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MAPPING LITHUANIAN TRANSITION TOWARDS SUSTAINABLE ENERGY: SOCIOLOGICAL ACCOUNT ON A WASTE-TO-ENERGY CASE*

Dainius Genys [1]*, Aušra Pažėraitė [2]

[1,2] Energy Security Research Center, Vytautas Magnus University, Vileikos g. 8, 44404 Kaunas
Economics and Management Faculty, Vytautas Magnus University, K. Donelaičio g. 52, 44244 Kaunas

E-mails:[1]dainius.genys@vdu.lt (Corresponding author); [2]ausra.pazeraite@vdu.lt*

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Abstract. Energy production technologies have become closer to people's everyday life. Therefore, its social acceptability and scale of spread play a significant role in moving towards a climate-neutral society. A growing body of academic literature shows that social aspects are becoming more central in the transition process. The study's novelty derives from the conceptual framework for analyzing the possible social challenges of the transition and from empirical data that contributes to a more thorough understanding of the direction of the transition and practical opportunities identified by the experts. This article explores expert opinions of Lithuanian readiness to transit towards sustainable energy by analyzing the applicability of Waste to Energy (WtE) and further development in Lithuania. The transition and social acceptability are discussed in three dimensions (socio-political, communal and market). The paper is based on qualitative research conducted at the end of 2021 and the beginning of 2022. Among other discoveries, the study revealed that the majority of experts tend to support WtE input for the Lithuanian transition towards a sustainable energy sector but indicated that some better public awareness, as well as the justified and transparent mechanism of WtE implementation (to correspond with public interest), are needed.

Keywords: sustainable transition; energy sector; waste-to-energy; expert; Lithuania

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1. Introduction

The relationship between energy and the economy in the contemporary world is interdependent. In modern times, energy served as a fundamental driver of human history and has shaped world economics, politics, and even the social structures of human life (Ang et al., 2015). The transition toward sustainable energy will be another big step. A well-functioning and consistent energy sector performance is especially crucial in such a small country as Lithuania. Lithuania inherited the energy sector, which was neither efficient nor developed to respond to the independent country's needs (for more than two decades, it was dependent on Russian energy) (Augutis et al., 2012). To move away from an "energy island" and to pursue a dynamic and so-called independent energy sector, Lithuania had to restructure its energy sector fundamentally: to diversify energy sources and suppliers, create internal markets and international access markets, etc. (Švedas, 2017). The quest was extensive and ambitious but most importantly – successful. However, Lithuania and the rest of the EU are facing another necessary transition – moving from a traditional (fossil fuel dominant) to a sustainable energy sector based on renewables and circular economy principles.

In June 2018, Lithuania adopted an updated National Energy Independence Strategy, which corresponds with both EU policy and the National Climate Change Management Strategy and sets the strategic goal of ensuring the energy needs of the Lithuanian population and business by defining a vision for the energy sector as a whole, as well as the directions for its further development and the principles of implementation (Lietuvos Respublikos Seimas, 2018). One of the key objectives mentioned in this strategy is to reduce the energy sector's impact on climate change and air pollution by moving towards green energy and energy-saving initiatives. The strategy emphasizes that the share of renewable energy must increase as technologies develop, thus ensuring that Lithuania improves energy security by 2020, its ability to compete in the energy sector by 2030 and energy sustainability and self-sufficiency by 2050 (Lietuvos Respublikos Seimas, 2018). Such a transition aiming for a sustainable and competitive energy sector being able to decrease consumption but increase efficiency stimulates to look for innovative technological solutions and their successful implementation. These are also necessary prerequisites for the successful development of the circular economy seeking to reduce resource use and waste generation. It is worth mentioning that important changes require a sufficient level of public involvement (Eurobarometer, 2017), resulting in behavioural changes and acceptance of new social norms. Moreover, society finds proper waste management one of the most important issues when considering climate change (Pažėraitė et al., 2021). Waste-to-energy (WtE) plants are pivotal for the transition towards sustainable energy based on a circular economy (Caferra et al., 2022; Kothari & Pathak, 2010; Pan et al., 2015).

The energy transition issues are increasingly appearing in the Lithuanian political discourse, which shows that this problem is becoming more and more relevant at the state level (Grigas, 2013; Česnakas et al., 2018). Participation in various international initiatives and the aspiration to respond to the global goals set by international organizations gradually contribute not only to the renewal of infrastructure and the implementation of technological innovations but also to changes in the mentality of Lithuanian society (Leonavičius & Genys, 2017). Such a challenge demands both discursive and objective risk assessments, based not only on technical and scientific rationality but also on collective reflection (including both individual and community levels) in creating the future of society.

Accordingly, this article aims to explore expert opinions on Lithuanian readiness to transit towards sustainable energy by analyzing WtE applicability and further development in Lithuania. The task of empirical research is to review the aspects that have both positive and negative impacts on the country's transition identified by experts. An expert in this article is defined as someone who has knowledge in the relevant field and is recognized by others as a qualified expert in a particular area (Rae & Alexander, 2017) and can provide the most relevant information. To cover the holistic view, specific WtE stakeholder groups were identified following their role in

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2022 Volume 10 Number 2 (December)
http://doi.org/10.9770/jesi.2022.10.2(33)

the WtE production value chain, i.e., users, scientists, technology developers, service suppliers, and policymakers. The research is based on qualitative research (the methodology is discussed later in the text) conducted at the end of 2021 and the beginning of 2022. The novelty of the study derives from the conceptual framework for analyzing the possible social challenges of the transition, as well as from empirical data that contributes to a more thorough understanding of the direction of the transition, limiting obstacles and practical opportunities for how to tackle them identified by the experts.

