of social impacts.

Based on the empirical data obtained, the value of Distributive Energy Justice was found universal across the three interviewed respondent community energy activists. However, the country context largely affected the perceived government's attitude, shaping the difference in conditions for ECs' development. These differences and similarities led to the conclusion that it is needed to differentiate the subsets of social impacts between the groups of countries and also suggested that grouping countries into groups, instead of tailoring the subsets to each country, is a possibility. Nevertheless, a larger dataset is needed to conclude the plausibility of such an approach.

Regardless of the pilot interviews' focus on Distributive Energy Justice only, respondents organically mentioned the other social impact categories. This way, Distributive Energy Justice was considered alongside Social Cohesion to form the value core of ECs, and leading to self-sufficiency, an attribute of

Community Resilience. Such unprompted mentions reinforced the assumption of the interconnected nature of social impacts embedded in our categorization.

The utilization of Likert-scale relevance ratings in interviews instead of surveys in the preliminary stage of this research provided valuable insights into the reasoning behind these assessments and unraveled the subjectivity of such ratings. Real-time discussions not only facilitated a clearer comprehension of participants' criteria for assessing relevance but also unveiled the nuanced factors influencing their decision-making, such as country contexts, and non-accessible through surveys. This insight highlights the necessity of transparent communication during the early phases of research to enhance the precision and depth of relevance evaluations.

Perhaps the most pivotal outcome of this study is the recognition of the limitations of a region-based approach to SIA. The findings, mainly coming from Participant A's experience with EC projects of various scales, strongly advocate for a shift towards a more nuanced and comprehensive two-dimensional framework. This revised framework, incorporating not only the geographical location but also the size of the energy community, emerged as a crucial consideration. This paradigm shift holds the potential to enhance the accuracy and applicability of future SIAs within the realm of energy communities, without overcomplicating the framework.

This study contributes to existing knowledge by refining and expanding the categorization of social impacts within energy communities. The revised framework aggregates the existing records and provides a scheme for reviewing and evaluating them. The implications of this paper extend to both theoretical and practical realms. The refined categories and regional context insights can inform future research methodologies. On a practical level, the findings have implications for policymakers and energy community practitioners, helping them tailor initiatives to regional contexts.

The identified gaps in this study suggest the following directions for future research. Firstly, the incorporation of a new dimension into the framework emerges as a crucial step forward. To enhance the framework's comprehensibility, it is imperative to introduce definitions and evaluation methodologies for the additional scale dimension. This expansion would not only refine the categorization process but also deepen our understanding of the dynamics

influencing social impact assessments. Secondly, the recommendation to expand the sample size for data collection remains pertinent. A broader dataset, capturing diverse opinions from energy community members, can offer richer insights. Furthermore, by encompassing a more extensive range of EU regions, future research can unveil both commonalities and distinctions, providing a nuanced understanding of regional variations. If presented with an opportunity, collecting representative data from each EU country would be beneficial to find differences and commonalities and group countries by their EC-related context, and not on commonly prescribed regions. Thirdly, while the pilot interviews yielded valuable insights, the constraints of time and participants' focus necessitated a reevaluation of the data collection method. While in-depth interviews will continue to be valuable, especially in the initial stages, exploring structured surveys offers the potential to gather a larger dataset. This shift in approach promises a more comprehensive understanding of social impacts and their relevance within the context of energy communities. Together, these suggested directions for future research aim to refine methodologies, broaden perspectives, and deepen the knowledge base in the dynamic field of energy community research.

To conclude, this study has fulfilled the objectives of identifying the social impacts of ECs recorded by literature, categorizing them, and defining the developed categories. While the trial hypothesis regarding region-relevant subsets of social impact is still in its infancy and requires further development, the insights presented here remain invaluable. It is our sincere hope that these findings will serve as a cornerstone for future research endeavors in the dynamic field of energy community studies.

