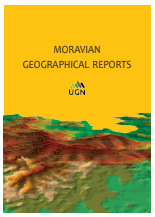

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To know is to accept. Uncovering the perception of renewables as a behavioural trigger of rural energy transition

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Abstract

Our research aims to reflect on rural communities' awareness and perceptions of various energy sources, particularly focusing on renewable energies. We argue that there is an urgent need to expand the knowledge base on the perspectives of rural communities directly and indirectly affected by renewable energy installations. From an empirical point of view, our study focuses on the Lipno county in the Kuyavian-Pomeranian Voivodeship (Poland), where a relatively unique constellation of renewable energy and local community is emerging. Our findings indicate a wide awareness about renewable energies in the community, but a rather shallow, imbalanced, and outdated knowledge on potentials, advantages and disadvantages of individual locally available renewable energy sources was detected. To break deeply rooted carbon dependency and lock-in and to trigger mechanisms of change leading to more sustainable futures, practical, contextual, and place-based knowledge is essentially needed to shape responsive attitudes. We claim that personal experience of the effects of renewable energy installation (especially small-scale ones) can be a proxy for the change and scaling up. This is a key because it proves the leading role of an inclusive approach to developing renewable energy in rural areas. Locals undertake new energy investments, which is the basis of spatial (territorial) distribution justice – they not only bear the costs of operating new energy installations but also derive tangible benefits from renewables.

Key words: *rural energy transition, renewables, awareness, perception, Poland*

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1. Introduction

As tensions in the global political situation connected to Russia's aggression in Ukraine rise, so do the issues related to the fossil fuel market. Currently, the world seems to have come to a crossroads regarding the energy production (United Nations, 2022). The war in Ukraine has forced countries worldwide to rethink their use of traditional energy sources and was a kind of "wake-up call" for our society that we are still highly dependent on fossil fuels. Even though many strategic documents, such as The Paris Agreement (2015) or the European Green Deal (2020), stressed out the need for immediate action towards reducing the human impact on climate change by, among others, changing the energy mix from fossil fuels to renewables, still, traditional energy sources such as coal, gas and oil play an important role in the energy supply worldwide. The current geopolitical situation revealed how undifferentiated the world's energy is and how much this affects us (World Food Programme, 2022). The problem with diversification of energy resources is particularly visible in post-socialist countries such as Poland, where the consequences of a centrally planned economy can be noticed to this day. One of the signs is that the economy is dependent on fossil fuels. In Poland, the share of coal on electricity generation is still very high, around 70% (Transformacja…, 2022).

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The global economy and rapid changes therein have prompted a call for action to develop local, green, and resilient renewable energy sources (RES). Rural areas must bear the brunt of such development as traditionally, and even now, they have been the site for renewable energy facilities. The present global situation, however, has revealed that the development of local renewable energy resources can support energy security and help develop rural areas (Duarte et al., 2022). One of the most crucial actors in this transition are the locals – the inhabitants, with their specific awareness, attitudes, and behaviours (Chodkowska-Miszczuk et al., 2021). In addition to the presence of dedicated energy infrastructure, public support, and systemic actions, among the key issues affecting social acceptance of renewables are the knowledge, previous user experiences, and personal benefits (Dwivedi et al., 2022). Therefore, this research aims to understand the rural communities' awareness and perceptions of energy sources, particularly renewables. The comparative studies considered the opinion of rural communities that experience the effects of the operation of renewable energy facilities daily and directly and those that are indirectly affected by renewables. From the empirical point of view, this study was conducted in the Lipno County (Powiat Lipnowski in Polish) (LAU1, formerly NUTS4) in the Kuyavian-Pomeranian Voivodeship in Poland. The research questions that have driven the empirical research were defined as follows:

- Q1: How do local communities perceive renewable energy sources?
- Q2: Is there any difference in the perception of specific renewable energy installations?
- Q3: Does the distance of the place of residence from the renewable energy installations affect the perceptions, awareness, and attitudes of local communities toward them?

The rest of the paper consists of four main parts. The following section provides the theoretical and methodological framework of the study. The next part focuses on the methodological aspects of the research and presents the outcomes of a survey conducted among the selected inhabitants of the Lipno county. The last sections of the paper are a discussion, where the issues presented in the paper are revisited, and a conclusion.

2. Theoretical departures

2.1 Energy transitions: From the global to the local dimension

Compared to the 2018 levels, global energy consumption is expected to increase by 150% in the next 30 years largely driven by the growth of developing countries (World Energy Outlook, 2019). Several countries are investing in renewable energy systems to offset the adverse environmental effects of fossil-fuel-based energy and at the same time ensure economic growth. Considering the higher cost of renewable energy transitions compared to fossil fuels or nuclear power, their inclusion into the policy and practice is challenging (Kim et al., 2020). The types of energy transition research can be divided into scientific or policy implementation, macro (national or regional level) to microscale (local or individual level), or, theoretical to empirical. Broadly, such typologies have focused on the macro scale of national or regional energy transitions. Most of the studies are based on analysing carbon emissions and developing empirical or theoretical models of the energy efficiency, costs, generation, performance and consumption, and environmental impacts. Or they have dealt with types of energy resources, their benefits and adverse effects, management, or policies (Kanger, 2021; Chang et al., 2021; Edomah et al., 2020; see Fig. 1).

Relatively less attention has been put on the actual uptake of policies or the energy literacy of communities and individuals, which would determine energy sustainability and transition to renewables. This is evident from the example of the implementation of renewable energies in rural areas of Poland (Fig. 2). It has led to uncertainties in "public-related issues with respect to using energy facilities and services in communities" (Kim et al., 2020) magnified from local to national scales. Thus, the perception and awareness of the public are critical towards driving energy transition in this time of energy crisis (Devine-Wright, 2012; Larson and Krannich, 2016; Kim et al., 2020). The perception and awareness of the public towards renewable energy transitions, however, and their consideration into policy instruments has been recognized as one of the "more challenging, albeit essential, duties of both researchers and government officers in the energy and electricity production sectors" (Chung and Kim, 2018; Kim et al., 2020).

2.2 Energy transitions in the East-Central European rural context

Energy availability and consumption are instrumental for local socioeconomic development. The transition from fossil fuel-based to renewable sources has largely been the focus of renewable energy research in the Global North, associated with better accessibility, availability of renewable energy sources and better living conditions (Frankowski and Herrero, 2021). The discussion has also been vastly developing around a sustainability shift of traditional energy systems already in place towards improved efficiency (Vujanović et al., 2021). It is well known that renewable energy installations require land and also a large investment for implementation but undoubtedly, their location possess many co-benefits, although certain possible drawbacks too. These co-benefits have been enumerated and quantified at the macro-scale to estimate the non-climatic monetary benefits (Dranka et al., 2022). Research from developing

