Beyond Forecasting: Using a Modified Delphi Method to Build Upon Participatory Action Research in Developing Principles for a Just and Inclusive Energy Transition

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Abstract

Energy transition debates have been characterized by a strong emphasis on the technical implications of shifting away from fossil fuels to renewable energy sources, with little consideration of social contexts. This is now changing, with a growing emphasis on reconfiguring the social aspects of energy, particularly in terms of introducing more democratic processes into behavior change and energy practice engagements. This article situates itself within these debates and demonstrates the transformative potential of combining participatory action research (PAR) approaches with a modified Delphi method for understanding energy transition issues, particularly beyond forecasting instruments. There remains a dearth in literature combining the Delphi method with PAR; its application in the field of energy transitions is very innovative. PAR draws from grassroots and local-based knowledge, Delphi panels typically focus on the insights from a panel of professional experts. In combining these two approaches, to develop principles for an inclusive and just energy transition, a reflexive form of dialogue emerges that gives voice to what are often considered dissonant or mismatched perspectives. Furthermore, the experimental use of a modified Delphi panel, combined with PAR, offers a strategy to promote knowledge sharing between different groups and to counter potential communication barriers among different actors in society. This article shows how a modified Delphi panel approach is considerably enhanced by combining elements of PAR, raising the potential of Delphi panels beyond forecasting instruments, which often seek to determine the way the future “will be,” toward an envisioning tool that collaboratively seeks to explore the way a low-carbon system “could be,” or perhaps “should be.” The development of energy transition principles, endorsed through the modified Delphi panel, offers a concrete way to enact practices of energy justice within a more democratized energy system.

Keywords

community-based research, mixed methods, PAR—participatory action research, social justice, methods in qualitative inquiry, Delphi panel

Delphi Panel Evolution: Beyond Forecasting Activities and Toward an Inclusive, More Democratic Orientation

Current debates regarding energy transitions are usually concerned with the technological implications of a shift toward renewable and cleaner energy alternatives. However, it is increasingly acknowledged that shaping a sustainable energy future requires more than just the technological delivery of “low-carbon” systems (Geels et al., 2020; Hughes, 2013; Luque-Ayala & Silver, 2016; Scoones et al., 2015). There is growing evidence indicating that transitioning toward...
low-carbon pathways is a far more complex process than simply substituting one energy source or technology for another (Geels et al., 2020; Scoones et al., 2015). For instance, energy transitions to low-carbon alternatives frequently experience implementation problems often linked to social acceptance deadlocks, agency issues, or policy inadequacies (Geels et al., 2020).

In line with recent efforts to modify the Delphi method toward adopting a greater participatory democracy focus, this article demonstrates the benefits of combining two distinct research approaches in developing and assessing the applicability of core principles toward a more inclusive and just energy transition in Europe. Significantly, it argues that a modified Delphi panel approach is considerably enhanced by integrating elements of participatory action research (PAR) to the process. This raises the potential of Delphi panels beyond forecasting instruments, which often seek to determine the way the future “will be,” toward an envisioning tool that collaboratively seeks to explore the way a low-carbon system “could be,” or perhaps “should be”.

The Delphi technique is one of the most widely used methods for foresight and forecasting activities (Bañuls & Turoff, 2011; Hussler et al., 2011; Landeta, 2006; Marchais-Roubelat & Roubelat, 2011; Ribeiro & Quintanilla, 2015). In the energy technologies and transitions literature, Delphi methods have been extensively used as scenario-based and forecasting tools (Nowack et al., 2011), in particular in the context of emerging or evolving energy technologies and innovation systems (Al-Saleh, 2009; Czaplicka-Kolarz et al., 2009; Devaney & Henchion, 2018; Hussler et al., 2011; Nowack et al., 2011; Ribeiro & Quintanilla, 2015; Rikkonen & Tapio, 2009). This focus on forecasting and developing alternative energy technologies has generated extensive knowledge, seeking to establish plausible technology evolution and diffusion pathways for the future of the energy system. The Delphi method has proven to be highly fruitful in the creation of scenarios and forecasting in energy transitions by drawing from the expertise of diverse groups and enhancing social learning (Makkonen et al., 2016; Mathur et al., 2008). Indeed, Rowe and Wright (1999) have proposed that Delphi groups (as forecasting tools) can on occasion outperform statistical groups. This strength is particularly relevant in instances where there are high levels of uncertainty or lack of appropriate information to conduct robust statistical analysis (Rowe & Wright, 1999, 2001).