6. Summary

This paper aims to define and evaluate the social impacts of Energy Communities (ECs) based on their relevance for a geographic region, to later create region-specific social impact subsets for social impact assessment (SIA). Given the increasing significance of ECs in addressing energy and climate challenges, the study seeks to illuminate the less-explored dimension of their social impacts. The investigation commences with a literature review, aiming to comprehend the intricate definitions of ECs, including the broad and commonly known, as well as specific and technology-related variations. The study also delves into the complex realm of social impacts, emphasizing the necessity for a nuanced understanding to guide the research.

A systematic search with a narrative synthesis methodology is employed. It involves a comprehensive review of relevant studies, followed by careful extraction of data on ECs' social impacts and social impact categories. The framework undergoes refinement through evaluating and defining the categories, the removal and merging of identified impacts, and assigning category labels to the remaining impacts.

The plausibility of the proposed framework is tested with one social impact category, Distributive Energy Justice, through pilot interviews with stakeholders involved in ECs in Hungary, Greece, and Italy. The insights gained from Likert scale-based relevance ratings and open-ended responses revealed the following regional nuances. Notably, governmental levels exhibited a pronounced influence on the perceived relevance of Distributive Energy Justice, in contrast to the more universal interest expressed by individual community members and Energy Communities as a whole. Additionally, respondents' unprompted mentions underscored the interconnectedness of social impact categories, signaling a more intricate web of influences than initially anticipated. Real-time discussions during Likert-scale assessments proved crucial, emphasizing the importance of collaborative reasoning in the early stages of research. Most significantly, the findings advocate for a fundamental shift in the proposed region-based approach to SIA. Instead, a call for a more nuanced two-dimensional framework is made, considering both the geographical location and size of Energy Communities.

The gaps in this study suggest the following directions for future research. First, incorporate a new dimension into the framework. The pilot interviews revealed that the difference in relevance of social impact might stem from an EC's size and activity scale. Therefore, the definitions and evaluation methodologies of a scale dimension are needed for a comprehensible framework of SIA. Second, expand the sample size of data collection to capture the diverse opinions of energy community members and find commonalities within and differences among the EU regions. Third, reevaluate the data collection method. The undertaken pilot interviews provided valuable insights; however, the time and participants' focus limits do not allow for a discussion of the whole framework. While in-depth interviews of prolonged duration would still be of value in the initial stages, a structured survey could be explored to gather a larger dataset, offering a more comprehensive understanding.

This research attempts to comprehensively analyze the literature on the social impacts of ECs and is a step in finding tendencies and patterns in an unresearched and highly contextual field. Even with the pilot interviews, it faced limitations in sample size and the collected amount of data. The findings were mainly used to re-tailor the framework and are yet not ready to be generalized. If taken into further development region and size-specific social impact subsets prove to be working, it could make SIA easier and more financially accessible for such inherently non-profit organizations as energy communities. Therefore, policymakers can leverage the insights to tailor legislation that supports the diverse social impacts of ECs, fostering just and equitable energy transitions. Moreover, practitioners within energy communities can benefit from a refined understanding of the social dynamics, enabling them to optimize their initiatives for the maximum benefit of their members and local communities.

In summary, the most valuable outcomes of this paper are the categorization of EC's social impacts, qualitative data on practitioners' varying experiences with distributive energy justice, and the trajectory for further research and development of a two-dimensional framework of energy communities' social impact assessment, considering both geographical location and scale. While the objective of creating finalized subsets of social impacts relevant to each region of the EU was not achieved, the foundation for such work is laid and the findings

pave the way for continued refinement and exploration in the evolving landscape of energy community research.

