



Publisher
Sustainability for Regions



EXPLORING RENEWABLE ENERGY FUTURE THROUGH HOUSEHOLD ENERGY BEHAVIOUR: CASES OF LITHUANIA AND MOROCCO*

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Received 18 December 2024; accepted 18 May 2025; published 30 June 2025

Abstract. The study examines the role of household energy behaviour in the transition to renewable energy, focusing on the comparative cases of Lithuania and Morocco. In both countries, households account for approximately 1/4 of total energy consumption, making them a key area for promoting energy efficiency and sustainability. Lithuania and Morocco have different approaches driven by their economic, cultural, and political environments. In Lithuania, household energy behaviour is influenced by efforts to promote using more energy-efficient appliances and renewable energy sources. Public policy and support are focused on building renovations, small-scale renewable energy production in households, and electrification of the transport sector, all of which are supported by public subsidies. Additionally, introducing energy-efficiency measures aims to reduce household energy consumption further. Morocco, on the other hand, emphasises large-scale renewable energy projects, such as the Noor Solar Complex, while targeting households with energy efficiency campaigns and providing financing mechanisms to make renewable energy technologies more accessible, thereby encouraging a more passive role in direct energy generation but active participation in energy-saving practices. The study uses a comparative case study approach, drawing on secondary data from sources such as the International Energy Agency (IEA) and national reports. The main findings show the importance of economic incentives, public awareness, and tailored policy interventions in shaping energy behaviour. Although there is public support for renewable energy in both countries, barriers such as financial costs and information gaps remain. The study provides insight into ways to involve households in the energy transition, highlighting the need for effective communication and strategic policies.

Keywords: household energy behaviour; renewable energy transition; Lithuania, Morocco; comparative case study

Reference to this paper should be made as follows: Smaliukiene, R., Katina, J. 2025. Exploring renewable energy future through household energy behaviour: cases of Lithuania and Morocco. *Insights into Regional Development*, 7(2), 109-122. <http://doi.org/10.70132/z7463939983>

JEL Classifications: D12, Q41, Q 40, Q56

Additional disciplines: sociology; information and communication

1. Introduction

* The research leading to these results has received funding from the project titled "Cluster for innovative energy" in the frame of the program "HORIZON-MSCA-2022-SE-01" under the Grant agreement number 101129820

Household energy consumption constitutes a significant portion of global energy use, accounting for approximately 30% of total energy consumption. This makes it a crucial factor in shaping the future of renewable energy. The transition towards renewable energy depends not only on technological advancements but also on the capacity of societies to adopt sustainable energy practices at the household level. Households contribute to this transition by adopting energy-efficient technologies, generating energy through home-based renewable systems, and supporting broader national energy policies aimed at sustainability and resilience.

However, how households use energy varies significantly between regions, influenced by economic development, energy availability, and cultural contexts. Understanding these differences is essential for designing effective strategies for energy transition. This study, therefore, focuses on a comparative analysis of household energy behaviour in Lithuania and Morocco. Despite their geographic and economic differences, this comparison is particularly valuable due to both countries' shared challenges in transitioning to sustainable energy sources and their substantial investments in renewable energy. Morocco's significant solar projects, like the Noor Solar Complex, and Lithuania's balanced investments in solar, wind, and biofuels highlight different pathways toward a common goal. Analysis of these variations provides new insights into the potential trajectories of renewable energy adoption at the household level.

Moreover, this comparison gains further relevance when considering that household energy consumption in both countries represents around one-fourth of total final energy use. In 2023, households in Lithuania used about 25% of the total final energy, primarily for heating, with additional consumption for appliances and lighting (IEA, 2023 a,b). Similarly, Moroccan households account for approximately 25% of the country's final energy consumption, including energy for heating, cooking and lighting (Enerdata, 2023). The figures underscore the importance of focusing on energy efficiency and renewable energy solutions in the residential sectors of both countries to reduce overall consumption and improve sustainability.

