Energy Research & Social Science 71 (2021) 101826

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Transferring awareness into action: A meta-analysis of the behavioral drivers of energy transitions in Germany, Austria, Finland, Morocco, Jordan and Iran

Nadejda Komendantova

Advanced Systems Analysis Program, International Institute for Applied Systems Analysis (IIASA), Austria

ARTICLE INFO

Keywords:
Social science energy research
Co-creation
Energy transition
Deployment of renewable energy sources
Behavioral change
Trade-offs in decision making

ABSTRACT

Energy transition is a so-called wicked policy problem which requires involvement of stakeholders and laypeople. This support should go beyond social acceptance, which is a rather passive attitude, and should include social factors such as willingness to participate in energy transition and willingness to use renewable energy sources. However, moving from awareness to action is a complex process and requires understanding of social factors. Until recently scientific research was mainly focused on technical and economic factors of energy transition however the volume of scientific results published by social science energy research is growing. The focus of this paper is on how people are making choices and which factors are influencing their choices. Research based on social sciences and behavioral economics shows preferences and rationalities of people when it comes to the question of available in frames of energy transition alternatives. The results of this paper are based on large-scale surveys, decision-making experiments and interviews conducted in Germany, Austria, Finland, Morocco, Jordan and Iran. The results show high level of awareness about the need of climate change mitigation across countries, which is decreasing with the level of details about the projects or the energy transition processes. The results also show dominance of economic rationality with concerns about energy prices and socio-economic impacts from energy transition over other concerns such as environmental protection. Also, such factors as maintenance and reparation of technology and possibility to participate in decision-making processes have impact on willingness to support energy transition which goes beyond social acceptance.

1. Introduction

The need to mitigate the adverse impacts of climate change is driving international climate policy. In particular, targets are being set for the decarbonization of different national economic sectors, such as energy generation, transportation, industry, housing, and others [1]. Different options are available for the decarbonization of the energy sector, including low carbon electricity generation, which can be achieved by, for instance, including a greater share of renewable energy sources (RES) in a country's electricity generation mix [2]. The governments of several countries have recognized the need for climate change mitigation and have set energy policy targets to achieve varying shares of RES in their electricity generation mix, with some countries aspiring to achieve complete decarbonization of their electricity sectors. In addition, stakeholders are calling for the deployment of RES as a locally available energy source to reach the goals of energy security policy and to avoid risks in the energy supply chain connected to the volatility of prices or supply by energy carriers in global energy markets [3]. The process of transition toward a greater share of RES in energy generation is known as "energy transition" [4]. This term is especially popular among policymaking stakeholders but is also commonly used by stakeholders in the academic and private sectors.

Energy transition is a so-called wicked process in that it involves a variety of stakeholders with different views and interests [5]. The processes of decision-making around energy transition and the implementation of energy policy at various levels of governance are influenced by a broad diversity of stakeholders. Thus, compromise solutions must be found. The actions of stakeholders and their diverse perspectives, aims, and views influence the deployment of renewable energy technology and shape energy transition [6]. Furthermore, energy transition at scale can result in profound societal transformations in terms of the way that society deals with the generation, transmission, and distribution of energy [7]. It is thus crucial to understand the positions and views of various stakeholders, to develop compromise policy

E-mail address: komendan@iiasa.ac.at.

https://doi.org/10.1016/j.erss.2020.101826
Received 3 April 2020; Received in revised form 14 October 2020; Accepted 15 October 2020
Available online 23 October 2020

solutions, and to propose various modes of stakeholder and citizen engagement in energy transition decision-making processes.

The definitions of energy transition stakeholders and social factors are closely connected. Social factors include acceptance of renewable energy technologies, the views and perspectives of stakeholders on these technologies, and their willingness to use and pay for RES. It is important to understand these factors and the differences in opinions between stakeholder groups in order to be able to develop compromise solutions.

Energy transition and the transformation of energy systems require technological capacities, economic incentives, and the political will to drive them. However, they also require behavioral changes by technology users and adapters. Energy policy measures used to stimulate the required behavioral change should be based on the understanding of so-called human factors of energy transition, such as social acceptance of various renewable energy technologies or willingness to use renewable energies and to engage in decision-making processes related to them.

Current research on energy transition mainly focuses on technical and economic factors. By 2014 only 3% of all published studies dealt with social factors of energy transition [8]; however, the number of scientific works on this topic is growing. All existing energy research studies in social science can currently be classified into four categories: studies focused on cultural analysis, including studies of socio-technological imaginaries; studies on policy analysis, such as the social construction of risks and standards and on the performativity of economic models; research exploring perspectives about public participation processes, expert–public relationships, and mobilized publics; and studies on sociotechnical systems, including large technological systems, the politics of design, and user- and actor-networks [9].

This paper is based on several years of research on the social factors of energy transition. Its goal is to compare perceptions of energy transition, views about its benefits, and its drivers and barriers between developed and developing countries, while at the same time testing the assumption that materialist and post-materialist values for developed and developing countries are different. This implies that rationalities and discourses regarding energy transition also differ between developed and developing countries. The main aim of this paper is to conduct a cross-country comparison of the social factors of energy transition, especially between developing and developed countries. In the present paper, we summarize the results of more than ten years of work in a number of developed and developing countries around the social factors of energy transition, including the acceptance of energy transition, the drivers of action, and how to turn awareness about the need for energy transition into action. This research has also included coming to an understanding of the stakeholder preferences regarding RES and also of the criteria that have a major influence on those preferences. The data were collected through various methods of stakeholder dialogue in the following countries: Austria, Germany, Morocco, Jordan, Iran, and the Arctic part of Finland. The analytical framework included discourse analysis and multi-criteria decision-making.

2. Background

2.1. Participatory governance of energy transitions

Energy transitions can be seen as a societal challenge that is connected to the unsustainable use of energy, thus requiring a radical shift in sociotechnical systems [9]. There is also an understanding of energy transition as a transformation of sociotechnical systems, which necessarily brings together a heterogeneous ensemble of people, artifacts, infrastructures, research, cultural categories, norms, laws, and natural resources [10].

Several characteristics connected with such transitions can be identified in the social sciences. Among them, are multi-dimensionality and the need for multi-actor processes and a long-term horizon, as well as uncertainty, contestation, and conflicting values. The diversity of these characteristics requires energy transition research to be interdisciplinarity and for there to be a growing role of the social sciences in that research.

The social sciences consider issues related to energy transition as the co-production of knowledge or societal change, occurring as part of the mutual shaping, co-constitution, or coproduction of science and technology with society. The topic of co-production also includes research on how social and cultural perspectives, including geographic position, values, cognitive categories, institutions, and fields, influence the adoption of technology and its impacts.

The topic of co-production is closely connected to research on understanding public engagement and includes such drivers of public understanding as trust and credibility, as well as public participation processes and social movements. Recent research results also identify a shift in the understanding of energy transition that is connected to the increased recognition of co-production. This shift moves the focus away from awareness-raising measures toward the pathways of engagement and participation that are vital to accelerating energy transition [11].

