

Using Community Values and Governance Preferences to Facilitate Transitions Toward Sustainable Energies

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Abstract—This study explores the use of community values and governance preferences by citizens for the diffusion of sustainable energy technologies. Three Texas communities are investigated to identify community values and governance preferences with regard to energy use. The results show that five underlying values influence the perception of energy use in communities: growth, independence, sustainability, affordable living, and mobility. Regarding preferences for governance, three forms of involvement in community processes were identified: information, communication, and participation in decision-making. The results indicate that values can be used to align expectations towards sustainable energies and shape related narratives. To make the often ‘invisible’ energy technologies tangible as well as experienceable and discussable for the citizens, demonstrator projects (such as energy-innovation hubs) should be considered as tools to anchor sustainable energies in a community.

Index Terms—Community development, community values, community well-being, policies, preferences for energy governance, sustainable energy, renewables, technology diffusion.

I. INTRODUCTION

FOR THE world to achieve energy security (reliable, affordable, and efficient access to energy services) and master the transition to low-carbon energy emissions, substantial governance efforts are required. To date, such efforts are primarily of technical and economic nature [1]; social implications have been addressed only marginally so far [3] and mostly focus on reducing the resistance of the general public [4] while largely neglecting the diffusion in local contexts such as communities. The term ‘community’ has varying meanings – especially in connection with energy use. In this paper, community is understood in terms of three aspects: identity (sharing of beliefs and values or ways of thinking and living), place (the geographical proximity of members), and scale (an intermediate level within a hierarchy

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of interacting scales of space that exceeds the individual household level) [62].

Local actors such as residents play an essential role in sustainable energy use [1]. In this paper, we examine the perception of energy use in communities that are located in an area dependent on conventional energies. We argue that governance approaches initiated by local authorities need to be matched with civic habits of energy use – in particular, the question of what citizens deem important with regard to sustainable energies in their community and how they want to be included in governance approaches on energy use. Regarding the first aspect, it is of interest which values are shared within a community. Examining values allows insights into the rationales upon which opinions and preferences about public matters are based, the relevance of trade-offs for public acceptability [4], and requirements for developing more comprehensive policies [5]. Regarding the second aspect, citizens’ preferences for being involved in decisions about the use of sustainable energy should be examined to develop governance approaches that are tailored towards community needs. Insights into preferences for local-level decision-making can provide a “vital and practicable means through which to deliver carbon reductions at individual, household, and community levels” [6].

The overarching goal of combining energy governance with community values and participation preferences goes beyond reducing social resistance to sustainable energy use: the approach aims at involving citizens in decision-making processes to increase living conditions and establish community well-being. Evaluating which values are prominent in a particular community may help to develop governance strategies that are sensitive to the lived values of the community [7] and align the expectations of local governments, residents, and other actors regarding which energy services should be provided in a community [8]. This study investigates the perception of energy in relation to its use, governance, and impact on the community from the perspective of three Texas communities using half-structured interviews. Two research questions are examined:

- 1) Which values are connected with perceptions of energy use in communities?
- 2) Which aspects of governance are perceived as being important for communities by citizens?

The results show that five underlying values are important to the perception of energy use by communities:

growth, independence, sustainability, affordable living, and mobility. Regarding preferences for governance, three forms of involvement in community processes were identified: information, communication, and participation in decision-making. Addressing values and preferences in energy governance is considered to be a promising approach to facilitating community well-being.

The paper is structured as follows: In Section II, the theoretical background on approaches to energy governance (Section II-A) and on values related to energy (Section II-B) are summarized. Section III describes the methodology of the study. The results are presented in Section IV and discussed regarding how governance approaches should incorporate community values (Section V). The paper closes with a conclusion and an outlook regarding the need for further research (Section VI).

II. THEORETICAL BACKGROUND

A. Energy Governance

Energy governance refers to the “myriad processes through which a group of people set and enforce the rules needed to enable that group to achieve desired outcomes” [8]. While the literature mainly focuses on approaches to govern the use of energy by local authorities, recent studies examine approaches to change energy use that are initiated by citizens. Findings on both approaches are summarized in the following.

Approaches Initiated by Authorities: Approaches to governmental administration have changed over time from ‘rowing’ and ‘steering’ to ‘anchoring’ [9], [10]. The first approach was predominant in the era of industrialization and built on strong trust in the government as an agent for the good of all [11] who designs and implements “policies focusing on a single, politically defined objective” [9]. The second approach was popularized in the 1980s and followed a more managerial perspective that aimed to facilitate market competition [9]. In the third approach, public authorities serve the citizens and meet their shared interests. Accordingly, the role of citizenship changed from ‘voters and clients’ to ‘customers’ and to ‘problem-solvers and co-creators’ [11]. With regard to the energy system, the literature suggests that until recently, ‘rowing’ and ‘steering’ were not uncommon in decision-making processes on the use of energy driven by an exclusive group of economic and technical experts [12]: Local authorities provide regulatory frameworks, that ensure legal certainty and at the same time are flexible enough not to rule out technical solutions from the outset. Such measures may include enforcing standards and policies, conducting impact assessments, and restricting energy utilization [13]. However, the intended objectives are not achieved solely by restrictive measures but rather by motivation and incentives to steer companies’ and residents’ behavior in certain directions. For example, in Norway, commercial and industrial customers are billed for the highest peak drawn from the grid each month. The objective is to incentivize consumers to reduce their power demand in order to ensure efficient grid utilization and reduced charges [14]. Other