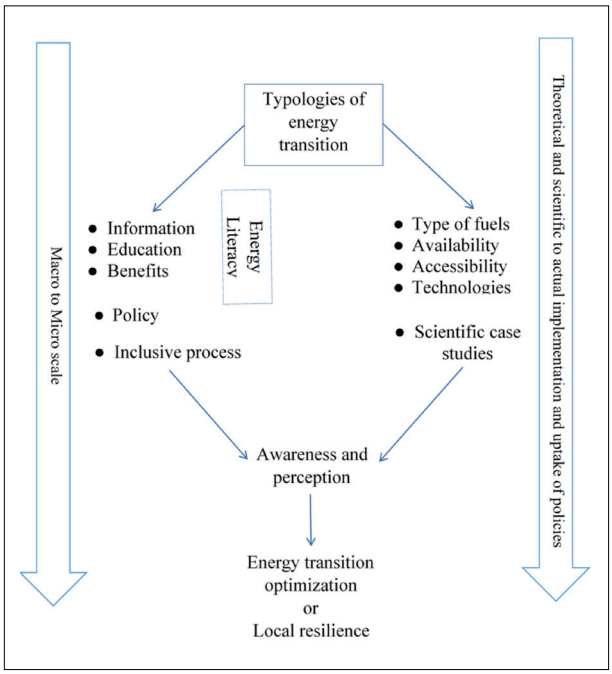

Fig. 1: Types of energy transition research
Source: authors' compilation

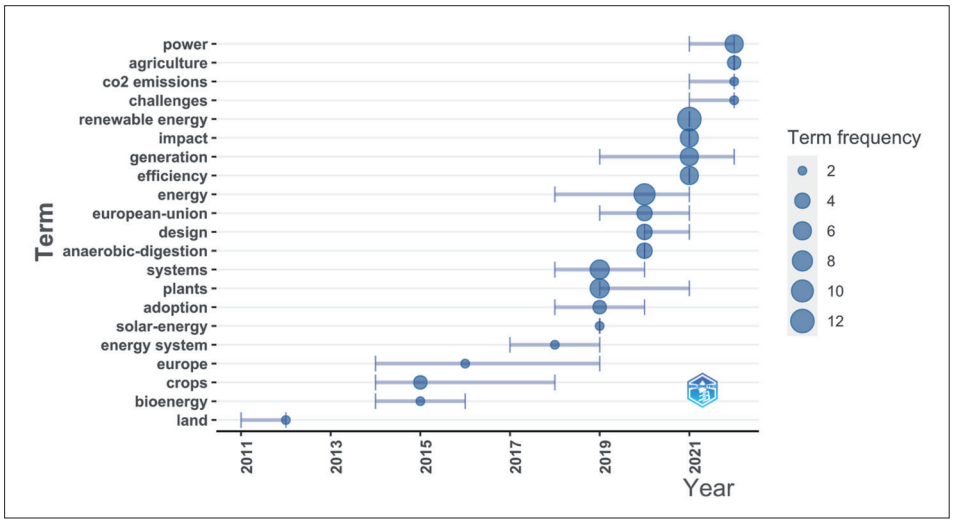

Fig. 2: Term trends of renewable energy in rural areas of Poland
Source: authors' study based on Web of Science review

countries, such as India and China, has largely focused on the indoor and outdoor health co-benefits of fuel switching (Maji and Kandlikar, 2020; Liu et al., 2022). On the other hand, empirical evidence from the Global North, however, is surprisingly lacking the mentioned co-benefits, but instead, driving force of co-benefits is rather seen in terms of environmental benefits, environmentally friendly perceptions and increased awareness of local communities (Frankowski and Herrero, 2021).

The Global North, and Europe in particular, has achieved a certain degree of energy security due to mass electrification and expansion of the natural gas grid during the industrial era. At the household level, however, many people still rely on the traditional types of fuel (coal, wood, oil, etc.). This is especially visible among poorer population living in peripheries and even more frequently can be observed in Central and Eastern European countries. Particularly in this part of Europe, it is very hard to persuade laypeople that apart from direct environmental benefits, renewable energy systems have a high potential to create economic opportunities, better living conditions and other co-benefits. This is especially case in rural areas (Standar et al., 2021). In this respect, energy transition and rural resilience certainly also depend on energy literacy (Chodkowska-Miszczuk et al., 2021) that is still far below standards in comparison to western European rural counterparts. It´s beyond a doubt that rural areas provide potentially the most suitable sites for renewable energy installations due to the availability of proper land, technical feasibility and also feedstock available (Kaya et al.,2019). On the other hand, an increased competition for land among different uses tend to reveal land use conflicts even in stabilised rural communities (Raška et al., 2022).

We already know that rural areas, especially those in Central and East European countries, exhibit a unique and highly diverse pattern among public perception, local development, and renewables (Standar et al., 2021). There is no doubt that every single rural community has potential to develop and utilise several local renewable sources of energy that may reduce their dependence on national power grids, improve local resilience and also energy security. In Poland for example, it is widely known that rural areas experience more frequent and longer energy disruptions. At the same time, a higher number of rural households depends on fossil fuels for heating if compared to urban areas (Kaya et al., 2019), so there is plenty of place for improvements. Additionally, about 45% of Polish households were using coal for space heating in 2018 (Kerimray et al., 2017), which signals that this problem tends to be concentrated in the rural with all environmental and health consequences. It needs to be highlighted that Poland has a long history of coal dependence which is exacerbated by the economic, political, technological and natural dimensions that need to be overcome. However, unfortunately, recently started warfare in Ukraine has changed a lot (Ahmed et al., 2022).

Understanding the perception and awareness of rural communities towards renewable energy systems is a backbone of successful energy transformations. Poland, which has reported to have one of the worst air qualities in the European Union (maybe even globally), is enormously promising research landscape for studying attitudes of local communities towards renewable energy transition. There have been detected significant shifts in the attitudes in Poland towards renewable energy, but these are considering solely other than in macro-level (Mroczek et al., 2011), Eurobarometer (2014) or Wojciechowska-Solis and Soroka (2018). If we turn our attention to rural communities, the response is extremely varied, regionally differentiated and context-specific. For example, Eiser et al. (2010) in their study reported that people living near wind farms in rural Poland tend to be less supportive for wind energy development, and generally less convinced about the benefits of locally sourced renewable energy installations and their positive impact on the local economy and the environment. On the other hand, some studies are highlighting that expectations of the public from renewable energy projects often go far beyond possibilities (Frantál, 2015) which may lead to a disillusionment. Local socio-cultural environment seems to be the key driver for acceptance of renewable energy projects (Lamy et al., 2020).

A set of studies has focused also on the potential of biogas plants and anaerobic digesters in rural areas (Martinát et al., 2020, Martinát et al., 2022; Chodkowska-Miszczuk et al., 2019). However, even this particular type of renewable energy system, though very well suited for rural areas, can raise local controversies when acquiring feedstock for anaerobic digestion (Chodkowska-Miszczuk et al., 2021).

Thus, the evidence from Central and East European countries has broadly focused so far on the fuel switching and identification of co-benefits of energy transition at

a macro scale. Other than macro scale is rarely studied. The household-level co-benefits have not been investigated at all, which is especially case of rural communities. Further, the energy transition literature seems to be limited to economic, technological, and institutional drivers (Cherp et al., 2018) and systematically avoiding the research of social spaces beyond technology. Highlighting technological and institutional challenges of energy transition, its speed of adoption and cost for various options, are very much a typical example of contemporary renewable energy research. On the other hand, the role of end-users and their lived experience is vastly under-research or even missing. As such, the absence of a human factor or the agency of users, and their inclusiveness in the energy transition, has led to structural research outcomes (Shove, 2003). Social theorists have argued that further research is needed to include the sociological dimensions which determine the uptake of policy and the creative agency of users for sustainable energy transition (Frankowski and Herrero, 2021). The agency of users can be defined as "improvisation, tinkering, bricolage, and repair work, and technology 'domestication' as important mechanisms for socio-technical change" (Geels et al., 2018). Thus, studies on household consumption, perception and awareness of individual users have gradually become the most important in determining and catalysing energy transitions. This finding seems to be far more important in rural areas, where society is closely knit and with apparently more direct links between human and natural components (Chodkowska-Miszczuk et al., 2021a).

