10/05/2024

URBAN SYNERGY THINKERS

TOWARDS AN IMPROVED E.T. PLANNING:

UTILIZING THE DELPHI TECHNIQUE TO OPTIMIZE ENERGY TRANSITION PLANNING

A PROPOSED SOLUTION

ECIU Challenge

INSA Rouen

Edited by:
Tracy Mae Ildefonso

Writers:
Tracy Mae Ildefonso
Judita Švaikauskaitė
Jing Aurora Tvinnereim
Adrianna Cieśla
Etienne Tyburn
Valentin Laugery

Art & Design:
Etienne Tyburn

Design:
Valentin Laugery

TABLE OF CONTENTS

Introduction

During ecological meetings to help aid with the world's climate change crises through various environmental and sustainable goals such as low-carbon emission targets (see: The UN Climate Change Conference or The Paris Agreement aka COP21), one frequent problem has been observed: the energy transition process is not progressing at a faster pace as expected. One fundamental reason that stunts a faster transition in various sectors of the world is the continuous reliance on fossil fuels (Court, 2014). Despite efforts in transitioning, such as building infrastructures relying on renewable energies, a certain aspect of this work will still have to rely on fossil fuels. For example, to build said infrastructure, the materials, such as photovoltaic panels, still needed to be shipped powered by fossil fuels from one country to another (ibid). As such, renewable energy is still not enough to be a standalone power source for most sectors in almost all countries at the moment. Thus, raises a fundamental and pertinent inquiry: how can we expedite the energy transition process and start seeing significant progress?

In 2024, INSA Rouen Normandie, in partnership with ECIU University, led by Prof. Bruno Renou and Prof. Maël Moreau, launched an international challenge entitled "ReThinking (in systems) the energy transition in a Metropolis." This academic challenge aims to understand the specifics of Rouen's current energy transition plan and to propose solutions to improve its effectiveness. The program gathered over 20 international students from various fields, such as, but not limited to, engineering, architecture, business, and social sciences. This hybrid program, which ran from January to April, brought all the participants to INSA Rouen Normandie for a week to observe how the Métropole Rouen Normandie implemented measures to ensure renewable energy sources are available for its residents. Thus fulfilling another goal of this challenge, which is potentially influencing and inspiring effective energy transition planning in the participants' home countries. Albeit an effective and progressive energy transition process in Rouen, the participants have learned that the process is still facing various challenges and problems.

In this paper, the Urban Synergy Thinkers team presents a proposed solution that can potentially help accelerate the achievement of the environmental objectives set for the coming years: utilizing the Delphi Technique in energy transition planning. This methodological tool centralizes all stakeholders involved in the planning process, ensuring the effective engagement of all players involved to produce a more sustainable, effective, and feasible planning and implementation. This proposed solution has been a product of lessons gathered in this challenge, both from the various experts' perspectives and physical observations during the study visit to the Metropolis of Rouen.

Our Team

The **Urban Synergy Thinkers** Team, aka the "Thinkers," consisting of individuals from different cultural and geographic backgrounds, collaborated and shared their experiences to develop a solution potentially suited for a universal metropolis. The team gathered inspiration from various works in their respective home countries in working towards the goal of providing a solution for this challenge.

Jing Aurora Tvinnereim

Norway

Societal safety & technology management
Risk Assessment, Entrepreneurial Methods

Adrianna Cieśla

Poland

Management, Business Studies
Planning and Organizing, Marketing

Dr Tracy Mae Ildefonso

Ireland

Media Communications & Social Sciences
Research and Interpersonal Communication Skills

Valentin Laugery

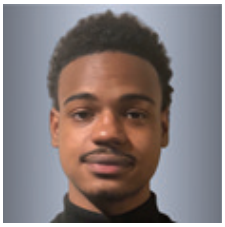
France

Civil Engineering & Architecture
3D Modeling, Technical Knowledge

Judita Švaikauskaitė

Lithuania

Environmental Engineering
Research and Global Awareness



Etienne Tyburn

France

Civil Engineering & Architecture
Architectural Knowledge

01

OUR E.T. PLANNING: HOW IT STARTED

1. Our E.T. Planning: How it Started

1.1. Preliminary work: Study the complexity of the territory & interactions between the stakeholders

The first significant step in finding solutions is to focus on understanding why the energy transition was not effective enough.