Until recently, the discourse about energy policy in general, and energy transition as a part of it, was dominated by a traditional top-down governance approach. This means that decisions were made by politicians, while inputs to such decisions were provided by experts, mainly from academia. Any other stakeholders were excluded from such decision-making processes. Furthermore, the decisions were communicated to other stakeholders and lay people in a Decide-Announce-Defend (DAD) model. This discourse was dominated by the view that every infrastructure project, and especially energy infrastructure projects, are important drivers of development. Connected with this understanding is the concept of Not-in-My-Backyard (NIMBY) which has also frequently been cited in energy policy research. According to this concept, some projects are important for the community as a whole but may have risks or costs at the local level. People living in communities where such projects are planned, would generally welcome such infrastructure, but not in their immediate vicinity. The nimby concept has been criticized by several scientists as a pejorative description of the legitimate interests of local communities.

During the last decade, the number of environmental accidents, together with growing awareness about environmental policy and the right of participation, has changed perceptions of infrastructure projects. Nowadays, people want to be involved in the decision-making processes that affect their communities. Many are also becoming more aware of their democratic right to participate. Various options for participation and engagement are starting to appear and, among these, is the concept of the participatory governance of energy transition. Participatory governance is based on the understanding that the involvement of local knowledge, so-called knowledge on the ground, of various stakeholders and various points of view gives legitimacy to decision-making processes and also increases the quality of their outcomes because it allows infrastructure and energy policy to be considered from several different angles. Another benefit of participatory governance is that it addresses expectations about procedural and output justice. Output justice is how risks, benefits, and costs of energy transition projects are split between various stakeholders, as well as between local communities and in society overall. Procedural justice is how a decision-making process was organized; what options there were for participation; if information was available, clear, and transparent; if all voices were heard; and whether feedback was collected, included, and addressed.

Bringing the views of stakeholders together is, however, an extensive task; moreover, stakeholder views can be influenced by conflicting interests, different perceptions of risks, the benefits and costs of infrastructure projects, and whether or not participation is possible. Participatory governance is thus closely connected to the issue of conflicts and compromise solutions. It includes decision-support and decision-making tools that allow stakeholder views and preferences to be understood and compromise solutions to be developed.

Here, we argue, for many reasons, that energy transition requires the

kind of broad participation that that cannot be analyzed using traditional top-down models. One argument is that the energy process is complex and involves many interests. There have been transition processes throughout history where certain interests were not included, and winners and losers were created. The knowledge that the losing party in a process might have its environment destroyed encourages all sides to try to influence the outcome. This, in turn, decreases the efficiency of its implementation. A top-down procedure of planning for energy infrastructure also often results in public protests. One example is the planning of electricity transmission grids in Germany and other countries. In some countries, not even one additional kilometer of new electricity transmission grids has been constructed over the last ten years, as protests have delayed implementation, increased costs, and, in some instances, led to the cancellation of the entire project. The involvement of more stakeholders can improve decision-making outcomes. Given that conventional leaders frequently operate within formal established roles, emerging leaders may be able to operate voluntarily and spontaneously and bring various insights into decision-making processes. Energy transition might also require changes in behavioral practices, norms, and rules in society; thus, energy transition implementation can be shaped by informal rather than by formal rules and norms. Participatory governance can lead to changes in the behaviors of both energy producers and energy consumers at the individual level, which is a prerequisite for energy transition.

This is why the issue of stakeholders and the definition of lay people is so important. Stakeholders can be persons, groups, or organizations that are affected by a project or by a process. They can also be employees, citizens, or customers who are involved in an organization or society.

While exploring the human factors of energy transition, social science energy research provides insights into the heterogeneity of the opinions, views, and perceptions of various stakeholders. These can include incumbent or elite stakeholders. These stakeholders may the developers, operators, and maintainers of energy systems, but they may also be users and adopters of technology or, conversely, they may influence the energy transition process in a negative way. Turnheim and Sovacool [12] identify various components that are connected to this heterogeneity of views, such as type of actors, variety of actor strategies within (and across) organizational populations, the transient nature of strategic positioning (over time), and the varied resources that incumbents may deploy to support transformative change. This classification is especially interesting with regard to incumbents of energy transitions that exist in a number of social realms and at various levels. Incumbents are not only the very visible monopolies: types of incumbent behavior can be observed in various stakeholder groups. There is scientific evidence that incumbents are willing to change their behavior when economic, societal, or environmental pressure becomes strong enough or opportunities arise [13].

Stakeholder groups can include individuals, institutions, or processes that have significant influence on energy transition or in a society. There are different classifications of stakeholders in energy transition, for example, technical stakeholders (scientists, engineers, researchers); financial stakeholders (property owners, local businesspersons, corporate directors, investors); physical stakeholders that have military or any kind of similar power; and regulatory stakeholders (lawyers, national planners, political representatives, members of a political party) [14].

Private households and lay people are also energy transition stakeholders, as they are the users of technologies. There are various behavioral drivers that influence the intentions of private households toward energy transition and also drivers that influence the lifestyles and everyday routines needed to reach the targets of climate change mitigation [15]. Based on different methods of policy analysis, this study identifies climate policy measures that can have an impact on the behavior of private households. The authors divide these measures into i) market-based, which includes economic instruments and information policies; and ii) command and control, which includes regulatory approaches, as well as public goods and services. The authors also find that there is a gap between how households perceive their responsibility and their ability to mitigate climate change, and the responsibilities and roles communicated by climate policies.

2.2. Theoretical background

One perspective comes from understanding energy transition as a change in the stakeholder landscape, a process that might create winners or losers, or as a change in relationships around energy generation and transmission. Following such a perspective in policy studies and institutional analysis, transition can be understood as a power struggle between various regimes [16] or as a conflict between various actors involved in energy transition and their roles [17]. In this case, therefore, the methods include various methods of participatory governance or the development of compromise solutions to balance various stakeholder interests.

Another perspective concerns cognitive factors in energy transition: how people perceive the risks and benefits of various technologies and the choices they are making, as well as how these behavioral factors are influencing the preferences of various stakeholder groups. Research in this domain has identified such behavioral factors as social norms and trust—as well as concerns about impacts on the environment and communities—as being crucial to the acceptance of energy transition [18].

Each of these perspectives requires different methods to understand the social and behavioral factors affecting various stakeholders, as well as the conflicting positions in which they find themselves. These methods include multi-criteria decision analysis and discourse analysis. We use these two methods in our research: discourse analysis allows the views and perceptions of different stakeholder groups to be understood, while multi-criteria decision analysis enables these views and perceptions to be ranked.

The method of discourse analysis originated in linguistics where it was used for the analysis of factors that influence the role of language in social structures. The aim of discourse analysis is to aid in understanding the reasoning of various groups of stakeholders, as this also shapes power relations and structures in society. It analyzes narratives that give meaning to social realities, power relations and structures in society, as well as the views, visions, and risk perceptions of stakeholder groups [19]. Social processes and interactions influence the ways in which stakeholders categorize their knowledge and information. These categories are reflected in discourses and influence worldviews.

The method of discourse analysis was applied during the last decade, originally to understand discourses about environmental politics or sustainable development. For example, a study on sustainable development in Germany identified “proactive” and “reactive” discourses [20]. Another study identified a “conventional energy coalition” and a “sustainable energy coalition” while exploring worldviews on energy transition [21]. There was also a study that identified the influence of “Cornucopian” and “Malthusian” views on infinite or limited resources in conflicting environmental discourses [22], and studies that identified how discourses about energy transition changed after major events like the Fukushima disaster [23].

