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Overlooked, misunderstood, or sidelined? Explaining why energy justice is not safeguarded in smart local energy systems

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ABSTRACT

Energy systems need to evolve to manage the rapid increase in distributed and intermittent renewable energy sources and growing peak loads. Smart local energy systems (SLESs) offer a promising approach by decentralizing and digitalizing energy management. However, SLESs risk exacerbating pre-existing disparities, because socioeconomically disadvantaged groups cannot participate in SLESs and therefore miss out on the benefits. One approach to addressing this issue is for those involved in SLES projects to safeguard the value of energy justice. While current research clearly indicates that energy justice is not safeguarded in SLES projects, it is unclear *why*. In this study, we draw on public values theory to investigate whether involved actors (i) altogether overlook justice, (ii) misunderstand justice as something other than energy justice, or (iii) sideline energy justice. Our investigation into four Dutch SLES projects, by means of fifteen semi-structured interviews and document analysis, reveals that justice is not overlooked. Rather, due to the narrow scope of SLES projects, involved actors rarely conceive justice in ways that resemble energy justice. When energy justice is considered, then this public value is often perceived as out of scope and a concern for later. These findings contribute to energy justice literature by providing actionable insights into why energy justice might not be safeguarded in decision-making. Most notably, our study highlights the need for clearly defined energy justice goals in SLES projects to ensure that energy justice is safeguarded.

1. Introduction

Energy systems around the world are switching from fossil fuels to low-carbon energy sources to reduce greenhouse gas emissions and decelerate global warming. The energy transition has widespread implications, including the necessity to reconfigure urban electricity grids to accommodate changes in electricity supply and demand [1]. A growing number of research and demonstration projects, predominantly in Europe and North America, are looking into smart local energy systems (SLESs) as a promising reconfiguration [2,3]. In technical terms, SLESs are IT systems that monitor and control energy technologies (e.g., solar panels, batteries, and smart appliances) to align local supply and demand of energy [3,4]. The promise of SLESs is their ability to accelerate the energy transition while relieving stress on the grid, thereby increasing the security of supply, optimizing the efficiency of renewable energy technologies, and postponing costly grid reinforcements [2].

However, the development of smart local energy systems is also a

cause for concern. Current research reveals that socioeconomically disadvantaged groups often cannot participate in SLESs due to a lack of resources [5,6]. As a result, affluent groups tend to benefit more from SLESs, thereby exacerbating pre-existing disparities. One approach to addressing this issue is for those involved in SLES projects to safeguard the value of energy justice. Although we acknowledge that this concept is multifaceted [7], for the purpose of this article and consistent with energy justice literature [8,9], we define safeguarding energy justice as recognizing socioeconomically disadvantaged groups as relevant and deserving actors, and ensuring that these groups can participate in and benefit from the development of SLES. While current research is clear that safeguarding energy justice is seldom a core objective in SLES projects, it is unclear *why*.

The purpose of this paper is to investigate why energy justice is not safeguarded by actors involved in SLES projects. For this purpose, we draw on public values theory to understand how these actors consider and prioritize different ideas about what is desirable for the common

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good [10-12]. Based on this theory, we formulate three hypotheses: actors in SLES projects (i) altogether overlook justice, (ii) misunderstand justice as something other than energy justice, or (iii) sideline energy justice [13]. To determine which hypotheses hold true, we examine the value orientations of actors involved in four Dutch SLES projects. Through a combination of interviews and document analysis, we uncover these actors' ideas about what public values the projects ought to safeguard, as well as why.

Our study contributes to energy justice literature with actionable insights into why energy justice might not be safeguarded in decision-making. As such, we respond to recent calls for studies that delve into *how* and *why* energy justice can be safeguarded, rather than only identifying *where* and *when* decision-making falls short [14,15]. In line with this objective, we adopt a pragmatic approach to the concept of energy justice, diverging from the typical normative stance often found in literature. This means that we use the concept solely for analytical purposes, without aiming to make judgments about what is just or unjust. For instance, when we note that justice is misunderstood, we are not implying that the interviewees' understandings of justice are (morally) wrong. Instead, we are highlighting that their views differ from the common understanding of energy justice in academic literature. Essentially, our aim is to explore why actors in SLES projects do not safeguard energy justice without attaching normative judgments to our findings.

In what follows, we first provide context by discussing energy system change and the development of SLESs in particular (Section 2.1). Then we move on to a discussion of energy justice literature to understand how the exacerbation of disparities caused by SLESs can be addressed (Section 2.2). Section 2.3 dives into public values literature to gain insight into why the value of energy justice may not be safeguarded in decision-making processes. The subsequent section discusses our case selection and outlines how we collected and analyzed our data (Section 3). Section 4 provides descriptions of our four cases. In Section 5, we present and interpret our results. We conclude our article by summarizing the main findings and discussing their policy implications (Section 6).

2. Theory

2.1. Smart local energy systems: promises and perils

Due to the ongoing energy transition, a lot is changing on both the demand and supply sides of electricity systems [1]. On the demand side, there is a noticeable increase due to the electrification of heating, cooling, and mobility [1]. Also, the simultaneity of demand has increased, especially during specific times of the day (e.g., when people plug in their electric vehicles upon returning home from work) or under specific weather conditions (e.g., hot or cold periods). Similarly, on the supply side, there is a shift towards more electricity supplied by intermittent and distributed renewable energy sources, particularly wind and solar energy [1]. This shift introduces supply peaks and greater dependence on weather conditions.

The trends on the demand and supply side pose two challenges for electricity systems [1]. First, the peaks in supply and demand can exceed the grid capacity, leading to net congestion and posing the risk of blackouts. This is a significant issue in the Netherlands where an increasing number of areas experience full grid capacity [16]. Net congestion also impedes the energy transition by limiting the connection of solar meadows and wind farms to the grid. Second, maintaining a constant match between supply and demand is crucial as temporal gaps pose a risk to the quality of supply in terms of voltage, frequency, and reliability. To address these challenges, research projects are exploring various ways to reconfigure energy systems [2]. One promising avenue of reconfiguration concerns the development of smart local energy systems.