After analyses of different real-life energy transition planning in various European Cities, such as Rouen, Oslo, and Kaunas, the team then realized that the complexity of the territory played a crucial role in this problem. Indeed, geographical, economic, and social constraints can slow down a metropolis' energy transition. For example, a landlocked city might struggle to develop a hydroelectric power source that will sustain the power needs of a city. By basing the analysis on a fictitious metropolis that the team named "The Polfin Metropolis," the Thinkers were able to analyze the links and interactions between all sectors and the impact of stakeholders on all these sectors. In addition, the team took into account all flows, both tangible and intangible, between these various sectors significantly affecting their relationships in different aspects, not just in energy transitioning. These flows include transportation, monetary, information, and resource flows. This approach has enabled the team to establish an in-depth diagnosis of the metropolis, which guided the reflections in improving future steps in energy transition planning.

Fig. 1 : The Urban Synergy Thinkers' model of the Polfin Metropolis

In the second phase of the project, the Thinkers critically examined the interactions between each sector involved in the energy transitioning process. The analysis revealed that all sectors were interconnected with each other, whether directly or indirectly, and could massively influence the others. These preliminary analyses were crucial to the development of a sustainable solution for the metropolis as this made the team aware of the importance of considering all the sectors and stakeholders involved in the energy transition. Thus, significantly shifting the focus to stakeholder consultation. This awareness is currently at the center of the team's proposed solution for improving energy transition planning in the future.

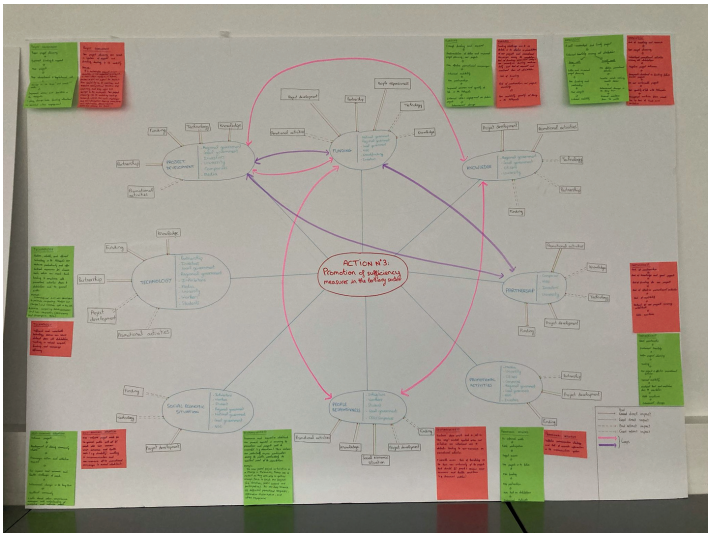


Fig. 2 : Mapping interactions and links between all sectors involved in ET planning: promoting sufficiency measures in the tertiary sector

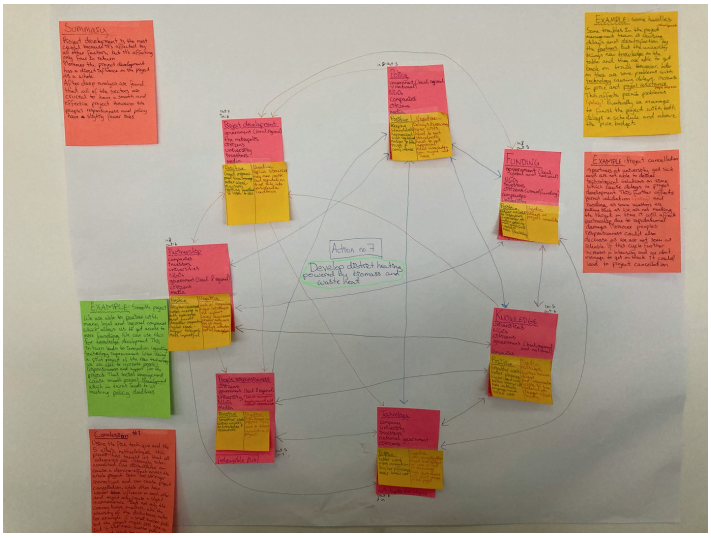


Fig. 3 : Mapping interactions and links between all sectors involved in ET planning: developing district heating powered by biomass & waste heat