There is an urgent need to focus research beyond technological and its limitations to support the transition from a human perspective. In other word, to thoroughly understand the perception and awareness of individuals. We structure these needs into two broader categories:

i. Beyond accessibility and availability – perception: The availability and accessibility of alternative and renewable energy resources, however, is not the sole criteria for optimal renewable energy transitions. This can be better understood by an example. In Poland, households typically rely on coal for heating due to its historical availability, and perceived risks associated with the natural gas supply. Furthermore, most households use low-efficiency stoves to burn coal and switch to wood in case of coal shortages or on colder days (Kerimray et al., 2017). Therefore, the easy availability and accessibility of coal and the perceived risk associated with alternative or renewable sources contribute the perception that renewable energy sources are rarely used. Such perceptions are in Poland deeply rooted in the information provided by the media and individual real--life experience, and consequently, people who hold this view cannot be held accountable for refusing to switch to renewable sources. The authors want to highlight, however, that along with the availability and accessibility, we urgently need to work with the perception of individual energy sources. We believe the perception of renewable energy needs to be shaped and gradually changed at the household or individual level especially in rural areas, where the energy transition is still struggling to sufficiently progress.
ii. Beyond climate change mitigation – Awareness of co-benefits: These changes in perception can be mediated by highlighting the co-benefits of switching to renewable energy sources that are directly related to everyday life. Benefits articulated as mitigation of climate change or reducing air pollution seem to be more impactful when people see them through the lens of their everyday lives (Křištofová et al., 2022). In other words, there is a need to go beyond the direct benefits of renewable energy systems and highlight the more relatable co-benefits. In this sense, improved awareness about co-benefits can be helpful and speed up and sustain energy transition, especially articulated as benefits to lifestyle, time consumption, energy costs or even distribution of subsidies. We are persuaded that managing of renewable energy systems may get additional impulse if co-benefits are suitably communicated (Stober et al., 2021).

3. Methodology

3.1 Methods, data and limitations

To address the research objectives, set in this paper, we proposed a four-stage research procedure, including:

i. the phase of constructing the conceptual and theoretical frameworks;
ii. the phase of desk research;
iii. the phase of empirical research (on-site query and survey); and
iv. the phase of data analysis, interpreting and discussing results and formulating conclusions.

After the initial stage of developing the research concept, we began the search for an answer to the research problem by means of literature studies and Internet searches: we analysed current strategic, national, regional, and municipal documents concerning renewable energy in Poland, and obtained the necessary data and information. Bibliometric analysis was performed in R-software using the 'bibliometrix' package (Aria and Cuccurullo, 2017). The Web of Science database was explored to search for relevant peer-reviewed literature. The key stage of this research procedure consisted of an empirical analysis, which was carried out in the selected study area (see section 3.2). The survey was conducted during a challenging time of the COVID-19 pandemic – the first quarter of 2022. This situation translated into difficult on-site contact with potential respondents, as well as their sceptical attitude towards participating in a subsequent online survey, as this type of research had proliferated during the lockdown.

The constraints of the pandemic situation necessitated the use of a hybrid method of eliciting responses to the survey questionnaire. A computer assisted web interviewing (CAWI) method was used, i.e. a Google web form was employed and widely distributed through social media, including community forums bringing together residents of the study area. At the same time, the pen-and-paper interviewing (PAPI) method was used when questionnaires were filled in on paper in contact with the interviewer. In both cases, the test sample was selected using the snowball method, so that the results achieved saturation levels (Guest et al., 2006). A total of 110 questionnaires were obtained, including 60 in electronic form and 50 on paper. Using two channels to distribute the survey helped the survey to reach a diverse range of backgrounds, both young people for whom the Internet is their natural environment, and older people who prefer direct contact for communication (Wylon et al., 2018). The sample is regarded, for our purposes, as random and large enough (considering the central limit theorem) for conducting statistical analysis. We are aware of the boundary conditions of the study. The research has some limitations regarding the reference to a case study and survey

conduction, which qualifies the opportunities to generalise. It is difficult to come to a clear interpretation of the results of analyses on a local scale based on the received research sample. Nevertheless, the local context, including social awareness of rural residents, is pivotal in the renewables development and broader – energy transition. It can be explored through social research methods only. In essence, the study's conclusions support solving the research problem raised in this paper and expand the conceptual framework discussed issue.

The socioeconomic structure of those who responded is presented in Table 1. Of the 110 respondents, 69 were women (62.7%) and 41 were men (37.3%). The largest group who took part in the survey were residents in the 20–29 age bracket (38.2%). This group was more likely to complete the survey online than in the traditional paper form. This was followed by those aged 40–49 (20% of respondents). These individuals, in turn, were more willing to complete PAPI-type surveys. The smallest groups of participants in the survey were those under 20 years of age (1.8% of total respondents) and those over 70 years of age (3.6%). An important issue in the context of the research on the perception of renewables is the potential use of one's own home, which clearly demonstrates the need for fuel – sources of heat. Most respondents lived in detached single-family houses (84.3%).

The IBM SPSS Statistics Data Editor software was employed to analyse the survey data obtained, including basic descriptive statistics, frequencies and cross-tabulation analyses. In the final stage of the research procedure, which consisted of compiling the results and formulating conclusions, the following software was used to support this process: Libre Office Draw, Inkscape, and QGIS as a mapping tool.

3.2 Area under study

The empirical research was carried out in the Lipno county (*Powiat Lipnowski*; LAU1, formerly NUTS4, with total area of 1,015.6 km^2) in the Kuyavian-Pomeranian Voivodeship (Województwo Kujawsko-Pomorskie in Polish) (NUTS2) in central Poland. It is a unit of territorial administration and local government, comprising nine independent municipalities with a significant predominance of rural areas and agriculture in the functional structure. The county is sparsely populated by ca. 65 thousand inhabitants (70% are rural inhabitants), which makes up 3.2% of the overall population of the voivodship. The Lipno county is a border area within the voivodship (see Fig. 3), peripherally located and distant from the main cities of the region (Bydgoszcz, Toruń, Włocławek, Grudziądz) and thus representing an internal periphery marked by several socio-economic problems and inequalities, including a negative migration balance, depopulation, progressive pauperisation, and marginalisation (see Tab. 2).

Characteristic	**Representation in the sample (%)**						
Age (years)	< 20	20–29	30–39	40–49	50–59	60–69	70+
	1.8%	38.2%	14.5%	20.1%	13.6%	8.2%	3.6%
Gender		Females				Males	
		62.7%				37.3%	
Education	Primary		Basic vocational		Secondary		Higher
	3.6%		21.8%		39.1%		35.5%
Domicile	Detached single-family house		Single-family terraced house		Apartment in a tenement house		Flat
	84.3%		0.9%		1.9%		12.9%
Financial situation	Bad		Average		Good		Very good
	1.9%		44.4%		49.1%		4.6%
Occupation	Student	Professional work		Own business	Own farm	Pensioner, parental leave	
	12.7%	57.3%		3.6%	10.0%	16.4%	

Tab. 1: Socio-economic structure of respondents
Source: authors' survey (N = 110)

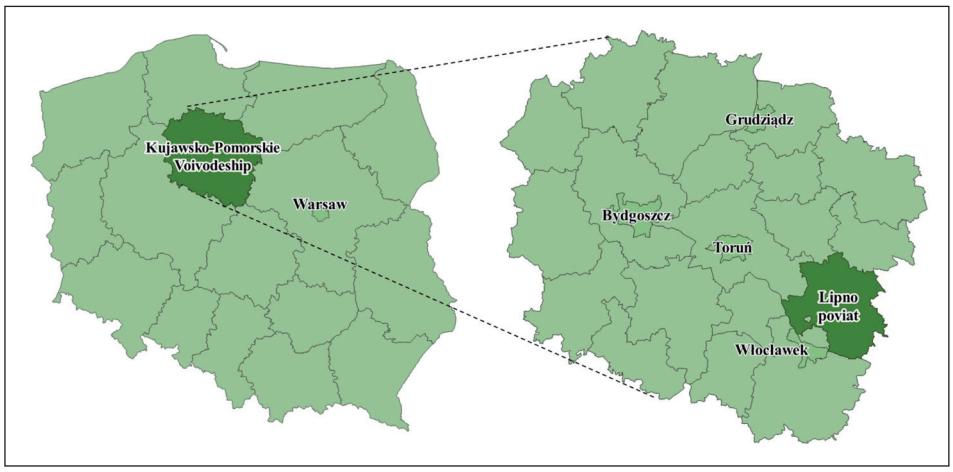

Fig. 3: Area under study – The location of the Lipno county in the Kuyavian-Pomeranian Voivodeship (right) and the location of the voivodship in Poland)
Source: authors' elaboration