Smart local energy systems (SLESs) are IT systems that monitor and

control energy technologies, such as solar panels, batteries, and smart appliances, to align local energy supply and demand [3,4]. Contrasting traditional energy systems, SLESs are characterized by greater decentralization, integration, and digitalization [2,3,5].

Decentralization in SLESs is evident as these systems introduce new roles for local actors such as local authorities, businesses, communities, or households. Within SLES, these actors can act as 'prosumers' by investing in solar panels or wind farms [17,18]. Additionally, they can offer flexible capacity, such as from batteries or heat pumps, to ease the alignment of supply and demand [2,19]. Managing supply and demand in SLESs involves integration, not only from energy technologies but also energy sectors through innovations such as vehicle-to-grid charging and the electrification of heat supply [1]. To support this integration, there is a shift towards 'smarter' energy systems with greater connectivity within the system as well as between the system and its users [3]. Smart technologies that are used in SLESs include smart meters, peer-to-peer trading software, monitoring technologies, and home energy management systems [2,5,20].

Smart local energy systems are promising in various respects. Technically, SLESs enhance energy supply reliability through efficient load management, automated decision-making, and improved monitoring of energy technologies and infrastructures to pinpoint potential grid issues [2,5]. Environmentally, SLESs increase the efficiency of renewable energy technologies by reducing the need for curtailment [3]. By alleviating the grid, SLESs also create additional capacity for connecting new solar meadows and wind farms [5]. Economically, SLESs can reduce the need for costly grid expansions and prevent grid failures, translating into potentially lower energy bills for end-users [2]. Furthermore, smart technologies can enhance price certainty through accurate monitoring and billing [3]. Socially, SLESs foster autonomy, self-sufficiency, and community-driven energy solutions [1,2,4,5].

However, the development of SLESs also raises a significant concern. Socioeconomically disadvantaged groups often lack the financial means to participate in SLESs, rendering them unable to reap the benefits [5]. For instance, these groups may be unable to invest in renewable energy technologies or may not have ownership over a house or land for installation [5]. Consequently, large-scale deployment of SLES might exacerbate socioeconomic disparities.

In this article, we seek to understand *why* the exacerbation of disparities is not addressed by actors involved in SLES projects. To investigate this question, it is important to know *how* this justice concern can be addressed by actors in SLES projects. In the next section, we turn to energy justice literature to gain insight into the interplay of injustices that underlies the perpetuation of winners and losers in the energy transition.

2.2. Safeguarding energy justice

In the last decade, an increasing number of academics have started to examine the energy transition from a justice perspective. The growth in academic interest is closely connected to a growing realization that the shift towards cleaner energy sources affects various groups in society differently [21,22]. While some people stand to benefit from the energy transition, such as through high returns on investments or improved living conditions, others may face challenges like job loss or financial strain due to higher energy costs [23]. Notably, the divides between 'winners' and 'losers' of the energy transition often mirrors existing socioeconomic divides [24]. This exacerbation of socioeconomic disparities is demonstrated by energy justice scholars in numerous empirical contributions [14,25].

Conceptual contributions to the energy justice literature suggest that socioeconomic disparities are sustained through an interplay of maldistribution, exclusion from decision-making processes, and misrecognition [26]. This idea builds on the distinction between three 'tenets' of justice: distributional justice, procedural justice, and recognition justice [9,27]. While distributional justice centers around the

question of who should get what [8], procedural justice concerns questions about who should decide on the distribution of benefits and burdens, and how [8]. Recognition justice relates to questions about (i) who is (not) a relevant stakeholder and should therefore be included in or excluded from decision-making processes, and (ii) who is (not) deserving of benefits or burdens [28]. While the three tenets are often discussed and analyzed in isolation, the exacerbation of disparities cannot be understood without considering the interplay between the tenets [26].

The development of SLEs is a case in point of how the interplay of tenets can lead to the exacerbation of disparities. Actors involved in the development of SLES consider affluent groups and businesses as relevant stakeholders because they have the energy technologies that can offer significant flexible capacity [6]. Also, disadvantaged groups typically lack smart appliances that can be remotely controlled, further limiting their ability to contribute to flexibility management [29]. Therefore, affluent groups and business are generally included in SLES projects whereas the “inclusion of marginalized and disadvantaged households is rarely the defining aim” in SLES projects ([6], p. 11). Smith et al.'s [6] finding is supported by the fact that most SLES research projects are situated in more affluent areas [2]. Besides exclusion from decision-making processes, disadvantaged groups also rarely benefit from SLEs [5]. That is because people must “fit and conform to a particular kind of flexible and smart energy user” to be considered deserving of the benefits of products and services developed in SLES projects ([6], p. 14). Disadvantaged groups cannot take up this role of ‘flexible and smart energy users’ and consequently are unable to benefit from SLEs.

One way to address the concern of widening socioeconomic disparities is for those involved in SLES projects to safeguard the value of energy justice in decision-making [8,9]. Safeguarding of energy justice refers to addressing the interplay of misrecognition, exclusion, and maldistribution that prevents disadvantaged groups from participating in and benefitting from SLEs. In other words, we understand energy justice as recognizing socioeconomically disadvantaged groups as relevant and deserving actors, and ensuring that these groups can participate in and benefit from the development of SLES. With this understanding of energy justice in mind, we question why actors involved in SLES projects do not safeguard energy justice in their decision-making.

2.3. Public values theory as a lens

To understand why actors involved in SLES projects do not safeguard energy justice, we turn to public values theory. Public values represent ideas about what is desirable for the common good [12,10]. In more simpler terms, the concept refers to what is valued by the public, for the public. Examples of well-known public values in the energy transition are sustainability, affordability, security of supply, and energy justice [30]. Public values theory builds on the long tradition of scholars investigating what constitutes the common good and how this can be safeguarded [11,31–33]. While public values literature does not offer definitive answers to these questions, the literature does offer insights into why decision-makers might struggle with safeguarding certain public values. In this section, we discuss three main struggles identified in public values theory and formulate three hypotheses about why actors involved in SLES projects may not safeguard the value of energy justice.