1.2. Improve the participation and commitment of all stakeholders

Upon analysing the Plan Climat Air Énergie Territorial (PCAET), it was observed that the Rouen metropolitan area faces several major challenges that may have hindered them in progressing in a phase that they have initially set out. For example, the city is pressured to meet targets set by the government. However, the city does not have enough capacity to implement such targets. At the same time, mobilizing funds to maintain public services and ensure economic stability had also become a challenge. One of the major obstacles that is yet to be solved is the commitment of all stakeholders to the energy transition. As pointed out in the team's preliminary work, this is a crucial factor. One of the possible reasons why such problems emerge is due to some of the stakeholders' needs that were not being met or being disregarded in the transition

planning. Hence, the disinterest in commitment. Thus, the Thinkers deemed it crucial to focus on effective stakeholder consultation in energy transition planning as this is deemed to be the most impacting and the most difficult to resolve in this part of any project.

In analyzing the origins of this problem, several contributory factors have been identified. These are a lack of stakeholder diversity, duplication of already established efforts, wasted resources, lack of mutual knowledge, ineffective communication and lack of transparency. Despite the existence of action plans, there are still significant gaps between the trajectories planned and the actual implementation of these plans in the territory.

As Prof. Mael Moreau, in charge of energy transition planning at Métropole Rouen Normandie, highlights, "What we can already improve on is the methodological framework: there have to be ways of rethinking the way we do energy planning that allows us to take into account the interests of the various stakeholders, with a better understanding of the impact that each action has on everyone," (personal communication, April 03, 2024).

As such, the Urban Synergy Thinkers would like to present a new methodological tool called the "Delphi Technique." The technique is new in the sense that this method was rarely applied in the energy and sustainability field when planning energy transition action plans. The technique, which aims to involve all stakeholders in the energy transition planning, is considered a new approach in an established field which focuses more on the human aspect of the project as opposed to the long-running methodological approach focusing more on the technical approach that is only comprehensible by limited members of a metropolis, such as the experts. Thus eliminating the public and the stakeholders, the people who will be most affected during the energy transition projects, leading to unmet needs and dissatisfaction. The Urban Synergy Thinkers believe that applying the Delphi Technique at the beginning of all energy transition planning can potentially help the planners create a more effective and feasible strategy that may lead to long-term and active commitment of everyone involved. Thus contributing to solving one current crucial problem: accelerating the energy transition process.

02

THE DELPHI TECHNIQUE

2. The Delphi Technique

Introduction

This chapter introduces the team's proposed solution for effective energy transition planning: The Delphi Technique. In the previous chapter, the Thinkers emphasized the importance of focusing on the human aspect of energy transition planning to meet all stakeholders' needs transcending the traditional approach which was technical in nature. Through discussion of the Delphi Technique's history in this chapter, it is observed that this transcendence is quite similar to the evolution that the Delphi Technique went through. The fundamental idea of the Delphi technique is a systematic forecasting approach through combining expert opinions to reach a consensus. This technique initially originated from the defence industry. However, the method has evolved from its initial scope and is now used in multiple domains such as healthcare, education, and management. The Delphi Technique, in newer studies, is now being applied in the energy transition field. Additionally, the method's applicability to the energy sector is explored in this chapter through analyses of empirical studies and existing schemes applying the tool in an energy transition project at both local and national levels. Moreover, while it is an effective tool, it has its strengths and weaknesses. These are discussed, as well as analyses of real-life examples of challenged projects because of the lack of implementation of the Delphi Technique.