The analysis of household behaviour in a border context is important as a significant contribution to the transition to renewable energy and energy consumption in general (Tvaronaviciene, 2024). Energy efficiency and locally generated renewable energy can address uncertainties in energy supply, price volatility, and climate targets. Governments have responded to these challenges through various measures, including targeted subsidies, incentives for renewable installations, and campaigns to reduce energy demand. According to the IEA (2023 a), changes in household energy behaviour can reduce global energy demand by up to 18% by 2030, highlighting the substantial impact of consumer practices on overall energy use (IEA, 2023 c,d). At the 8th IEA Annual Conference on World Energy Efficiency, energy ministers globally emphasised that behavioural changes, alongside technical efficiency, are key to reducing consumption.

The primary objective of this study is to explore the differences and similarities in household energy behaviour between Lithuania and Morocco and to understand how these behaviours contribute to energy resilience and the broader transition to renewable energy. The study aims to provide information on the role of household energy practices in supporting national energy goals and addressing global energy challenges.

The research question in this article is: How do household energy behaviours in Lithuania and Morocco contribute to energy resilience and the transition towards renewable energy, and what factors influence these behaviours in each country?

The study uses a comparative case study approach to analyse the energy behaviour of Lithuanian and Moroccan households. This approach explores how households in each country contribute to the transition to renewable energy. Data for the study were collected from secondary sources, including reports from the International Energy Agency (IEA), national energy strategies, and household energy behaviour surveys. The analysis focuses on the

main factors influencing household energy behaviour, such as economic conditions, access to energy technologies, and policies to promote renewable energy. By comparing these data, the study aims to identify common challenges and opportunities to strengthen the sustainable energy transition in the residential sectors of both countries.

2. Theoretical background

2.1. Definition of household energy behaviour

Household energy behaviour is the term used to describe people's choices about using energy in their homes. Modern approaches extend beyond just saving energy, including decisions about energy-efficient renovations (Pelenur, 2018), installing energy-saving appliances, and integrating renewable energy technologies (Alberini, 2018). Several factors, such as socioeconomic status, cultural norms, environmental awareness, and access to energy-saving technologies, influence this behaviour. Key factors affecting energy behaviour include income level, energy prices, household size, and the efficiency of appliances and buildings. Psychological and social influences, such as habits, attitudes towards energy savings and social norms, also play an essential role. Studies indicate that educational campaigns and financial incentives can effectively encourage household energy-saving behaviour (Ślupik, 2021; Bhattarai et al., 2024; Qiao & Lin, 2024). However, the energy behaviour of households is challenging to characterise due to the interplay between these factors, which can vary considerably between regions and demographic areas (Simionescu et al., 2020; Tvaronavičienė, 2024).

The environmental impact of household energy consumption is considerable, as residential energy use significantly contributes to global greenhouse gas emissions. Therefore, promoting sustainable household energy behaviour is crucial to achieving environmental sustainability objectives. Potential measures and strategies to influence the energy behaviour of households include improving energy efficiency through retrofitting and refurbishing buildings, promoting the usage of renewable energy technologies, and implementing policies to encourage behavioural change toward energy savings (Han et al., 2021). It is important to note that the household's energy behaviour includes energy consumption at home and vehicle ownership. In regions with a rapid increase in the use of electric vehicles (EV), these have reduced the overall energy consumption of cars, thus contributing to carbon neutrality (Yin, 2024). Evidently, policies that shape household energy behaviour considerably affect energy consumption. Policymakers and practitioners can develop more effective interventions to reduce energy consumption and mitigate environmental impacts by understanding the motivations and barriers.

2.2. Factors affecting household energy behaviour

Various situational factors and lifestyle patterns shape household energy behaviour. The perceived behavioural change varies between individuals and contexts, influencing how people adopt energy-saving behaviours and actively participate in the energy market. Situational factors such as access to electricity, efficient energy sources, and modern household technologies are essential in determining household energy consumption patterns (Kuhe & Bisu, 2020). Lifestyle also significantly impacts energy use, with daily routines and energy-consuming appliances being key considerations when analysing household energy behaviour. SCOPUS AI generated Concept map, generated after entering the phrase “Renewable Energy Future through Household Energy Behavior”, is presented below in Figure 1.