2. Sociological contexts and dimensions of energy transition

The energy sector could be understood as an inevitable part of the development of industrial society, the development of which in itself (from an objectivist point of view) creates threats (i.e., ecological disasters, etc.) and contributes to the emergence of a risk society (Beck, 1992; 1998). The development of the energy sector is related to the need to ensure a reliable energy supply and to provide ourselves with cheap and ecological energy resources (Winzer, 2012; Sovacool & Griffiths, 2019). The pursuit of sustainable transition is intertwined with various technical, economic, ecological, political, social and even cultural aspects. It is believed that such complicated connections conflict with each other (Sovacool & Mukherjee, 2011). For example, economic interests and environmental protection have long been considered incompatible, but emerging environmental threats and improving technologies encourage further economic development to be developed through an environmentally friendly perspective (Zinn, 2006). The ambition of the Green Deal formed by the EU, which combines the ideas of sustainable development and the circular economy, encourages the search for synergy between economic growth, environmental protection and social justice. Broader integration of waste into the circular economy can result in various benefits. From a financial point of view, it can significantly foster the supply of sustainable bioproducts and bioenergy (Jain et al., 2022). The growing supply is accompanied by the development of innovations, which substantially contributes to sustainable development at large (Lieder & Rashid, 2016). Another study showed that the transition toward a circular economy facilitates valuable financial, environmental, and social performance (Rodríguez-Espíndola et al., 2022). It is worth mentioning that societal benefits are faster perceived if dedicated policy measures are in place (Rodríguez-Espíndola et al., 2022). Despite the societal benefits of the circular economy, various challenges remain. One of them is the consensus among all the stakeholders involved and finding valuable patterns of cooperation (Paiho et al., 2020) in meeting their own and society's needs. Some experts argue that cultural hesitation may be named among the most pressing barriers to circular economy development (Kirchherr et al., 2018). Some studies suggest that these barriers are determined by the lack of governmental activism (Kirchherr et al., 2018) in building awareness among different social groups.

More than one study (Augutis et al., 2017; Vosylius et al., 2013; Baublys et al., 2015) is devoted to the analysis of the security of the Lithuanian energy sector and the search for security enhancement scenarios. It is claimed that the priorities of Lithuania's energy security do not fundamentally differ from those of many other Western European countries, where energy security is associated with ensuring the possibility of self-sufficiency in energy resources (Juozaitis, 2020). The quest for sustainability in the energy sector is understood not only as the physical ability to acquire the desired type of energy resources, or the ability to pay an acceptable price for them (one that would not harm the functioning of economic entities, meet the financial capabilities of the population and would not stop the development of the state's economy), but to ensure a gradual transition to renewable energy sources, increasing the use of solar, wind and other low-polluting energy sources, helping to decarbonize the entire EU economy.

The connections between energy, its sources and various technologies with society's everyday environment in these modern times not only contribute to the challenges posed by the development of complex techno-economic processes but also require much more rational, considered risk assessments and collective reflection in creating the future of society. The emerging need to assess various emerging risks, not as discursively constructed, but as actually existing, moving away from techno-scientific rationality and approaching the level of the individual and

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2022 Volume 10 Number 2 (December)
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his experience (Beck, 1992), encourages sociological researchers to contribute to new ideas and ways of acting emergence, corresponding to new social changes. The ideas of sustainable development and circular economy are increasingly being applied, creating visions of goals to be implemented in the areas of economic growth, environmental protection and social equality (Dryzek, 1997).

To achieve a smooth energy transition, not only specific policy measures are needed, but also the analysis supporting them, which would meet the expectations of all interested parties. Alignment of interests is possible only if it is not limited to the application of advanced calculation techniques or narrow expert knowledge, but is fully enabled through cooperation between all participating interest groups (Fischhoff, 2015). Research also shows that stakeholders at different levels can play an important role in contributing to the social acceptability of technological development (Cohen et al., 2014).

The development or transition of the energy sector depends not only on technological progress but also on the previously mentioned factors resulting from economic, social, political and other circumstances. Different authors (Wolsink, 2010; Barat-Auleda & Domènech, 2022) present different necessary configurations of the circumstances enabling the energy transition. Swiss scientists (Wüstenhagen et al., 2007), analyzing the social acceptability factors of renewable energy, distinguish three levels that guarantee a smooth energy transition.

The first dimension is socio-political acceptability, which relates to the social acceptability of technology at all levels (Wüstenhagen et al., 2007). Most of the obstacles to the successful implementation of projects are caused precisely by the lack of social approval. Sociopolitical acceptability includes both the attitude of ordinary citizens and other actors, such as policymakers and other interested parties, who, by applying various strategies, can influence public opinion and acceptability. In other words, this dimension allows us to grasp the potential of approval that exists in society.