The first difficulty faced by decision-makers when attempting to safeguard public values is that there are often numerous public values at stake in decision-making. To illustrate, Jørgensen and Bozeman [34] conducted a literature review to make an inventory of all public values potentially at stake in decision-making. The literature review resulted in an inventory of no less than 72 public values. In the context of energy system change, Van der Wel et al. [13] identified a smaller but still significant number of 18 public values at stake (see Table 1). In both inventories of public values, justice is only one of the large number of public values at stake. Because of that, decision-makers may easily

Table 1
Categorization of public values in energy system change. **Source.** Van der Wel et al. [13].

Dimension	Public value
Environmental	Not wasteful Environmental protection Naturalness Sustainability
Economic	Efficiency Availability Affordability Accessibility Competitiveness
Technical	Reliability Safety Security
Socio-ethical	Autonomy Privacy Justice Good governance Quality of life Localness

overlook justice altogether. That is, decision-makers may, consciously or unconsciously, pay no attention to questions regarding distribution (‘who gets what’), procedures (‘who decides and how’), and recognition (‘who is deserving and relevant’). For instance, Hanke et al. [35] found that energy communities have largely ignored concerns about under-represented groups and energy poverty because these topics have not been discussed.

The second challenge for decision-makers is that public values can be interpreted in different ways [36]. Not only can people have different ideas about *what* a certain value entails, but also *who* the affected public is [37]. Concerning the former, distributional justice, for instance, can be interpreted in widely different ways such as distribution based on personal responsibility, the polluter pays principle, or in favor of the less fortunate [38]. Concerning the latter, ‘publics’ are not predefined but rather social constructs that decision-makers use as ‘operational fictions’ to identify and balance public values [39,40]. Decision-makers might agree to distribute in favor of the less fortunate but disagree on who should be considered ‘the less fortunate’. Because public values can be interpreted in different ways, misunderstandings can easily occur. Drawing on this insight, we hypothesize that actors involved in SLES projects can misunderstand justice as something other than energy justice, i.e., recognizing socioeconomically disadvantaged groups as relevant and deserving actors, and ensuring that these groups can participate in and benefit from the development of SLES. This is evidenced by Smith et al. [6], who found that actors involved in SLES projects often interpret justice as supporting those with significant flexibility capital, typically affluent groups, rather than focusing on disadvantaged groups.

The third difficulty faced by decision-makers when attempting to safeguard public values is that public values often require balancing [36]. Balancing of public values may be needed due to inherent tensions between public values or interpretations thereof, or under pressure of limited time and resources [41]. A well-known example of such a balancing act is the energy trilemma that highlights the competing demands of energy security, equitable access to energy, and environmental sustainability [42]. In the process of balancing public values, decision-makers choose to safeguard some while sidelining others [41]. Sidelining can take place in two ways: decision-makers can cognitively sideline public values (i.e., not deeming certain values important to pursue) or practically sideline public values (i.e., not actively pursuing certain values even though these are deemed important). An example of the latter is provided by Bacchiocchi et al. [43], who found that Indigenous people's concerns are acknowledged but nonetheless sidelined in decision-making on offshore wind farms in the United States. In light of our research aim, we investigate whether actors involved in SLES

projects sideline energy justice either cognitively or practically.

To summarize, we can formulate three hypotheses about why actors involved in SLES projects may not safeguard energy justice: (i) they altogether overlook justice, (ii) they misunderstand justice as something other than energy justice, or (iii) they cognitively or practically sideline energy justice. In the next section we explain how we investigated the value orientations of actors involved in SLES projects to assess the extent to which these hypotheses hold true.

3. Methods

In this section we first explain our case selection (Section 3.1) before discussing how we gathered (Section 3.2) and analyzed (Section 3.3) the data from publicly available progress reports and semi-structured interviews.

3.1. Case selection

We selected the following four Dutch SLES projects: GO-e, LIFE City Platform, ROBUST, and TROEF. The authors of this paper actively participate in the LIFE City Platform project, where we examine legal and governance challenges for SLESs. To prevent bias, we asked each interviewee the same set of questions and did not rely on prior knowledge or assumptions. Additionally, in our data analysis, we did not focus on differences between the projects, as our aim was to understand general value orientations in SLES projects rather than specific distinctions between projects. However, during analysis, it became evident that the LIFE project stands out in various ways. To provide a more detailed understanding of our findings, we decided to highlight these differences in the results section. The four SLES projects started in 2021 and last until 2024 or 2025. The projects arose from the MOOI funding program from the Netherlands Enterprise Agency, a public agency tasked with facilitating and financing the collaboration between businesses and other types of organizations. The core objective of the MOOI funding program was to stimulate the development of “new or substantially improved [...] smart solutions for the reliability, affordability, and fairness of the electricity supply, which will have a first market application in the Netherlands by 2025 at the latest” ([44], p. 11). Although fairness is mentioned as a core value, the funding program does not specify what fairness entails.

We selected the four SLES projects because these represent extreme cases. That is, it is reasonable to expect that energy justice is a relatively important value in decision-making within these projects compared to other SLES projects because of two reasons. One, promoting fairness is a core objective – albeit one that is not further specified – of the funding program from which the projects originate. Two, since the selected projects are recently initiated and ongoing, the projects are more likely than older projects to reflect the growing attention to justice issues in the energy transition within and beyond academic circles since the mid-2010s [14,25,45]. In the Netherlands, this is evidenced by a shift in energy policy, where “initial implicit notions of justice [...] developed into an explicit policy topic” ([46], p. 6). This shift has led to, among other things, a national research program and policy agenda on energy poverty [47,48]. One can therefore reasonably expect that actors involved in the selected Dutch projects are aware of justice issues and are taking them into consideration when designing SLESs.

3.2. Data collection

To investigate the value orientations of actors involved in the selected SLES projects, we collected publicly available progress reports and conducted semi-structured interviews. In the following two subsections we outline the approach to and purpose of these activities.