Instances of Delphi-led forecasting applications are varied and include its use in the development of value chain opportunities in the bioeconomy in Ireland (Devaney & Henchion, 2018), the exploration of futures of distributed small-scale renewable energy in Finland (Vahpo et al., 2016), expert assessment on potential impacts of biofuel energy sources at a global scale (Ribeiro & Quintanilla, 2015), and the exploration of opportunities and threats in the development of renewable energy in Saudi Arabia (Al-Saleh, 2009). There are, however, emerging challenges to the dominance of hard technological solutions as the only pathway to achieving a low-carbon energy system, with mounting evidence focused on strengthening the role of democracy and the socio-political domain. These debates are often framed in terms of how best to “manage” transitions and create better accountability mechanisms in the pursuit of innovation (Chilvers & Longhurst, 2016; Hussler et al., 2011). This stems from a growing realization and acknowledgment that the social pillar underpinning sustainability transitions is a central factor in promoting change. Furthermore, as aptly argued by Strathern (2007) and Chilvers and Kearnes (2015), while sustainability relies heavily on technology and scientific developments, there is a growing unsteadiness in the way that we anchor our views of the future, which is now increasingly forecast as “fragile” (Strathern, 2007, p. 465).

In the fast-evolving context of climate change instability, and the critical need for alternatives to fossil fuel energy sources, urgent questions are constantly being asked of science and technology (Bijker et al., 2009; Chilvers & Kearnes, 2015). To address the growing demand for answers and respond to a creeping pessimism in science’s ability to provide solutions, there is an unfolding coproductionist paradigm starting to take hold that emphasizes more democratic forms of knowledge creation and decision-making (Chilvers & Kearnes, 2015; Hussler et al., 2011). In response to these emerging trends and challenges, the Delphi technique has evolved substantially and contributes toward more democratic forms of research (Linstone & Turoff, 2011; Makkonen et al., 2016). Democracy itself is evolving, and a feature that has come to define modern day democracy is an added emphasis on political equality (Dahl, 2006; Fishman, 2016). In this sense of the term, democracy can be understood as a process of ruling, which links decisions to the interests and judgments of people whose lives are regulated by these decisions (Cohen, 2007; Szulecki, 2018).

Valuable questions of how expertise and group creation are established within Delphi panels is one important contribution on this quest for more democratic forms of knowledge. Hussler et al. (2011), for example, explored the stability and accuracy of expert and nonexpert Delphi panel forecasts in the context of the future of nuclear energy in France. This comparative study calls for a recasting of Delphi technique approaches with a greater emphasis on participatory democracy, based on findings which show that nonexpert judgments can be productive and offer opportunities for learning that would otherwise not be available in expert groups. What was most revealing in this instance was how expert groups were found to be more homogeneous—and therefore more limited—in the variety of opinions they offer, in addition to advocating more entrenched positions (Hussler et al., 2011).

Drawing from pragmatic philosophical insights, Tapio et al. (2011) consider the merits of integrating quantitative and qualitative materials in the Delphi process, conceptualizing it as an “analytical continuum” (p. 1621), whereby different approaches are used and adapted to different situations to bring about new conceptions of the future beyond a more static forecasting of probable futures. Making use of Roy Amara’s breakdown of probable, preferable, and possible futures (Amara, 1981), the authors make the case for mixed methodologies to
form more coherent scenarios of the future. Based on a systematic review of the literature, the authors look at differing levels of integration of mixed methodologies. Their findings signal promising advantages to orienting Delphi techniques beyond the highly leveraged approaches of forecasting probable and possible futures and toward playing a role in establishing alternative preferred futures. A similar argument is proposed by Rowe and Wright (2011) in showing how the Delphi method has evolved toward mixed-method orientations in order to fill a need for academics and decision makers to seek out more holistic approaches that address complex, “real-world problems” (p. 1488).

However, while the technique has evolved substantially, the large contribution of Delphi panel research continues to be firmly placed in the field of technology development and forecasting. The method is widely used for measuring and supporting decision making in many disciplines and fields of knowledge (Rowe & Wright, 1999). Most notably, Fletcher and Marchildon (2014) apply a modified Delphi method to qualitative PAR research into health leadership in Canada, emphasizing approaches that enhance confidentiality in the PAR process. Methodological reviews of the Delphi technique suggest that its potential and utility can be enhanced (Rowe & Wright, 2011). In a recent article, Wittmayer et al. (2018) explore a variety of different methodologies in the emerging field of environmental transformations research. The authors make the distinction between two modes of research goals, the first being transformational and characterized by a reflexive and fluid stance toward knowledge creation, while the second is factual-based and descriptive and is characterized by adopting a more fixed and objective approach. The authors suggest that the Delphi method research in this field has largely adopted a more descriptive rather than transformational approach. Critically, the authors argue that methods are strongly influenced by the underlying purpose they serve, and often, this has an impact on the potential of that method, and the way in which it is mobilized (Wittmayer et al., 2018). This is valuable argument for considering the evolution of the Delphi method. It can be argued that while its potential as a forecasting technique in the pursuit of technological innovation should not be overlooked, its potential as a communication technique should be acknowledged in light of the need to allow for more iterative and transformative dialogue to emerge (Linstone & Turoff, 2011).

Situating Discourse and Method in Terms of Energy and Environmental Justice: The Turn to Qualitative and Democratic-Based Frames

Energy is deeply enmeshed in the provision of basic human necessities from food and education to health and mobility. Modern societies are now more than ever dependent on the complex global socio-technological networks that rely heavily on infrastructure kept alive by energy. It is also increasingly accepted that energy service provision has a social justice function working toward the reproduction of fairer and more equal relationships in society (Patterson et al., 2018).