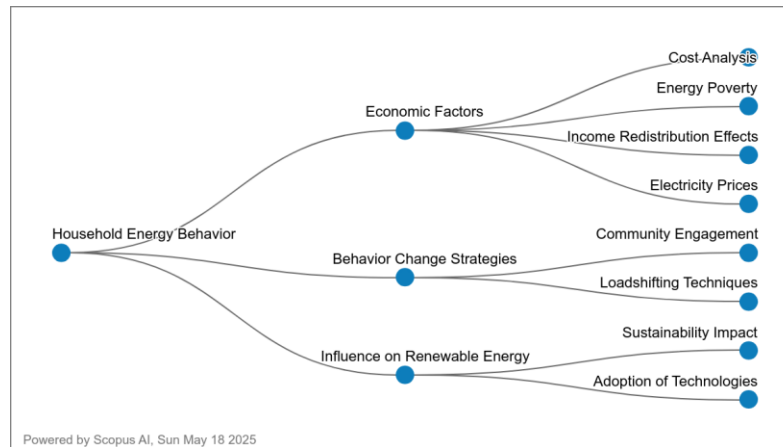


Figure 1. SCOPUS AI generated a Concept map after entering the phrase “Renewable Energy Future through Household Energy Behavior.”

Household behaviour greatly affects greenhouse gas (GHG) emissions. Behavioural changes, such as energy-efficient renovations, installing energy-saving appliances, and using renewable energy technologies, can significantly reduce emissions (Balezantis et al., 2024).

Households' attitudes towards renewable technologies and their knowledge about energy consumption are crucial for adopting sustainable energy systems (Brown et al., 2023). It is important to emphasise that household energy consumption can be changed through various interventions and policies. Promoting renewable microgeneration technologies is a critical intervention to reduce energy consumption and encourage the uptake of renewable energy solutions in households. Assessing households' willingness to pay for energy renovations, energy-efficient appliances, and renewable energy technologies can provide valuable insights for developing effective policies and measures to reduce GHG emissions (Balezantis et al., 2024). These strategies can significantly promote sustainable household energy behaviour and mitigate environmental impacts (Heinrich et al., 2022).

Theoretically, two behavioural interventions dominate energy policy implementation: reward and social comparison. A reward-based strategy is based on the promise that households will save energy by changing their behaviour. Reward-based interventions have been shown to significantly impact household energy behaviour, leading to reductions in energy consumption (Tiedemann, 2009). The social comparison strategy is based on feedback, such as home energy reports. It has also been shown to be more effective in promoting household energy and conservation behaviour than reports based on historical comparison.

The dominant strategy for encouraging behavioural change in household energy consumption is reward-based, particularly through initiatives that motivate households to participate in community projects and invest in energy efficiency improvements.

The availability of new, affordable technologies is an important stimulus (Sotnyk et al., 2023; Brown et al., 2023). For example, motivating households to improve their buildings' energy performance can lead to better indoor environmental quality (IEQ) and greater energy efficiency (Ghita & Catalina, 2015). Renovated and newly constructed buildings typically achieve better IEQ and energy performance than older structures (Prozuments et al., 2023). The primary goal of these upgrades is to reduce energy consumption, particularly heating. In addition, these upgrades are being introduced as they can reduce the energy required for heating, hot water and electricity in homes. Technologies like heat recovery ventilation systems and exhaust air heat pumps can improve district heating systems' efficiency, reducing energy use and CO₂ emissions in retrofitted homes. In addition,

incorporating solar district heating systems in these buildings can significantly reduce CO₂ emissions and help countries meet their emission reduction targets (Rehman et al., 2020; Gargasas, Bazienė & Dzienis, 2023).

Overall, reward-based strategies can be promoted. There is considerable evidence that they encourage changes in household energy behaviour.

3. The context of household energy behaviour: energy sector in Lithuania and Morocco

Lithuania and Morocco differ significantly in geography, geopolitics, culture and economy, leading to different approaches to energy policy. Despite these differences, both countries have set clear climate and environmental goals, committing to international agreements and establishing national targets to reduce carbon emissions and increase the use of renewable energy. However, the progress and implementation methods vary between the two countries.