3.2.1. Publicly available progress reports

The projects release annual progress reports that detail, among other

things, the projects' structure, objectives, guiding principles, ongoing activities, achieved results, and bottlenecks. We used the reports for the case descriptions (see Section 4) and to investigate actors' value orientations. We obtained a total of seven progress reports, with three projects publishing reports for both 2021 and 2022, while TROEF released only the report of 2022 (Table 2).

3.2.2. Semi-structured interviews

We conducted fifteen semi-structured interviews with actors involved in the four selected projects, using purposive sampling to ensure a representative selection. Our interviewees came from a variety of organizations, including knowledge institutes ($n = 6$), private companies ($n = 5$), municipalities ($n = 2$), a DSO ($n = 1$), and a civil society organization ($n = 1$). This selection covers all types of actors typically involved in SLES projects [6] and aligns with the fact that knowledge institutes and businesses comprise about 65 % of actors involved in the selected projects. Table 3 provides an overview of the interviewees, including the codes assigned to each interviewee, which are used in the results section. The overview does not specify the type of organization where the interviewees work to ensure anonymity. Also, it is unnecessary for the purposes of our study to relate the value orientations to specific types of organizations because we seek a general understanding of the value orientations in SLES projects. On average, each interview lasted one hour and 8 min. During the interviews, we explored the value orientations of interviewees. With this exploration, we could triangulate the findings from our document analysis. Furthermore, the interviews provided additional insights that the progress reports did not offer, such as why certain values were cognitively or practically sidelined rather than prioritized.

After inviting the interviewees to introduce themselves and to describe their role in the project, we asked them which public values they pursue in their project. Subsequently, we introduced interviewees to the Miro board (i.e., an online whiteboard tool) depicted in Fig. 1, featuring eighteen values derived from the public values framework for energy system change of Van der Wel et al. [13]. Interviewees answered the three questions in the bottom left of the Miro board for each public value. While interviewees could provide multiple interpretations, they had to pick the one that resonated most for the prioritization. We explained that the provided categorization (e.g., economic, technical) was available to aid interpretation but found that interviewees often disregarded it. For the second question, interviewees had to move each public value into one of the boxes ranging from ‘totally agree’ to ‘totally disagree’, and explain the reasoning behind their prioritization. The third question was meant to see if there were instances in which public values were deemed important to pursue but nonetheless practically sidelined. The interviews took over an hour on average because the participants usually needed considerable time to answer the three questions on the Miro board for all public values.

At the end of the interview, interviewees could use the purple card to indicate additional public values that they wanted to discuss. However, we opted to not include these public values in our analysis because interviewees mainly used this option to emphasize a point they made earlier, which resulted in values that were very close to values from our framework.

Table 2
Overview of collected annual progress reports.

Project	Year	Document title	Code
GO-e	2022	MOOI32001 Voortgangsrapportage 1	GO-e DOC1
GO-e	2023	MOOI32001 Voortgangsrapportage 2	GO-e DOC2
LIFE	2022	MOOI32019 Voortgangsrapportage 1	LIFE DOC1
LIFE	2023	MOOI32019 Voortgangsrapportage 2	LIFE DOC2
ROBUST	2022	MOOI32014 Voortgangsrapportage 1	ROBUST DOC1
ROBUST	2023	MOOI32014 Voortgangsrapportage 2	ROBUST DOC2
TROEF	2023	MOOI32025 Voortgangsrapportage	TROEF DOC1

Table 3
Overview of interviewees.

#	Code
1	GO-e1
2	GO-e2
3	GO-e3
4	LIFE1
5	LIFE2
6	LIFE3
7	LIFE4
8	LIFE5
9	ROBUST1
10	ROBUST2
11	ROBUST3
12	TROEF1
13	TROEF2
14	TROEF3
15	TROEF4

3.3. Data analysis

We analyzed the reports and interviews using NVivo 14. We did not conduct a comparative analysis between types of organizations because an explorative analysis revealed no notable differences. Specifically, after the coding process, we compared interviewees' responses and found similar responses across the various organizations. Also, our study seeks a general understanding of value orientations in SLES projects rather than insights into the nuanced differences between types of organizations.

For the analysis, we developed a codebook consisting of four main categories and subcategories. The four main categories are aspiration, interpretation, prioritization, and implementation (see Table 4). Under these four main categories, we listed the eighteen values from the public values framework (see Table 1) as subcategories.

Under the header 'aspiration', we kept track of the number of times that public values were mentioned. For this we looked at (i) the sections of the reports outlining objectives and principles, and (ii) the responses of interviewees to the question of what public values they pursue in their project. Keeping track of which public values were mentioned, provided insight into whether justice is aspired or overlooked.

Under the header 'interpretation', we coded for each public value the different interpretations in terms of *what* the value entails and *who* the implicated public is. For this we looked at the responses to the first question on the Miro board. In the process of coding, we identified three envisioned publics: unspecified collectives (viz. when there was no mentioning of a public), users, and disadvantaged groups. Examples of codes are 'digital safety of energy systems as data security for unspecified collectives' and 'justice of energy service as ability to profit for disadvantaged groups'. With this analysis we gained insight into the extent to which justice is misunderstood as something other than energy justice.

Under the header 'prioritization' we coded reasons for (not) considering public values important to pursue. For this we looked at the responses to the second question on the Miro board. Examples of codes include 'not in scope' or 'adoption and acceptance'. Additionally, we conducted a descriptive quantitative analysis using SPSS by assigning numerical values to the prioritizations of interviewees (5 = Totally agree, 1 = Totally disagree) to calculate the minimum, maximum, and mean values for each public value. The combination of the qualitative and quantitative analysis provided insight into whether and why energy justice is cognitively sidelined.

Under the header 'implementation' we coded for each public value if the actors actively pursue the public values which they deem important and, if not, why not. For this we looked at (i) the bottlenecks detailed in the reports and (ii) the responses to the third question on the Miro board. This analysis provided insight into whether and why energy justice is practically sidelined.