Energy justice has extensive and evolving roots linked to wider social and environmental justice framings, which have changed substantially since the 1980s, as complex issues such as climate change have made it necessary to adopt more multi-dimensional approaches and discourses (Agyeman et al., 2016). Agyeman et al. (2016), in their review of environmental justice discourses in the United States, show that early discourses during the 1970s and 1980s were usually concerned with objectively measuring and substantiating claims that revealed how people on low income, or people of color, were unevenly exposed to environmental hazards (such as toxic and hazardous waste). From the 1990s onward, environmental justice discourses moved from purely quantitative-based arguments and methodologies toward more critical explanatory frameworks and theories that embraced multiple meanings and levels of complexity (Agyeman et al., 2016). Environmental justice frames expanded to look at processes of disrespect, degradation, devaluation, and exclusion and explored along multiple scales and from a variety of different perspectives issues relating to gender, identity, and nonhuman nature (Agyeman et al., 2016; Schlosberg, 2009). Added to this discourse, there is now an emphasis on recognizing the role inclusive democratic inputs can have into processes of envisioning and implementing a low-carbon future (Agyeman et al., 2016; Chivers & Kearnes, 2015; Healy & Barry, 2017).

While a critical in-depth expansion of environmental and energy justice debates is beyond the scope of this article, a key point to highlight is that energy justice is a central theme in existing climate change and energy transitions strategies and is a crucial element in the development of more democratic forms of knowledge creation and decision-making (Healy & Barry, 2017). Patterson et al. (2018) point to the significant role of the concept of social justice as an organizing principle for the political project of leading society toward a low-carbon future while also constraining global warming to a safe 1.5 °C threshold. Equity and justice are seen as vital components in ensuring the stability and feasibility of ambitious political plans to create a new energy regime and low-carbon society (Klinsky et al., 2017).

Critically, discourses addressing justice, equity, and more democratic processes emphasize the need to socially internalize the necessity for pursuing alternatives to fossil fuel energies while also understanding the deep-seated implications of future energy systems for society. There are no easy “silver-bullet” style solutions to achieving a low-carbon society, and attempts to collectively journey toward this goal are arguably best achieved through a renewal of social justice principles and political commitments keen on protecting vulnerable groups in society, now and into the future (Patterson et al., 2018). For this reason, this article argues that there are a number of core principles that would promote a fairer and more inclusive vision for the future of the energy system. Developing energy transition principles, such as the ones presented in this article offer a
The Delphi panel can be described as a technique, which captures reliable group information through a series of cyclic rounds of engagement, where group members remain anonymous to each other (Eubank et al., 2016). A key component of the Delphi panel is that it enables and promotes a process of iterative dialogue leading to knowledge creation through consensus, stability, and/or dissonance among the research participants (Rowe & Wright, 1999).

This form of inquiry is particularly relevant in areas of research that are extremely complex or where there is a degree of uncertainty (Masse et al., 2014). It is also beneficial in research areas where disagreement is a predominant obstacle for further developments or in cutting edge fields of study where there is little information available (Avella, 2016). Recent papers have contributed toward the evolution of the Delphi technique by problematizing misconceived notions that Delphi panels seek to produce consensus as an ultimate goal. Instead, the argument is put forward that it is its structured, iterative, and reliable communication process (Rowe & Wright, 1999) that bestows validity to final findings, whether there is consensus or not (Linstone & Turoff, 2011).

The design and process of the Delphi panel is typically based on a series of rounds (often in the form of online surveys) that facilitate a staged process of feedback and dialogue that encourages respondents to reflect on their initial perspectives, learn from others, and reconsider their own stance (Hsu & Sandford, 2007). In general, the innovative component of the Delphi panel (in terms of design) is that the findings from the first round are not merely used as a stand-alone source of information but rather are also used to shape subsequent rounds.

**Description of Delphi Panel Process: Three Key Stages of Implementation**

The implementation of the Delphi panel process reported in this article entailed three core stages. The first stage involved the development of initial materials and survey questions for consultation with the panel. The second stage pertained to the selection and recruitment of an interdisciplinary panel of academic participants. The third stage entailed a two-round survey to the panel.

The initial stage of the Delphi process was concerned with the development of initial materials and survey questions, which were subsequently presented to the panel. A modified Delphi panel design was used, this differs from the conventional Delphi technique, in the main, from the fact that initial materials for panel discussion were developed and put together in advance of the incentive stages of consultation with panel members (Avella, 2016). Applying this approach, PAR findings were integrated as draft principles and formed the basis of the survey structure for the Delphi panel survey (see subsequent section below for further details on PAR).

Recruitment of the Delphi panel was also a key stage. The Delphi panel membership was limited to academic participants. The rationale for selecting academic experts, rather than decision makers or other levels of expertise, was based on the precondition to explore stability of opinion across disciplines. In this context, the decision was made to develop a recruiting strategy, selecting panel members from different disciplines and departments, with academics representing in broad terms different branches of science. Namely, a diversity of academics from applied science and social science backgrounds with an appropriate level of expertise and engagement with energy...
system sustainability and transition research. A purposive sampling strategy was used, so as to achieve greater diversity and potential for learning (Devaney & Henchion, 2018; Hussler et al., 2011), this is in agreement with best practice guidelines, which posit that there is no fixed definition of expertise or hierarchy (Makkonen et al., 2016). The final panel was composed of academics from different backgrounds including civil engineering, geography, social anthropology, sociology, health promotion, and economics. The group was composed of members from a range of European countries comprising Germany, Ireland, Portugal, Spain, and the UK.

