The Impact of Government Policies, Industry on Public Perception of Sustainable Energy: A Comparison of Portugal, Spain, and the Netherlands

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INTRODUCTION

In recent years, sustainable energy has gained increasing attention due to the urgent need for clean and renewable energy sources to combat climate change (Rizzil et al., 2014). It is crucial not only for a greener future but also for the stability and growth of economies. However, adopting sustainable energy solutions faces social challenges related to public behaviors, which hinder the acceptance of new technologies (Qazi et al., 2022). Despite the existence of measures and solutions for sustainable energy that are readily available, their adoption by society has not been widespread. This phenomenon underscores the need to understand factors influencing public perception and decision-making regarding sustainable energy technologies. Government policies and industry leaders play a significant role in shaping public behaviors as follows:

- Governments - are critical in creating and implementing policies and measures to incentivize energy-efficient solutions while addressing regulatory challenges (Qazi et al., 2022).
- Industry companies - are often at the forefront of developing and implementing innovative technologies and solutions, driven by market demand, competition, and the need for sustainable and efficient practices.
- Public decisions - are influenced by various factors such as awareness, affordability, and perceived benefits.

Numerous theoretical models have been proposed to study the public acceptance of new technology. One of the most widely used is the Technology Acceptance Model (TAM) (Mosly and Makki, 2018). TAM aims to predict and study the behavioral intentions of individuals to use technology (Davis, 1985). This model was proposed from the perspective of behavioral science, integrating expectation theory and self-efficacy theory (Davis, 1989). TAM originated from the combination of the theory of reasoned action (TRA) and the theory of planned behavior (TPB), two comprehensive theories of behavior extended by the TAM. TAM divides the factors affecting individual behavioral attitudes toward adopting new technology into two variables: perceived usefulness and perceived ease of use. Additional factors could be added to study the acceptance of new energy technologies in the countries under study, such as the costs, environmental awareness, and policies (Yu et al., 2022).

Therefore, by gaining a comprehensive understanding of the perspectives of governments, industries, and societies, we can effectively address the challenges and barriers that hinder the adoption of these technologies and promote their wider acceptance and implementation (Yu et al., 2022). A comparative methodology between Portugal, Spain, and the Netherlands has been chosen to achieve this goal partially. These three locations were selected based on their different approaches to renewable energy, geographical diversity, and availability of data and resources, making them ideal for this research. Portugal, Spain, and the Netherlands have different approaches and targets regarding renewable energy. Still, they are all making efforts to increase the use of renewable energy sources and to transition to a more sustainable energy system, as detailed below.

Portugal is known for its strong commitment to renewable energy sources, with a national target of producing 47% of its electricity from renewables by 2030 (The Portuguese National Energy and Climate Plan 2021-2030, 2019). The Azores and Madeira Islands are two

autonomous regions of Portugal that have a unique geography, culture, and energy landscape. These regions are isolated electrical and have significant potential for the development of renewable energy sources, such as wind and solar power. However, the challenges and opportunities associated with the transition to a more sustainable energy future are different in each region.

The Netherlands has a more moderate approach to renewable energy, with a target of producing 26% of its energy from renewable sources by 2030. (The Dutch Integrated National Energy and Climate Plan 2021-2030, 2019). The country has been focusing on expanding the use of renewable energy sources in the transportation sector, and it is also making efforts to increase the use of renewable energy in the industrial and residential sectors.

Spain has diverse energy resources and a varying energy landscape across its regions. The Spanish government has set a target to produce 42% of its electricity from renewable sources by 2030 (The Spanish Integrated National Energy and Climate Plan 2021-2030, 2019). Some regions, such as Andalusia and Catalonia, have a significant potential for solar energy, while Galicia and the Basque Country have more potential for wind energy. The Canary Islands, a Spanish autonomous community, have a unique geography and energy landscape, with the potential for the development of ocean energy and other renewables. The country has been making efforts to increase the use of renewable energy in the transportation sector and is also focusing on decarbonizing the industrial and residential sectors.

This work proposal is innovative because it intends to provide a comparative analysis of three different countries, delivering a comprehensive understanding of the impact of government policies, and industry on public perception of sustainable energy. Moreover, it will provide insights into best practices and challenges in promoting sustainable energy adoption in different countries, which can be useful for policy makers and stakeholders in other countries.