4. Case studies

Before discussing the results from our analysis, we provide further information on our cases. This information helps to interpret the findings from the analysis. In this section, we explain the set-up, objectives, and activities of the four selected cases.

4.1. GO-e

The GO-e project, initiated in April 2021 and scheduled to conclude in March 2024, has two core objectives. First, the project aims to explore the potential of flexibility as a viable alternative to conventional grid reinforcement methods for electricity grids. Second, GO-e seeks to devise system solutions and adaptable services to ensure sufficient flexibility capacity within the built environment. The project involves a consortium comprising three distribution system operators (DSOs), four knowledge institutes, eight businesses, and a user panel. Activities within GO-e include the development of prototype flexibility services for both consumers and businesses, as well as an analysis of future needs for flexibility.

4.2. LIFE City Platform

The LIFE City Platform project, initiated in May 2021 and scheduled to conclude in March 2025, aims to develop a district-scale energy management platform to resolve grid problems by optimizing local energy infrastructure, integrating renewable energy, and creating public support, focusing on the needs of end-users and local stakeholders in its design and implementation. The project seeks an answer to the question how net congestion can be avoided through flexible sharing of energy assets while providing an inclusive return. The consortium consists of one DSO, three knowledge institutes, five businesses, one civil society organization, and two municipalities. Activities undertaken include the development of a Digital Twin, Multi-Market-Model, and Next-Generation Grid Management System, along with a 'Social Platform' designed to facilitate value redistribution among local businesses and residents of a disadvantaged neighborhood.

4.3. ROBUST

The ROBUST project, which began in April 2021 and will conclude in September 2025, seeks to enhance energy systems at the city-region level. Its primary goal is to develop a resilient infrastructure that can offer support to the national grid when needed, thereby contributing to grid stability. Additionally, the project aims to alleviate local congestion issues and reduce maintenance and reinforcement expenses. The consortium comprises two DSOs, four knowledge institutes, three businesses, two municipalities, and a user panel. Project activities include the integration of energy services to unlock flexibility at the city-region level and the development of a power flow model for flexibility systems.

4.4. TROEF

The TROEF project, running from April 2021 to June 2024, aims to create a platform enabling users to benefit from actively contributing to the energy transition by engaging with the Internet of Energy. The consortium consists of one DSO, two knowledge institutes, five businesses, the Dutch institute for standardization, and three user panels. Its key activities involve establishing standards for Internet-of-Energy concepts and building a platform that can facilitate energy exchange, leverage flexibility, and demonstrate the origin of energy.

5. Results

In this section, we discuss our findings and evaluate the hypotheses. Each of the following subsections follows a similar structure: we begin

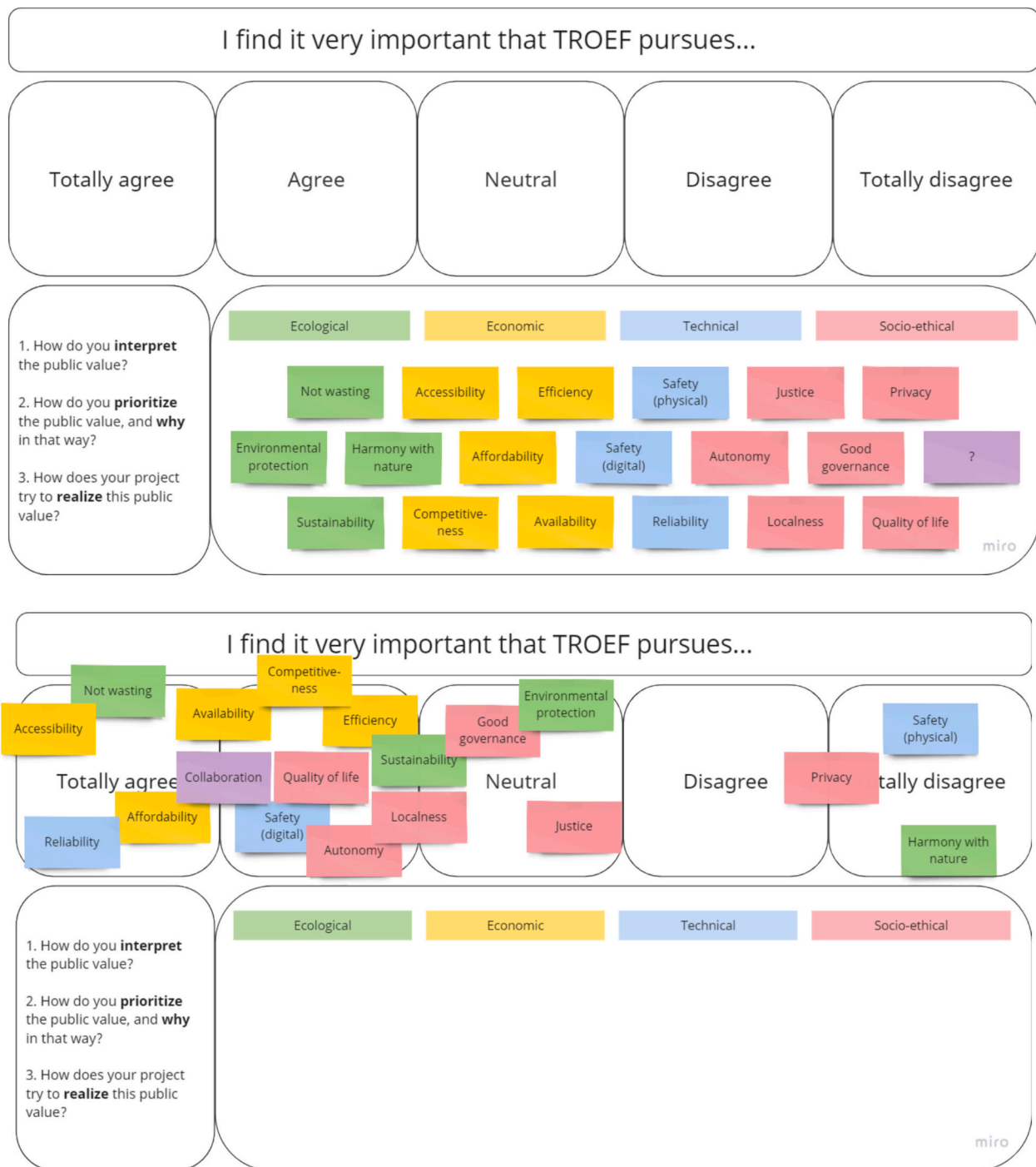


Fig. 1. Examples of Miro boards used in the interviews, before and after the interview.