Initial recruitment of panel members had a response rate of 67% with 10 of the 15 preselected participants agreeing to take part in the survey. The response rate for the first and second rounds of the survey was 90% and 9 of the 10 participants who agreed to take part in the survey completed the task.

The final stage of the Delphi process involved the delivery of two survey rounds, which were conducted through email. Panel respondents were asked to consider each principle individually and were given three basic options for assessment: agree, disagree, or reframe. The list of principles was introduced to panel members with a brief summary detailing the background process in the development of these principles. Panel members were also encouraged to provide brief commentary on each specific choice. These rounds functioned as feedback loops, which provided information to participants and outlined areas of agreement or disagreement. This process of feedback promoted asynchronous dialogue, not just between panel members but also between the panel and the different communities from which the principles were originally drawn. The key objective of this process was to establish stability of opinion and levels of consensus around these principles. A final section of the survey offered the option to recommend alternative principles.

The process of reaching consensus usually does not refer to absolute agreement among all respondents but instead refers to a preestablished agreement rate, usually between 50% and 70% (Avella, 2016). The feedback loop in this instance allowed for a gradual paring down of agreed upon items and those on which there was least agreement (Avella, 2006).

The second Delphi panel survey provided the feedback component. Based on an overview of the information in the survey, the second iteration entailed a reframing and rewording of the original principles proposed. The panel was asked to consider these alterations and reevaluate their position. Again, panel respondents were asked to review each principle individually and were given three basic options to assess these, based on agree, disagree, or reframe.

Combining PAR: Initial Development of Principles Grounded on Empirical Community Engagements

The development of drafted principles, as described in the first stage of the Delphi panel process above, originated from findings drawn from the thematic analysis of PAR insights, collected using multiple data collection methods. This constitutes a large volume of data pursued with the principle aim of exploring new understandings of energy-related practices and enhancing stakeholder engagement in Europe’s energy transition.

The PAR approach was incorporated in these multiple data collection methods as a means to facilitate and empower people to act, overcoming common hierarchical approaches to knowledge and power dynamics. A significant aspect of PAR is its call “for engagement with people in collaborative relationships, opening new “communicative spaces” in which dialogue and development can flourish, drawing on many ways of knowing” (Reason & Bradbury, 2001). The manner in which research evolves can be described as an organic process of engagement that leads to a deeper capacity to understand and position ideas individually and collectively. PAR research practices can be understood to exist within a continuum, which extend from collaborative style research development with active engagement of stakeholders (Westhues et al., 2008) to grassroots-led citizen science approaches (English et al., 2018). Within this continuum, the work presented here is linked to the collaborative approach, with inputs and active engagement from research stakeholders developed in a reflexive manner having an impact on the structure, delivery, and evaluation of research outputs.

Drawing on Multiple Methods of Data Collection

The PAR research process in this project was grounded primarily on qualitative-based data in the form of narratives and dialogue drawn from semistructured interviews, focus groups, and citizens’ juries. These provided the core primary data for drafting the initial principles. A number of criteria were applied in the selection of six participating communities across Europe (see Table 1 for further details). These participating communities were loosely framed as neighborhoods, and recruitment of participants was carried out using an intersectional approach with care given toward a good gender, age, and socioeconomic mix of participants (Hancock, 2007). Participants in each community were identified and selected by the research team. Participants were members of that local community and tended to be either residents in the area, or people who worked or studied in the locality. The sampling frame utilized for the fieldwork involved both purposive sampling and snowball sampling techniques. Purposive sampling was utilized to ensure a balanced representation of participants (Babbie, 2013).

Data collection in these six communities developed in three stages, each feeding into the next stage and allowing for reflexive learning and identification of stakeholder-led themes for the subsequent stages. The first stage was interviews, followed by focus groups and leading toward the citizens’ juries.

Semistructured interviews were chosen as a flexible method to engage with community members on their views of the energy system, ranging from the energy transition to sustainability. A total of 44 in-depth, semistructured interviews were carried out ($n = 44$). The interview process consisted of
The commitment to PAR was most strongly realized through the fora of deliberative citizens’ juries. The development of the citizens’ jury, a form of deliberative mini-public, is a practical expression of the turn toward deliberative democracy that has emerged at the start in the 21st Century, with a clear goal to meet the challenges presented by the types of governance arrangements required for a complex networked society (Barnes et al., 2007). This format was used to promote the development of collaborative understandings of the energy system and scenarios and pathways for a sustainable energy transition. For example, the thematic focus of each citizens’ jury differed in response to local suggestions and input. The research findings obtained from interviews and focus groups informed these subsequent community engagements through citizens’ juries—providing points of dialogue with the community. The use of the citizens’ juries consisted of three separate small groups of participants (between 8 and 12 in each group), in three separate communities (located in Barcelona, Liverpool, and Paris). The process involved brief accessible “expert” presentations (the selection of experts again based on local context and input), followed by moderated small group deliberations and roundtable discussions with the experts who delivered the presentations. These were then concluded with a number of final decisions and recommendations.