measures can be initiated by the municipality (e.g., legal and/or financial allowances), business partners (e.g., R&D, product co-creation, risk-pooling, leveraging technical expertise), and financial stakeholders (e.g., investments) [15]. More recent efforts aim to involve the public in decision-making processes on energy use, thus trying to reduce public resistance [3]. However, a study by Hoffmann et al. [12] suggests that local governments shape community-centered energy initiatives quite differently, ranging from collective decision-making to institutionally defined programs that emphasize budgetary outlay reductions and judicious husbanding of tax revenues. In addition, citizens are often unaware of measures to facilitate the sustainable use of energy initiated by their local governments [16]. According to Jackson [17], effective energy governance should combine technological innovations and the way in which these interact with local social and cultural terrains to facilitate the emergence of more ‘place-based’ energy infrastructures. In a study on local energy governance in the U.K., Fudge et al. [6] found that such efforts include technological and social/cultural approaches as well as mixtures of both.

Approaches Initiated by Citizens: In terms of civic habits and related initiatives of energy use, literature on energy governance mainly frames people in economic ways, e.g., as consumers. However, Willis [1] found that people can take on other roles than just as economic actors, such as civic actors (voting, participation in civic life); as employers and employees; and as members of a community. In this regard, the actions of people are central to sustainable energy use and thus bound to ‘socio-material systems’ – physical infrastructures and social practices that provide the conditions within which individuals think and act [18]. Civic efforts to achieve sustainable energy use range from energy consumption to production.

Energy Consumption: Energy often remains invisible to most citizens – decisive about the consumption of energy are so-called energy services (“[...] functions performed using energy which are means to obtain or facilitate desired end services or states” [19]) such as cooking, heating, and ironing. The unreflective use of such services results in high energy consumption. More efficient approaches described in the literature refer to ‘simple and painless’ techniques that reduce energy consumption (such as switching to low-energy light bulbs [20] and approaches at a large scale (e.g., insulation and replacing windows or heating systems [21]).

Energy Production: Energy prosumer households do not only consume but also produce and sell electricity [22]. This can be achieved by combining technologies such as photovoltaic, battery storages, and direct-current microgrids. Measures supporting and facilitating prosumer behavior in marginalized communities and households contribute to social and energy justice [23]. In addition, the literature points to a large number of successful projects initiated by residents to make communities more sustainable and energy self-sufficient [24]. Such ‘grassroots’ innovations are heavily dependent on community members being engaged, agreeing on a shared vision of the community’s future, and aligning their behavior accordingly [24], [25], [26]. In addition, intermediary

actors (such as local institutions) need to coordinate support amidst very different social and political circumstances for grassroots initiatives to survive in the long term, grow, and diffuse [27].

If grassroots initiatives are successful, collective renewable energy prosumerism can take the form of a social movement that engages in energy system transformation [28] and result in radically innovative energy policies and business models capable of generating at the same time quality of life, jobs, and sustainable communities [29].

Local governments need to identify the best way to engage citizens and enlist them in changing their energy use [30]. Such efforts need to appeal to the values that citizens deem as important in their communities. Analyzing community values allows an understanding of how the public perceives governmental actions [10]. The next section summarizes findings on energy-related values and value systems.

B. Values Related to Energy Use

Community well-being is defined as “the combination of social, economic, environmental, cultural, and political conditions identified by individuals and their communities as essential for them to flourish and fulfill their potential” [31]. Well-being is contextual to a locality as it is populated with unique populations of people and surrounded by distinct economic and political structures. Understanding local perspectives requires knowledge of what people value about their lives which demands context-specific and democratic community-focused assessments [32]. Fernando and Cooley [33] define community values as “(1) shared common grounds for community members; (2) serve the interests of the community members; (3) define the community character and identity; (4) can guide action giving it direction, and emotional intensity; (5) shape the choices and decisions that members make as a community; and (6) function as standards or frames for judging and justifying decisions and action”. Several aspects of such values may be connected to energy use, e.g., the ability to obtain energy services or resources as part of intrinsic human values and the services enabled by electricity as part of social significance values [34] as well as the comfort offered by using energy [35] and environmental-friendly lifestyle achieved by sustainable energy use [36] as part of well-being.

Several studies have examined values to develop strategies for renewables [37], [38], energy transmission systems [39], and energy transitions in general [4], [40], [41], [42], [43]. Results show that values can be activated by the ‘technical design’ in terms of specific technical aspects of the energy system [4], [44] as well as by the ‘institutional design’ in terms of how these systems are governed [44]. In turn, values influence the perception of energy technologies and may even motivate citizens to pay a premium for renewable energy [38] or take climate action [43]. Theory differentiates between private and shared public values [45], while the latter are constantly negotiated by various stakeholder groups such as governments or activists [46] and thus non-static [47]. According to Graham et al. [7], individuals or

groups may articulate verbally or express through everyday activities what they value in their lives and the places they live. Demski et al. [4] identified 15 public values that constitute what they call a “public value system for energy system change.” The values constituting this system go beyond technological or ecological aspects and include cultural and social aspects. However, public values are oriented towards society as a whole [48] and thus mitigate specific issues of local communities.