Based on their cognitive patterns and worldviews, different stakeholders can select different options from among the available alternatives (where such alternatives exist) [24–26] and this can lay the ground for potential conflict. Multi-criteria decision analysis (MCDA) allows for the evaluation of various conflicting criteria in the decision-making process of one person or of different groups of stakeholders. The method can also be used as a mediation tool to develop compromise solutions when conflicting options are selected.

MCDA enables the elicitation of various stakeholder preferences in workshops or decision-making experiments. The results are evaluated using algorithms elaborated for multi-stakeholder multi-criteria decisions in conditions of uncertainty. The MCDA framework is a decision

analytical approach for co-creation in multi-stakeholder multi-criteria environments through the development of decision analytical tools and processes.

The MCDA framework is applied because energy transition is a complex socioeconomic process with the potential to lead to the transformation of the entire energy sector. The process also has political, social, economic, and technical dimensions and involves a multitude of stakeholders. Socio-technological transition processes can lead to shifts in technologies, business models, governance structures, consumption patterns, values, and worldviews. A successful transition requires a variety of views from various stakeholder groups to be understood and compromise solutions to be developed. A multitude of methods for analyzing and solving decision problems with multiple criteria have been suggested during the last decades. A common approach is to make preference assessments by specifying a set of attributes that represent the relevant aspects of the possible outcomes of a decision. Value functions are then defined over the alternatives to each attribute and a weight function is defined over the attribute set. Typically, a multi-criteria decision situation is modeled like a tree with criteria weights and values of alternatives under the different criteria.

3. Methodology

All these methods require intensive stakeholder interactions in various forms, such as decision-making experiments, workshops, focus groups, interviews, surveys, etc. Data gathered from stakeholder dialogues can be analyzed using different tools, including mathematical models, content analysis methods, regressions, correlations, and statistical analysis.

During the completed research projects, the results were derived from research and interactions with energy policy stakeholders in Austria, Germany, Finland, Jordan, Morocco, and Iran. Policymakers and stakeholders from the private sector, academia, and civil society participated in this research. They were identified on the basis of comprehensive stakeholder mapping according to their influence and role in energy transition.

The results of this research and of papers cited by this work is based on extensive data collection work (Table 1).

In Austria, the inhabitants of the so-called Climate and Energy Model (CEM) regions, which set ambitious targets for energy transition and high shares of RES in the local energy mix, participated in the research. The large-scale survey was conducted in two regions, Amstetten and Freistadt, which were selected for their similar socioeconomic characteristics and the different measures of participatory governance for energy transition available to them. The goal was to reach a comprehensive sampling of inhabitants, comparable to the sampling used in prior surveys on elections. The local media in all communities where the research was carried out were thus mobilized. Links to the questionnaires used were published in the local newspapers of 25 communities in Freistadt and 19 communities in Amstetten, followed by web-based questionnaires, then telephone interviews, and finally by personal interviews in which a team of five people participated. Expert interviews were conducted in three CEM regions: Ebreichsdorf, Baden, and Freistadt. These regions were selected because they belong to different cluster groups and include rural, semi-rural, and semi-urban areas.

In Germany, the empirical data were collected on the back of public information campaigns organized by the transmission system operator TenneT. The large-scale survey was conducted with inhabitants of the following communities: Ahlerstedt, Bad Brückenau, Borgenteich, Brackel, Elfenhausen, Fritzlar, Großburgwedel, Hammeln, Hassendorf, Hildesheim, Horst, Kirchheim, Kirchlinteln, Lehrte, Petersberg, Rischenau, Walrode, Warburg, Wasserlosen, Wilster, Winsen, and Wolfshagen. The goal of this research was to collect information on factors relating to the social acceptance of, and opposition to, the infrastructure necessary for energy transition.

Table 1
Empirical data collection.

Country	Method of data collection	Major topic	Received data
Austria	Large-scale survey based on multiple-choice questionnaires with responses collected online, and through telephone and personal interviews	Factors of public acceptance and engagement in energy transition	1,601 completed questionnaires
Austria	In-depth qualitative expert interviews with duration of one to two hours and semi-open questions	Drivers of and barriers to energy transition	20 fully recorded and transcribed interviews in each of three case regions studied
Germany	Large-scale survey based on multiple-choice questionnaires with responses collected online, and through telephone and personal interviews	Drivers of public acceptance and opposition to energy transition infrastructure	307 completed questionnaires
Jordan	Online survey with multiple-choice questions	Perceptions of risks and benefits of various electricity generation technologies and energy transition	Three rounds of survey, with about around 50 completed questionnaires collected in each
Jordan	Large-scale survey based on multiple-choice questionnaire	Drivers of public perceptions of risks and benefits of renewable energies	200 completed questionnaires
Jordan	Decision-making experiments and games with application of multi-criteria decision analysis	Preferences of various criteria that are relevant for energy transition	Seven workshops organized with decision- and policymakers, representatives of local communities, financing and private sectors, academia, and youth
Morocco	Large-scale survey based on multiple-choice questionnaire	Factors of public acceptance of energy transition infrastructure	200 completed questionnaires
Iran	Large-scale survey based on multiple-choice questionnaire	Factors of public acceptance of energy transition and willingness to use renewable energies	260 completed questionnaires
Arctic part of Finland	Qualitative in-depth interviews with key stakeholder groups, also including representatives of indigenous communities	Factors of public acceptance of renewable energy infrastructure and possibilities to engage in an environmental impact assessment	31 one to two-hour interviews that were fully transcribed

In Jordan, large-scale surveys were conducted twice. The first time, we approached the inhabitants of various communities, such as Aqaba and Zarka, where various energy infrastructure projects were planned. The team of six interviewers approached people from the targeted groups on a personal basis. The goal of this research was to collect quantitative information on the factors of public acceptance of various kinds of infrastructure for energy transition. In the second round, we conducted the survey via online tools with the goal of collecting opinions about different renewable energy technologies, and about perceptions of the risks and benefits associated with each of these technologies.

In Morocco, we conducted a large-scale survey with people living within a radius of 20, 40, and 60 km of renewable energy installations,

for instance, the concentrated solar power installation in the community of Ouarzazate. The team of six interviewers approached targeted people identified using comprehensive socioeconomic sampling. The goal of this research was to collect information about the factors that influence social acceptance of renewable energy infrastructure. We also had a stakeholder forum and several focus group discussions in the community of Tata in Morocco, where various kinds of renewable energy project are being considered.

In Iran, we contacted 260 students from different universities located in Esfahan city, in the center of Iran. The students were aged between 18 and 35 years and were selected randomly.

In the Arctic part of Finland, we conducted comprehensive stakeholder mapping based on a review of official environmental impact assessment documents and websites. We identified stakeholders that played a central role in one or several different phases of the selected environmental impact assessment cases. We also invited these people for interviews, which were conducted partly in person and partly by phone. Apart from stakeholders such as project developers and government officials, we interviewed reindeer herders affected by energy transition infrastructure projects who were part of local communities in northern Finland.