A thematic analysis of all these materials gathered was carried out using NVivo software (version 12) to aid in the sorting, storing, and management of materials during the development of the thematic framework (Nowell et al., 2017). The analysis process included a gradual identification and aggregation of recurring patterns of meaning within the qualitative data set (Braun & Clarke, 2006; Nowell et al., 2017). In particular, the discussions from the citizens’ juries led to a number of recommendations for tackling issues pertaining to energy system transitions and sustainability. A range of themes framed around energy justice, inclusion, and participation emerged and were reviewed by a team of four researchers who had been involved in the data collection and PAR process. These themes represented strong views and values related to issues linked to energy justice and inclusion, and these were subsequently distilled and transformed as principles for further scrutiny using Delphi panel feedback.

### Research Limitations

Overall, the process of integration of PAR research findings in the Delphi process was largely very successful. However, a possible limitation of the Delphi process is that the final iteration of the principles was not formally fed back to all the communities involved in the research process. This was largely due to the geographical dispersal of these communities combined with a lack of resources to pursue further formal engagements at community level. There were, however, less formal interactions with some representatives from these communities (namely, those in Barcelona and Paris) where there was the opportunity to share some of these findings. The principles were also disseminated at conferences, seminars, and other events with policy makers at EU level.

### Development of Principles for a Just and Inclusive Energy Transition

The development of principles for a fair and inclusive energy transition and the PAR process that it followed emphasize the

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**Table 1. Breakdown of the Six Research Communities, Along With Their Defining Characteristics.**

| Community Type Defining Characteristic |
|---------------------------------------|
| Community | Type | Defining Characteristic |
|-----------|------|-------------------------|
| Affluent neighborhood in Paris (France) | New development intended to adhere to latest sustainable urban principles |
| Rural neighborhood in Co Cork (Ireland) | Historic market town with rural hinterland. Changing land use and employment patterns |
| Peripheral neighborhood in Liverpool (UK) | New Town development, with sudden significant inward migration. Issues: high unemployment, antisocial behavior, crime, limited social cohesion, and isolation |
| Student cohort in Co Cork (Ireland) | Socially diverse community undergoing major life transition-entering adult life |
| Peripheral neighborhood in Naples (Italy) | New Town development, with sudden significant inward migration. Issues: high unemployment, antisocial behavior, and crime |
| City Centre Barcelona (Spain) | Strong heritage and history. Cohesive and socioeconomically diverse urban community |
need to consider processes of exclusion and inclusion tied to emerging new forms of energy production and consumption (Chilvers & Longhurst, 2016). The changes necessary to transition to a low-carbon energy system involve the emergence of new actors and development of new synergies between stakeholders and the wider public. Politically unsettling trends linked to energy poverty (Bouzarovski, 2014) and energy justice issues (Healy & Barry, 2017) unmask the artificial technocratic split between the technical and social aspects of energy and stress the need for more inclusive and socially responsible discourses about energy and energy citizenship. Struggles around meaning and recognition are central features of the development of a collective voice, which highlight the need to renew and validate core principles of justice and inclusiveness. The principles shared below represent this need to regularly reinforce and reevaluate a commitment to justice and inclusiveness in both a pragmatic manner linked to lived-experience and community-led know-how and integrated into wider holistic frames through multidisciplinary commentary. In total, 10 principles emerged from the Delphi panel, and each principle is discussed individually in terms of the level of agreement received by the panel members. Some of the core comments and complementary suggestions made are also included. Nine of these principles were directly distilled from thematic analysis drawn from PAR research, while the final principle emerged as a suggestion from a Delphi panel member after the first Delphi round was completed.

As Table 2 indicates, there were varying degrees of consensus regarding each individual principle. Of the 10 principles evaluated only 9 successfully reached acceptable consensus from the Delphi panel process. Namely, Principle 9 failed to reach consensus among the panel, even after considerable refinement of ideas was concluded.

**Overview of Delphi Panel Results for Each Principle**

This section provides an overview of the results from the panel survey and represents a culmination of the dialogue initiated through PAR and distilled into 10 principles. A brief overview of each principle, accompanied with notable feedback from the Delphi panel engagements, is outlined.

**Principle 1:** All institutions promoting energy transitions should establish well-devised channels of communication, social engagement, and inclusive dialogue.

This principle expresses the need to ensure that institutions promoting energy transitions have a set of well-devised communication channels that facilitate social engagement and inclusive dialogue. The principle seeks to mediate against overly tiered and technocratic forms of communication within institutions, which often present barriers for the public to interact and engage with energy transition issues (Chilvers & Longhurst, 2016). The consensus rate relevant to this principle was high and during the first round of the Delphi panel survey, eight out of nine participants agreed with the principle. However, a number of potential difficulties were highlighted, including the need for the continued development of adequate tools to support future communication, collaborative social engagement, and inclusive dialogue practices.