With regard to sustainable energy use in communities, several studies have shown that energy consumption depends on the occupant behavior of residents [49], [50]. Such determinants of energy consumption result from interactions with services and technologies, which are motivated by occupancy patterns, attitudes, and beliefs [35]. Therefore, examining such underlying concepts and social practices is crucial for understanding energy consumption and influencing related behaviors – however, this relation has hardly been considered in studies so far [49]. Related analyses need to consider several dimensions, such as processes (concerned with who develops measures, who is involved, and who has influence) and outcomes (concerned with how the outcomes of a measure are spatially and socially distributed) [12], [51]. Attitudes towards such aspects are developed by interactions between community members. In this way, a community develops “commonality in its values,” although never a perfect agreement (Dietz et al., 2005) and sometimes even resulting in opposing interpretations of values [52]. Another aspect is that context-dependent can or cannot be found in a community [53] – both tangible (such as infrastructures and technologies) and intangible (such as knowledge, collaboration, and information). Thus, it is necessary to explore in depth which values are shared by individuals of a community that relate to the use of energy. The next section describes the methods that were used in a study to examine energy-related values in three Texas communities.

III. METHODS AND MATERIALS

A. Investigated Communities

The unit of analysis was the community level. Three Texas communities were chosen to participate in the study due to their differing dependence on industries related to conventional energies. The city of Odessa is located in the west of Texas and has a population of over 114,428 citizens. As part of the Texas Permian Basin, the community’s economy is dependent on the oil and gas excavation industry, and its role is principally the home of associated service companies. Beaumont is located 85 miles northeast of Houston and has a population of over 115,000. Beaumont is part of the Texas Triangle, the region of initial oil discovery in Texas, and continues to have an economy largely dependent on industry focused on oil refining and derivative product production. Located northwest of San Antonio, Boerne is a community in the high-growth corridor between Austin and San Antonio, Texas. It is a city of about 18,000 citizens and currently plans to determine the potential of solar electricity for its ‘rolling ten year plan’.

B. Data Collection

Interviews with residents on the topic of community perception and development of the three communities were conducted, recorded under advised consent, transcribed, and cleaned to ensure accuracy. All interviewees' identities were anonymized.

Interviews: As part of the 'Home to Texas' research project [54] of the IC² Institute (University of Texas at Austin, USA), an interview guide with ten questions on the topic of community perception and development was created. The questions were formulated in such a way that they could be answered by any interviewee without prior knowledge (e.g., What key actions such as programs, initiatives, and activities takes the community right now to make itself more attractive to visitors, businesses, and possible new residents? What stories or experiences could you share to illustrate the importance or effectiveness (or lack thereof) of the actions you mentioned? What key things do you feel hold back your community from realizing its full potential?). In addition, interviewees were asked to reflect upon whether their perceptions of community aspects represent the opinion of the entire community in order to identify values shared within the community. Using this guide, 77 individuals living in the communities were conducted (Odessa: 12 male, 14 female; Beaumont: 12 male, 12 female; Boerne: 16 male, 11 female; age: 18-24 years: 8, 25-34: 5, 35-44: 13, 45-54: 23, older than 55: 28). Informed consent was obtained from all interviewees. The selection of interviewees aimed at selecting key stakeholders who are engaged in their communities and represent a broad range of university, industry, government, and support groups [54]. Preliminary talks before the interviews were used to identify interviewees with these characteristics.

C. Data Preparation

Interviews: Interviews were transcribed as basic transcripts. Then, for the purposes of analysis, the responses of all interviewees for each question were recorded in an Excel spreadsheet sequentially, ready for the codification process.

D. Data Analysis

The interviews were annotated with respect to 5 aspects: the perceptions of energy use, problems with energy use, wishes and needs regarding energy use, the perception of governance forms, and indications of initiatives in the communities emanating from the citizens. An annotation scheme on basis of value-describing words such as responsibility, consumption, fairness, and rationality was used for this purpose [62]. Coding conflicts were resolved in discussions between the coders and used in revisions of the annotation scheme to better reflect the diversity of statements in the underlying data [63]. In this way, five categories of values were identified in relation to energy use (growth, independence, sustainability, affordable living, mobility) and three categories for preferences on energy governance (information, communication, and participation in decision-making). In the results section, citations are coded as follows: Interview_Community (Beaumont, Boerne, Odessa)_Number of the Interview.

IV. RESULTS

A. The Perception of Energy Use on the Basis of Values

The data analysis points to five basic values that influence the perception of energy use: growth, independence, affordable living, sustainability, and mobility. These values can range from low to high in the community. In some cases, the data suggest a medium level, especially when values are appreciated by some parts of the community and disregarded by others. Such split perceptions are specifically evident in questions about what is holding the community back or what needs to be changed in the community. In the following, the values are defined and described in terms of their impact on the perception and evaluation of energy use.