	Lipno county	Kujawsko-Pomorskie Voivodship	Poland
Population	64,975	2,047,900	38,080,411
Feminisation rate	101	106	107
Migration balance	– 2.65	– 1.07	0.09
Density of population	64	114	122

Tab. 2: Sociodemographic characteristics of the area under study (2021)
Source: authors' compilation based on Statistics Poland (2022)

We can stress that this is an agricultural and environmentally valuable area (28% of the county´s area is legally protected), but at the same time, the natural conditions of the area are well suited for the development of renewable energy. According to the Kuyavian-Pomeranian Office for Spatial and Regional Planning in Włocławek, there is a high potential for renewable energy generation in the Lipno county (some of which is already in operation). Wind energy and, more recently, solar energy have been notable at the scale of the voivodship. It is worth noting here that the voivodship is the second in Poland in terms of energy production from renewables (Strategia…, 2020). Therefore, the choice of this research area allows us to take a closer look at the energy transition, its manifestations and mechanisms in regions that are peripheral but for renewable energy highly relevant, both for the region and on a wider supra-regional scale.

4. Results

4.1 Energy sources in rural areas: Knowledge and awareness

Renewable energy sources are considered as the best alternative to coal fuel by 67% of rural residents surveyed, followed by nuclear energy, which was supported by 12% of respondents. At the same time, respondents are quite positive about their knowledge of renewables, with 58% of them declaring average knowledge, 34% declaring good knowledge, 6% declaring very good knowledge, and only about 2% declaring poor knowledge. Among the fundamental premises that characterise this knowledge is the general linking of renewables with pro-environmental measures. This significant level of generalisation of the knowledge held is also reflected in the identification of the best power plants from an environmental point of view, i.e. solar (63%), wind (56%), and hydroelectric (38%). These are the most common renewable energy facilities, also known in the literature as the WSW (water, sun and wind) triad (see Krupnik et al., 2022). On the other hand, shortcomings in terms of detailed knowledge are reflected, for example, in the difficulties encountered in deciphering the acronym RES or the term 'unconventional energy'. Respondents are also unaware of possible investment plans to build new energy facilities in their immediate area.

There were opinions among respondents that the most appropriate power plants from the point of view of implementing pro-environmental measures are those using fossil fuels: nuclear (7%) and coal (2%). Analysing the demographic and social characteristics of those indicating nuclear power plants, they are aged between 20 and 40 (63%), with a university education, and professionally employed. They describe their financial situation as good or average and live in detached single-family houses. For respondents supporting coal, the characteristic most strongly correlated with this indication is the fact that they all live in a single-family home, which may indicate that the choice of coal is directly related to the fact that it is used primarily as a heat source in these homes. Habits, routine, and having the infrastructure to burn coal have undoubtedly influenced the final assessment of this source.

The structure of responses on the question on the impact of renewable energy facilities on respondents' physical and mental health, depending on its distance from their place of residence can also yield a vector of the extent of knowledge and perception of RES. Among respondents living within 1 km from the facilities, almost 60% denied any health impact. On the other hand, as the distance to facilities increases, the share of responses declaring the existence of impacts on well-being and health increases, which seems to confirm that the clichéd and schematic perceptions of renewable energy facilities is still strongly present (see Fig. 4).

When comparing respondents' answers to the question on the impact of renewable energy facilities on the quality of life and the landscape, a very interesting picture emerges, shaped by variables related to the respondents' level of education and social status. Overall, far more respondents indicate a positive impact of renewables on the quality of life compared to the number of responses stating a positive impact on the landscape. In contrast, the negative assessments of renewables are far more related to the landscape than the quality of life (see Fig. 5). Among these effects of concern to the public, the following are mentioned first: effects associated with the operation of wind turbines, which are numerous in the study area, including threats to birds' migration, shadow flicker effect, noise annoyance, but also unpleasant odour (applies to biogas plants). A positive assessment relating to the impact of renewable energy facilities on the landscape characterises those with a secondary education, who are in employment, while those with a higher education, including young people still improving their qualifications, are more likely to see a negative impact. Those with higher education also give a negative assessment in terms of the impact of renewables on the quality of life. The group perceiving this negative impact is diverse; its members range from the working population to farm owners and those still in education. In contrast, a positive assessment in this respect is expressed by respondents with basic vocational and secondary education.

4.2 Is knowledge enough?

It is not only the knowledge, awareness, and perception regarding energy sources and technologies, that shape attitudes and behaviours, but also habits resulting from the prevailing energy (carbon) culture in a given area (Bole, 2021). The experiences resulting from each individual exploration of different energy technologies and their confrontation with one's own expectations and needs are also highly relevant (Chodkowska-Miszczuk, 2021). Those living near renewable energy facilities are in this situation. The study area (Lipno

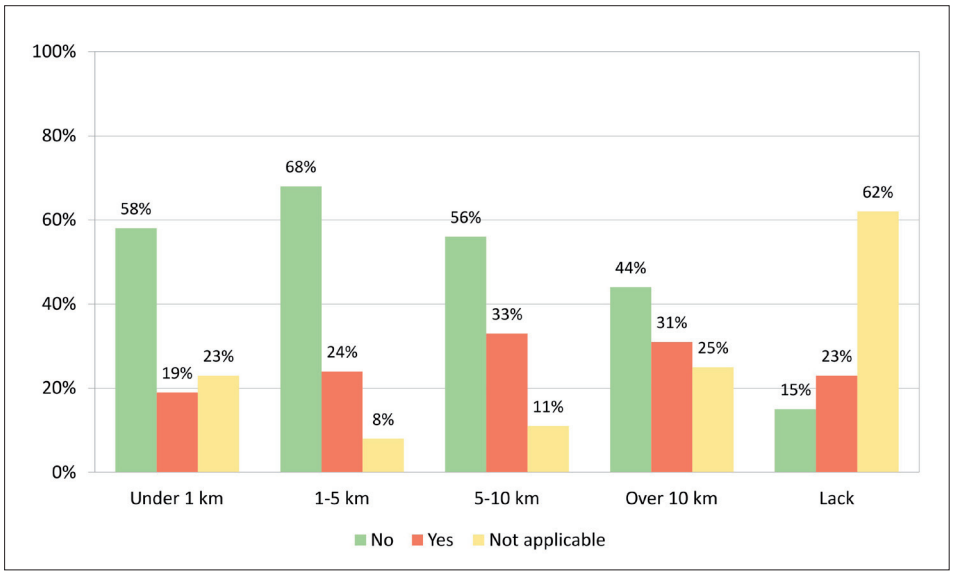

Fig. 4: Structure of responses regarding the impact on health depending on the distance of residence from renewable energy facilities. Source: authors' survey