**Principle 2:** All civic and public spaces involved in energy system transition dialogues should provide a stage for participation based on equality in terms of gender, social background, and socioeconomic status.

This principle seeks to develop criteria that recognize social and cultural difference as a basic requirement and is mindful of pervasive discrimination and marginalization processes. The

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**Table 2. Final Results of Delphi Panel for the Development of Principles for a Fair and Inclusive Energy Transition in Europe.**

| Principle | Final Statement | Level of Consensus |
|-----------|----------------|--------------------|
| 1         | All institutions promoting energy transitions should establish well-devised channels of communication, social engagement, and inclusive dialogue. | 89% Consensus rate |
| 2         | All civic and public spaces involved in energy system transition dialogues should provide a stage for participation based on equality in terms of gender, social background, and socioeconomic status. | 100% Consensus rate |
| 3         | Accountability and monitoring mechanisms should be included in all new energy projects, which include regular evaluation of citizen complaints, feedback from energy users and regular reports that demonstrate how citizen complaints and comments have been addressed. | 100% Consensus rate |
| 4         | All new energy production and consumption projects and policies should be future proofed. This evaluation must include a long-term feasibility and contingency strategy. | 89% Consensus rate |
| 5         | Energy poverty mitigation strategies should be integrated into new energy projects. | 100% Consensus rate |
| 6         | All energy projects should adopt a precautionary approach in terms of possible social and environmental harms. | 100% Consensus rate |
| 7         | Citizen inputs should be solicited using inclusive participatory procedures, integrated into the process of initial conception, planning, and implementation and evaluation of energy projects. | 78% Consensus rate |
| 8         | Policies seeking to reduce or change end user energy practices should strive to be consistent with existing structural and social conditions and short- and long-term adaptability strategies. Proactive measures should be taken to overcome major barriers. | 78% Consensus rate |
| 9         | Local societal impact of energy generation projects should be offset by normalizing community ownership and deepening the application of local social dividends. | 44% Consensus rate |
| 10        | Adequate measures should be devised and enforced to protect consumers from unforeseen financial liabilities and other drawbacks arising from large-scale projects. | 78% Consensus rate |
Principle 3: Accountability and monitoring mechanisms should be included in all new energy projects, which include regular evaluation of citizen complaints, feedback from energy users, and regular reports that demonstrate how citizen complaints and comments have been addressed.

This principle focuses on the monitoring, assessment, and evaluation of energy projects in an accountable manner. The emphasis on end-user feedback highlights the value of using external measures of assessment rather than developing more insular and internal criteria, which often fail to consider progress from the perspective of end-users. The regularity of these evaluations was added after the first round, and it notes the need to address issues in a timely manner. Further refinement of the principle based on comments offered in the first round added the idea of making assessments proactive in order to avoid adopting a remedial stance that relies on complaints as a driver for improvements. Similar to Principle 1, there were calls for the development of appropriate and practical methodologies that would enable the implementation of this principle using well-developed and tested methodologies. One participant added that independent watchdog organizations are the way in which to ensure this important principle is met. In the second iteration of the Delphi panel, all nine expert participants agreed with Principle 3.

Principle 4: All new energy production and consumption projects and policies should be future proofed. This evaluation must include a long-term feasibility and contingency strategy.

Principle 4 taps into the temporal component issue in the promotion of energy transition projects and policies. Particularly, it values the task of foreseeing the level of impact that certain projects might have, both directly and indirectly. It seeks to ensure that short- and long-term goals are consistent and compatible. For instance, sustainability strategies are strongly influenced by political and electoral cycles, which considerably influence the timing and consistency of policy trajectories. Therefore, the principle of future proofing works toward achieving continuity and stability in the process of new energy project implementation is important. Some issues emerged from the Delphi panel process, it included concerns over uncertainty and the best means to evaluate what can be a highly subjective conceptions of “the future.” Nonetheless, most participants were in agreement and suggested some practical devices for addressing evaluations of the future. Recommendations included presenting results from these evaluations in scenario format and incorporation of contingency plans into this process. In the final iteration, eight of nine participants agreed in full with the principle.

Principle 5: Energy poverty mitigation strategies should be integrated into new energy projects.

This principle received overwhelming agreement between all expert participants. The principle overall indicates that all new energy projects should include an energy poverty mitigation strategy. The high level of support for this principle suggests that there is a well-established understanding that energy poverty is a critical issue to consider in new forms of energy supply and consumption. It is becoming increasingly accepted in academic circles that energy transitions may lead to new processes of exclusion, which culminate in new experiences of energy poverty (Bouzarovski, 2014). All nine participants agreed with the principle in the first round of the Delphi panel. No further changes or reframing were carried out.

Principle 6: All energy projects should adopt a precautionary approach in terms of possible social and environmental harms.