7. Acknowledgements

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9. Appendix

9.1 Social Impacts and Category Labels

Social Impact	Distributive EJ	Procedural EJ	Recognitio nal EJ	Restorative EJ	Social Cohesion	Community Resilience
Affordability of energy						
Energy security						
Fairness in siting of infrastructure						
Employment/ Job creation (quantity and quality)						
Social justice (extending beyond resource allocation)						
Participation in decision- making/ participatory governance						
Transparency of decision-making						
Equality in access - diversity and inclusion						
Mobilization of local knowledge						
Access to legal counsel						
Compliance with upper- level legislation						
General personal and property rights						
Recognition of and engaging with marginalized groups						
Risk informing						

Social Impact	Distributive EJ	Procedural EJ	Recognitio nal EJ	Restorative EJ	Social Cohesion	Community Resilience
Accountability						
Cosmopolitan justice, promotion of global partnerships						
Active political citizenship						
Public satisfaction with local decision-making						
Energy democracy						
Social network (incl. interaction between various stakeholders)						
Social capital (consequence of social network)						
Social mobilization						
Identification with the community						
Community confidence						
Community trust						
Shared ownership						
Social infrastructure						
General culture and history						
Handling the social cost of fossil fuels						
Reduced social isolation						
Lifestyle changes						
Self-sufficiency						

Social Impact	Distributive EJ	Procedural EJ	Recognitio nal EJ	Restorative EJ	Social Cohesion	Community Resilience
Avoiding demographic outflow						
Physical health						
Mental health						
Thermal comfort						
Skill development						
Knowledge development						
Knowledge spreading/sharing						
Energy consciousness/literacy						
Citizen involvement in sustainable economic processes						
Amenity and aesthetic value creation						

Table 9.1 1 The social impacts and their category labels/tags.