The second dimension is community acceptability, for which the approval of the local community is the most important. The potential for dissent is linked to a social factor known as "nimby" (not in my backyard) found in the development of earlier energy technologies (primarily nuclear energy). According to the authors, people tend to support renewable energy if it is not implemented in their backyard. Another essential aspect of this dimension (which also impacts the broader society) is the distribution of returns from implemented projects. The authors argue that key factors influencing community acceptance include the relationship between distributive justice (how costs and benefits are shared), procedural justice (opportunities for all relevant stakeholders to participate in the decision-making process), and the trust of local communities in information and investor intentions (Wüstenhagen et al., 2007).

The third dimension is market acceptability, which includes the process of acceptance of innovation in the market, including the roles of consumers, investors and industry. Renewable energy and the associated interpretation of potential benefits are popular in public discourse as they allow speakers to promise a "beautiful future" (cheap and green energy). However, according to the authors, the reality is that, first of all, the desire of specific entities (regardless of the government or entrepreneurs) to invest in technology must appear, as well as a sufficient number of consumers willing to pay a potentially higher price for environmentally friendly energy (Wüstenhagen et al., 2007). Thus, market acceptability can also be a determining factor affecting other dimensions. For example, if some new technology is more efficient than old ones (or contributes to the solution of some current ecological problem), is able to offer tangible benefits, and the market is able to facilitate the practical limitations of the new technology, this can increase both social and community acceptance. WtE could be a typical example of politicians juggling catchy slogans. Behind it are different technologies with different levels of readiness, which makes local communities not inclined to become a testing ground (Malinauskaite et al., 2017; Caferra et al., 2021).

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2022 Volume 10 Number 2 (December)
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3. The role of energy experts: visioning solutions or accumulating problems?

Regarding the role of experts in the energy transition context, they have a great responsibility to evaluate many aspects and circumstances before proposing a concrete solution. This kind of pressure scares the experts themselves. The reluctance to betray the public's trust due to inadequate assessment of the existing threats often encourages the evaluation of the situation based on the principles of the "worst-case scenario" (Dupras & Williams-Jones, 2012). Bearing in mind the social construction of risk, when examining experts' opinions and before presenting generalizations, it is crucial to ensure that the research group consists of experts from a broader range of fields. In addition, there is a risk of overextending the object and it is difficult to calibrate unequivocal arguments. On the other hand, it allows us to see a broader perspective by grasping potential points of disagreement and tension, which will inevitably require a public voice and a political solution to overcome (Leonavičius, Juozaitis & Genys, 2019).

Expert assessments are usually based on the available more immense amount of information, knowledge of specific areas, or the ability to extrapolate data from the past, predicting the future. Detailed modelling of the situation allows for establishing clear criteria for the decision-making process and the application of political strategies, assessing the need for further research, and discussing the problem in a unique way, even in the context of uncertainty (Chilvers & Kearnes, 2020). Accordingly, expert assessments are given greater weight in strategic issues, including the EU's aspiration to ensure a sustainable transition to renewable energy.

An expert approach, especially when interviewing qualified professionals from different fields, helps to grasp a holistic picture of the problem under consideration. The ability to combine the available knowledge with their interpretations by directing considerations to the search for specific actions consequently allows turning abstract knowledge into concrete advice. The expert approach expands the public discourse of energy security and introduces rational arguments indicating sensitive issues, possible development scenarios and optimal ways of solving them (Collins & Evans, 2007).

4. Methodology

A qualitative research approach (semi-structured qualitative interviews and a focus group discussion) is used in the study to gain knowledge about the research question from the interviewee's perspective. The main characteristics of semi-structured qualitative interviews are useful for achieving the goal: the lighter structure does not impose the opinion of the interviewer; the dominance of open-ended questions allows more detailed information to be gathered; greater attention to the specific situation and sequences of actions indicated by the interviewee provides knowledge of the particular case (King, 2004). A huge strength of face-to-face qualitative interviews is the wealth of information gained through the communication process (Gillham, 2000) and the ability to understand the phenomena under investigation by a specific target group.

With the consent of the informants, the interviews were recorded. Then the data were transcribed and analyzed by grouping them according to the preliminary topics and those that emerged during the analysis. The duration of the interviews varied from 30 to 55 minutes. Most of the interviews (23) were conducted live but remotely (i.e., using online communication platforms like Zoom). 9 interviews were conducted in a self-filling manner, i.e., by sending questions to the informants who filled the answers in blank spaces. The Chamber of Commerce was approached in an attempt to reach service delivery professionals. The administration was asked to distribute the survey questions to a specific (with research topic-related) audience, who had the opportunity to contact the authors of the survey and conduct a live interview or answer the questions themselves. This way, 35 questionnaires were sent out, and 9 were returned with completed answers. The implementation of the research took place in three

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2022 Volume 10 Number 2 (December)
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stages: focus group interviews – in November 2021; semi-structured interviews – in November 2021 - January 2022; survey of representatives of the Chamber of Commerce – in January 2022.

The questionnaire consists of three parts. In the first introductory part, the questions are intended to clarify a more general approach to WtE, the suitability and appropriateness of the country for the WtE. They assess the main challenges and opportunities for its further development and implementation in Lithuania. The second part focuses on more specific questions aimed at clarifying the main obstacles to the implementation of WtE at the community level. And finally, the third part assesses the subjective expert opinion on the prospects for developing WtE at the market level.

Before selecting specific study participants who could provide the most relevant information, specific WtE stakeholder groups were identified. The stakeholders were divided into target groups following their role in the WtE production value chain, i.e., users, scientists, technology developers, service suppliers, and policymakers. Accordingly, each of these groups was formed according to different activities, nature of work, roles, responsibilities, etc. This way, the research participants' heterogeneity was controlled to cover various aspects of the problem.