Table 4
Overview of how the main categories of the codebook relate to the hypotheses of the study.

Main category	Hypothesis
Aspiration	H1: Is justice altogether overlooked?
Interpretation	H2: Is justice misunderstood as something other than energy justice?
Prioritization	H3a: Is energy justice cognitively sidelined (i.e., considered less important)?
Implementation	H3b: Is energy justice practically sidelined (i.e., not actively pursued)?

with a general discussion of the findings and then conclude with a summary and evaluation of the hypothesis.

5.1. Hypothesis 1: is justice overlooked?

Similar to the public values affordability, reliability, and sustainability, we find that justice is core aspiration in each project. That is, each project articulates specific ideas about procedural justice ('who decides and how'), distributional justice ('who gets what'), and recognition justice ('who is deserving and relevant'). Regarding procedural justice, we find that each project explicitly seeks to co-create energy services together with envisioned users of those services. For instance,

GO-e's progress report states that "large-scale flexibilization of our electricity use can only succeed if end-users participate on a large scale. That is why consumers and business energy users are central to the design of the flex services and products in GO-e" (GO-e DOC1). With regards to distributional justice, we find that the projects explicitly aim to ensure that users are "rewarded for active participation in the energy transition" (TROEF DOC1), for instance by providing financial compensation when users offer up the battery capacity of EVs to help stabilize the grid (GO-e2; ROBUST3). Regarding recognitional justice, it is evident that the envisioned users of the services – i.e., affluent groups or businesses with energy technologies that can offer flexible capacity – are the publics deemed relevant and deserving.

Besides these specific justice aspirations, the interviews and reports also reveal more broad justice aspirations that are not specified nor connected to concrete objectives. For instance, ROBUST's progress reports (ROBUST DOC1; ROBUST DOC2) state that the project provides an 'inclusive transition path' and contributes to a 'fair electricity supply' but does not specify how. Another example was provided by GO-e1, who highlighted the importance of fostering justice and inclusiveness without explaining what this means or how it might be achieved. Notably, the broad references to justice revealed in the interviews and progress reports mirror the broad justice aspirations in the funding program from which the projects originate (see Section 3.1).

The LIFE project is somewhat of an exception in the sense that the project has specific justice aspirations that extend beyond enabling affluent groups and businesses to participate in and benefit from the development of the SLES. The LIFE project explicitly aims to include residents from the disadvantaged neighborhood Venserpolder in the design of their products and services (LIFE DOC1; LIFE DOC2). Furthermore, LIFE's progress reports state that the project aims to develop an "inclusive smart energy system" that contributes to avoiding net congestion while providing "an inclusive return". LIFE3 explains that this means that "people who are struggling to survive, such as in a neighborhood like Venserpolder, can also benefit".

With respect to the first hypothesis, the results do not support the assertion that justice is overlooked. On the contrary, we found that the projects provide clear answers to the questions 'who gets what', 'who decides and how', and 'who is deserving and relevant'. Whether consciously or unconsciously, the projects thus take a clear stance on how justice ought to be pursued. Namely, the projects consider energy asset owners as relevant and deserving actors (i.e., recognitional justice), and aim to enable these actors to participate in (i.e., procedural justice) and profit from (i.e., distributional justice) SLEs. While in some instances the interviews and progress reports, similar to the funding program, do reveal broader justice aspirations, these aspirations are not specified nor related to concrete objectives. The LIFE City Platform is the odd one out, as the project does aspire to enable residents from a disadvantaged neighborhood to also participate in and profit from the SLES.

5.2. Hypothesis 2: is justice misunderstood?

Interviewees had different views on *what* justice entails and *who* the public is. In most cases, interviewees provided broad interpretations of justice that did not specify who the envisioned public is. By broad interpretations we mean that interviewees referred to general justice principles, such as fairness (ROBUST3), freedom (TROEF4), transparency (TROEF1), the ability to profit (GO-e1; GO-e2), the ability to participate (TROEF3), equal prices (GO-e3), equal access (LIFE1), equal opportunities (TROEF2), equal distribution (TROEF2), and equal profiting (LIFE2). Additionally, it is remarkable that in 13 out of 20 instances of interpreting justice, interviewees refrained from specifying a particular group. Instead, interviewees referred to an unspecified collective, conceptualizing justice as, for example, 'everyone paying the same price for energy' (GO-e3) or 'everyone having the ability to use an equal amount of energy' (TROEF1).

On the one hand, the prevalence of broad and unspecified interpretations of justice is surprising given the specific justice aspirations in the progress reports. One possible explanation is that actors involved in SLES projects are largely unaware that their projects take a clear stance on recognition justice, i.e., considering asset owners as relevant and deserving. This assumption is supported by the finding that users are considered as publics only in 4 out of 20 interpretations of justice. Examples of such interpretations include 'the ability of users to profit from using the service' (GO-e2) and 'not infringing on trust of users' (ROBUST2). On the other hand, the broad interpretations of justice are unsurprising because these interpretations mirror the broad justice aspirations that also commonly featured in interviews and progress reports as well as the funding program.

Another finding that mirrors the project's justice aspirations is the lack of attention to disadvantaged groups. Only in 3 instances were disadvantaged groups the envisioned public in the interpretations of justice: 'equal profiting for disadvantaged groups' (LIFE2), 'equal ability to understand and make use of data for disadvantaged groups' (TROEF2), and 'participation of and redistribution for disadvantaged groups' (LIFE4). Again, the LIFE City Platform stands out as interviewees from this project more commonly provided interpretations of justice in which disadvantaged groups are the envisioned public.