Prior to empirical data collection, interview protocols and questionnaires were developed based on available scientific evidence about energy transition and its drivers, as well as on prevailing background conditions in each country. For the large-scale surveys, the data collection instruments were pretested and validated in interviews and conducted prior to the surveys.

Some of these surveys included stratified sampling. Based on available socioeconomic and demographic data from national statistics, we identified how many people from which social groups should be contacted, after which a team of interviewers approached the targeted respondents. In other cases, surveys were based on random sampling, but included a section on demographic data. In the analysis phase the results collected were weighted according to demographic characteristics.

The collected data were analyzed using various statistical methods and programs such as SPSS and also included correlation and regression analysis. The interviews were analyzed with the help of various methods of content analysis, including INVivo and Atlas.si.

4. Results on the social factors of energy transition

The start of this research was the assumption of Ingelhart [27], namely, that the factors influencing behavioral patterns toward energy transition will be different depending on the country, its economic development or political structure, and its political orientation in terms of energy transition. Ingelhart also assumes that there should be a difference in preferences for social, economic, and environmental criteria between various countries; this difference can be explained by the major discourse in the country, which is framed by values. Such values can be “postmaterialist” and “materialist.” Depending on existing values, people of each country can prioritize self-expression and quality of life, which will be connected to “postmaterialist” values, or they can prioritize economic factors and security, which will be connected to “materialist” values.

There were, indeed, some differences between the countries where we conducted research on the social factors of energy transition over the course of the last ten years, but common patterns could be observed much more frequently. Here, we split the results into three categories of behavioral factor: awareness of the need for energy transition, willingness to use RES, and engagement and ownership of the energy transition process.

4.1. Awareness about the need for energy transition

The results show a high level of awareness about climate change in almost all six countries. Some countries display an especially high, almost universal, level of awareness about the occurrence of climate change. The responses also show a high level of awareness about climate change being the consequences of human activities. However, the correlation between these two factors might vary from country to country. In some countries, the level of awareness about climate change as a consequence of human activities is high, while in other countries, climate change is deemed to result from natural processes.

The level of awareness decreases, however, at a further level of detail about renewable energy projects, energy generation and transmission infrastructure, or the energy transition process. For instance, the level of awareness about climate change and its impacts was almost universal in Austria and Germany, and very high in the other four countries—the Arctic part of Finland, Jordan, Morocco, and Iran. Awareness about the need for climate change mitigation was also very high in almost all countries. However, even in Austria and Germany, not everybody made the connection between climate change and human activities, and awareness about such a connection was lower in the other four countries. When it came to energy transition as a policy process, however, the level of awareness was much lower, and if we talked about the local characteristics of energy transition projects, the level of awareness was even lower, even though the level of awareness about concrete renewable energy projects was higher (Table 2).

In countries like Austria and Germany there is a well-established majority opinion on the need for energy transition toward a greater share of renewable energy sources. In Morocco and Jordan, the acceptance of renewable energy sources is driven mainly by energy security policy concerns, such as the need to diversify energy supply sources and to reduce the share of imported energy. Awareness is created through various information campaigns, and by efforts to communicate the need for radical change in energy generation and consumption.

For example, the large-scale survey conducted in the two Austrian regions, Amstetten and Freistadt, shows that 96% of all participants believe that climate change is occurring and 78% of all respondents believe that it is caused by human activities. A similarly high level of awareness was also observed in other countries. This awareness generally drives a positive attitude toward RES projects. In Austria, 61% of the inhabitants of Amstetten and Freistadt supported the deployment of RES as a relevant climate change mitigation measure.

Similar patterns were observed in other countries. For example, in Morocco, the reported acceptance of particular RES projects, such as concentrated solar power (CSP) in Ouarzazate, was very high, with most of the population (91%) being either completely in favor, or in favor of the project [28]. The same positive attitude was observed in other countries, from Iran to the Arctic part of Finland [29,30].

The general pattern, which was also revealed by our research, is that people are much better informed than we thought about the need to mitigate climate change, the impacts of human activities on climate change, and RES as a possible contribution to achieving this. At the same time, people’s level of knowledge about the details of RES projects in their own vicinity was much lower. For example, in the Austrian regions of Freistadt and Amstetten, over 40% of all respondents were not aware of energy transition measures in their communities. They were well informed about the need for energy transition, but not as well informed about its implementation. Only 17% of all respondents confirmed their knowledge of various energy policy initiatives being implemented in their region. The same was observed in Morocco, where less than 25% of respondents felt that they were well-informed or at least somewhat informed about RES projects in their region, while 45% felt that they were badly informed or not informed at all.

In four countries, Austria, Germany, Morocco, and Jordan, the large-scale survey was conducted using the same methods of research, a similar questionnaire, and similar data collection tools. The results regarding public awareness about renewable energies is therefore comparable among these countries.

Table 3 shows our results regarding the awareness level of actual RES projects in the vicinity of communities where the survey was conducted.

Table 2
Awareness about various areas of climate change mitigation policy.

Country	Climate change and its impacts	Connection between climate change and human activities	Need for climate change mitigation	Renewable energy sources as a climate change mitigation option	Policy processes on energy transition	Local measures of energy transition
Austria	Almost universal	High	Almost universal	Almost universal	Medium	Low
Germany	Almost universal	High	Almost universal	Almost universal	Medium	Low
Finland	High	Medium	Medium	Medium	Low	Low
Jordan	High	Medium	High	High	Low	Low
Morocco	High	Medium	High	High	Low	Low
Iran	High	Medium	Medium	Medium	Low	Low

Table 3
Results on the level of awareness about RES projects in local communities (Question: How well are you informed about RES projects in your community?).

	Well informed	Somewhat informed	Neither well nor badly informed	Badly informed	Not at all informed
Austria	19%	41%	8%	25%	7%
Germany	11%	44%	18%	22%	5%
Jordan	12%	23%	34%	18%	13%
Morocco	7%	15%	33%	40%	5%

The question was how well people felt they were informed about RES projects in their communities. The number of people who felt badly informed or not at all informed was significant in all four countries.

A similar pattern of awareness about RES projects can be also observed in relation to the age of respondents in all four countries. Younger people felt that they had little information about RES projects in their communities. In all three countries, the level of awareness among people over the age of 41 was higher. In Jordan, the level of awareness among people over the age of 60 was lower than in Germany or Austria (Table 4).

The least informed group in our case countries were young people under the age of 20. As shown by observations of various events dedicated to the deployment of information about energy generation and transition infrastructure, this group of people also seldomly visit public information events, but they can be very critical about infrastructure projects. These results attest to the need for specialized, targeted campaigns for various social groups using various information channels including social media.

4.2. Willingness to use RES

Even though RES are mainly perceived as beneficial technological solutions, a number of concerns connected with their deployment were also identified (Table 5).

Table 4
Level of awareness about RES projects in communities depending on age.

	Yes I know about it	I have heard about it	No
Austria			
Under 20	8%	42%	50%
21–40	12%	40%	48%
41–60	19%	51%	30%
Over 60	20%	55%	25%
Germany			
Under 20	5%	25%	70%
21–40	13%	30%	57%
41–60	47%	40%	13%
Over 60	42%	38%	20%
Jordan			
Under 20	14%	32%	54%
21–40	23%	25%	52%
41–60	36%	42%	22%
Over 60	18%	25%	57%

Table 5
Observed concerns about energy transition or renewable energy sources.