This group is divided into two to more accurately and comprehensively identify the technology assessment from the consumer side. The first part of the group consists of young professionals interested in environmental protection and waste sorting. The second one is more deeply related to the problem, i.e., public opinion specialists, independent actors, developers of environmental protection and sustainable development initiatives, energy marketing and communication specialists, environmental activists, and representatives of civil society. Finally, representatives of technology consumer companies (working in different fields) also joined this group. Because WtE interests researchers from various disciplines, the research participants were selected to represent diverse disciplines and share other competencies. Participants were chosen to respond to different hierarchical positions in the power chain to fill the group of policymakers. Accordingly, interviews were conducted with the highest level – ministry leadership; medium-level – heads of departments; and lower-level professionals – persons performing daily practical activities, as well as state supervisory authorities (e.g., regulatory authorities).

The limitations of the research are related to the methodology. Accordingly, the study is not intended to provide objective processes or distribution of existing attitudes towards WtE among different social groups. On the contrary, qualitative research is intended to find out the subjective reflection of experts, so it could be treated either as the initial stage of a larger study or as a contextual (expert opinion-based) study aimed at gathering much broader qualitative information to map the transition towards sustainable energy sector development.

5. Socio-political WtE critique – management, sustainability and public impact

The transition from fossil fuels to the use of renewable energy technologies, ensuring a stable supply and guaranteeing energy production aligned with maximum environmental protection, is beginning to change the established belief that energy security could be based solely on affordability and availability aspects. In this way, the prevailing belief that the energy transition to renewable energy must be based on technical and economic arguments is no longer productive, as it cannot assess the previously discussed circumstances (local and ecological impact, etc.). The sociopolitical dimension helps to understand the readiness and possibility of dialogue between different stakeholders.

The experts were asked to comment on the general situation in the country and assess the acceptability and prospects of WtE. In this respect, four main opinion tendencies emerged among the experts' views. Some informants drew attention to the links between WtE's perspectives and information - its consistency, purposefulness, informativeness of the society, and overall representation of the technology in public discourse.

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2022 Volume 10 Number 2 (December)
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Others tended to link WtE prospects to societal behaviour and financial support. The third tendency raised the risks and suitability of WtE for the existing Lithuanian infrastructure. Finally, the fourth - highlighted the importance of policy coherence and implementation.

Public awareness, or, in other words, lack of information, was identified as a big challenge for a smoother transition towards renewable energy in Lithuania by some experts. Interestingly, this aspect was similarly addressed by the policymakers, the technology users/waste providers, and the researchers. Everyone said that information could be both a challenge (such as opposing society) and an opportunity (such as changing public attitudes to waste management). Public education can become a crucial factor, as experts say it is directly related to public behaviour, which affects the development and applicability of WtE technologies. As we will see later, informativeness is linked to public response and broader participation in sustainable development programs. If public attitudes are negative, it isn't easy to expect the successful application of technological development and vice-versa.

The main challenge is the need for more information: there should be more broad talk about energy production methods, their advantages and disadvantages, and how to deal with them. Expert 24
Environmental requirements, proper communication, and possible population resistance. Expert 27
Poor public information on waste management. To this day, people are encouraged to recycle, but it needs to be explained what happens to waste that is not suitable for recycling. They also need to understand how large the industrial waste stream is and that most of that waste is not suitable for recycling. There needs to be more information on landfill problems, so there is no need seen to look for alternatives. In addition, there is a widespread belief that WtE technologies are inherently polluting, smelly, etc., and public hostility arises as soon as the WtE plant is talked about. Expert 12
Recycling waste into energy in society is primarily associated with incineration, which is received quite negatively. Other technological alternatives are less widely considered. But for applying different methods, I would probably see the same greatest challenge in society - as hardly acceptable and negatively received. Expert 11

Accordingly, another part of the experts, talking about the challenges of public attitudes and the prospects of the technology, pointed to the importance of financial aid for the WtE, which, according to experts, could also help change public attitudes and accelerate the development of WtE technology.

The best is financial motivation: if the resident recycles, he pays less, and if he does not recycle, he pays more. Also, controls, warnings, and fines for improper waste management are necessary, but this should not be overstated because if the residents have difficult conditions in sorting and properly disposing of waste, everything can move to the surrounding environment. Expert 6
It is essential to have clear strategic goals, then it is worth investing purposefully to achieve a significant breakthrough. I would think the same with WtE; otherwise, it's easy to get into chaos. Expert 1

As was mentioned in the theoretical part, the economics related to technological development is related to a more general attitude and this was observed by the experts in practice, paying attention to the aspect of social justice in the development of WtE, especially the fair and reasonable distribution of investments and profits, as well as the availability of services to specific communities and strategic interest of the country.

The third group associated WtE with certain risks that go beyond the scope of this particular technology and may have a wider impact on society. Concerns have been raised about the efficiency of the technology, raising questions about its potential impact on the environment and climate change. Addressing the experience of other countries, its readiness for Lithuania was questioned, more precisely, its further development in terms of sustainability. One of the experts raised a similar issue, pointing to the potential danger i.e., the emergence of a

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2022 Volume 10 Number 2 (December)
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business industry (as a consequence of further development of WtE in the country) which could make it difficult to control the processes avoiding counterproductive benefits. For example, instead of helping to deal with the country's waste, taking imports from other countries would, according to experts, contribute to the accumulation of waste.