The *first* difference between the countries to be considered is the varying *goals and achievements* of the energy policy. Following the implementation of the National Energy Independence Strategy, Lithuania ceased importing energy from Russia in 2022 and is committed to meeting all its electricity needs from renewable sources by 2030 and achieving climate neutrality by 2050. Lithuania has a national energy independence strategy, which has been adopted and periodically updated since 2012. The strategy forms the basis for structural reforms in the energy sector. This is in response to the high prices of energy resources and the use of energy as a political tool. Lithuania has a terminal for liquefied natural gas (LNG), which allows it to import natural gas from any LNG trading supplier (Energetikos Ministerija, n.d.). However, to achieve further energy independence, there is a need for a rapid increase in investment in clean energy. The National Energy Independence Strategy identifies renewable energy as a key objective. The objective is to increase the proportion of renewable energy in the final energy consumption balance, thus reducing dependence on fossil fuel imports. The long-term energy policy aims to achieve complete energy sector decarbonisation by 2050 (Energetikos Ministerija, 2024).

Morocco's energy strategy focuses on reducing reliance on fossil fuels, which constitute about 90% of its energy consumption, and increasing energy security through developing renewable energy projects. The country's National Energy and Energy Efficiency Plan launched in 2008 aims to reduce the country's carbon footprint and energy production costs. The plan prioritises energy efficiency and aims to increase renewable energy production equally from wind, solar, and hydroelectric sources to achieve a more balanced and resilient energy sector (SDG, n.d.). However, Morocco's energy sector relies heavily on fossil fuels, representing approximately 90% of its total energy consumption. The country's energy consumption includes significant shares from coal (30.8%) and fuel oil (56.4%) (IEA, 2023 c). Despite this dependence, Morocco is increasing its share of renewables in its energy mix. At the end of 2022, renewables accounted for 38% of the country's total electricity capacity, with ambitious plans to increase this to 52% by 2030 (ITA, n.d.).

The *second* difference between countries lies in the trends in *household energy consumption*. On the demand side, residential consumers must improve efficiency and use more energy from renewable sources. Household energy consumption accounted for 28.4 per cent and is falling year-on-year (Statistics Lithuania, 2023). To achieve this goal, the Lithuanian government has allocated approximately €265 million in support for residential solar power plants from 2021 onward, with a total capacity of 1.33 GW of household power plants, representing more than half of the country's total solar power capacity (Energetikos Ministerija, 2023). The involvement of producing consumers has become a pivotal element in the advancement of solar energy in Lithuania, contributing considerably to the reduction of dependence on imported electricity.

Morocco has witnessed a notable shift in household energy consumption trends, primarily driven by the country's strategic initiatives to enhance electrification and expand energy access. Most rural areas now have access to

electricity, which has resulted in a consistent increase in household energy consumption. The data reveal a 5% annual growth in national demand for primary energy, driven partly by increased household electricity consumption. This consumption increased at an average rate of 6% per year due to widespread electrification and economic growth in rural areas. The national energy strategy emphasises promoting energy efficiency and integrating renewable energy sources to meet increasing demand. The strategy includes developing renewable energy projects and improving energy efficiency across various sectors (MoF, n.d.).

The *third* difference lies in the *renewable sources of energy*. Analysing the structure of renewable energy sources reveals striking differences between countries. Lithuania relies heavily on biofuels as a source of renewables, whereas Morocco prioritises solar and wind energy. The primary source of renewable energy in Lithuania is biofuels (firewood, wood waste and agricultural waste), most of which are used for electricity generation and central heating (51.8%) in households (34.1%) (Statistics Lithuania, 2023b). Recent government initiatives have encouraged energy-producing consumers, positioning these power plants as a popular solution for residential energy needs. Subsidised household solar power plants are specifically designed to generate domestic electricity and improve the efficiency of home heating systems. Subsidies have had the effect of converting around 7% (100k) of households into electricity producers, which has significantly contributed to more than 2/3 of the electricity generated in Lithuania in 2023 coming from renewable sources, while electricity consumption from the grid has fallen by 1.2% per year (Energetikos Ministerija, 2023a). All this shows the essential changes in the energy consumption behaviour of households in Lithuania.