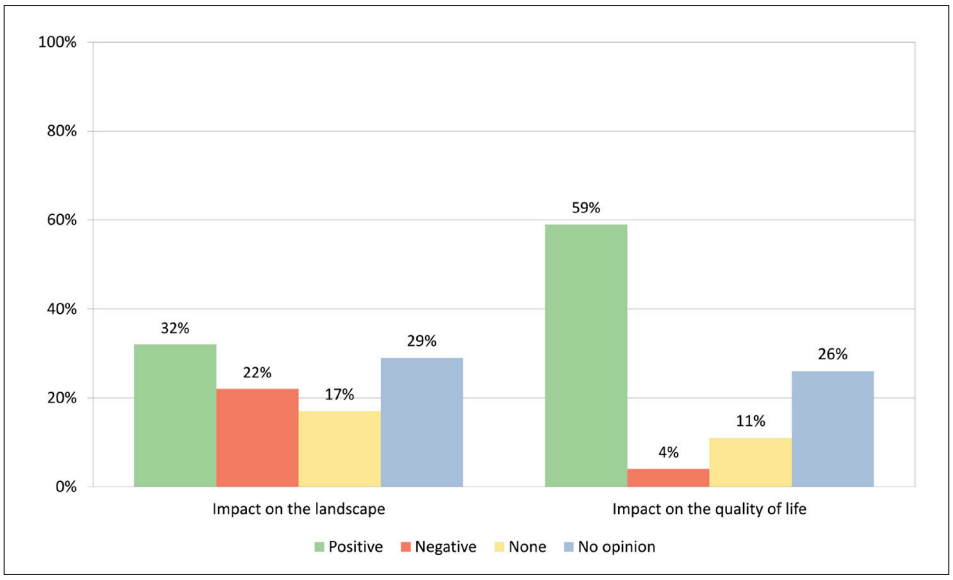

Fig. 5: Structure of responses to the question on the impact of RES on the landscape and quality of life Source: authors' survey

county), which covers an area of approximately thousand square kilometres, is abundant in wind farms (according to the Energy Regulatory Office (2022), there are 21 wind farms consisting of all together 53 wind turbines). The wind turbines are scattered, often located close to residential developments (see Figs. 6 and 7). Hence, nearly three fourths of respondents (74%) live within 5 km of a wind turbine. As the previous research results illustrate, respondents articulate much more negative opinions about RES' impact on the landscape and place than on residents' quality of life and health (see Figs. 4 and 5). This situation is also reflected in the perception of wind farms. Those living within the neighbourhood of wind turbines indicate problems with low noise, a reduction in property values, a negative impact on wildlife (fauna), and an adverse change in the landscape. At the same time, there is a lack of indication of health consequences (Fig. 8).

Personal experiences of renewable energy facilities that shape attitudes and behaviour are also acquired during the direct use of renewable energy technologies. More than 43% of respondents own and use renewable energy technologies and a further 13% of respondents are seriously considering such investments. These are small-scale projects, including photovoltaics (71% of all renewable installations owned), solar panels, and heat pumps. It indicates that the users of one such technology are opting for another, so as to provide electricity and heat production in parallel. The most popular are the 'solar sets', including PVs and solar collector (14% of users) and photovoltaics and heat pumps (9% of users). Sixty percent of owners of renewable energy technologies are satisfied with the investment undertaken, and among the main reasons for investing in their own renewable energy system they indicate a general factor of concern for the environment, but above all individual reasons such as caring for health (smog reduction), building their own energy independence, and receiving financial support for this investment (see Fig. 9).

The individual (and almost immediate) benefits in terms of real savings, building one's own energy security and the financial effects that are associated with the use of individual

Fig. 6: Wind farm in Sumin village, Lipno county
Photo: S. Kuziemkowska

Fig. 7: Wind farm in Dobrzyń nad Wisłą village
Photo: S. Kuziemkowska

renewable energy solutions, are key considerations in shaping knowledge, awareness, attitudes, and energy literacy. Photovoltaic panels, so prevalent in prosumer energy, and solar energy more broadly, are also becoming a vector shaping the structure of large-scale renewable energy. When asked if they would like to replace an existing wind turbine nearby with another plant mode, almost73% of respondents indicate a solar power plant. A further 17% point to hydropower and only 1% are happy to accept a biogas plant. What is extremely important is that only less than 2% of respondents would prefer a traditional power plant (coal or nuclear) in place of a nearby wind power plant. From the newly planned renewable energy facilities, respondents would be most likely to see the afore-mentioned solar power plants in their immediate surroundings (58%), and the least indicated was the biogas plant (2%). It is significant that 13% of respondents do not want to be adjacent to any renewable energy facility (with women predominating in this group).

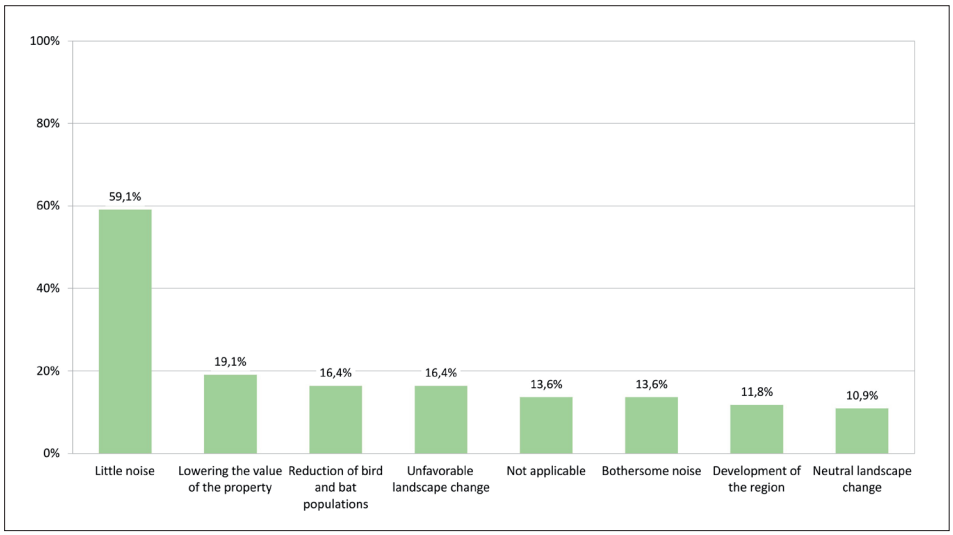

Fig. 8: Structure of responses to the question on the impact of the location of a wind farm near the place of residence Source: authors' survey

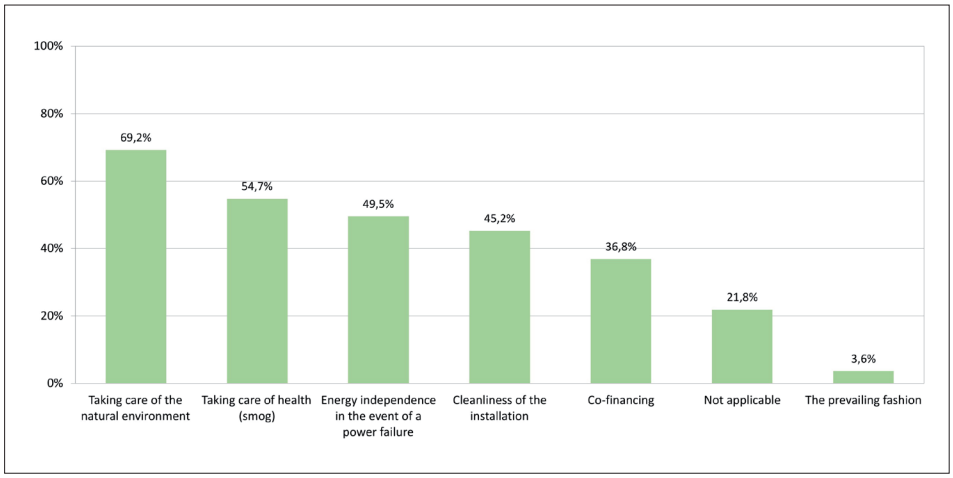

Fig. 9: Structure of responses to the question on the reasons for the decision to purchase and install RES technologies Source: authors' survey

One third of them are, on the one hand, representatives of generations Z and Y (20–30 years old), and another third are, on the other, people between 50 and 60 years old. Half of them have a secondary education and another 30% have a basic vocational qualification. They are mostly employed (57%), but also receiving social support.