Growth refers to the quality of a community being able to expand. This quality can refer both to the size of the community in terms of energy companies located there and to the energy infrastructures available for the residents. Economically, growth offers a community the opportunity to diversify its local industries. Diversification is perceived as being important, particularly by Odessa and Beaumont residents, as a counter to the predominance of the oil industry and refineries:

[...] we always talk about being diverse in our industries. But we always end up back at the oil side. I'm in the oil business. And every time something goes wrong, we always say we're going to branch out and be better at bringing in other industries. And then the next thing you know, we're hooping and hollering because we have just landed a contract for a \$7 billion gasoline plant, still in the oil and gas side. So I say we're conflicted in the fact that we talked about one thing, and we're still conflicted about staying in oil and gas and heavy petroleum kinda stuff. (Interview_Odessa_26)

In this regard (and given the fact that natural resources such as oil and gas are limited), individual respondents argue that alternative energy could be a way to diversify the industry while introducing future technologies to the community that will ensure its continued existence and further development. The disdain for economic growth in the direction of renewable energy is cited by respondents as one of the main reasons for stagnation:

You know, I am an educator, so I always think that education drives creativity which then drives innovation, invention, curiosity, and so it has always kind of floored me that we don't invest more in alternative energies. And that's not just the traditional ones on solar, and with the geothermal, why we were not, we didn't become a hub for energy transmission and energy production. [...] That, that, in a way, is holding our community back, and an unwillingness to embrace the future technologies to pull us into the future. (Interview_Odessa_13)

This negative perception of growth based on alternative energy is not found in all communities. Statements from respondents in Boerne, for example, show that the introduction of sustainable energy systems can succeed if citizens value growth and this matching vision can be communicated to policymakers:

When I got here, [...] we weren't providing solar; we didn't do energy storage. I came in saying, look, here's what our

members want. They want alternative energy; they want solar [...] You know, the problem is our political climate has gotten to the point where nobody who has a vision wants to get in there and take all the arrows from the people, right? [...] And so, I would hope that what we could do is share the vision and hopefully get everybody on board. (Interview_Boerne_46)

At the same time, the community of Boerne is divided when it comes to growth in terms of population numbers. Due to the strong influx of new citizens, a faction has formed that rejects growth and even launches corresponding initiatives to prevent influx. The basic concern is that the infrastructures for power supply, transport, and water supply are not sufficient for the newcomers. It is pointed out that in community development, the necessary expansion of infrastructures must be predicted and initiated in time:

I think the local government, they always that is one area where infrastructure can sometimes get behind development. [...] And by that, I mean very much on a real basis, meaning streets, electric, you know, water, things like that, that keep the city nice. (Interview_Boerne_28)

Independence refers to the quality of a community being able to act without help or influence from external parties. This quality relates to both the dependence on energy supply and the dependence on energy companies. Regarding the supply of energy, the data indicate for all three communities that multiple crises, such as hurricanes, fires, and floods, have significantly affected public life. In addition to the loss of lives, livelihoods, and economic assets, the collapse of the power supply is cited as the most significant consequence of such disasters. Renewable energy could provide an opportunity here to bridge interruptions in the grid, making the community more independent and resilient to crises such as natural catastrophes and negative influences of external actors:

I would change the construction codes so that their energy and water efficiency and fighting require fire safety. That's, to me, a very important part of resilience. I would throw solar power on every viable rooftop in this whole area. Because again, we're not relying on energy being drawn from all over the place where we're at the end of the line we're generating locally. So if the grid goes down, for whatever reason, we have a fallback option. [...] But we can have other issues with wildfires, we're gonna have issues with grid disruptions from foreign state actors, you know, from hacking, and we don't have any of that resilience. Now, I would like to empower that resilience with more solar power. (Interview_Boerne_64)

Furthermore, the predominance of the oil industry reveals a dependence on its economic success: On the one hand, this branch of the energy industry enables well-paying jobs but also causes unemployment and mass exodus from the community in times of crisis. This circle of 'feast and famine' was identified particularly in the Odessa community:

And then, of course, by contrast, when prices aren't, you know, crude oil prices drop in oil and gas production goes down, there's not as much money flowing. And then we have unemployment issues, and so we do have this kind of feast or famine cycle. (Interview_Odessa_04)

The high dependence of the Odessa and Beaumont communities on the conventional energy sector brings with it a

dependence on policy decisions in this area. In particular, policy regimes that promote renewable energy pose a challenge to communities in such dependency relationships:

[...] who knows what the future is with, what we got going on, mainly because gas prices, you know, with Mr. Biden being anti-energy. But, you know, hopefully, we'll, you know, we'll be diverse and get through it in this area; he can really impact this area depending on what happens. Yeah, that's why I say that not anything political; it can really affect this area more than other stuff. (Interview_Beaumont_12)

Affordable living refers to the quality of a community being able to offer its citizens sufficiently high enough incomes to cover the expenses for necessities of daily life. With regard to energy use, this relates to the costs that have to be spent on energy services in homes – especially for heating and cooling. The influence of the oil industry in the region is seen as a trigger for rising energy prices. One suggestion in this regard is that the companies should bear such additional costs for the community:

Oh, push for the like alternative power source and provide free electricity and the free Internet service for anybody in town. Right, I mean, I really think that the, you know, if oil companies actually invest into alternative energy source, which they can. This is the place to do it, you know, the wind, the solar. Why, why are we paying for like high price for the gas we're thinking we are the one. (Interview_Odessa_38)

Overall, this aspect of affordable living is acknowledged by individual interviewees in the three communities, but overall, it is only marginally appreciated. The reasons for this are, on the one hand, the high costs of houses in general. Especially in the community of Odessa, the high salaries of employees have led to a general increase in house prices. In addition, the design and construction of energy-efficient homes require greater effort than that of standard homes, which contradicts the need for quick, low-complexity, low-cost solutions to high housing demand.