Some of these things are already being abandoned in some countries because it is a costly technology to incinerate, filter, etc. And where to put all the slag and ash generated at the end? <...> The same is true with incineration; the heavy nano-particles with the vapour come out because the filters still don't hold everything. Another thing the slag and ash that will need to be buried were said to be used to build roads, and to reposition the layers in landfills, but here the same thing comes through, we are still hiding it somewhere. I do not see the prospects and opportunities for sustainability in incineration, and it was stupid to build two more factories. Expert 7

It is still very worrying that we are importing waste, it should be banned here, so if Poland does not deal with its rubbish, then it has to deal with it in its territory. And it is still very worrying that these systems, such as cogeneration, operate solely on economic principles. There must be a powerful ecological motive to prevent the import of foreign waste into Lithuania, during which trucks have to pass through Lithuania, emitting CO2, and bringing that kind of waste. <...> and what seems very wrong is that if we look only at the concept of profit, it is awful, because then those cogenerations will be interested in burning more, then we will import the garbage to ourselves, even though we, ourselves, have reduced the amount of waste. On the other hand, there is a real advantage in that it is better than digesting in landfills for those hundreds of years. Cogeneration is part of the circular economy, where waste is converted into energy. Simply put, we have built too much, and those developers are interested in burning as much as possible while the goal is still to reduce waste. Expert 8

However, both experts agreed with the benefits of WtE in addressing waste management but questioned the further development of the technology. Both experts assessed the problem from a consumer and environmental perspective, so ecological arguments predominate in their approach. Using environmental arguments and a deeper relationship between WtE and ecology, the experts highlighted the difference between popular public understanding and expert knowledge.

According to experts, the last trend within this topic is related to the management and administration of environmental and energy problems. Different experts pointed to international and domestic policy choices. According to experts, WtE is just a technology, the productivity and efficiency of which depend on a wider range of strategic choices. Respectively, it is not easy to unambiguously assess the situation in Lithuania. The expert also drew attention to the fact that the situation in Lithuania also partly depends on the priorities and tendencies of the international environmental and energy policy. Another expert extended the idea by saying that it is best to assess the situation when the main goal is known - what is being sought and what breakthrough is expected; otherwise, interpretations may be different or contradictory.

Everything is set up correctly in the waste prevention plan; it needs to be implemented. The infrastructure complies with European standards; they are maintained and licensed. There are responsibilities, but at the same time, naturally, each system has specific "high voltage points," thus specific solutions are needed, sometimes, the system can fail, and it is not just a Lithuanian problem; it is a common thing in all countries. Expert 25

The other thing is what we want to achieve; a sustainable economy, energy security, or successful green course implementation. And it is a problem to connect them; the state needs a clear policy on what goal we are pursuing. We can burn everything and deliver more of those cogeneration plants, but we are looking at what we are aiming for. Or we don't need it because we will recycle everything, separate food waste, force everyone to use only recycled packaging, and there will be nothing to burn. But when we put it all together, everything goes out so that no one knows how to manoeuvre here. Expert 26

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2022 Volume 10 Number 2 (December)
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Both experts represent the group of policymakers; thus, it is natural they focus on the administration of the problem. We can see that it takes work to ensure a smooth administration of the process, especially in a broader context, even disposing of sufficient knowledge about technology and its benefits to society. Once again, it was noted by the experts that one thing is to administer the implementation and even the development of the WtE, and the other is to harmonize the process so that it runs smoothly from an economic, social and environmental point of view. On the other hand, as was already mentioned, it isn't easy to crystallize the potential of WtE without clear strategic priorities.

Summarizing the differences in attitudes between the groups, it can be seen that the issue is contextualized widely, taking different aspects into account. Qualitative research does not allow us to make quantitative generalizations, but we can see that more positive views of WtE's prospects in Lithuania dominated among the respondents. In a more general context, the experts drew attention to public awareness, financial aid and potential risks. The differences in attitudes are related to the variety of stakeholder groups. Understandably, the philosophy of environmentalists and activists is more conservative in this case, and marketing specialists and opinion makers (influencers) interpret the issue as both an opportunity and a challenge. Representatives of technology developers mentioned rather pragmatic aspects that could change the situation in the desired direction. Finally, decision-makers suggested assessments of the current situation from a policy and governance perspective. Despite the differences in attitude between different stakeholder groups, no apparent contradictions or disagreements emerged at this research stage. The differences are more of an interpretive nature, related to professional and disciplinary bias rather than principal differences in understanding the operation and applicability of WtE. Such a palette of opinions from different perspectives confirms the theoretical hypotheses of how difficult it is to achieve a more or less unified understanding in this dimension, the formation of which is a complicated process that may take a long time.

Lastly, some experts speaking about the societal mentality draw attention to the country's historical development of waste management. According to them, the problem is the long-lasting tradition of forming landfills and the relatively slow reorientation of large companies (working in the field) adjusting to WtE. In another case, the division mentioned above of the governmental attitude, when it seems that the benefits of waste sorting and WtE are publicly discussed but not translated into practice (for example, in governmental institutions). Using the examples of the situation in public and governmental institutions, the expert linked three crucial aspects - attitude, management and behaviour - into one problem.