Meanwhile, Morocco's renewable energy sector is recognised for its significant investment in solar energy, particularly the Noor Solar Project. Morocco is making notable progress in developing large-scale renewable energy projects, with the Noor Solar Project being the most prominent. The aim is to provide reliable, sustainable, and affordable energy. However, it should be noted that reducing energy intensity in the Moroccan economy remains a challenge. Currently, the share of renewable energies in the total installed capacity is 38% (MoF, n.d.), while renewable energy accounts for less than 10% of the total energy supply (IEA 2023 a). The increasing energy demand, averaging 3% per year (Enerdata, 2023b), has hindered a substantial increase in the share of renewables in total final consumption over the last decade. A significant portion of fossil fuel energy is consumed by households, prompting the government to set targets for using renewable energy in homes (IEA, 2023 c). The Moroccan government has taken several initiatives to promote renewable energy and improve energy efficiency among household energy users. The most prominent initiative, as mentioned above, is the Noor Solar Plan, which provides electricity generated at the solar power plant to users. Additionally, the government has expanded the access to electricity to rural areas through renewable energy sources. Energy efficiency programs that promote energy-efficient appliances have also been designed to reduce household energy consumption.

In summary, Lithuania's energy strategy for households encompasses multiple facets: ensuring the provision of clean energy (both heat and electricity) from renewable sources within the centralised supply system and encouraging households to produce and supply their electricity from renewable sources, mainly small solar power plants. On the contrary, Morocco's energy strategy focuses primarily on large-scale renewable energy projects, positioning households as passive consumers of the provided energy.

4. Household energy behaviour: a case of Lithuania

Household energy consumption. In Lithuania, household energy consumption primarily focuses on space heating, representing around 63.5% of final energy use in the residential sector in 2022. Heating and cooking of water also represented significant portions, covering 14.9% and 6.3%, respectively. Electricity for lighting and other electrical appliances represented 13.9% of household energy use (Eurostat, n.d.).

The primary energy sources used in Lithuanian households include solid biofuels, natural gas, and electricity. In 2022, about 34.1% of the renewable energy consumed in households was sourced from firewood and wood waste, a significant component of household energy use, especially for heating purposes (Statistics Lithuania, 2023a). Other renewable sources, such as solar and wind energy, play a more minor but growing role in household energy consumption. This is important, as household gas prices increased significantly between 2020 and 2022 due to the geopolitical situation but have decreased since then. Overall, Lithuania is working to increase the share of renewables in household energy consumption to achieve complete self-sufficiency in energy by 2050.

Patterns in household energy behaviour. The literature on household energy behaviour in Lithuania represents three main patterns.

First, there has been a notable pattern in how households adopt technologies for producing and using renewable energy at home and for private transportation. Installing renewable energy technologies in households has an important positive effect, as it helps reduce energy transmission losses. In a study of Lithuanian households with small solar power plants, researchers found that energy flows between the household and the distribution grid are reduced by about 10% of the total annual energy flows between the household and the distribution grid; for smaller systems (less than 10 kW), this value can be even higher (18% or more) (Riupa et al., 2022). This represents significant savings in electricity transmission. In addition, households where small solar systems are installed tend to change their electricity behaviour. Households that install rooftop solar panels are found to be more aware of their energy consumption as they are more likely to monitor their energy use through apps or smart meters. They are more likely to use the energy immediately rather than send it to the grid, saving money. With solar power systems, households shift their energy usage to times when solar production is highest (midday), leading to changes in consumption patterns (Hubert et al., 2024). As a result, households using renewable energy tend to use less electricity from the grid, incentivising energy savings and reducing CO₂ emissions. One of the most significant factors influencing the adoption of renewable energy technologies in households is the decision-making process concerning renewable energy by households. Public policy plays a crucial role in this process by reducing barriers to adopting renewable energy through subsidies offered to households that implement renewable energy production and efficiency technologies.

Second is the pattern of willingness to accept renewable energy in their homes. The survey conducted in Lithuania revealed positive trends in household energy behaviour, with more than 60% of households wanting to use renewable energy sources to produce heating, air conditioning, hot water or electricity at home (Štreimikienė et al., 2022). This is done both to minimise environmental impact and to save energy. This is linked to both the desire to reduce environmental impact and the desire to save energy.