Sustainability refers to the quality of a community being able to ensure that it meets the energy needs of the present without compromising the ability of future generations to meet their own needs. Sustainability concerns are expressed differently in the communities – for example, as a result of water supply problems (Boerne), pollution problems (Odessa), or health problems (Beaumont). As an example, in the following citation, an interviewee from Beaumont discusses possible correlations between the use of conventional energy systems and serious diseases:

You know we've got high incidence rates of cancer. We're upwind downwind of all these plants. If that is a cause, I don't know if it is or not, but do we have to live by a plant. How this town developed was much like the town I grew up in, Beaumont, all the workers in labor, live very close to plant because they didn't have a car and they could walk to work. (Interview_Beaumont_07)

Using alternate energies is seen as one pillar in a comprehensive concept for the future development towards a 'green' community that mitigate such threats – as the following citation from an interview with a resident from Boerne illustrates:

When I was first getting involved in trying to influence the city, my goal was to make it the model green community. And that pivoted over time to be kept to a goal of making it a model resilient community, which environment plays a role in the pillars are typically, you know, culture, you know, societies, sort of social, economic, and environmental, are kind of the three pillars, they have a resiliency plan. And so we really brought the environmental part big time. (Interview_Boerne_64)

However, several interviewees indicate that the use of alternate energy sources may be impeded by the overall reliance on conventional energies. This could lead to innovative energy technologies being developed and deployed in other parts of the country before opening up to the use of alternative energy sources in the communities examined in this study:

Some people might say well, no, let's move my best morning oil pass laws that will benefit oil, right? But the thing is that, as a country, not everybody's in West Texas, not everybody's in Texas. So the changes and the advances in diversifying the economy and other parts of the country, whether using other energy sources, they're going to keep progressing. (Interview_Odessa_45)

Another aspect related to the value of sustainability is how to make the communities more attractive to visitors. The communities of Beaumont and Boerne have landscape areas relevant to tourism, the preservation of which is contrasted by the use of conventional energy. In this context, the importance of having a reputation of being a 'green' community in order to be attractive to tourists is pointed out. Such endeavors require a comprehensive strategy that considers not only ecological and economic perspectives but also the issue of sustainable energies as a basis for environmental preservation:

So, I think that when you look at that from a visitor standpoint as well as a resident standpoint, we're taking both of those things into consideration, and we're making sure that our park systems, our lake, how we're building our master plan. (Interview_Boerne_66)

Mobility refers to the quality of a community enabling its citizens to move freely. This value is relevant in all three communities and poses corresponding challenges: Odessa lacks downtown parking, Beaumont has high volumes of commuter traffic, and Boerne generally experiences high volumes of downtown traffic due to a large influx of new residents. Sustainable energy is important for two aspects in this context: traffic reduction and noise reduction.

Regarding the first aspect, interviewees state that flexible access to downtowns is important in order to take advantage of the offerings available there. If the possibility to move freely is restricted, the attractiveness of local offers decreases considerably:

That's what everyone's been saying from Odessa is I don't want to go to downtown because there's no parking. (Interview_Odessa_25)

Regarding the second aspect, interviewees report that noise pollution resulting from high traffic volumes severely limits the well-being of residents and visitors in the downtown area:

My wife and I have lost interest in shopping at the antique stores and eating at the local restaurants while loud and

speeding vehicles and trucks move along the primary roadways right through the middle of town. (Interview_Boerne_51)

Two renewable energy-related solutions are mentioned by respondents that could mitigate such problems: Public transport via electric buses and micro-mobility in the form of electric scooters. Electric mobility is environmentally friendly and quiet, which can reduce noise levels in city centers. By expanding public transport, visitors can get to the city center flexibly without using a car:

I would create a public transportation connection to San Antonio. Really high-quality, floaty, awesome bus. You know, I think it'd be best if it started in Boerne and would stop at certain transit hubs. But you can ride it this way. All the way downtown back. Buses tend to be more realistic for us because they're more flexible in terms of where you can take them. [...] And electrification of buses is coming along fast. It already exists, and the cost-benefit analysis. It's getting close to favoring it. (Interview_Beaumont_64)

However, data suggests that replacing individual driving with electrified public transport is not embraced by the majority of Beaumont's residents:

Today we're a pretty mobile society, and even if you do not own a car, there are public transit methods that can do that which are underutilized in our community. It's got a robust system and electric buses that run around. I just see a very low ridership. (Interview_Beaumont_07)

The rejection of electric mobility by parts of the community may be due to the region's dependence on the oil industry and conventional energy. In the following quote, an Odessa resident describes that a 'pro-oil' attitude could affect support for alternative forms of moving freely:

Oh, you probably have those people that are very pro-oil. I guess here's the word. And look, I think oil is important [...] Yeah, we all know that the future is going to go to, you know, electric vehicles at one time or another. [...] But I think that if we don't do that, obviously, to the detriment of our area, that's going to come. No matter what happens and it might come sooner than later. And so, in Texas, we typically will. We're more conservative, so we don't. (Interview_Odessa_45)

B. Preferences for Energy Governance

To determine how community attitudes toward energy use based on community values should be addressed in decision-making processes with citizens, an analysis of preferences in governance was conducted. The results indicate a spectrum of desired formats ranging from passive (being informed) and semi-active (discussing with decision-makers) to active forms of participation (being part of decision-making processes). The categories with their respective formats are summarized below.