5. Discussion

Most of the rural residents surveyed declare that they have knowledge of renewable energy sources, which is quite promising indication for the further energy transition (Zabaniotou, 2018; Chodkowska-Miszczuk et al., 2019). The responses on the question of identifying the diverse types of renewable energy technologies centre on the well-known water-sun-wind triad (Krupnik et al., 2022). Nonetheless, this good, or self-perceived satisfactory, level of knowledge of the local public primarily means that RESs are positioned within the general group of ecological and pro-environmental measures contemporarily promoted and resulting from the implementation of current climate policies and commitments (Furmankiewicz et al., 2021). It is characteristic for the respondents to use vague statements, also borrowed from the media narrative. Clichéd, schematic, and even stereotypical thinking prevails, as evidenced, for example, by the fact that negative opinions about wind power plants are articulated to a much greater extent by people living outside the 10 km zone from the wind power plant than by those directly adjacent to such a facility, who experience the effects of the location of the plants in their surroundings daily. These negative opinions, both in terms of the impact of wind turbines on the landscape and on health, are characteristic of people with a university education, including young people who are still improving their qualifications. Their opinion is based on information obtained from various sources rather than personal experience. It is also worth mentioning here that when asked about their acceptance of possible new power plants, 13% of respondents, mostly women aged 20–30 and 50–60, declare that they do not want to be adjacent to any power plant. And of course, this fact can be directly associated with the NIMBY (Not In My Back Yard) syndrome, but as we know from research (Wolsink, 2007), this idea is too simplistic, static, and unjustified. It is an attractive facade, often used in public discourse. Opposition to energy projects cannot be defined solely by the criterion of physical distance because other factors play a crucial role: social and cultural (Wolsink, 2007, Chodkowska-Miszczuk et al., 2021). In this context, gender and the division of traditional social functions should be considered. Concern for energy security is more the domain of men than women, which is related to a different

awareness of this issue (Chodkowska-Miszczuk, 2022). General declarations of knowledge of renewable energy are not borne out by a more detailed and specialised range of knowledge. So, they are familiar with the popular term 'windmills' used for wind power plants, or 'solar' for PVs and solar thermal collectors, but they have problems correctly deciphering the acronym RES. They do not know what the investment plans are in this field in their immediate vicinity, both defined by the lowest administrative levels (LAU2 and LAU1). And yet the rural area under study is predestined for the development of renewable energy sources, as the already existing plants seem to confirm. Undoubtedly, this local energy awareness would be strengthened by people acting as local leaders – change leaders (Kola-Bezka, 2020). To break the carbon lock-in and trigger the mechanisms of change, practical, contextual, place-based knowledge is needed to shape responsive attitudes. And this is what local leaders have: investors and owners of RES installations (Chodkowska-Miszczuk, 2022) can also play their role.

Knowledge and, more broadly, awareness can be formed through direct and long-term experience as an owner of the operation of new energy technologies using renewable energy sources. This change is most clearly expressed by the popularisation of prosumer PV installations in recent years and intensified in recent months, obviously as a result of public support (Energy Market Agency, 2022). In Poland, the first two months of 2022 alone saw an increase of PV capacity by more than 1 GW, guaranteeing a place on the European podium in terms of PV capacity. It is estimated that three fourths of the installed capacity in Polish photovoltaics are prosumer solutions (Instytut Energetyki Odnawialnej, 2022). The benefits of having small-scale PVs as part of the household, especially in a hybrid version providing heat and electricity production, clearly provoke an approving attitude towards this type of generator and solar energy. These favourable and convincing effects have gained prominence and strengthened in recent months, i.e. since the beginning of the energy and economic crisis, because in addition to real financial savings, the presence of one's own renewable energy solutions guarantees the building of individual independence. And it is the individual benefits and gains that come with the development of renewable energy projects that are key to creating mechanisms for change, as they are primarily responsible for the effective transposition of policy objectives and targets (e.g. on building climate neutrality) from general slogans and messages to the local level and local needs and opportunities.

The positive reception of small scale PV projects also translates into favourable views on large-scale solar farms. It is photovoltaic farms that are desired by rural residents, eager to see them replace the existing wind farms, which have a much longer history in the Polish rural space than large-scale photovoltaics. And according to the survey, the perception of wind turbines is generally positive rather than negative, both in terms of their impact on quality of life and the landscape. This raises the question of whether a unidirectional vector of change, focused on the use of a single energy source (solar energy) can lead to multifaceted and non-obvious consequences and ultimately prove unreliable. The asymmetric development of the renewables portfolio may bring further challenges, such as the need to ensure continuity of electricity production, which is not so obvious in the case of PV. It can also lead to the emergence of socio-spatial conflicts regarding land use changes in the form of the exclusion of large areas of agricultural land from agricultural production and their allocation for industrial (energy) activities. The extremely tempting option associated with the rapid development of large-scale PV farms in rural areas, as those with public support, may highlight the weakness of the transformation so conceived. We are already seeing such problems with wind farms, once equally strongly promoted. Rural areas are primarily the location of large-scale RES power plants, which incurs investment and subsequent operating costs, while the energy generated there can be and is consumed in another, often remote area, such as a city (Buechler and Martínez-Molina, 2021). Therefore, Faulques et al. (2022) highlight the spatial distributive justice as one of the fundamental motivators of renewable energy development. The fact that rural society unilaterally bears the costs that result from locating energy production sites in rural areas is not compatible with sustainable development and a just transition.

It is worth considering at this point whether building public awareness as a key driver of the social change that is the energy transition (Krupnik et al., 2022) by providing direct experience of the effects of small-scale RES systems might be a proxy for larger-scale change. If the involvement of one renewable source in prosumer energy brings such benefits in terms of public acceptance and perception of this source on a larger scale, perhaps this is the right way to familiarise people with other types of renewable energy technologies? Of course, this process requires system support, just as with photovoltaics. What is needed here is an adaptive mechanism that would allow energy needs to be flexibly adapted to the possibilities offered by a variety of sources and technologies. The energy mix can be created both by WSW and other sources, e.g. biogas, whose raw materials (including waste) are produced and available almost everywhere (Chodkowska-Miszczuk et al., 2021). Differentiation is undoubtedly the key here, as this is the only way to build and increase individual financial, energy, and logistical benefits that lead in a broader sense to sustainable system changes. In the current times of crisis, building energy security is also taking on a new dimension, as it turns out that coal (which is the backbone of the Polish energy sector, including households) is becoming a niche commodity, both due to its rising price and limited availability. Hence, there is a need for greater attention to local action but carried out in such a way as to address the barriers to building local energy security arising from the presence of administrative borders (Perrin, Bouisset, 2022). In our view, therefore, the local level represented in our study by the county (LAU1), which brings together several or even more than a dozen smaller units (municipalities/LAU2) is an excellent area for joint energy actions tailored to the needs of local society. This is because it does not lose local context, but bypasses the restrictions of administrative arrangements and, above all, strengthens local potential and social capital through cooperation.

6. Conclusions

The overall aim of the research presented in this paper was to better understand rural communities' awareness and perceptions of energy sources, particularly renewable energy facilities, as these occur among the population of the Lipno county in central Poland. The survey that included diverse groups of the population was conducted so that as many perspectives as possible could be covered. Our findings are summarised below. Renewable energy sources are referenced by two thirds of our respondents as an optimal alternative to traditional sources of energy. This is a rather optimistic result that we believe is affected by widespread use of

renewables in the Lipno county. Our respondents are also quite positive about their knowledge concerning advantages and disadvantages of individual renewable energy sources, but as shown in our findings, the reality is very different and rather limited. To illustrate the limited level of awareness about renewable energy, most respondents supported the simplifying premise that renewable energy is principally linked to pro-environmental measures (than to cover their basic energy needs). This finding is surprising and deserve further clarification.