Concerns about renewable energies or energy transition	Explanation
Economic	Levelized costs of electricity: Observed in Germany, Austria, Morocco, Jordan, and Iran
Technical	Maintenance of renewable energy devices, how easy it is to use them and to repair in case of damage: Observed in Iran, Jordan, and Morocco
Political	Opportunity to participate in decision making regarding energy transition: Observed in Germany, Austria, Finland, Jordan, and Morocco
Environmental	Impacts on water resources: Observed in Morocco and JordanImpacts on land use: Observed in Finland and Morocco

Economic concerns were those mentioned most frequently. They included such factors as the cost of energy transition, whether transition would provide sufficient economic stimulus to the job market, what the multiplier effects would be in local economies, or how the competitiveness of local industrial enterprises would be affected. This attitude was observed not only in developing or transition economies, but also in the developed economies.

Our decision-making experiments conducted in Morocco, Jordan, Austria, and Germany show that if stakeholders have alternatives among the available criteria, the economic criteria are most frequently prioritized (Table 6).

The preferences around economic concerns are also supported by findings from decision-making experiments that we conducted in Jordan. The participatory process we organized in Jordan is a good example of how preferences for various criteria shape decisions regarding technology. The four-year stakeholder process in Jordan involved major Jordanian stakeholders from such sectors as policymaking, finance and industry, academia, young leaders, national and local NGOs, civil society, and local communities. Several rounds of decision-making experiments were conducted in which participants ranked 11 relevant-for-energy-transition criteria, such as the use of domestic energy sources, global warming potential, domestic value chain, technology and knowledge transfer, electricity system costs, on-site job creation, pressure on local land resources, pressure on local water security, occurrence and manageability of non-emission hazardous waste, and local air pollution and safety. Various methods of negotiation were applied. During some rounds of rankings, participants remained silent so as not to influence one another's results. Conversely, during other rounds, they had to reach a group compromise solution by providing valid arguments and convincing each other. First, participants ranked criteria in homogenous groups and then in mixed stakeholder groups. The results were analyzed with the application of MCDA and DecideIT. Six months later, we followed up with another survey among the same group of people, asking them to rank criteria again, but this time on their own rather than in a group.

The results were quite surprising, as during all rounds of negotiations

Table 6
Concerns across various countries.

Concerns	Austria	Germany	Finland	Morocco	Jordan	Iran
Economic	High	High	High	High	High	High
Technical	Medium	Medium	Medium	High	High	High
Political	High	High	High	Medium	Medium	Medium
Environmental	Low	Low	Medium	Medium	Medium	Low

and in all stakeholder groups, the economic criteria, such as electricity system costs, emerged as the absolute priority. Safety was perceived as the second most important criterion, while environmental criteria were ranked in the middle, depending on stakeholder groups, with local communities and NGOs ranking them slightly higher than the financial community. Environmental criteria with direct impacts for communities, such as water or land availability, were ranked higher than criteria with a perceived global impact, such as climate change. Interestingly, when stakeholders ranked criteria alone and anonymously, the economic criteria moved even higher and environmental criteria landed right at the bottom of the ranking, with global warming potential (meaning climate change mitigation) being the least important criterion in decision making regarding choice of electricity generation technologies (Fig. 1).

Economic rationality and its influence on the acceptance of, and willingness to use, RES is also reflected in stakeholder expectations of benefits obtained from the deployment of RES. In Morocco, when lay people were asked about expected benefits from RES, the majority of them named socioeconomic benefits: 80% were expecting very or somewhat positive impacts for their communities, and 66% were expecting very or somewhat positive impacts for themselves. However, they were more uncertain about the impact of RES on the environment: 92% of respondents expected either positive or no impacts on the environment [28]. This situation changed when we conducted our stakeholder forum in the province of Tata later. Many people talked about impacts on land- and water usage.

The ***maintenance of renewable energy technologies*** and possibilities of repairing them if they are damaged were among the concerns expressed about technical factors. These concerns were noted mainly in the Middle East and North African region in Jordan and Morocco, and in Iran.

The application of the Theory of Planned Behavior to evaluate the willingness of people to use RES showed the impact of moral norms. We understand moral norms as internal moral rules or values, motivated by anticipated self-administered rewards or punishments. Moral norms are beliefs about what is right or wrong. The moral norm is to support the use of RES as a climate change mitigation option. The results showed that the willingness to use RES was positively influenced by moral norms. At the same time the Human Beliefs Model and the Theory of Behavioral Control, which served a basis for our decision-making experiments in many countries of the Middle East and North African region, showed that perceived behavioral control of how easy or difficult it is to use renewable energy sources, is the major factor influencing the intentions of lay people toward RES. As well as moral norms, other factors, such as attitudes to renewable energies in the form of expectations of positive benefits, are also significant factors influencing intention and motivating lay people to use RES.

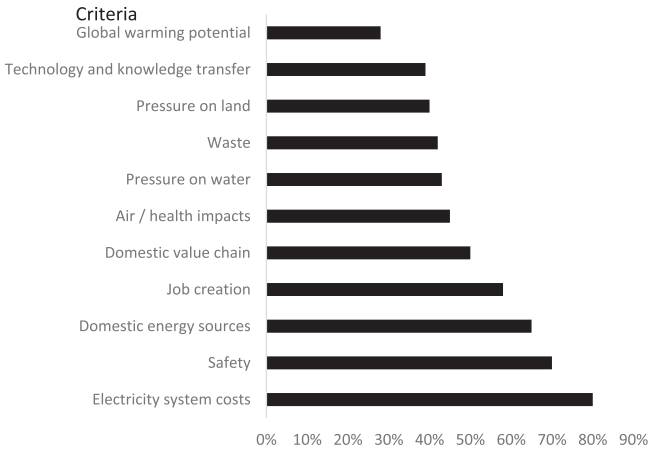

Fig. 1. Stakeholder preferences of criteria relevant for energy transition.

Political concerns were linked to the opportunity to participate in decision-making processes with respect to energy transition. Here we describe the results summarizing political concerns regarding the opportunities to participate and how participation is understood, as well as the perception of ownership of the energy transition.

Understanding of participation: In Austria and Germany concerns were expressed in relation not only to the deployment of renewable energy technologies, but also to the energy transition process itself. Inhabitants expressed the wish to participate in decision-making processes and highlighted the limited opportunities to do so. However, the fact that these concerns were more frequently expressed in Germany and Austria might be connected to the fact that there is a higher level of awareness about participatory governance in these two countries.

In Morocco, participation was initially understood as engagement in renewable energy projects, for example, being employed by renewable energy companies. The participatory process in Morocco showed that communities wish to participate in decision-making processes about renewable energy projects that will be deployed on their land and in the discussions about the distribution of benefits from these projects and compensation for land and water usage.

In Finland, concerns were expressed about the organization of Environmental Impact Assessments and the integration of feedback from inhabitants. In Jordan, during the ranking of decision-making experiments on procedural justice, the criterion regarding opportunities to participate in decision making was always ranked as the highest priority, higher, in fact, than that of compensation for deployed infrastructure.