Still, there are several common barriers that traditional renewable energy policies are unable to overcome in Lithuania (Štreimikienė et al., 2022): (1) high upfront costs and long payback periods, (2) lack of information and knowledge, (3) low environmental priority, (4) resistance to change, and people's habits. A representative survey of the Lithuanian population showed that 60% of the respondents are unwilling to pay extra for renewable electricity. Furthermore, the same study showed that most Lithuanian households surveyed (62.5%) use biodiesel or bioethanol in their cars. However, only 5.5% of the respondents use electric or hybrid cars. Nevertheless, 62% of respondents would like to buy an electric or hybrid car, but 74.9% face financial difficulties in purchasing an electric or hybrid car despite government support for such vehicles (Štreimikienė et al., 2022). A more detailed study in Lithuania reveals different public attitudes towards different types of renewable energy. Although most of the population supports using green energy, there is a notable reluctance to adopt bioenergy, especially biomass (Liobikienė, Miceikienė, 2002). This is even though biomass accounts for Lithuania's largest share of district heating. The negative perception of biomass is particularly pronounced regarding its use in private transport.

To overcome this negative attitude, financial mechanisms emerged as the most influential in shaping attitudes toward bioenergy. Importantly, individuals who consider financial support critical also tend to be more knowledgeable about bioenergy, indicating that the Lithuanian population understands the essential role of government support. This suggests that subsidies and financial incentives could motivate people to adopt bioenergy.

Third, there is a pattern in willingness to decrease energy consumption at home. The survey shows that 67% of the population often or always takes active measures to save energy in Lithuania (Figure 2).

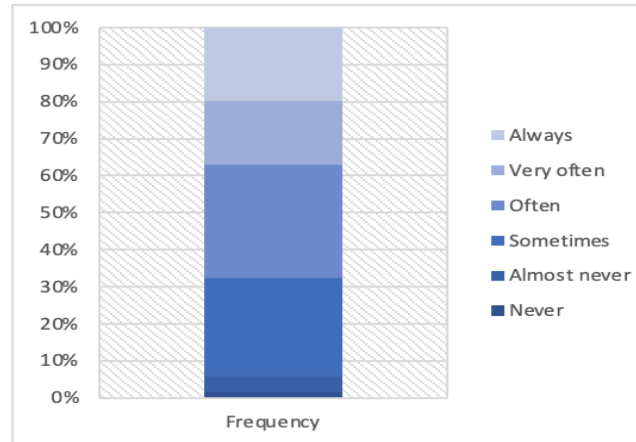


Figure 2. Frequency of energy-saving actions in daily life: survey responses on energy conservation measures
Source: Telešienė et al., 2024

According to the data, 74.3% of the population intends to take measures to reduce their energy consumption in the future (Figure 3). This intention is based on the belief that using less energy will reduce the impact of the household on the environment. In Lithuania, 67.8% of the population believes in this effect. Furthermore, household representatives believe that it is up to them to take measures to reduce energy consumption (72.2%) (Telešienė et al., 2024).

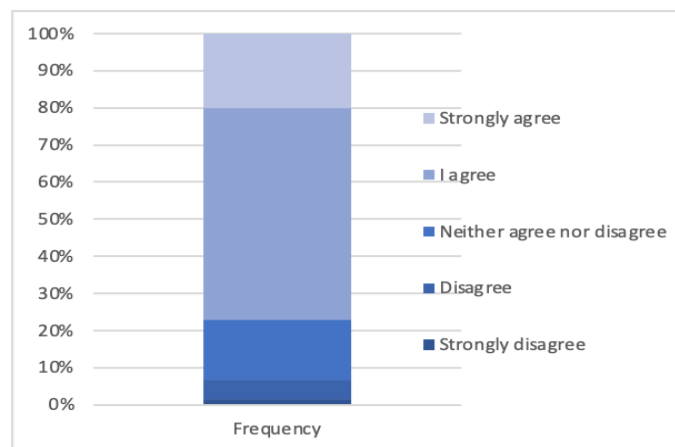


Figure 3. Frequency of intention to take measures to reduce energy consumption in the future
Source: Telešienė et al., 2024

As the above data show, the population believes that their household energy consumption is highly dependent on their choices, so information on renewable energy can significantly change the composition of household energy consumption. According to the survey (Štreimikienė et al., 2022), more than 30% of respondents have information about possible support measures for renewable energy in the household, 45.6% of respondents have heard about possible support measures but lack some information (Štreimikienė et al., 2022). Consequently, disseminating information on renewable energy options in the home can be more efficient.