The development of WtE in Lithuania is hindered by the fact that the cult of landfills is powerful in our country. Large waste management companies (e.g., Ekonovus or Ecoservice) do not participate in WtE processes. Expert 12
There is still no, or lack of sorting opportunities in educational institutions, places like kindergartens and schools should be a priority to cultivate a new generation with understanding and everyday skills of what needs to be done, and today it is still necessary to explain why this needs to be done. The system needs to be corrected in other institutions, even governmental ones. If we disagree on the highest level where education is required, then society will do what it is said to do; they will not have that inner need; if there are containers - they will recycle, but if they do not find a container - they will not recycle. The effort does not come from a person, e.g. "I understand why I need it, and I want it", but it's more like imposed process, e.g. "it was brought here, and I was told to do so". There's a lack of that education, not in the form of advertising (flyers, posters), but in the form of infrastructure. Expert 7
What is missing for faster progress? Political Leadership in the Ministry of the Environment. It is a populist saying. But on the other hand, there is also some apparent resistance from specific regions. Expert 23

We can see from the examples that the effectiveness of WtE also depends on the behaviour of society and institutions. The expert mentioned that specific examples of conduct by public authorities would illustrate the

ISSN 2345-0282 (online) http://jssidoi.org/jesi/
2022 Volume 10 Number 2 (December)
http://doi.org/10.9770/jesi.2022.10.2(33)

transition from slogans to activities and could have an educational function, i.e., from which others could learn and copy specific examples of how waste management should be organized.

6. WtE potential - creating a sustainable energy sector by recreating communal leadership?

The energy transition from fossil fuels to renewable energy based on the principles of the circular economy includes economy, industry, and social aspects. Important is not only the material or socio-political contexts that shaped the logic of energy consumption, the market and regulatory mechanisms, but also the features of community life - the structure of agreements and practices that exist in society, or otherwise - the formulation and representation of community interest both at the local and national level. In this sense, the latest technologies and modern management trends collide with the abilities of a young democracy to balance different interests and the possibilities of a relatively prosperous, but economically unequal society.

The opinion of experts regarding the readiness of specific communities to accept renewable energy technologies into their neighbourhoods was divided into two distinct parts. The first group of experts drew attention to more general trends, stating that the response of Lithuanian civil society to WtE objects in Lithuania is predictable and does not differ much from more general trends in Europe. On the one hand, society understands that part of the waste will inevitably either be burned or buried in a landfill. Hence, it is more prudent to burn it efficiently than to bury it after taking it to the city's outskirts and leaving it for future generations. On the other hand, until it is clear how such an object will work in reality, people's cautious attitude is understandable, especially if it is close to their homes. Accordingly, according to experts:

Much explanatory work for the public is needed; this is the only way to show that it is not a threat to the neighbourhood. It is worse when these people's fears are manipulated by persons with narrow interests - for business or political ambitions. Interfering with people stops even technically sustainable solutions and raises their price, which is later paid by the same society anyway. Expert 17
The public needs to gain more knowledge about the problems caused by landfills. Expert 18
The active part of civil society, which wants to have a say on all issues, would tend to protest against expansion. Expert 19

Another part of the experts talked about specific examples that speak of a particular hostility visible at the community level, which is related to specific and practical issues of WtE implementation, such as the environmental impact in a local environment:

Citizens living near cogeneration plants are unhappy about air pollution, which is increased due to burning waste. There may be no such difference for those who live further away. This is relatively new; companies provide positive information that energy is extracted from waste. Still, it has yet to be known whether it will be used effectively or whether it will not be necessary to import waste from other countries. Expert 6
There was a very high resistance in Kaunas because, in general, when building such massive objects as cogeneration power plants in Lithuania, there is perhaps too little talking with the community. In Kaunas, when the cogeneration plant was being built, there was a neighbourhood nearby, and there was a lot of opposition from the residents because of the possible pollution and the vibration from the trucks driving by all the time. It was said that the pollution would increase, and the residents tried to protest, but the project failed anyway. On the other hand, there was too little information; people mistakenly think that burning emits smoke into the environment, filters are put in place, protection standards are followed, and a lot of internal things are covered up, where it is not completely clear. Each community will look after its security and, another thing, the community could also benefit, because, for example, the developers of one cogeneration plant said that they were inclined to talk with the community about how to compensate them, they were inclined to invest, maybe build a kindergarten, to invest in the needs of local people. Expert 8

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2022 Volume 10 Number 2 (December)
http://doi.org/10.9770/jesi.2022.10.2(33)

The opinion of the experts was argued with specific examples. Nevertheless, it contradicts the more general public view that emerged in other studies. For example, in a comprehensive research of public attitudes, examining the existing relationships between risk perception and climate change concepts, as well as attitudes towards them, it was observed that in the attitudes of Lithuanian residents towards energy technologies, a clear differentiation prevails between renewable and non-renewable energy technologies. The country's population has a positive view of renewable energy technologies, while most non-renewable ones have a negative view. The positive assessment of renewable energy technologies shows a high level of acceptability of these technologies in Lithuania, and the technologies themselves are associated with lower risks than non-renewable and other energy technologies." (Budžytė 2021: 149); this allows the author to conclude that "part of the Lithuanian population is ready for value changes in society implemented through energy sector reforms" (Ibid 149). Meanwhile, the results of this study correspond to the theoretical assumption that, often, the dominant attitudes in the general attitude of society, which are tried to be implemented in a local territory (when implementing specific technological innovations), lose support. According to experts, this is not necessarily related to the moral attitude of concrete communities against technology. Still, it works with a set of practical issues (first of all, the specific impact on a particular environment), which do not seem so important in the general discourse but acquire practical value in reality. In the case of Lithuania, such an attitude of local communities, according to experts, can also be associated with the lack of good examples that would allow for the presentation of practical evidence and reasoned answers to the communities concerns. Meanwhile, even those individual cases that are successfully implemented and even provide tangible national benefits are still accompanied by public protests, which reflect the existing dilemma of public benefit versus community risk and eventually settle in shared memory.