In conclusion, our findings indicate that justice is largely misunderstood as something other than energy justice. That is, justice is often understood as something other than recognizing socioeconomically disadvantaged groups as relevant and deserving actors, and ensuring that these groups can participate in and benefit from the development of SLES. More specifically, we found that most interpretations of justice are broad and do not specify who is relevant and deserving. The broad interpretations of justice do *imply* energy justice since justice principles such as 'inclusiveness' and 'equal profiting' imply that disadvantaged groups can also participate and benefit. However, *explicit* attention to and prioritization of energy justice seems necessary to counter the tendency of SLEs to widen socio-economic disparities. Nonetheless, we conclude that justice is *largely* misunderstood rather than *completely* misunderstood, because actors involved in the LIFE City Platform project do commonly provide interpretations of justice that recognize disadvantaged groups as relevant and deserving actors.

5.3. Hypothesis 3a: is energy justice cognitively sidelined?

Our quantitative analysis of prioritizations revealed that sustainability, availability, affordability, reliability, and accessibility are most highly prioritized, with mean scores of more than 4 out of 5. The least prioritized are environmental protection, physical safety, and harmony with nature, with mean scores lower than 3. Justice holds the twelfth position out of eighteen public values, with a mean value of 3.5. The LIFE City Platform project stands out, because interviewees from this project prioritize justice significantly higher (viz., a mean score of 4.4) compared to interviewees from the other projects (viz., a mean score of 3.1). At first glance, the overall low prioritization of justice is surprising given that justice is a core aspiration. That is, each project aspires to enable asset owners to participate in and benefit from the development of energy services. However, the low prioritization of justice is not surprising in light of the finding that justice is often not interpreted in line with these aspirations but rather understood as referring to inclusion and fair distribution in a broader sense.

Another notable finding from the quantitative analysis is that while some interviewees strongly agreed that justice is important to pursue (i.e., putting the value in the 'totally agree' box), other interviewees strongly disagreed (i.e., putting the value in the 'totally disagree' box). We found that justice is prioritized when the public value is interpreted in line with the projects' justice aspirations. For instance, when justice is interpreted as fair distribution of profits among users (LIFE1), taking good care of users' assets (ROBUST2), or enabling users to profit from their flexible capacity (GO-e2). However, when justice is conceived

more broadly, then interviewees consider this public value ‘out of scope’ or ‘something for later’ (GO-e2; GO-e3; LIFE5; ROBUST1; TROEF1; TROEF2; TROEF4). As GO-e3 mentioned: “We first try to unlock flexibility with a high acceptance rate among the people who participate so that it has the potential to scale, and then justice and other things come into play”.

Interviewees are generally fine with not prioritizing broader conceptions of justice, arguing that such objectives would “blur the focus” of the project (GO-e2) and complicate technological development (GO-e3). GO-e2 even candidly acknowledged that the project can lead to unjust outcomes:

“So, I would actually like to mark [justice] as completely disagree, because you can easily argue that [our project] also leads to an unjust system. I think we see injustices more and more in the energy transition. People who cannot participate, people who are not flexible, for instance, they end up with high prices. While those people might not have the financial means to buy a battery to take advantage of... I do not know if it is a good idea, but I am just giving some examples. Justice is not a design criterion for anything we are doing”.

Based on the findings described above, we conclude that energy justice is largely sidelined in terms of being considered less important to pursue. Justice is not cognitively sidelined when conceived within the scope of the project and in line with the project’s aspirations of justice. However, when justice is conceived more broadly and in ways that more closely resemble energy justice, we find that this value is considered ‘out of scope’ and ‘something for later’. Again, the LIFE City Platform project is the exception as involved actors interpret justice in ways that resemble energy justice (see Section 5.2) and prioritize justice significantly higher than actors involved in other projects.

5.4. Hypothesis 3b: is energy justice practically sidelined?

Seven of the fifteen interviewees prioritized justice, i.e., put justice in the ‘Agree’ or ‘Totally agree’ box. In most instances, justice was actively pursued when prioritized (5 out of 7). However, as mentioned previously, only the LIFE City Platform project interprets and prioritizes justice in a way that resembles energy justice. It is therefore all the more striking that the two exceptions both concern the LIFE City Platform project. In the one exception, LIFE1 emphasized the need for justice in terms of equal profit distribution among users, expressing a concern about the current efforts, stating: “I do not have the impression that much is currently being done about that”. In the other case, LIFE3 noted that he was unsure who in the project is actively working towards addressing the lack of skills and knowledge that inhibit some groups to make good financial decisions.

Other examples further support the image that the LIFE City Platform project struggles to actively pursue energy justice. LIFE4 highlights the project’s attempts to “create procedures for different stakeholders and even vulnerable groups to participate”, but also admits that actors involved in the LIFE City Platform project “have been struggling with that”. The struggle is illustrated in the project’s progress reports. The progress reports (LIFE DOC1; LIFE DOC2) mention that there are two objectives that together must ensure energy justice. One objective is the initiation of an energy cooperative in the disadvantaged neighborhood Venserpolder. The other is the development of a ‘Social Platform’ that governs the redistribution of profits. The latest progress report (LIFE DOC2) states that the project has “begun assessing possibilities of setting up a local energy cooperative” and that “the LIFE Social Platform concept is being further developed for upcoming co-creation sessions with the local residents”. These findings raise questions about the extent to which energy justice is *actively* pursued as both objectives are far from being achieved even though the project is past the halfway point.

To summarize, all projects, except for the LIFE City Platform project, largely misunderstand justice and do not prioritize energy justice.

Consequently, these projects effectively sideline energy justice, i.e., do not actively pursue energy justice. While the LIFE City Platform project does aspire and prioritize energy justice, the project nonetheless struggles to actively pursue this value. The progress reports indicate that efforts aimed at achieving objectives related to energy justice have not yielded concrete results. On the contrary, the project seems to be far from achieving these objectives. This lack of progress does not seem to indicate an overall inability to meet objectives, as there are tangible results with respect to the project’s technical objectives (LIFE DOC1; LIFE DOC2).