According to Streimikiene (2022), community-based social marketing (CBSM) can be used as a tool to promote the reduction of household greenhouse gas (GHG) emissions through behavioural change. The results of the replicated study show that households can significantly reduce GHG emissions, saving energy and money without significant investments.

Although the use of renewable energy in Lithuania has increased significantly due to government policies, the full potential of using renewable energy in households is still unused due to household behaviour, which can be changed by providing more information to residents.

4. Household energy behaviour: a case of Morocco

Household energy consumption. Households are Morocco's second largest electricity consumer; therefore, household energy behaviour is making a tremendous impact on energy consumption in the country. Energy consumption is concentrated in cooking, water heating, and space heating, with significant regional variations due to climatic conditions. In Morocco, around 38% of household energy consumption is used for cooking, 24% for heating, and 24% (IEA, 2023a), with no consumable channels over time (Iysaouy, 2019). Moroccan households' main energy sources are butane gas, electricity and biomass. Butane gas is a widely used energy source, especially for cooking and water heating, as it is available to households through public subsidies. Electricity is used for lighting and electrical appliances and is becoming more widespread in rural areas, accounting for around 18% of household energy consumption (IEA, 2023a). In rural areas, biomass, especially firewood, remains an important energy source, particularly for cooking and space heating (MoF, n.d.).

Renewable energy sources, such as solar energy, are slowly penetrating Moroccan households. Solar water heaters are becoming more common, especially in newer developments and in urban areas. However, their overall contribution to household energy production is still low compared to traditional sources (Enerdata, 2023 b).

Patterns in household energy behaviour. The literature on household energy behaviour in Morocco is subject to some different patterns than in Lithuania.

First, Moroccans, in general, are very aware that renewable energy is part of climate change mitigation and strongly support renewable energy projects in the country. Large-scale surveys near renewable energy installations, such as the concentrated solar power project in Ouarzazate, show that most respondents understand the importance of switching to renewable energy. Around 91% of the respondents supported specific renewable energy projects, recognising their potential benefits for energy security and sustainability (Komendantova, 2021). However, despite the generally positive attitude toward renewable energy, there are still concerns about the economic implications. Moroccan respondents often prioritise economic factors when evaluating energy transformation projects (Komendantova, 2021). Issues such as the cost of the energy transition and its potential to create local economic opportunities are key. Many people evaluate renewable energy projects based on how they will affect local job creation and economic stability and, therefore, prefer tangible economic benefits to abstract environmental benefits. Unlike Lithuania, surveys of Moroccan households indicate a lack of active participation in the installation of renewable energy systems, with their role largely limited to benefiting from existing

renewable energy infrastructure. Morocco's energy policy primarily influences this limited engagement, which precedes the development of large-scale renewable energy projects over smaller, community-driven initiatives.

Second, the acceptance and support of renewable energy in Morocco also depend on the accessibility of information and participation in decision-making processes. The survey results note that many Moroccans feel inadequately informed about local renewable energy projects, with more than 40% of the survey participants reporting a lack of awareness about the specifics of these projects (Komendantova, 2021). The government has implemented laws and regulations to reduce energy consumption and increase efficiency. In addition, energy efficiency promotion campaigns show ways to reduce energy consumption and improve energy efficiency. Since 2008, the Kingdom has conducted public energy awareness campaigns on national television channels.

Additionally, municipalities have disseminated guidelines to assist citizens in enhancing their energy efficiency (Hafdaoui et al., 2023). The objective is to modify household energy consumption through behaviour change, specifically by promoting energy savings and efficiency, while considering the regional economy, terrain and climate. Despite these efforts, researchers have stated that challenges remain in enhancing efficient energy use (Hafdaoui et al., 2023; El Iysaouy et al., 2023). The information gap suggests that, while there is an underlying support for renewable energy, a better-informed public might engage more actively in the transition process. Improving communication about the benefits and operations of renewable energy projects could help bridge this gap and increase public support for renewable energy projects.