7. WtE transition factors – technological progress vs market achievements

Experts agree that WtE is an excellent solution for managing a large part of the waste that cannot be recycled, but it is part of a larger process. You cannot isolate one link and disconnect it from the chain. Thus, WtE should also be considered part of a wider waste management process. Sorting, recycling and incineration should all be balanced and not seen as separate and independent or unrelated businesses. According to the experts, it is important to distinguish between incineration and WtE. Whereas waste incineration is not recognized as part of the circular economy, either at the directive or strategic EU level, WtE is. WtE is a second-generation biofuel, such as biomethane, made from all non-food products.

According to experts, the potential for WtE development is strongly linked to infrastructure and public sorting habits. Both aspects require attention and concrete solutions. According to the experts, if high quality in sorting is reached, mechanical biological treatment would not be needed in waste management, significantly reducing the cost component. Sorting food waste and degradable waste is very important. After all, once mixed in the general stream, they cannot be used in compost because they are contaminated with heavy metals. By contrast, sorting them into mechanical biological treatment plants allows them to be transformed into energy products. Otherwise, and this is the most common case, it goes to incineration. Experts believe that the major cities are the most significant waste generators - Vilnius, Kaunas and Klaipėda - but none of these cities have biogas generators.

Some experts highlighted WtE as a niche of a specific business opportunity. If WtE is developed exclusively as a business, the whole coherence and sustainability of the waste management process are jeopardized by this concept. The criticism is based on the natural business imperative for profit. Still, the risk is that the profit motive will lead to an increase in production volumes, i.e., burning as much waste as possible and converting as much waste as possible into heating (or other energy products), while arguing and emphasizing the benefits of the technology in terms of solving the strategic challenges (e.g., reducing pollution, reducing waste and generating heating for the town). However, the dominance of WtE is likely to harm other waste management sectors, such as

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2022 Volume 10 Number 2 (December)
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sorting and recycling. Thus, WtE should also be seen as a part of a broader waste management process. Sorting, recycling and WtE should all be balanced and not seen as separate and independent or unrelated businesses.

By specifying the market limitations of WtE, the experts mentioned the importance of not focusing on the nuances of the technology itself but on its application and wider impact on overall waste management. WtE certainly has a role to play in this process. Still, it needs to be clearly defined in terms of the country's strategic interests, such as demand, infrastructure, strategic development of renewable energy, and so on. Experts have mentioned the possibility of a counterproductive impact of WtE (on the country's interests) in case it begins to over-dominate the public waste sorting habits or recycling process.

It can be something other than the predominant way because the [essence of] materials are lost; they are converted into heat energy, but the immediate essence of the material is changed, and we don't get back what was in the product. Slags, residual products, and ash are generated and must be safely managed and disposed of in a landfill. Expert 25
Does not encourage recycling, no single priority between economy, green course, and energy. Expert 26
WtE development depends on many factors. As I mentioned, its development can be consistent if it is connected to an integrated vision of the waste management problem and strategic orientations. For example, when the price rises for other energy raw materials or supply disruptions, WtE may prove to be an efficient and cheap alternative. However, in the longer term, again as prices and/of supplies fluctuate or as new factors enter the supply chain (e.g,. as the share of renewable energy increases), WtE may become less effective or even problematic keeping in mind the broader context of, for example, sustainable energy development or environmental protection. Expert 30

Experts pointed out how WtE is related and, at the same time, dependent on other energy and environmental issues. WtE contributes to both, but its objectives and functions must be very clearly defined; otherwise, it may have the opposite effect. It can be concluded that the potential of WtE technology depends on a combination of various aspects, not only self-evident – infrastructure, economic, or political priorities –, but also the attitudes and habits of consumers.

According to experts, the development of WtE as a business branch of the energy industry is noticeable and has the potential to expand. However, there are some risks in such development. For example, suppose this [as a specific, autonomous business branch of the energy industry dispatched from the overall concept of waste management] development evolves without supervision. In that case, it could have a broader impact on the whole waste management process. In such a case, there will likely be less waste for recycling, and waste incineration will become dominant. However, experts were not inclined to answer unequivocally whether WtE (if we can recycle) is the best solution for sustainable development. They acknowledged the immediate advantages but needed to be assured of long-term benefits. In addition, the experts emphasized another problem specific to Lithuania. That is the issue of WtE not being consistently administered in Lithuania. This is because responsibilities are scattered across different institutions and municipalities, making decisions dependent on other decision-makers and different priorities, needing a coherent approach, systematic administration from start to finish and thinking in a complex way.