6. Conclusion and policy implications

6.1. Conclusion

For the energy transition to take place, energy systems need to change. In the field of energy system change, smart local energy systems (SLEs) are the new kids on the block [2]. While being praised for their numerous societal promises, SLEs and the development thereof are also a cause for concern [5,6]. Socioeconomically disadvantaged groups often cannot participate in SLEs and therefore benefit less than affluent groups [5]. To effectively address this exacerbation of pre-existing disparities, actors involved in the development of SLEs can safeguard the value of energy justice. This means recognizing socioeconomically disadvantaged groups as relevant and deserving actors, and ensuring that these groups can participate in and benefit from the development of SLEs [8,9]. However, previous studies indicate that actors involved in SLEs projects currently do not consider energy justice a core objective [5,6]. To understand why energy justice is not safeguarded, we examined the value orientations of actors involved in four Dutch SLE projects. With the insights into these value orientations, we investigated whether and why actors involved in SLE projects (i) altogether overlook justice, (ii) misunderstand justice as something other than energy justice, or (iii) sideline energy justice.

Two conclusions follow from our study. One is that justice is not altogether overlooked but rather largely misunderstood and sidelined by actors involved in SLE projects. The second is that actors’ value orientations – and particularly their way of perceiving and pursuing justice – depend on actors’ ideas about the scope of their projects and, in turn, on the funding program from which SLE projects originate. We discuss both conclusions below.

Our first conclusion is built on three insights. First, justice is not overlooked, as evidenced by the numerous explicit ideas in reports and interviews about recognition justice (i.e., ‘who is relevant and deserving’), procedural justice (i.e., ‘who decides and how’), and distributional justice (i.e., ‘who gets what’). Specifically, SLE projects commonly consider energy asset owners as relevant and deserving actors, and aim to enable these actors to participate in and profit from SLEs.

Second, we found that justice is largely misunderstood as something other than energy justice. Not only do actors’ interpretations of justice rarely resemble energy justice, most interpretations also do not align with the projects’ justice aspirations. Instead of mirroring the clear and specific justice aspirations, most interviewees provided broad interpretations of justice that do not specify who is relevant and deserving. In contrast to these findings, interviewees from the LIFE City Platform project did provide interpretations of justice that resemble energy justice. More specifically, these interviewees commonly understood justice as enabling residents from a disadvantaged neighborhood to participate in the co-creation of energy services as well as benefit from these services.

Third, we found that energy justice is largely sidelined. In each project, except for the LIFE City Platform project, energy justice is considered outside the project’s scope and therefore a concern for later. As a result, recognizing and including disadvantaged groups is not prioritized nor actively pursued in most SLE projects. While

interviewees from the LIFE City Platform project do prioritize energy justice, the interviews and progress reports also indicate that active pursuit of this value is difficult at best.

Turning to the second conclusion, our study shows that actors' ideas about the scope of their projects influence these actors' value orientations and – more specifically – how they perceive and pursue justice. The scope of SLES projects commonly centers around advancing the energy transition (i.e., sustainability) while ensuring a secure energy supply (i.e., availability and reliability). To achieve these objectives, involved actors develop easy-to-use energy services (i.e., accessibility) that unlock flexible capacity, allowing households and businesses to benefit from their flexible assets and thereby avoiding costly grid reinforcements (i.e., affordability). This dominant notion of the scope of the project and related value orientation does not align well with prioritizing energy justice, because disadvantaged groups are not the envisioned users of the energy services. Consequently, actors involved in SLES projects see little reason to include disadvantaged groups in the co-creation of services or to enable these groups to benefit from the services.

Our study suggests that the projects' narrow scope, in turn, stems from the narrow scope of the funding program from which the projects originate. Both the funding program and the SLES projects focus on developing marketable services “for the reliability, affordability, and fairness of the electricity supply” ([44], p. 11). While the funding program outlines clear goals relating to reliability and affordability, fairness lacks such specific objectives. This lack of clarity and commitment is reflected in the progress reports of the projects, which often mention terms like ‘fairness’ and ‘inclusiveness’ without clearly outlining what these values mean or how the projects intend to safeguard them.

6.2. Policy implications

Our conclusions indicate that, in order to safeguard energy justice in the development of SLEs, funding programs should set specific energy justice goals and evaluate applications based on their plans to achieve these goals. One approach to integrating energy justice into funding criteria is to adopt the evaluation framework proposed by Milchram et al. [49]. This would incentivize actors involved in SLES projects to include plans for achieving energy justice goals in their funding applications. Currently, the approval of funding applications does not hinge on whether projects aspire, prioritize, and actively pursue energy justice. Consequently, SLES projects, much like the funding programs themselves, only vaguely allude to justice and fairness without clear and actionable targets. One practical solution could be to require a dedicated section on energy justice within funding applications. Here, applicants would have to outline their plans for meeting the justice goals outlined in the funding program. Monitoring these efforts could be supported by implementing Energy Justice Milestone Reports, which would require SLES projects to “document, evidence, and demonstrate the advance of justice” ([50], p. 2).

Taking heed of the comments from our interviewees, we do recognize that safeguarding energy justice may potentially hinder efforts to alleviate net congestion, a pressing issue requiring urgent attention. Imposing social objectives on SLES projects might discourage participation from stakeholders. For instance, companies may hesitate to participate without a compelling business case. On a positive note, incorporating energy justice objectives in funding programs might spark creative approaches, leading to unforeseen solutions that can serve both purposes. Nevertheless, it is essential to remain vigilant. It is possible that striving for energy justice alongside a rapid energy transition will prove incompatible [51]. If that turns out to be the case, then alternative strategies, such as developing separate policies and innovation processes, may offer a more promising path for advancing energy justice than attempting to integrate this objective into policies and processes focused on accelerating the energy transition.

CRedit authorship contribution statement

Kees van der Wel: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization.
Sanne Akerboom: Writing – review & editing, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

The data that has been used is confidential.

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