Opportunities to participate: Even in countries with a history of participation such as Austria and Germany, a significant share of respondents indicated that opportunities for participation are limited. In Austria, 65% of inhabitants were aware of participatory governance of energy transition, but also stated that current opportunities for participation are limited. At the same time, 35% of all respondents were not keen to participate in decision making on energy transition mainly because of lack of knowledge, time, and trust in decision-making processes. Some of the most frequent answers were: “I cannot change anything anyway,” or “My voice will not be heard.” Other factors hindering participation are having other priorities, lack of perceived transparency in the process, lack of interest, the belief that energy transition does not affect someone personally, and the belief that energy transition is not important. These factors were, however, minor in comparison to the three main ones: lack of knowledge about opportunities to participate; participation is a time-consuming exercise given the impossibility of changing anything; and the lack of trust in decision makers implementing participatory processes.

The results of the large-scale survey in Austria also showed a clear mismatch between opportunities to participate; the areas in which participation was possible; and which part of the decision-making process people would like to participate in. The majority preferred to

participate in decision-making on technology selection (57%), site or location selection (20%), and definition of the project's needs and goals (11%). Some people wanted a say in project planning (8%), while project financing was the least favorable option (4%). Our evaluation of available participation options showed that participation in the financing of the project is one of the most frequently options offered.

Engagement in decision-making processes on the needs and types of energy transition projects in the region was only possible via energy groups in some regions. Through these, interested citizens were able to comment on the energy transition and the projects at hand and have their comments communicated to decision makers. In most regions, participation mainly included targeted stakeholders and representatives of stakeholder groups.

The mapping of various measures of energy transition in a number of countries where we conducted our research using Arnstein's Ladder of Citizen Participation, showed that the majority of these measures were at the level of tokenism. This level involves such elements as media campaigns, climate schools, and public information events, exhibitions, and excursions. Measures to raise awareness dominate the area of work with local inhabitants. The number of measures to provide for financial participation or engagement in decision-making processes is minor compared with awareness-raising measures and information campaigns [32].

Ownership of energy transition: The feeling of ownership of energy transition is another driver of willingness to use RES and to participate in energy transition. Our research shows that in Austria and Germany, opportunities for ownership of energy transition only began to appear in the last decades. These include financial participation, such as crowd funding, or participation in decision-making processes through various forms of stakeholder dialogue, ranging from consultation to real partnership, and even citizen control over energy transition measures. There is a clear correlation between the availability of opportunities to participate in energy transition and trust in policy stakeholders who are shaping the energy transition.

Results in Austria show that a feeling of ownership of energy transition increases trust in the national and local level policymakers responsible for energy transition implementation. There was a clear correlation between the existence of participatory governance measures, such as energy groups to provide feedback, and elements of trust in policymakers [31].

In Germany, we evaluated actions taken by energy companies to address public acceptance carried out in accordance with the action plan jointly developed with NGOs. All actions were mapped on the Ladder of Arnstein. It was identified that some actions had elements of therapy regarding risks perceptions. Several measures were at the level of providing information. This included public information campaigns, which had different forms and targeted different social groups. There were some elements of consultation, mainly through surveys or feedback forms. The measures at the level of placation and partnership involved cooperation with NGOs to develop action plans on transparency and environmental protection. We did not identify any measures at the level of delegation and citizen control [33].

Our research in Morocco showed that expectations regarding participation in energy transition projects was different from our original understanding and mainly connected to expectations about being employed by the company rather than having the opportunity to participate in decision-making processes on the implementation of the project. The Arab Spring provided new opportunities and expectations leading to the establishment of a number of new NGOs. In some regions, the number of local NGOs even became overwhelming. However, a closer look at these NGOs showed that they were not really engaged in energy policies for various reasons, one being that energy policy decision-making happens at the national level and another that these NGOs were interest groups, rather than policy oriented. Recent development programs and RES projects in Morocco have created a new culture of inclusion with new types of groups set up to give voice to demands and claims regarding energy transition. Thus, the green growth concept has opened up new opportunities for participation; the number of civil society actors has reached 80,000 associations [34].

On the subject of participation levels, the same tendency was observed regarding the engagement of indigenous communities. We analyzed the level of participation by indigenous people in environmental impact assessments for energy transition projects in the Arctic parts of Finland. Our results identified tokenism as the most common level of participation. People had an opportunity to provide their feedback and to share their knowledge, but this did not really mean that their participation affected decision-making. The different goals and objectives of various types of stakeholders regarding participation, the lack of communication, the miscommunication, and the lack of knowledge on the part of the parties involved were barriers to participation. Perceptions of participation among the reindeer herders themselves were very polarized. Some believed in the benefits of participation, while others had had a negative experience. The latter were related to communication deficits, for example, when meetings had unclear objectives that resulted in frustration about the process itself. Currently, people only have a few alternatives to select from and provide their feedback. Moreover, developers lacked resources and knowledge on how to organize a participatory process on the selection of alternatives. The people consulted wished to have permanent contact with project developers throughout the project to communicate concerns, needs, and potentially negative impacts [30].

Concerns about environmental impacts of renewable energies were expressed in Morocco and Jordan regarding the use of water resources. Both are desert countries that are already experiencing water scarcity and the effects of climate change on precipitation levels. Large-scale installations, such as concentrated solar power, are increasingly of concern, particularly if they use technology that requires water for cleaning and technological processes. Concerns about the use of land for large-scale renewable energy installations were raised not only by local communities in Morocco but also in Finland, especially by the reindeer husbandry community.

One might assume that such results could appear in countries with developing economies or economies in transition, needing to achieve a certain level of economic growth. However, we observed similar results across all countries, also including European countries, with the only difference being that the variation between group ranking and individual ranking was stronger, which showed that the prioritization of environmental criteria has become a matter of social influence in Europe.

5. Conclusion and recommendations on social factors of energy transition

This paper summarizes several years' accumulated experience of organizing stakeholder processes on energy transition. These processes have been designed to gauge the attitudes to energy transition of various stakeholder groups and lay people and to assess what opportunities they have had to engage with it. Here, we present recommendations for the implementation of measures to address the social factors of energy transition and, on the basis of behavioral factors, to turn awareness into action.

Our recommendations are organized into three groups: communication and awareness raising; attitudes toward RES; and engagement and participation. For each group, we have also included recommendations for actions, for example, in the communication process one recommendation is to move from a global to a local level (Fig. 2).