2.1. The Background of The Delphi Technique

The Delphi method presents an approach to gathering insights and fostering consensus. Originally, it was developed by the RAND Corporation for military forecasting to anticipate future attacks (Nasa et al., 2021). The RAND Global and Emerging Risks division specializes in creating innovative methods and conducting thorough research on significant global threats. Their Center for Qualitative and Mixed Methods focuses on developing tools for empirical research through exploratory data collection and analysis. Later on, various fields and disciplines started using and adapting the Delphi method in their studies and research, such as healthcare, education, and management. The Delphi Technique is used to estimate the likelihood of an event occurring within a timeframe, predict its expected timing, identify policy issues requiring attention and improve

decision-making (Khodyakov et al., 2023). These are achieved through a structured, iterative, and anonymous communication process used to aid decision-making in situations of uncertainty and limited information (ibid). It involves getting input from a selected group of experts multiple times and sharing their responses anonymously to develop group consensus objectively, serving as evidence for decision-makers (ibid).

2.2 How to implement The Delphi Technique

According to Khodyakov and colleagues (2023), the process of implementing the Delphi technique involves hand-picking a selected group of experts, known as "Delphi panelists." These panelists initially respond based on their knowledge and personal insights, which will later refine their responses after reviewing and, at times, discussing how their opinions align with the collective responses of their peers. The Delphi method can be administered via surveys in paper and/or digital formats, or through in-person modalities during data gathering and feedback stages. The professionals who organize and oversee Delphi studies, commonly called "panel conveners," might also supply summaries of current research findings related to the topic being studied alongside or prior to the initial Delphi survey. In instances where there is minimal existing research, panelists could be invited to contribute to the identification of topics for future rounds.

After the panelists complete the initial round by answering questions and justifying their choices, they are presented with a comparison of their responses to those of their colleagues. They are then invited to reaffirm or adjust their initial answers. This iterative cycle continues over successive rounds until the responses stabilize, a mutual agreement is achieved, or a predetermined number of rounds is fulfilled. Finally, the coordinators of the panel compile the outcomes, usually making a list of final consensus statements. It is important to note that there is no agreement in the literature on the best way to measure consensus. Also, one should decide on how to measure if consensus is reached before starting the study to avoid data fishing. What is appropriate may depend on the goal of the study (Khodyakov et al., 2023). Von der Gracht (2012) provides a review of consensus measurement in Delphi studies.

The classic Delphi Method involves four key characteristics: anonymity, iteration, feedback and statistical summary. Anonymity is used to ensure objectivity which mitigates cognitive biases. This helps participants to express unconventional opinions without worrying about reputational loss. The Delphi method uses an iterative process, usually two to seven rounds. However, excessive rounds may lead to participants modifying their opinions just to finalize the process. The next step is the feedback process providing a summary of the responses. In this process, an opportunity will be given to the participants to re-evaluate and revise their responses if needed. The Delphi method uses statistical methods to analyze numerical responses (Khodyakov et al., 2023).

Hence, the classic Delphi Method applies the following steps:

1. Choose a panel convener.
2. Identify experts.
3. Carry out rounds of questionnaires.
4. Summarize the results.

2.3. Advantages and Disadvantages of The Delphi Technique

Like any methodology, the Delphi technique has its strengths and weaknesses. The crucial aspect is to assess if the benefits outweigh the drawbacks and determine if the concessions are acceptable. In the Thinkers' proposed solution, which is to focus on the human aspect of energy transition planning, it is essential to carefully consider the pros and cons of the Delphi technique to reach a beneficial consensus, make an informed decision while ensuring that goals are not lost and compromised amidst the process.

The following are the perceived advantages and disadvantages of using the Delphi Technique according to Drumm and colleagues (2022) and Toumia (2022):

ADVANTAGES

Anonymity – By anonymity, people will be encouraged to share their opinions without the fear of other's opinions or divulging themselves as non-experts on the subject of inquiry.

Reduction of groupthink – The consensus will be based on the data gathered rather than data influenced by team members' various perspectives. It is crucial to determine the people's accurate and authentic insights regarding the project to lessen or eliminate biases or preconceived notions. As a result, a more objective and unbiased evaluation of the project will possibly develop.