As the most suitably renewable energy facilities from an environmental point of view, solar power plants were mentioned the most frequently by nearly two thirds of respondents (63%), followed by wind turbines by more than half of respondents (56%), and hydroelectric (38%). On the other hand, the lowest environmental benefits were connected to nuclear (7%) and coal (2%) power plants. We find the extremely low support for nuclear energy surprising given to the ongoing geopolitical situation and energy crisis evolving in Eastern Europe since early 2022. This finding also deserves more in-depth inquiry. Among the surveyed respondents living within 1 kilometre of any renewable energy facility, almost 60% denied any impact on their health. On the other hand, two fifths of our respondents declare that some health impact is possible, which is a worrying finding. We are aware of a relatively small sample of respondents, however, that might have affected our results.

Overall, far more respondents indicated a positive impact of renewable energies on local quality of life when compared to those stating a positive impact on the landscape. It seems that the population of the Lipno county is more sensitive and rather conservative as for landscape protection, which might be a consequence of numerous renewable energy facilities installed in the region in the last years without truly in-depth consultations with local people. For example, the effects frequently associated with the operation of wind turbines, which are numerous in the study area, included threats to bird migration, shadow flicker effect, noise, but also unpleasant odour (applies to biogas plants).

Another surprising finding is that more positive assessment of the impact of renewable energies on the landscape was detected by respondents with a secondary education than with respondents with a higher education (and young people) who are more likely to see negative impacts. Additionally, those with higher education negatively assessed the impact of renewable energy on the quality of life. This group is diverse; its members range from the working population to farm owners and those still in university education. In contrast, a positive evaluation is expressed by respondents with basic vocational and secondary education. This result is an alarming finding that needs to be taken into consideration when planning further renewable energy projects and planning awareness campaigns.

Almost three quarter of our respondents live within 5 kilometres from a wind turbine. The neighbourhood experience was measured far more negative than positive. To be clear about the factors feeding the negative attitudes, noise is mentioned primarily, although the levels of noise are described as low, followed by a threat of reduction of their property value. Our findings from the Lipno county also suggest a negative impact on faunae, and an adverse change in the landscape. Our respondents would be most likely to see in their neighbourhoods the solar power plants (57.8% of responses), while just 1.8% indicated their willingness to live in the proximity of biogas plant.

We believe that our findings contribute to building the knowledge base about the attitudes about renewable energy in peripheral regions, where renewable energy facilities are frequently operating on a large scale but mutual communication between the investors and local populations is traditionally lower. We argue that although just transition principles are leading our way towards more sustainable futures, unjustifiable regional differences still can be found in rural peripheries. In other words, there is undoubtedly a need for decision-makers to pay more attention to addressing the issue of equitable energy transition in rural areas.

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References:

AHMED, S., HASAN, M. M., KAMAL, M. R. (2022): Russia–Ukraine crisis: The effects on the European stock market. European Financial Management. Early View.

ARIA, M., CUCCURULLO, C. (2017): Bibliometrix: An R-tool for comprehensive science mapping analysis, Journal of Informetrics, 11(4): 959–975.

BOLE, D. (2021): What is industrial culture anyway?' Theoretical framing of the concept in economic geography, Geography Compass, 15(11): e1295.

BUECHLER, S., MARTÍNEZ-MOLINA, K. G. (2021): Energy justice, renewable energy, and the rural-urban divide: Insights from the Southwest U.S., Energy and Climate Change, 2: 100048.

CHANG, M., THELLUFSEN, J. Z., ZAKERI, B., PICKERING, B., PFENNINGER, S., LUND, H., ØSTERGAARD, P. A. (2021): Trends in tools and approaches for modelling the energy transition. Applied Energy, 290: 116731.

CHERP, A., VINICHENKO, V., JEWELL, J., BRUTSCHIN, E., SOVACOOL, B. (2018): Integrating techno-economic, socio-technical and political perspectives on national energy transitions: A meta-theoretical framework. Energy Research & Social Science, 37: 175–190.

CHODKOWSKA-MISZCZUK, J. (2022): A new narrative for sustainability: Exploring biogas plants as 'first movers' in raising energy awareness, Australian Journal of Environmental Education, Cambridge University Press, 28(2): 152–167.

CHODKOWSKA-MISZCZUK, J., MARTINÁT S., COWELL, R. (2019): Community tensions, participation, and local development: factors affecting the spatial embeddedness of anaerobic digestion in Poland and the Czech Republic. Energy Research and Social Sciences, 55: 134–145.

CHODKOWSKA-MISZCZUK, J., MARTINÁT, S., VAN DER HORST, D. (2021): Changes in feedstocks of rural anaerobic digestion plants: external drivers towards a circular bioeconomy. Renewable & Sustainable Energy Reviews, 148: 111344.

CHODKOWSKA-MISZCZUK, J., KOLA-BEZKA, M., LEWANDOWSKA, A., MARTINÁT, S. (2021a): Local Communities' Energy Literacy as a Way to Rural Resilience-An Insight from Inner Peripheries. Energies, 14(9): 2575.

CHUNG, J. B., KIM, E. S. (2018): Public perception of energy transition in Korea: Nuclear power, climate change, and party preference. Energy Policy, 116: 137–144.

DEVINE-WRIGHT, P. (2005): Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. Wind Energy: An International Journal for Progress and Applications in Wind Power Conversion Technology, 8(2): 125–139.

DEVINE-WRIGHT, P. (2012): Renewable energy and the public. New York, Routledge.

DRANKA, G. G., FERREIRA, P., VAZ, A. I. F. (2022): Co-benefits between energy efficiency and demand-response on renewable-based energy systems. Renewable and Sustainable Energy Reviews, 169: 112936.

DUARTE, R., GARCÍA-RIAZUELO, A., SÁEZ, L. A., SARASA, C. (2022): Economic and territorial integration of renewables in rural areas: Lessons from a long-term perspective, Energy Economics, 110: 106005.

DWIVEDI, A., DWIVEDI, P., JOSHI, K., SHARMA, V., SENGAR, A., AGRAWAL, R., SHARMA, P. K., DIXIT, G., BARTHWAL, M. (2022): Local leader's impact on adoption of renewable energy generation technology by rural communities in the Himalayan region, Journal of Cleaner Production, 352: 131479.

EDOMAH, N., BAZILIAN, M., SOVACOOL, B. K. (2020): Sociotechnical typologies for national energy transitions. Environmental Research Letters, 15(11): 111001.

EISER, J. R., ALUCHNA, K., JONES, C. R. (2010): Local wind or Russian gas? Contextual influences on Polish attitudes to wind energy development. Environment and Planning C: Politics and Space, 28 (4): 590–608.

ENERGY MARKET AGENCY (2022): [online]. Available at: https://www.are.waw.pl/

ENERGY REGULATORY OFFICE (2022): [online]. Available at: https://www.ure.gov.pl/pl

EUROBAROMETER (2014): Climate Change, Special Eurobarometer 409. Brussels, European Commission [online]. [cit. 14.07.2018]. Available at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_409_en.pdf

EUROPEAN GREEN DEAL (2020): [online]. Available at: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal

FAULQUES, M., BONNET, J., BOURDIN, S., JUGE, M., PIGEON, J., RICHARD, C. (2022): Generational effect and territorial distributive justice, the two main drivers for willingness to pay for renewable energies, Energy Policy, 168: 113094.

FRANKOWSKI, J., HERRERO, S. T. (2021): "What is in it for me?" A people-centered account of household energy transition co-benefits in Poland. Energy Research & Social Science, 71: 101787.

FRANTÁL, B. (2015): Have local government and public expectations of wind energy project benefits been met? Implications for repowering schemes. Journal of Environmental Policy & Planning, 17(2): 217–236.