Several experiments focusing on decision-making have shown that people tend to prioritize short-term risks, such as economic slowdowns, over long-term risks, like climate change. Even though awareness about the need to mitigate climate change is high, people make trade-offs in their every-day routines, prioritizing actions with short-term benefits over those with long-term benefits. They also tend to prioritize personal

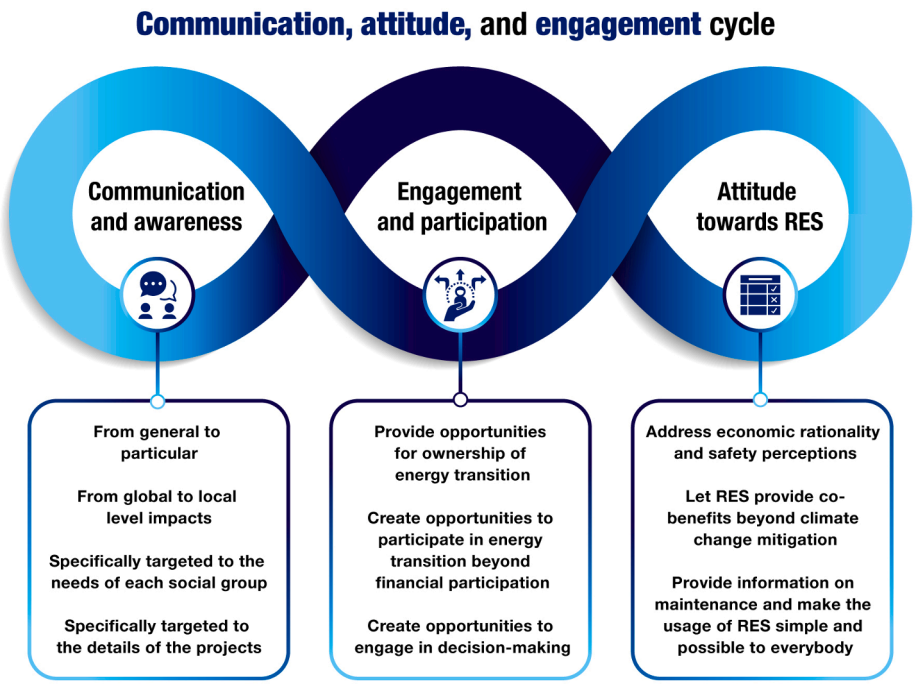

Fig. 2. Communication, attitude, and engagement cycle.

or local benefits over benefits at the global level and current benefits or benefits for the current generation over future benefits or benefits for future generations. These trade-offs between the available alternatives together with the prioritization of certain actions is a major reason why awareness about the need for climate change mitigation is not turning into action.

The first recommendation is with respect to communication and awareness-raising about the need for energy transition. Currently, the majority of awareness-raising measures deal with the need for climate change mitigation, mainly from the perspective of fairness between present and future generations and among various geographical regions. These communication measures also relate to the problem of climate change from the risk perspective, highlighting the probabilities and potential consequences of risks and natural hazards of climate change. Indeed, many such communication measures have been very successful. At the same time, however, our results show that lay people were much less informed and aware regarding the details of local RES projects and that the level of awareness among various social groups can vary significantly. We thus conclude that a shift is needed from global public information campaigns to campaigns with a regional focus comprising more information about the RES projects being planned in local communities. A more targeted campaign is also needed, with personal communication being preferable to written material and an emphasis on reaching all social groups, including young people.

The next recommendation concerns drivers of behavioral change regarding RES projects. Here our results correspond with those of Ingelhart [27] who mentions several studies on people's opinions about contested options such as environmental protection. However, much less has been written about why people think as they do and how deeply committed, they are to solve the problem. Climate change mitigation does not relate solely to awareness of the threats and risks of climate change, but as long as communication with lay people is along these lines, the NIMBY narrative in the deployment of RES could be the one to dominate, namely, climate change is indeed a threat, actions to mitigate it are urgently needed, and it is mainly the task of public authorities to deal with mitigation while providing the necessary regulations, technology, and financing. Such a discourse, however, foresees a role for private capital in RES project financing backed by various investment support and de-risking measures. In the present discourse, the role of local people is discussed mainly in the context of social and public acceptance or willingness to use and pay for renewable energy.

Climate change mitigation at scale requires not only the use of technologies, regulations, and finance but also behavioral change and the willingness of millions of private households to engage with energy transition and to really bring about change. Behavioral change, however, involves trade-offs in decision-making. Several scientific works on trade-offs, not only on energy transition, but also in general, show that people tend to make choices from the perspective of economic rationality or safety. They also tend to choose mitigation of short-term over long-term risks. Of course, as in every wicked policy problem, there are a variety of opinions and voices regarding energy transition. Our recommendation on energy transition is that RES should address expectations of economic rationality and safety. RES are already expected to have benefits in terms of socioeconomic development—they could also be positioned as safer energy generation technologies, not just in the light of climate change, but also in terms of their immediate impacts on local communities. Another recommendation is for RES to be communicated as improving the quality of life *today* for *current* generations.

These results correspond with the findings of Turnheim and Sovacool [12] that the most popular benefits of solar photovoltaic (PV) deployment in, for example, Germany are the economic ones, followed by political, social, and technical, with environmental benefits at the bottom of the list. Those authors also found that the most frequently mentioned economic benefits were the creation of new businesses and jobs in the manufacturing of PV components. Other economic benefits included profits for investors and reduced electricity costs in general, and PV costs in particular, as well as the creation of a market and new skills to operate and manage RES.

However, our results contradict the findings of Ingelhart [27] that people in countries with "postmaterialist" values with an emphasis on self-expression and quality of life, are much more willing to prioritize environmental protection, while people in countries with "materialist" values above all single out security and economic factors. We observed prioritization of security and economic factors and a low ranking of environmental protection across all countries, with almost no variation in terms of cultural background.

Behavioral change is not only a matter of communication; it is also based on being presented with available alternatives. People are more comfortable with a number of alternatives to choose from based on their preferred decision-making criteria, which could be safety, energy costs, or protection of the environment. However, it is not sufficient to have alternatives. As the Human Beliefs Model or Theory of Behavioral Control show, it should also be possible to implement those alternatives. As various decision-making experiments show, the alternatives presented should have benefits over other solutions.

The final recommendation concerns transferring awareness about the need for converting climate change mitigation into action. Existing evidence in behavioral economics shows that active participation happens when there is an increased feeling of process ownership. This also corresponds with the findings of Turnheim and Sovacool [12] that one of the highest social co-benefits of RES deployment is to enable a citizen energy democracy, which provides people with an opportunity to be part of the energy transition and by widening participation in policy-making in general.

Ownership of this kind can manifest itself in individual action or in various forms of collective action such as energy cooperatives, for example, participation in decision-making processes or in financial initiatives such as various forms of crowd funding. Further measures are thus recommended to strengthen ownership of the energy transition process by transcending nimbyism and ideas about social acceptance. When developing energy policy measures, it is thus important to consider the responsibility and ownership of energy transition and to develop compromise solutions or solutions tailored to a variety of discourses.

Declaration of Competing Interest

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

Acknowledgment

I am grateful to various funding institutions such as Austrian Climate Research Program (ACRP), European Commission and especially Co-Inform project, Federal Ministry for Economic Cooperation and Development of Germany and others which supported my research on human and social factors of energy transition for more than ten years. I also would like to express my deep gratitude to stakeholders, experts and laypeople in Austria, Germany, Finland, Morocco, Jordan and Iran who were very generous with their time and knowledge while participating in numerous stakeholders' events organized in frames of our research projects. Co-Creating Misinformation-Resilient Societies (Co-Inform). Funded by the European Commission (grant agreement 770302).

References

[1] IPCC, 2019: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)].

[2] A. Patt, (2015). Transforming Energy: Solving Climate Change with Technology Policy. Cambridge University Press. July 2015. https://doi.org/10.1017/CBO9781139162210.

[3] REN 21 (2019). Renewables 2019. Global Status Report. (Paris: REN21 Secretariat). ISBN 978-3-9818911-7-1.