WORKING HYPOTHESIS AND PRINCIPAL OBJECTIVES

This doctoral thesis addresses the following hypotheses:
1. Government policies significantly impact the public perception of sustainable energy.
2. Industry leaders influence public perception through their actions and communications.
3. Public perception in Portugal, the Netherlands, and Spain towards sustainable energy is influenced by a combination of government policies and industry leaders.
4. The approaches to sustainable energy in Portugal, the Netherlands, and Spain are affected by cultural and historical differences.
5. Environmental awareness has a significant positive effect on the attitude towards using new energy technologies in these countries.

Based on the hypotheses outlined above, this study aims to achieve the following objectives:
1. To analyze the impact of government policies on public perception of sustainable energy in Portugal, the Netherlands, and Spain.
2. To examine the influence of industry leaders on public perception of sustainable energy.
3. To compare the public perception and attitude towards sustainable energy between Portugal, the Netherlands, and Spain.
4. To identify the best practices and challenges of promoting sustainable energy in the three countries.
5. To investigate the cultural and historical factors affecting the approach to sustainable energy in Portugal, the Netherlands, and Spain.
6. To suggest recommendations for improving the promotion of sustainable energy based on the results of the study.

METHODOLOGY

This study aims to investigate the public perception of renewable energy technologies in Portugal, Spain, and the Netherlands, examine the influence of government policies and industries on public behavior and decision-making, and understand the role of the Technology Acceptance Model (TAM) in explaining public perception within the context of these countries. A mixed-methods approach will be employed, combining qualitative and quantitative research methods to comprehensively understand the topic.

This study aims to provide valuable insights into the public perception of renewable energy technologies and the complex dynamics between government policies, industries, and public behavior by employing a mixed-methods approach. The findings will contribute to developing effective policies, strategies, and initiatives to promote sustainable energy adoption and mitigate barriers to its implementation.

1. Literature Review:
A systematic literature review (García-Peñalvo, 2022) will identify critical factors influencing public behaviors and attitudes toward sustainable energy. Relevant academic databases will be searched using predefined keywords and inclusion/exclusion criteria. The following databases will be included in the search:
-Scopus
-Web of Science (WoS)

The review will encompass studies that examine public perception, government policies, industry practices, and their impact on sustainable energy adoption. The findings from the literature review will inform the development of the survey questionnaire and interview protocols.

2. Survey:
A survey will be administered to a representative sample of the population in each country under study. A separate online questionnaire will be created for each country via Google Forms, based on the TAM model, and adapted to include specific variables such as gender, nationality, country, age, occupation, marital status, yearly income, accommodation type, and accommodation ownership. The survey will be tested in each country to ensure clarity and reliability within the respective cultural contexts.

3. Interviews:
A semi-structured separate interview guide will be designed for policymakers and industry leaders in Portugal, Spain, and the Netherlands, addressing country-specific research questions and themes. In-depth interviews will be conducted with policymakers and industry leaders in each country, either in-person or remotely, depending on their availability and preferences. The interviews will explore their perspectives, experiences, and insights on the interactions between public perception, government policies, industry practices, and sustainable energy adoption. The interviews will be audio-recorded with participants' consent and transcribed verbatim for qualitative analysis.

4. Data Analysis:

Quantitative data from the survey will be analyzed using appropriate statistical software (e.g., SPSS) to examine patterns, relationships, and associations between variables. Qualitative data from the interviews will be analyzed using thematic analysis, identifying key themes and patterns within the transcripts. Triangulation of quantitative and qualitative findings will provide a comprehensive understanding of public perception, the impact of government policies and industries, and their interplay in shaping public behavior and decision-making related to sustainable new technologies.

5. Ethical Considerations:

This study will adhere to the ethical guidelines the British Educational Research Association (BERA, 2018) outlined. Informed consent will be obtained from all participants, and their confidentiality and privacy will be protected throughout the study. Research ethics approval will be sought from the University of Salamanca.

MATERIAL MEANS AND RESOURCES AVAILABLE

The research will be conducted as part of the Ph.D. Programme on Education in the Knowledge Society at the University of Salamanca. (García-Peñalvo, 2013a, 2103b, 2014; García-Peñalvo et al., 2020).

The thesis is being carried out in collaboration with the GRIAL Research Group (García-Peñalvo et al., 2019; Grupo GRIAL, 2019) and the CIETI-LABORIS Research Group (https://bit.ly/3NcN0pu).

Moreover, as an employee of EDP (Energias de Portugal), the Ph.D. candidate has access to valuable data and resources that can provide valuable insights for this research. https://bit.ly/3MRtgXb

TIMING SCHEDULE

The work is organized across four years and divided into six phases.