The “precautionary principle,” as it is applied to new energy projects, highlights the significance of equity from an intergenerational perspective. It also highlights the fact that potentially harmful outcomes should be addressed in terms of whether or not significant scientific evidence exists to understand the full extent of these potential harms. This idea is closely linked with Principle 4, which established the necessity to future proof new energy projects. However, the guiding idea here is that even in the face of uncertainty regarding the future and the specific risks associated with the development of new projects, if there is the potential of a significant threat, proactive measures should be prioritized. Additionally, this principle also brings into focus the procedural way in which decisions are made in the face of uncertainty. Namely, who judges what levels of threat are acceptable and what degree of certainty is necessary before decisions are made. Inclusive stakeholder deliberations are often an answer to these procedural dilemmas especially when there are obvious limitations in terms of existing scientific evidence. All expert participants agreed with Principle 6 in the first iteration of the Delphi panel and no further changes to the principle were requested or carried out. A few comments were offered which highlight that this is a welcome and well-regarded principle, which should be included for the purposes of promoting equity and inclusivity with regard sustainable energy transitions.
Principle 7: Citizen’s inputs should be solicited using inclusive participatory procedures, integrated into the process of initial conception, planning, implementation, and evaluation of energy projects.

This is a core idea in terms of ensuring that inclusivity is reflected in all energy projects in a meaningful way. It also offers a breakdown of different stages where participation should take place. Oftentimes, participatory procedures either are staged as single events, detached from the process of project development or are carried out at times where input is no longer viable. Thus, different opportunities that follow more closely the process of project development are valuable. Comments were expressed regarding a potential overlap between Principle 1 and Principle 7, but overall there was robust consensus on considering Principle 7 on its own merit as a standalone principle. Consensus over this principle was 78%, while one participant disagreed, arguing that citizens are often not the most “appropriate collective for informing large energy project decisions.” It was suggested that government would more appropriately occupy this role. This idea captures diverse views on governance in the field that vary between those who see government as the central stakeholder in overseeing and commenting on these large-scale matters and those who assert that governance must extend beyond government bodies to include local and grassroots stakeholders (Bridge & Perreault, 2009). Because there was over 70% agreement on the merits of adopting a more inclusive approach, there was no revision of the principle based on this single rejection from round two of the Delphi panel.

Principle 8: Policies seeking to reduce or change end-user energy practices should strive to be consistent with existing structural and social conditions and short- and long-term adaptability strategies. Proactive measures should be taken to overcome major barriers.

Behavior change theories have gained considerable traction in terms of energy transition policy and have informed everything from calls to reduce energy consumption at household level to campaigns to change current mobility and transportation practices. Many of these practices, however, are closely aligned with a range of external factors and should not be reduced to a matter of choice by individual consumers. In other words, there are complex prerequisites and conditions which guide and discipline behavior (Axon et al., 2018). Understanding them is at the heart of more holistic and realistic approaches to tackling problematic energy practices. Energy behavior is thus a component within the energy system, and the factors that shape collective behaviors are only best understood if correctly situated within this big picture perspective.

Initial consensus rates for this principle, in the first iteration of the Delphi panel survey, were low. Five of the nine participants requested the principle be reframed, while four agreed to carry the principle with no further changes. Cautionary notes included a dilemma between “respect[ing] the pace for societal change” and meeting the “urgent need to transition quickly.” Furthermore, it was added that the critical issue here is to develop a better understanding of how strategies may find resistance, either through lack of structural and social conditions, and how to respond proactively to these issues.

Principle 9: Local societal impact of energy generation projects should be offset by normalizing community ownership and deepening the application of local social dividends.

Principle 9 was the most divisive from the list provided in the Delphi panel, and despite the two rounds of the Delphi panel survey, consensus for this principle could not be reached. The final consensus rate was just 44%.

Community ownership has gained increased interest around Europe as states seek to stimulate the uptake of new technologies and reduce local resistance to the development of renewable energy with varying degrees of impact for urban and rural neighborhoods (Walker, 2008). Offsetting some of the impacts of energy production through community ownership models is a key idea often associated with these strategies. Furthermore, community ownership could also lead to the promotion of smaller scale, lower impact projects. While these ideas have gained increased currency in some policy circles, there is significant disparity across Europe regarding the promotion of community ownership as a viable model for energy system sustainability. For this reason, the conditions that allow for energy generation projects to become more adequately embedded in the localities where energy is being extracted and produced remain underdeveloped. There are a number of difficulties in promoting this form of energy ownership, and it is perhaps unsurprising that Principle 9 met with several objections. Some of the objections highlighted include:

- difficulty in choosing adequate forms of compensation and offsetting (beyond monetary compensation);
- ownership leading to commodification and marketization of social needs;
- undue focus on financial discourses and side-stepping political questions;
- difficulty of implementation and unfairness of process as offsetting and compensation would be more appealing to less affluent communities; and
- better alternatives in maintaining emphasis on meaningful participation rather than local ownership.

Principle 10: Adequate measures should be devised and enforced to protect consumers from unforeseen financial liabilities and other drawbacks arising from large-scale projects.