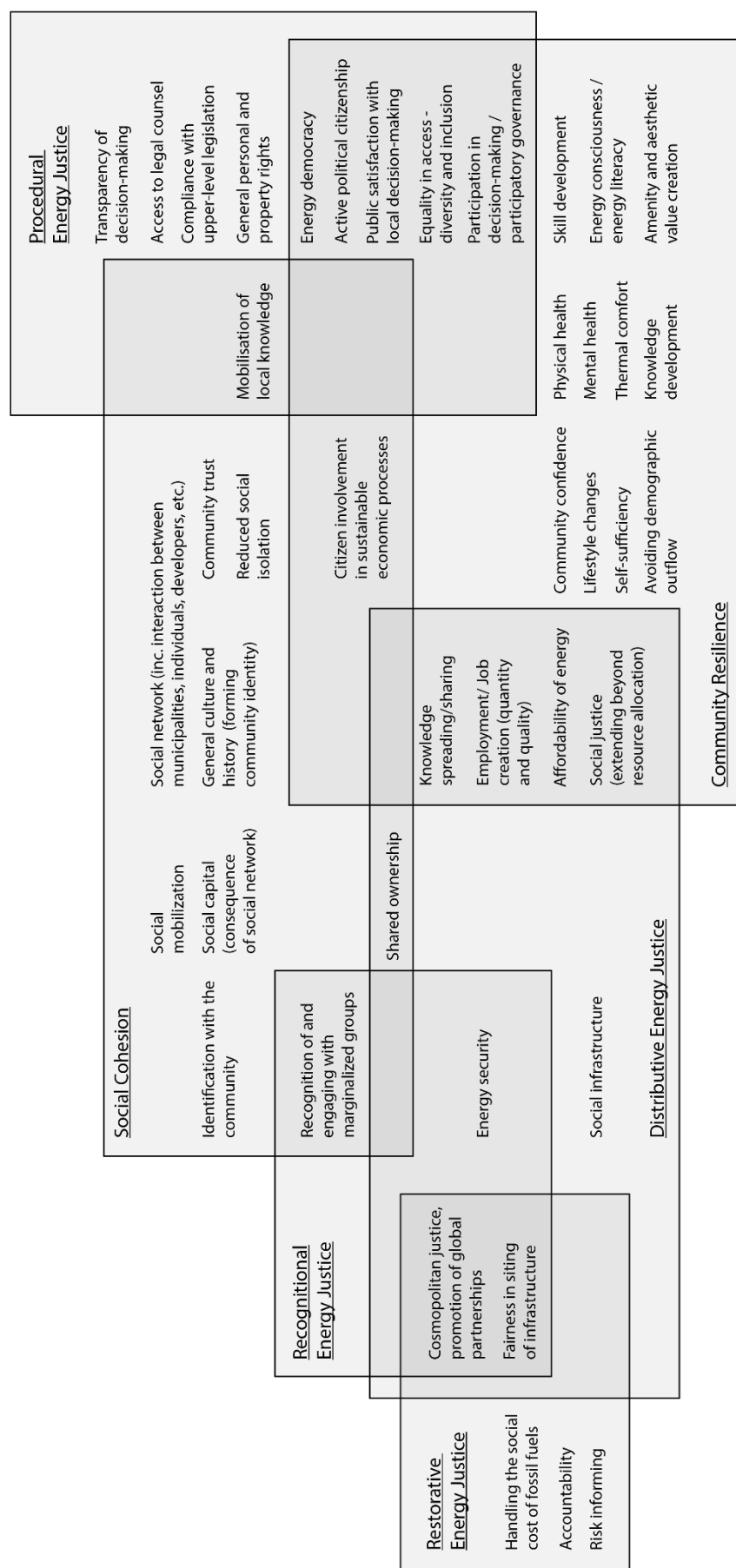


Figure 9.1 2 The social impact categories, their intersections, and impact examples (enlarged).

9.2 Social Impacts Relevance Rating with Comments

How relevant is Distributive Energy Justice to ECs for...?		
Stakeholder	Relevance	Comments
Italy		
You personally	6	Legislations allow ECs with varying focus.
Your EC	7	We see evidence of ECs prioritizing this impact.
Your local government	7	We see the local governments addressing this impact through ECs.
Your regional government	6	Regional governments encourage a broader range of ECs.
Your national government	5	There is advocacy for ECs, but no actions.
The citizens of your country	From 7 to 4 to undefined	From active EC members to people not getting involved in the energy discussion, to people who are not aware of ECs and therefore don't hold an opinion.
Greece		
You personally	7	“Because for me energy communities are <i>all</i> about ensuring that the benefits of the energy transition are shared equally”.
Your EC	7	The EU Directives emphasize the non-profit nature of ECs, we see it as a call for Distributive Energy Justice and strive to help develop initiatives like that.
Your local government	5-6	It's beneficial for the municipalities to promote Distributive Energy Justice, and they do it out of good causes, but there is no strong political underlying, like fighting the extractive economy.
Your regional government	5-6	
Your national government	4	-//-
The citizens of your country	6	It became relevant to the people in light of the energy crisis. But again, there is no political underlying. However, it is mostly for those who are familiar with the concepts of ECs, self-consumption, energy efficiency, etc.

Table 9.2 3 (part.) The social impact categories' relevance, with interviewees' comments on choosing a certain rating.

How relevant is Distributive Energy Justice to ECs for...?		
Stakeholder	Relevance	Comments
Hungary		
You personally	6	It is important because it leads to an unintended consequence of raising energy awareness.
Your EC	6	Not 7, because other objectives, like <i>social cohesion</i> , are also important for our initiative.
Your local government	1	The bureaucratic obstacles our initiative is facing lead us to a conclusion that ECs, and distributive energy justice, are not the government's priority.
Your regional government	1	
Your national government	1	
The citizens of your country	6	We believe people are generally interested in Distributive Energy Justice and find it important.

Table 9.2 4 (cont.) The social impact categories' relevance, with interviewees' comments on choosing a certain rating.

10. Declaration

The author declares with this signature that this paper is her work, the literature was handled according to the regulations, and the paper complies with the laws applicable to it.

A handwritten signature in blue ink, appearing to be 'W3/k', located in the bottom right corner of the page.