[4] World Energy Council (2014). Global Energy Transitions.

[5] F. Reusswig, N. Komendantova, A. Battaglini, New governance challenges and conflicts of the energy transition: renewable electricity generation and transmission as contested socio-technical options, Lecture Notes in Energy 61 (2018) 231–256.

[6] Sovacool, Benjamin K. (2016): The history and politics of energy transitions: Comparing contested views and finding common ground, WIDER Working Paper, No. 2016/81, ISBN 978-92-9256-124-6, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, https://doi.org/10.35188/UNU-WIDER/2016/124-6.

[7] A. Grübler, C. Wilson, G. Nemet, Apples, oranges, and consistent comparisons of the temporal dynamics of energy transitions, Energy Res. Social Sci. 22 (12) (2016) 18–25, https://doi.org/10.1016/j.erss.2016.08.015.

[8] B. Sovacool, What are we doing here? Analyzing fifteen years of energy scholarship and proposing a social science research agenda, Energy Res. Social Sci. 1 (2014) (2014) 1–29.

[9] D.J. Hess, B.K. Sovacool. Sociotechnical matters: Reviewing and integrating science and technology studies with energy social science. Energy Research & Social Science 65. a101462 2020 ISSN 2214–6296.

[10] J. Köhler, F.W. Geels, F. Kern, J. Markard, E. Onsongo, A. Wieczorek, F. Alkemade, F. Avelino, A. Bergek, F. Boons, L. Fünfschilling, D. Hess, G. Holtz, S. Hyysalo, K. Jenkins, P. Kivimaa, M. Martiskainen, A. McMeekin, M.S. Mühlemeier, B. Nykvist, B. Pel, R. Raven, H. Rohracher, B. Sandén, J. Schot, B. Sovacool, B. Turnheim, D. Welch, P. Wells, An agenda for sustainability transitions research: State of the art and future directions, Environ. Innov. Soc. Transitions (2019), https://doi.org/10.1016/j.eist.2019.01.004.

[11] B.K. Sovacool, A grounded comparison of energy security in Denmark, Brazil, Bangladesh, and China, in: S.F. Krishna-Hensel (Ed.), New security frontiers : critical energy and the resource challenge, Ashgate, 2012, pp. 67–92.

[12] B. Turnheim, B. Sovacool, Forever stuck in old ways? Pluralising incumbencies in sustainability transitions. Environmental Innovation and Societal Transitions, 2020.

[13] Wüstenhagen, R., Wolsink, M., Burer, M., (2007). Social Acceptance of Renewable Energy Innovation: An Introduction to the Concept. Energy Policy, May 2007. DOI: 10.1016/j.enpol.2006.12.001.

[14] B. Sovacool, L. Baker, M. Martiskainen, A. Hook, Processes of elite power and low-carbon pathways: Experimentation, financialization, and dispossession, Global Environ. Change 59 (2019) (2019), 101985.

[15] G. Dubois, B. Sovacool, C. Aall, M. Nilsson, C. Barbier, A. Herrmann, S. Bruyère, C. Andersson, B. Skold, F. Nadaud, F. Dorner, K. Moberg, J. Ceron, H. Fischer, D. Amelung, M. Baltruszewicz, J. Fischer, F. Benevise, V. Louis, R. Sauerborn, It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures, Energy Res. Social Sci. 52 (2019) (2019) 144–158.

[16] A. Gruebler, C. Wilson, G. Nemet, Apples, oranges, and consistent comparisons of the temporal dynamics of energy transitions, Energy Res. Social Sci. 22 (2016) (2016) 18–25.

[17] G. Unruh, (2000). Understanding carbon lock-in. Energy Policy 28 (12) (2000), pp.817-830.

[18] M. Wolsink (2012) Wind Power: the Basic Challenge concerning Social Acceptance. Robert A Meyers (Ed.) Encyclopedia of Sustainability Science and Technology. Vol.17, 12218-12254. Springer, New York.

[19] L. Phillips, M. Jorgensen, Discourse Analysis as Theory and Method, SAGE publications (2002).

[20] A. Leipprand, C. Flachsland, M. Pahle, Advocates or cartographers? Scientific advisors and the narratives of German energy transition, Energy Policy 102 (2017) 222–236.

[21] C. Kempfert, J. Horne, Good governance of the Energiewende in Germany: Wishful thinking is manageable? Hertie School Experts of the German Federal Elections (2013).

[22] G. Laugs, H. Moll, A review of the bandwidth and environmental discourses of future energy scenarios: Shades of green and gray Renewable and Sustainable Energy Reviews 67 2017 issue C: 520–530.

[23] L. Hermwille, The Role of Narratives in Socio-Technical transitions – Fukushima and the Energy Regimes of Japan, Germany, and the United Kingdom, Energy Res. Social Sci. 01 (2015) 237–246.

[24] I. Ajzen, (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes Volume 50, Issue 2, December 1991, Pages 179-211.

[25] J. Eccles, A. Wigfield, Motivational Beliefs, Values and Goals, Annu. Rev. Psychol. 53 (1) (2002) 109–132, https://doi.org/10.1146/annurev.psych.53.100901.135153.

[26] A. Bandura, (1986). Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, N.J: Prentice-Hall, 1986. Print.

[27] R. Ingelhart, (1995). Public Support for Environmental Protection: Objective Problems and Subjective Values in 43 Societies. Political Science and Politics. Vol. 28, No. 1 (Mar., 1995), pp. 57-72 (16 pages). DOI: 10.2307/420583.

[28] S. Hanger, N. Komendantova, B. Schinke, D. Zejli, A. Ihlal, A. Patt, Community acceptance of large-scale solar energy installations in developing countries: evidence from Morocco, Energy Research and Social Science 14 (2016) 80–89.

[29] M. Yazdanpanah, N. Komendantova, J. Linnerooth-Bayer, Z. Shirazi, Green or In Between? Examining Young Adults' Perceptions of Renewable Energy in Iran, Energy Res. Social Sci. 8 (2015) (2015) 78–85.

[30] M. Landauer, N. Komendantova, Participatory environmental governance of infrastructure projects affecting reindeer husbandry in the Arctic, J. Environ. Manage. 223 (2018) 385–395, https://doi.org/10.1016/j.jenvman.2018.06.049.

[31] N. Komentantova, S. Neumuller, Discourses about energy transition in Austrian climate and energy model regions: Turning awareness into action, Energy Environ. (2020), https://doi.org/10.1177/0958305X20907086.

[32] N. Komendantova, M. Riegler, S. Neumueller, Of transitions and models: Community engagement, democracy, and empowerment in the Austrian energy

transition, Energy Res. Social Sci. 39 (2018) 141–151, https://doi.org/10.1016/j.erss.2017.10.031.

[33] N. Komendantova, M. Vocciante, A. Battaglini, Can the BestGrid Process Improve Stakeholder Involvement in Electricity Transmission Projects? Energies 2015 (8) (2015) 9407–9433, https://doi.org/10.3390/en8099407.

[34] C. Günay, C. Haddad, S. Gharib, E.M. Jamea, D. Zejli, N. Komendantova (2018). Green growth and its global-local meanings - Insights from Morocco. Working Paper 103. Österreichisches Institut für Internationale Politik – oiip.