Information Measures: The data show a variety of information needs that should be addressed in communication measures on energy governance strategies. Information needs include how targets and agendas for energy use at the national level align with local contexts and how they can be implemented there.

Conversely, citizens are interested in whether local efforts toward alternative forms of energy have implications at the

regional and national level, e.g., in terms of energy security of states in the face of unreliability with the existing power grid. In this context, citizens are also interested in the extent and level of investment in energy infrastructure and the reasons for these decisions. With regard to reasons, it is of particular interest in whether such measures follow superordinate plans and whether the well-being of the community is considered in and facilitated by such plans. Other information needs include preparedness for crises such as floods, hurricanes, and wildfires, especially with regard to the associated risks to energy security. Furthermore, citizens are interested in ways to reduce their own costs through energy savings and the efficiency of various methods, such as home insulation and the private use of solar energy.

A general problem that could be identified on the basis of the data concerns the question of how exactly such information needs should be addressed for citizens. In the three communities, contrasts emerge in terms of how informed citizens are. While some interviewees are aware of the actions and efforts of local governments, others are poorly informed about developments in their communities, particularly with regard to energy use. Rather than purely informational measures, decision-makers thus emphasize sharing formats that can ensure that important information has actually been noted and understood (see discussion measures). However, because such formats rarely reach the entire population of a community, demonstration projects are proposed to illustrate the possibilities of innovative technologies beyond conventional energies to residents in the sense of a ‘show, don’t tell’:

I think that’s an area that really needs to be worked on to show that there are possibilities here for people doing something other than the oil field and actually help this community grow into something a little bit more diverse in terms of economy. (Interview_Odessa_52)

Discussion measures: Statements from the interviews make it clear that governance approaches must always take into account a variety of opinions and perspectives from citizens:

If you are going to represent the citizens, then you need to be able to make sure that you are representing them well. How do you do that? By being able to bring their thoughts, their ideas, their hopes, and their dreams to the table, maybe they might sound foolish to everybody that sitting at the table, but it means something to the person that shared with you. (Interview_Beaumont_58)

In this context, the question arises as to how citizens’ opinions can be adequately recorded and discussed in semi-active formats. A few interviews suggest that decision-makers should regularly conduct community research, for example, by using questionnaires to gather the public’s views on specific issues. Others call more for direct exchanges with decision-makers, although social media are perceived to be unsuitable for this purpose:

What happens is our social media feeds fuel reaction, okay? The reason social media has become such a thing is not because it’s boring or factual but because it’s dramatic and bold, okay? And you don’t want to know the details. [...] they’re not interested in finding the truth, or the facts, or even

listening to other opinions. They’ve already made up their mind that “this is bad”. (Interview_Boerne_46)

Preferred formats for direct exchange include ‘future workshops’ and informal meetings, where important issues can be discussed with decision-makers at eye level. Such less formalized formats could be used as a compromise when citizens reject direct participation in decision-making processes (see participation measures):

And so if it was me, and I was giving advice to the city, I would try to find some alternative forums [...] I really think there needs to be maybe less formalized meetings where people maybe feel comfortable. Maybe people don’t feel comfortable going to a city council meeting, you know, maybe have town halls or something like that. (Interview_Boerne_36)

Participation measures: On the scale between passive and active measures, participation approaches are located at the second pole. They enable citizens to intervene in decision-making processes. In order to include citizens in such processes, two barriers must first be removed, according to the interviewees. The first barrier concerns ‘wanting’ – citizens are often not very interested in co-determination unless their personal interests are directly affected:

There’s an old saying that, you know, that “government is run by those who show up.” Right. And that’s really true. I mean, most people do not want to take the personal responsibility of going down to a city council meeting and learning and understanding [...]. They don’t really want to be involved unless it comes back and affects them personally. (Interview_Boerne_46)

The second barrier is that citizens want to get involved but do not know how. A lack of knowledge about participation opportunities often indicates a need for appropriate information measures:

I believe that lack of community involvement, lack of the knowledge of what our city has to offer. So, for the longest, I didn’t know really what the port did, Port of Port Arthur, and it’s one of the largest in the world. We have large refineries here, but how can I get involved? (Interview_Beaumont_52)

If citizens are able to intervene in decisions, the question arises as to how they can be efficiently involved in the associated processes – especially if citizens reject the development paths envisaged by the local government. Participation measures should therefore be integrated into the overarching plan, which assigns roles to all stakeholders according to their respective capabilities:

But they also have funding [...] to do basically this master plan for addressing equity in this region. It’s like, freaking awesome. [...] because other cities aren’t doing this. They’re not saying, Hey, what’s everybody doing? Who’s best at what? How can we create a mechanism to track everybody that comes through our entire system, everybody, but also get them to the right people who are doing the right things? (Interview_Boerne_64)

As a second approach, it is recommended to identify and specifically promote already existing local initiatives. Such initiatives can include discussion or action groups as well as companies. As an example, an interviewee describes the

‘opportunity Odessa movement’ that aims at facilitating the general community well-being:

Now another thing that’s coming up a lot of people aren’t aware of [...] is a group of about 50 people who were part of this opportunity Odessa movement. [...] Last spring, we were just about to kick off a community gathering to talk to people and find out what they felt like their needs [...] it is something that is happening that, you know, looks at quality of life. Maybe what it’s, it’s more of a visioning process for the community for 5, 10, 15, 20 years down the road. (Interview_Odessa_02)

If such initiatives do not exist in the field of sustainable energy, interviewees recommend facilitating entrepreneurship instead. In this way, younger people are offered a perspective to stay in the community, which in turn ensures the community’s opportunity to grow in the future:

And I would also create incentives or other programs as such to encourage and support starting businesses using the creative minds of new adults and again with the younger community. (Interview_Beaumont_39)

To meet these demands, it is additionally recommended that a plan be developed that considers how children can be prepared to become entrepreneurs in the community:

I would ramp up the community college, what we call a career in technical education, trade, that’s foundational. I think also I would ramp up a lot of the advanced sciences, you know, ironically, are the two everything that we’re going to be doing into the 21st and 22nd century is going to involve engineering, physics, and chemistry, and then maybe even in some cases biology for the creation of new fuels, those programs need to be turned up on lab. And right now, I’m not even sure if we’re preparing students to be able to do those fields in our public schools. (Interview_Odessa_13)

V. DISCUSSION

A. Theoretical and Practical Implications

This study examined the values and governance preferences related to sustainable energy use in three Texas communities dominated by a conventional energy industry. The results show that examining values such as growth, independence, affordable living, sustainability, and mobility can provide multiple clues as to how to enhance the well-being of a community in various areas such as future development, economics, housing, traffic, and tourism. The findings on the perception of values confirm that both specific aspects of the energy systems and how these systems are governed significantly influence public perception [4], [44]. This leads to the question of how values can be used in governance approaches. The results suggest three primary fields of application: developing policies, aligning the expectations of citizens, and involving citizens in community development.

Regarding the development of policies, a key requirement is regarded to be the alignment of policies with existing community practices [56] – especially when local governments are required to implement national and global policies on a local level [57]. The investigation of values allows conclusions to be drawn about the rationale and acceptability of governance approaches from the perspective of the citizens,

which confirms findings by [4] and [5]. However, developing policies that consider general value systems related to energy use (e.g., [4]) is less purposeful – such values need to be specified and contextualized for local contexts. The results of this study exemplify which values are deemed important by citizens of specific communities. These values partly overlap with findings on public value systems from other studies – for example, the category ‘sustainability’ has an intersection with the category ‘environment and nature’ as used in the study by [4]. However, the findings allow insights into local conditions and requirements – both community-specific and cross-community: for example, independence is of great importance in all three communities, while growth is perceived controversially in Boerne. Insights into values that are shared across communities provide clues as to which governance approaches that match these values might be promising only locally or regionally. Required governance measures include setting and enforcing rules, monitoring compliance, and/or channeling resources to socially desirable ends. In this regard, insights from the examination of values should be incorporated into the design of rules and policies to make them socially acceptable – for example, reservations in Boerne about infrastructure congestion by new residents could be addressed by requiring newcomers to support the expansion of facilities financially or by contributing to the community’s well-being in other ways such as services for the public good that are consistent with other community values (e.g., sustainability).

Regarding the *alignment of expectations*, the results indicate that citizens expect their political leaders to develop a vision for their community that is agreeable from the perspective of citizens. Addressing the preferences and needs of local stakeholders involved in the process in such visions is thus necessary for transitions towards sustainable energies [56]. The results on the perception of values point to three distinct manifestations: Values in line with the use of renewable energies (e.g., independence), values that are only shared by parts of a community and thus contested (e.g., growth), and values that oppose the use of renewable energies (e.g., mobility). The interpretation of values results from the local conditions in the respective communities, such as the high influx of new residents in Boerne, leading to different interpretations of the growth value (growth as a necessary precondition for the community to evolve in the future vs. growth as a threat to the infrastructures of the community). Such varying interpretations of values have also been discovered in a study by [52]. They are a source of resistance as well as friction within a community and should be considered carefully when initiating governance approaches. However, they also allow mediating compromises by analyzing the preconditions for different value interpretations.