Year 1: (M1-M12)

- Start phase 1: Defining the research plan.
    - Delimitation of the scope of the topic
    - Selection of the approach and methodology
    - Selection of techniques and verification of their suitability
    - Temporal planning of the actions to be carried out
    - Writing and revision of the plan

- Start phase 2: Literature Review
    - Systematic literature review of the previous studies about public perception in Portugal, Spain, and the Netherlands towards renewable energy technologies
    - Define the sample size, characteristics, selection criteria
    - Identify the variables that will be investigated in the study, the course structure and select appropriate instruments for data collection and evaluation
    - Preparation of a paper with the results of the systematic literature review.

Year 2: (M13-M24)

- Start phase 3: Quantitative Study
    - Develop separate survey questionnaires for each country
    - Pilot test the survey to ensure clarity
    - Data collection of the quantitative information with the population
    - Analyze the survey data separately

- Start phase 4: Qualitative Study
    - Design semi-structured interview guides
    - Conduct interviews with policymakers and industry leaders in each country either in person or remotely
    - Data collection of the qualitative information
    - Transcribe and analyze the qualitative data collected

Year 3: (M25-M36)

- Start phase 5: Integration and Synthesis
    - Joint analysis of the quantitative and qualitative results
    - Preparation of papers for publication in academic journals

Year 4: (M37-M48)

- Start phase 6: Finalizing the Thesis and Defense
  - Beginning of preparations for the final thesis defense
  - Finalization of the thesis manuscript
  - Preparation of a paper with the final results of the thesis.
  - Defense of the thesis

Additionally, throughout the 4-year PhD program, I will submitt abstracts and presenting findings at relevant conferences, workshops, and symposiums to gain visibility and receive feedback from the scientific community. Here are some journals and conferences that focus on the public perception of renewable energy technologies, as well as the impact of government policies and industries on public behavior and decision-making related to sustainable new technologies:

Journals:
1. Energy Policy
2. Renewable and Sustainable Energy Reviews
3. Energy Research & Social Science
4. Journal of Environmental Psychology
5. Nature Energy
6. Energy and Buildings
7. Journal of Cleaner Production
8. Environmental Research Letters
9. Sustainability Science
10. Applied Energy

Conferences and Workshops:
1. Technological Ecosystems for Enhancing Multiculturality TEEM
2. International Conference on Energy, Environment, and Economics (EE&E)
3. Conference on Energy, Environment, and Climate Change (ICEECC)
4. International Workshop on Sustainable Energy Technologies and Systems (SETS)
5. Workshop on Renewable Energy Policy and Planning (REPP)
6. Conference on Energy Psychology and Sustainable Behavior Change (EPSBC)
7. Workshop on Public Opinion and Policy-Making in Energy Transitions (POPET)
8. International Conference on Renewable Energy and Sustainable Development (ICRESD)
9. Conference on Energy, Sustainability, and Society (ESS)
10. International Conference on Sustainable Energy Technologies (SET)

Task & phases of the research	M1-M6	M7-M12	M13-M18	M19-M24	M25-M30	M31-M36	M37-M42	M43-M48
Phase 1: Planning								
Delimitation of the scope of the topic	■							
Selection of the approach and methodology	■							
Selection of techniques and verification of their suitability	■							
Temporal planning of the actions to be carried out	■							
Writing and revision of the plan	■							
Phase 2: Literature Review								
Systematic literature review of the previous studies about public perception in Portugal, Spain, and Netherlands towards renewable energy technologies		■						
Determine the sample size, characteristics, and selection criteria		■						
Identify and define the variables that will be investigated in the study		■						
Define the course structure and content, considering the research objectives and methodology		■						
Select appropriate instruments for data collection and evaluation		■						
Phase 3: Quantitative Study								
Develop separate survey questionnaires for each country			■					
Pilot test the survey to ensure clarity			■					
Data collection of the quantitative information with the population			■					
Analyze the survey data separately			■					
Phase 4: Qualitative Study								
Design semi-structured interview guides				■				
Conduct interviews with policy makers and industry leaders in each country either in person or remotely				■				
Data collection of the qualitative information				■				
Transcribe and analyze of the qualitative data collected				■				
Phase 5: Integration and Synthesis								
Joint analysis of the quantitative and qualitative results					■			
Preparation of papers for publication in academic journals						■		
Phase 6: Finalizing the Thesis and Defense								
Beginning of preparations for the final thesis defense							■	
Finalization of the thesis manuscript							■	
Preparation of final defense materials, including slides, handouts, and presentations								■
Defense of the thesis								■

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