Third, urbanisation primarily influences households' energy behaviour in Morocco. Research shows that urban households in Morocco tend to consume more energy due to better access to electricity and modern appliances (Haouraji et al., 2020). Meanwhile, rural households mainly use traditional energy sources for cooking and heating, such as biomass, which consists of wood and other organic materials. While urban households benefit from a larger energy infrastructure that allows for more intensive and diversified energy use, rural households face access restrictions and continue to rely on biomass energy. This disparity in energy use between urban and rural households has implications for future energy consumption trends. With increasing GDP and urbanisation, Moroccan residential energy demand is projected to increase by 70% by 2030, with electricity as the final energy experiencing the highest increase (Haouraji et al., 2020). Following this pattern, economic growth and urbanisation will lead to increased energy consumption despite a growing awareness of the need for energy efficiency and sustainable practices.

To sum up, Moroccans are well aware of the role of renewable energy in mitigating climate change and are generally supportive of related projects; several factors influence their attitudes toward energy transformation. Economic considerations, such as the impact on local job creation and costs, often precede environmental concerns. Furthermore, the level of public participation and the availability of information are significant, as many Moroccans feel that they are not sufficiently informed about specific projects. The differences between urban and rural energy consumption and rapid urbanisation and economic growth pose challenges to sustainable energy use. Addressing these challenges through targeted communication and supportive policies is the key to encouraging more active and informed participation of households in the transition to renewable energy.

Conclusions

This study provides insight into how household energy behaviour contributes to the transition to renewable energy in Lithuania and Morocco, highlighting similarities and differences due to different economic, cultural and political contexts. In Lithuania, household energy behaviour has changed significantly due to government policies promoting small-scale renewable energy generation, such as residential solar energy systems. As a result, households have become more involved in producing renewable energy and are more energy efficient. Lithuania's focus on energy independence and sustainability is reflected in households' positive uptake of

renewable technologies, although barriers such as financial constraints remain. In contrast, Morocco has large-scale renewable energy projects, such as the Noor solar project, and households play a more passive role in the transition process. There is widespread public support for renewable energy. They are troubled by limited awareness of how to support national or local renewable energy projects more actively. The Moroccan government has implemented several initiatives to promote energy efficiency and address this. However, more must be done to increase public awareness and participation, especially in rural areas where traditional energy sources dominate.

The comparative analysis between the two countries highlights the vital role of tailored policies and interventions in shaping household energy behaviour. While both countries are committed to sustainable energy change, their strategies differ in scale and focus, reflecting their unique socioeconomic circumstances. Effective communication, economic incentives, and targeted policies can stimulate energy-saving behaviour in both countries and contribute to global climate goals.

The study had a limitation: it relied on secondary data sources. The renewable energy market is changing rapidly, as are people's attitudes and preferences towards using renewable energy. This dynamic nature means that the data used may not fully reflect new trends or changes in consumer behaviour after the data collection period. Furthermore, the rapid technological progress in both Lithuania and Morocco can significantly change household energy consumption behaviour. Future studies should consider incorporating longitudinal data and real-time analysis to understand how these changes affect households' adoption of renewable energy technologies and practices.

Future research could focus on a more in-depth study of the long-term impact of these households' energy-saving behaviour on national energy resilience and sustainability. In general, the study highlights that achieving the energy transition goals will require technological solutions and a deeper engagement with the social aspects of energy consumption.

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Funding: The research leading to these results has received funding from the project titled "Cluster for innovative energy" in the frame of the program "HORIZON-MSCA-2022-SE-01" under the Grant agreement number 101129820



Funded by the
European Union

Author Contributions: Conceptualisation: *R. Smaliukiene, J. Katina*; methodology: *R. Smaliukiene*; data analysis: *R. Smaliukiene, J. Katina*, writing—original draft preparation: *R. Smaliukiene*, writing; review and editing: *N. El Amrani El Idrissi*. All authors have read and agreed to the published version of the manuscript.

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