Overall, the alignment of expectations should take into account that new requirements do not contradict community values and established habits of using energy. For all three communities (and especially Odessa and Beaumont), fossil energy is of considerable importance for the prosperity and identity of the inhabitants. Replacing conventional energy in favor of renewables thus poses a challenge to conventionalized

ways of life in the communities. It is thus important to find a compromise between preserving established ways of doing things and developing new ways of doing things for specific problems in the energy sector. Renewable energy should thus not be framed as a replacement for the prevailing oil industry but as an approach to address phenomena that run counter to community values: Renewable energy can be used to diversify energy industries and infrastructures (growth), provide safeguards against grid outage (independence), reduce energy costs (affordable living), address pollution problems (sustainability), and reduce car ownership in inner cities through public transport based on electric mobility (mobility). By framing sustainable energy expectations towards such concrete problems, citizens are shown development paths of their communities in line with conventional energy-use habits. In such transition processes, innovative technology is adapted to an unchanged environment instead of changing the environment in ways favorable to the technology [58]. In this way, the effects of renewables can be made visible, which eases the alignment of expectations and supports attaining higher expectations [59].

Regarding the *involvement of citizens*, the data show a contrast in expectations regarding participation in governance between local governments (high interest in participation, perception that citizens do not get involved) and residents (high interest in expressing opinions, perception that local government does not ask and is not interested in opinions). This problem is compounded by the fact that information, discussion, and participation formats do not engage all citizens and are not even perceived by many citizens. In addition, energy technologies are often not very “visible” in the sense that they can be experienced and discussed and are thus only relevant to citizens in the event of problems with direct effects. The results of the study suggest two possible solutions: using existing citizen initiatives and creating demonstrators.

Existing Citizen Initiatives in communities include interest and working groups as well as interested institutions. Such groups are already locally networked and have members who are actively engaged in the community. Involving citizen initiatives in governance measures would facilitate the visibility of sustainable energies. For such initiatives to be successful in the long run, intermediaries are needed to coordinate support, aggregate knowledge generated in individual initiatives, and promote knowledge sharing with other projects [27]. For instance, the ‘opportunity Odessa movement’ aims at improving the general community well-being. By discussing the local values and issues related to the use of energy, this focus could be broadened to include sustainable energy transitions.

Demonstrators can be projects that illustrate sustainable energy technologies or innovation hubs that promote entrepreneurship in this field. The goals of such demonstrators are diverse and include illustrating the advantages of energy technologies, increasing familiarity with the topic, bringing together citizens for discussion, and making intangible energy services visible. Through such projects, both companies in a community and citizens can become interested in the topic and involved in discussions with decision-makers. Demonstrators would thus become community anchors,

creating ties across community groups to help build collective identity. Demonstrators can also be used to increase citizens’ energy literacy – the “understanding of the nature and role of energy in the world and daily lives accompanied by the ability to apply this understanding to answer questions and solve problems” [60]. Such knowledge transfers include concrete, practical suggestions for energy-efficient energy use and production, as well as effective measures to increase the energy efficiency of buildings, such as insulation. By involving schools, local businesses, and local economic development agencies, demonstrators can contribute to long-term community development: For example, students could become interested in energy technologies and be encouraged to meet with companies and institutions that can provide them with internships and training in entrepreneurship. In this way, students are trained via demonstrators to become the founders of future start-ups in the energy sector. This could lead to the emergence of local companies that offer consulting services or develop and make available technologies themselves – for example, the neighborhood-wide use of solar energy in the form of ‘energy communities’. Studies indicate that when businesses are run by locals, this can bring high advantages because the company managers are familiar with the needs of the clientele [61]. In this way, the role of citizens would change from passive ‘voters’ to active ‘problem-solvers’ and to ‘co-creators’ of future community development [11]. Finally, demonstrators can help make the “invisible” about current and future energy practices “visible” and stimulate future thinking for community well-being.

Overall, the results show that the diffusion of sustainable energies is not necessarily a technical but rather a social-cultural challenge. One solution to this challenge is to establish place-based energy infrastructures [17] that take into account local contexts and the social groups that act within them. The study of value systems and governance preferences enables the development of policies, framings of communication measures, and efforts to engage residents in issues of energy use. In this way, governance approaches initiated by local authorities can be tailored towards civic habits and related initiatives of energy use to ensure community development in socially acceptable pathways.

B. Limitations

The research methodology has some limitations: Interviews were used to cover the multi-faceted perception of energy use in communities in depth. However, due to the qualitative nature of the study, the results are subject to interpretation by the coders. In addition, it cannot be excluded that further values and governance preferences exist that could not be identified in the study. Methods such as values-based surveys of community members and environmental rhetoric evaluations of community public messaging may assist in investigating community values in a more structured way but, at the same time, could be limited in terms of only capturing “desired” values rather than more unfiltered values emerging through qualitative sourcing. How such differing approaches need to be combined to compensate for each other’s disadvantages

should be the subject of follow-on work and consideration. Furthermore, only three Texas communities were investigated in the study and therefore, the results may not be generalizable for other communities in different contexts and cultures. Further research is thus needed to validate the findings.

VI. CONCLUSION

This study examines which values are connected to the perception of energy use in communities and which aspects of governance are perceived as being important for communities by citizens. To this end, we reviewed the values of residents in representative Texas communities with economies based on oil and gas extraction, processing, and use. The results show that five values (growth, independence, affordable living, sustainability, mobility) and three governance preferences (information, discussion, and participation) are related to energy use in communities. The findings can be used to facilitate sustainable energy use – in particular, by developing policies, aligning expectations, and involving citizens in community development on the basis of values and governance preferences.

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