FURMANKIEWICZ, M., HEWITT, R. J., KAZAK, J. K. (2021): Can rural stakeholders drive the low-carbon transition? Analysis of climate-related activities planned in local development strategies in Poland, Renewable and Sustainable Energy Reviews, 150: 111419.

GEELS, F. W., SCHWANEN, T., SORRELL, S., JENKINS, K., SOVACOOL, B. K. (2018): Reducing energy demand through low carbon innovation: A sociotechnical transitions perspective and thirteen research debates. Energy Research & Social Science, 40: 23–35.

GUEST, G., BUNCE, A., JOHNSON, L. (2006): How many interviews are enough? An experiment with data saturation and variability. Field Methods, 18(1): 59–82.

INSTYTUT ENERGETYKI ODNAWIALNEJ (2022): Rynek fotowoltaiki w Polsce. Warszawa, Instytut Energetyki Odnawialnej.

INTERNATIONAL ENERGY AGENCY (2022): World Energy Balances [online]. Available at: https://www.iea.org

KANGER, L. (2021): Rethinking the Multi-level Perspective for energy transitions: From regime life-cycle to explanatory typology of transition pathways. Energy Research & Social Science, 71: 101829.

KAYA, O., FLORKOWSKI, W. J., US, A., KLEPACKA, A. M. (2019): Renewable energy perception by rural residents of a peripheral EU region. Sustainability, 11(7): 2075.

KERIMRAY, A., ROJAS-SOLÓRZANO, L., TORKMAHALLEH, M. A., HOPKE, P. K., GALLACHÓIR, B. P. Ó. (2017): Coal use for residential heating: patterns, health implications and lessons learned. Energy for Sustainable Development, 40: 19–30.

KIM, J., JEONG, D., CHOI, D., PARK, E. (2020): Exploring public perceptions of renewable energy: Evidence from a word network model in social network services. Energy Strategy Reviews, 32: 100552.

KOLA-BEZKA, M. (2020): Community-led local development in urban and other areas: Lessons from Kujawsko-Pomorskie voivodship. Economics and Law, 19: 505–521.

KŘIŠTOFOVÁ, K., LEHNERT, M., MARTINÁT, S., TOKAR, V., OPRAVIL, Z. (2022): Adaptation to climate change in the eastern regions of the Czech Republic: An analysis of the measures proposed by local governments. Land Use Policy, 114: 105949.

KRUPNIK, S., WAGNER, A., KORETSKAYA, O., ... , VON WIRTH, T. (2022): Beyond technology: A research agenda for social sciences and humanities research on renewable energy in Europe. Energy Research & Social Science, 89: 102536.

LAMY, J., DE BRUIN, W. B., AZEVEDO, I. M., MORGAN, M. G. (2020): Keep wind projects close? A case study of distance, culture, and cost in offshore and onshore wind energy siting. Energy Research & Social Science, 63: 101377.

LARSON, E. C., KRANNICH, R. S. (2016): "A great idea, just not near me!" understanding public attitudes about renewable energy facilities. Society & Natural Resources, 29(12): 1436–1451.

LIU, J., ZHOU, W., YANG, J., REN, H., ZAKERI, B., TONG, D., GUO, Y., KLIMONT, Z., ZHU, T., TANG, Z., TANG, X., YI, H. (2022): Importing or self-dependent: energy transition in Beijing towards carbon neutrality

and the air pollution reduction co-benefits. Climatic Change, 173(3): 1–24.

MAJI, P., KANDLIKAR, M. (2020): Quantifying the air quality, climate and equity implications of India's household energy transition. Energy for Sustainable Development, 55: 37–47.

MARTINÁT, S., CHODKOWSKA-MISZCZUK, J., KULLA, M., … , FRANTÁL, B. (2022): Best Practice Forever? Dynamics behind the Perception of Farm-Fed Anaerobic Digestion Plants in Rural Peripheries. Energies, 15(7): 2533.

MARTINÁT, S., COWELL, R., NAVRÁTIL, J. (2020): Rich or poor? Who actually lives in proximity to AD plants in Wales?. Biomass and Bioenergy, 143: 105799.

MROCZEK, B. (2011): Akceptacja dorosłych Polaków dla energetyki wiatrowej i innych odnawialnych źródeł energii. Streszczenie raportu; Pomorski Uniwersytet Medyczny w Szczecinie, Szczecin, Zakład Publicznego.

PERRIN, B. (2022): Emerging local public action in renewable energy production. Discussion of the territorial dimension of the energy transition based on the cases of four inter-municipal cooperation entities in France, Energy Policy, 168: 113143.

RAŠKA, P., FRANTÁL, B., MARTINÁT, S., HRUŠKA, V. (2022): Exploring local land use conflicts through successive planning decisions: a dynamic approach and theory-driven typology of potentially conflicting planning decisions. Journal of Environmental Planning and Management, 1–20.

SHOVE, E. A. (2003): Comfort, Cleanliness and Convenience: The Social Organization of Normality. Berg.

STANDAR, A., KOZERA, A., SATOŁA, Ł. (2021): The Importance of Local Investments Co-Financed by the European Union in the Field of Renewable Energy Sources in Rural Areas of Poland. Energies, 14(2): 450.

STOBER, D., SUŠKEVIČS, M., EITER, S., MÜLLER, S., MARTINÁT, S., BUCHECKER, M. (2021): What is the quality of participatory renewable energy planning in Europe? A comparative analysis of innovative practices in 25 projects. Energy Research & Social Science, 71: 101804.

STRATEGIA ROZWOJU WOJEWÓDZTWA KUJAWSKO-POMORSKIEGO DO 2030 ROKU (2020): Strategia Przyspieszenia 2030+. Załącznik do uchwały nr XXVIII/399/20 Sejmiku Województwa Kujawsko-Pomorskiego z dnia 21 grudnia 2020 r. Wloclawek, Województwo Kujawsko-Pomorskie.

TRANSFORMACJA ENERGETYCZNA W POLSCE (2022): Forum Energii, Analizy i dialog [online]. Available at: https://www.forum-energii.eu/pl/analizy/transformacja-2022

UNITED NATIONS (2015): The Paris Agreement [online]. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

UNITED NATIONS (2022): Global impact of war in Ukraine: Energy crisis [online]. Available at: https://news.un.org/pages/wp-content/uploads/2022/08/GCRG_3rd-Brief_Aug3_2022_FINAL.pdf

VAN DER HORST, D. (2007): NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies. Energy policy, 35(5): 2705–2714.

VUJANOVIĆ, M., WANG, Q., MOHSEN, M., DUIĆ, N., YAN, J. (2021): Recent progress in sustainable energy-efficient technologies and environmental impacts on energy systems. Applied Energy, 283: 116280.

WOJCIECHOWSKA-SOLIS, J., OROKA, A. (2018): Attitude of the Polish society towards renewable energy sources. Segmentation by gender. Intercathedr, 1: 87–93.

WORLD ENERGY OUTLOOK (2019): Energy Information Administration [online]. [cit. 02.10.2022] Available at: https://www.eia.gov/todayinenergy/detail.php?id=41433

WOLSINK, M. (2007). Wind Power Implementation: The Nature of Public Attitudes: Equity and Fairness instead of 'backyard Motives', Renewable and Sustainable Energy Reviews 11(6): 1188–1207.

WYLON, M., KEMPA, A., SŁOWY, A., CHODKOWSKA-MISZCZUK, J. 2018): Challenges of urban transport in the face of studentification – a case study of Toruń, Economic and Regional Studies, 11(4): 90–109.

ZABANIOTOU, A. (2018) Redesigning a bioenergy sector in EU in the transition to circular waste-based Bioeconomy-A multidisciplinary review, Journal of Cleaner Production, 177: 197–206.

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