8. Discussion

The experts located the place of WtE in the country's transition towards sustainable energy by distinguishing and highlighting the aspects of technological applicability and its benefits. According to experts, to reveal the benefits of WtE to the full extent, the contextual aspects should be taken into account, i.e., the whole chain of waste management needs to be rationalized. Accordingly, it consists of waste sorting, gathering, recycling and management. The higher the quality and scope of sorting, the better the results. Most of the waste can be recycled

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in Lithuania, and some can be incinerated. Experts pointed out that incineration should not be overly admired, as almost all waste can be incinerated. Still, the potential consequences include a stagnant sorting system and diminishing public waste sorting skills. Experts have repeatedly emphasized the chain of waste management: sorting, recycling, and only incineration of all that is not worthwhile or cannot be recycled. Speaking about the prospects of WtE in Lithuania, the experts noted that Lithuania has a notable legacy - large mountains of landfills –and the use of WtE technologies can be helpful in their management. The study participants indicated that despite the problem's urgency, there is no final decision on how to organize this process. However, the question is marked red on the political agenda. Thus, the efficiency of WtE is to be assessed by summing up all aspects (including the environmental impact of waste logistics and transportation), i.e., not only counting the number of WtE installations but also estimating the amount of energy consumed in transporting waste from one point to another and the pollution generated by that transport, as well as in economic terms – how much it will cost to the state and end users.

Table 1. WtE Assessment Based on Three Dimensions

	Positive/ transition-enabling aspects	**Negative/transition-disabling aspects**
Socio-political acceptability	WtE is a well-developed technology which is already beneficial (corresponding with strategic interests); WtE mediates energy demand and increases green energy in the overall energy balance in the country.	It is difficult to reveal the full potential of WtE due to public mentality (unwillingness to sort the waste), waste logistics (separation of contaminated waste) and administrative (lack of unified governing strategies) reasons in the country.
Community acceptability	WtE reduces local problems (such as landfills) and contributes to the strategic goal (ensuring energy security with sustainable energy generation) by providing reliable and relatively cheaper heat supply to the local neighbourhoods.	Due to the lack of good practices, the overall positive public attitude towards WtE in Lithuania only partially converts into local readiness to accept concrete WtE plant implementation in the local neighbourhoods.
Market acceptability	WtE is relatively easily integrated and balanced into the current energy infrastructure as a part of an extensive waste management process.	WtE has an uncertain future in light of other technological (waste management) progress and changing consumer behaviour; WtE tends to grow into a specific business industry whose interests might contradict the country's strategic goals.

Source: made by the authors

The theoretical assumption formed at the beginning of the research that a successful energy transition depends on the country's overall readiness became evident in the empirical part as well. The specific aspects identified by the experts covering both positive (transition-enabling) and negative (transition-disabling) aspects could be summarized into three dimensions (in this case, socio-political, community, and market) (see Table 1).

Conclusions

According to the experts, we have reached a time when creating something technologically efficient is no longer difficult. Making that technology work for the benefit of all is much more difficult. This requirement changes the efficiency of and attitude to technology because one is to pursue narrow interests, and the other is to seek benefits for the larger public. Empirical discoveries corresponded with the theoretical notion that social aspects are becoming more critical for assessing and evaluating energy sector development, especially when building a sustainable energy sector based on such innovative technologies as WtE.

Summarizing the aspects of attitudes towards WtE among different stakeholder groups in Lithuania, some differences of concern about the future scenarios of WtE in the country emerged. Still, no principal differences in

the assessments of the country's transition were evident. Most experts support WtE input for the Lithuanian shift towards a sustainable energy sector. Still, they indicate that some better public awareness and a justified and transparent mechanism of WtE implementation (in order to correspond with public interest) are needed. Different groups rationalized their views with arguments closer to their background (e.g., environmental activists with ecological arguments, public researchers with public attitudes and behaviour, policymakers with administrative and management problems, etc.), which allowed them to grasp a holistic view of the analyzed issue. Different energy threats stem from political, economic, technological and social spheres. Likely, different opinions will not be avoided until generally accepted strategic goals can mobilize various stakeholders and unify justification for the transition towards a sustainable energy sector.

Empirical findings also speak about the practical value of the study: an opportunity to understand the direction and circumstances of the transition process. The subjective testimony of experts (in terms of both current and future challenges, as well as possible opportunities) enables the formation of a targeted and argumented political response to ensure the success of the transition, as well as the construction of an effective and evidence-based (on the aspects raised by the experts) communication campaigns targeting both specific interest groups and public attitudes in general.

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Dainius GENYS is chief researcher at Energy Security Research Center at Vytautas Magnus University. His research interests: energy security research and democratization process. He is the co-author of the book – "Sociology of energy security: theory and practice". He is a member of Lithuanian Sociological Association, the European Sociological Association, International Sociology Association, the Advancement of the Baltic Studies Association (AABS) and other organizations.
ORCID ID: https://orcid.org/0000-0003-1224-0127

Aušra PAŽĖRAITĖ is assoc. prof. at Economics and Management faculty at Vytautas Magnus University. Her research interests: marketing decisions toward climate neutral society, value creation. She has participated in a number of research projects as an expert and as a project manager as well has written academic papers on energy marketing and innovative marketing issues. She is a member of the International Association for Energy Economics (IAEE) and other organizations.
ORCID ID: https://orcid.org/0000-0002-4387-2074