Principle 10 was not part of the initial list of principles put forward in the first iteration of the Delphi panel. As discussed in the methodology, there was an option at the end of the first iteration of the Delphi panel for participants to make suggestions for alternative principles. From this process, a participant suggested devising a principle relating to consumer protection...
measures, which resonated well with a number of the themes emerging from the PAR process.

The merits for greater consumer protection measures are self-evident, given that energy transitions, with added emphasis on new forms of energy production and consumption models, represent a considerable risk to the consumer (Monast & Adair, 2013). While there are existing consumer laws and regulations, the pace of change brought about by this transition requires a level of monitoring and regulatory refinement that is often lacking. Nation states have a critical role in guaranteeing consumer rights are upheld; however, trends toward increased delegation of this role to different organizations and agencies have quite often led to regulatory laxity (Costello, 2019).

Overall, there was substantial agreement around this principle. Seven participants agreed with the principle, while two participants asked that the principle be reframed. The main objection related to some participants suggesting that adequate consumer protection legislation is already in place.

**Conclusion**

This article provides an account of the rationale and process for integrating Delphi technique methodologies with PAR. This approach sits well with existing trends in Delphi methodologies, which seek to leverage the role of participatory democracy as a way to strengthen the value of research both in terms of its ethical and epistemological foundations and as a means of reaching greater analytical depth and precision (Hussler et al., 2011). It sought to illustrate how Delphi panels can be mobilized as a mixed-method technique that is oriented toward inclusive dialogue and reflexivity, where reflexivity is a process of critical reflection involving researchers and participants interrogating their own “paradigms,” and is a dynamic process of interaction between data and participants, which leads to refined focus and understanding (Srivastava & Hopwood, 2009). The flexible and asynchronous characteristics of the dialogue that Delphi facilitates (Linstone & Turoff, 2011) are ideally suited to enabling a series of positive, iterative feedback loops. In this instance, it allowed for deeper connections and a form of dialogue to develop between PAR research participants, Delphi panel experts, and the researchers. The process presented in this article also illustrates the value of using Delphi techniques beyond forecasting technological diffusion pathways and toward more aspirational and coproduced visions of energy transitions, which can contribute to the creation of discourse stability around the social pillar of sustainability.

A limitation to the approach taken in this article is due to the fact the iterative process did not fully convey the feedback from the Delphi panel to all participants in local communities. This was more a logistical and resource shortcoming than an actual oversight on the part of the project’s program of engagement. Despite this shortcoming, the approach offers a constructive and productive example of techniques evolving toward more reflexive and accountable research methodologies (Fletcher & Marchildon, 2014; Hussler et al., 2011). This article thus provides a useful demonstration of the efficacy of the Delphi method in collaborative approaches that are both accessible and applicable beyond forecasting. Its potential contribution to transformative and actionable research, with direct impact for more democratic decision making, is also demonstrated.

The aim of the Delphi panel exercise overall was to enable a link between PAR identified themes that were developed into principles. It explored the possibility of establishing a degree of interdisciplinary stability and consensus among academic experts with regard these principles, with a view to supporting a fair and inclusive energy transition pathway in Europe.

It can be justifiably argued that existing frameworks that support everyday energy production, distribution and consumption of fossil fuels has largely normalized their use in our societies and accounts for the (in)visibility that is often associated with the way people consume energy and relate to the energy system (Dunphy et al., 2017). This (in)visibility has a range of sociopolitical implications, in particular it has reproduced highly hierarchical and technocratic forms of engagement with the energy system whereby individuals and communities have a minimal role to play as citizens in its development. This, however, can be interpreted as a characteristic specific to carbon-based energy systems, and as we move toward low-carbon alternatives, there is an opportunity to refashion a more inclusive and democratic form of public engagement with energy. Research, it can be argued, has the dual role of (1) reimagining new modes of dialogue and democratic collaboration and (2) pioneering pathways toward change. Work in the development and refinement of principles for a just and equitable energy transition may signal the origins of a new political arena where citizens are active stakeholders in shaping the future of the energy system.

The promotion and evolution of the Delphi method itself signals a potential way forward. The modified Delphi panel presented in this article focused on the refinement of these principles and allowed for a set of standards that have been validated both by community engagements and from the inputs and comments of a panel of interdisciplinary expert academics with diversified knowledge of this field. Overall, our modified Delphi panel process (combined with PAR) has been successful in terms of refining the drafted principles and strengthening their applicability as standards when considering future energy sustainability and transition strategies.

The current trend toward using participatory democracy techniques as research tools offers significant potentiality for developing useful forecasting methodology and reflexive communication within the context of transitioning to a low-carbon energy system. However, this innovative approach requires further testing and fine-tuning. One particular aspect that is less investigated is the potentially problematic role of “expert knowledge” in new conceptions of the future (Hussler et al., 2011). In this context, it would be interesting to explore the value and merit of having mixed transdisciplinary Delphi panel compositions or nonexpert panel compositions, which could potentially further enhance and complement the PAR research process. These forecasting methodologies or visions could arguably also help bridge the gap between climate action and
inaction, which is a recurring issue in the promotion of the energy transition across Europe. It also offers promising ways of establishing alternative “preferred” futures with added stability for change processes.

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