Elimination of Dominant Personalities – It is important to ensure that everyone's opinions are heard, regardless of their level or lack of assertiveness or dominance. By doing so, we can prevent dominant personalities from swaying others to their point of view and gather more reliable responses from all respondents.

Geographical Flexibility – Due to technological advances, such as the internet, online questionnaires can be devised which will be accessible to everyone, regardless of geographical location or time constraints. This will result in a greater number of respondents from various regions seamlessly. Online public consultation will also eliminate the need for an in-person forum, thus giving comfort and benefits to the researchers, such as lesser costs and an easier data-gathering process.

Flexibility in Questioning – Through the Delphi technique, researchers can continually adapt and refine their questioning approach based on the responses received. This enables a more focused and targeted exploration of the topic, allowing for the development of ideas through adjustment of questions in response to changing information. This will help the project gather tools to have a thorough and accurate analysis of data.

DISADVANTAGES

Time-Consuming – Sometimes, unexpected delays may occur despite the best efforts to avoid them. It is challenging to predict how quickly the responses from the people will be gathered. However, the respondents can be motivated by offering incentives such as gift cards. Moreover, it is important to be prepared for any delays and plan accordingly.

Potential for Dropout – Due to various reasons, such as poor survey structure or attention deficit, respondents initially involved at the beginning of the data collection can easily lose their interest leading to incomplete participation in the survey. Such circumstances may result in the loss of valuable expertise from different stakeholders and may potentially affect the data gathered. Hence, it is important to construct a questionnaire that is concise, and visually appealing, and, as cited earlier, the team can provide incentives to motivate participation from the respondents.

Difficulty in Panel Selection – Choosing the most beneficial panel members while ensuring diversity of expertise and perspectives can be a challenging task. It often requires significant effort to convince each panel member to share their knowledge and experience. The panel group can be divided into two categories – experts with technical knowledge who provide information and guidance about technology limitations and infrastructure, and community members who provide a societal perspective by sharing information about the impediments that the local community can handle to achieve future success. Each group may require different approaches to complete the selection process. However, diversity in panel members ensures authentic and trustworthy results and data.

Lack of Face-to-Face Interaction – Due to the lack of physical interaction, people tend to give shorter responses when communicating their beliefs and opinions.

An in-person interaction allows the respondents to articulate their insights further, accompanied by expressions and body language. Communication through digital methods may be challenging in interpreting and understanding the emotions of the respondents.

Subjectivity – It is worth noting that some of the expert respondents may have personal interests in providing certain responses, such as the possibility of securing a job or investment opportunity. Additionally, the opinions that they express may be influenced by external sources, such as media, the internet, or hearsay. These factors may have an impact on the objectivity of the responses provided. The researchers need to apply discernment in the analysis of such responses.

Difficulty in Reaching Consensus – It can be difficult to reach a consensus from stakeholders depending on the challenge encountered during data gathering, such as lack of the amount of feedback despite efforts to extend the deadline. In such cases, if the data is not enough, it might result in one-sided or biased information or a lack of empirical evidence to back some claims and arguments. This might result in failure to devise an effective project output.

After evaluating both the advantages and disadvantages of the Delphi technique, it can be concluded that this technique is a suitable choice for the improvement of energy transition planning, ensuring a tailor-specific approach to the various needs of various stakeholders. The researcher, however, must be cautious in using this technique. If the researchers can effectively leverage the advantages and mitigate the disadvantages, the Delphi technique will be advantageous and beneficial in delivering invaluable outputs based on the goals set out in their projects.

2.4. Literature Review

In this section, an introductory analysis of the available literature concerning the application of the Delphi Technique in Energy Transition planning is discussed. These studies presented the usefulness of the technique in application to a field different from its originating field, which was the defence industry. The technique can also help in reaching an agreement between polarizing views and opinions that significantly delay the planning process.

2.4.1 The Finnish Study

A Finnish study by Sillman and colleagues (2023) investigated how different fields perceived the energy transition by using the Delphi technique. The study focused on identifying the barriers and actions in achieving the targets, such as achieving carbon neutrality, which requires substantial changes across many industry sectors. When inquired about the necessary actions to reach this goal, the responses revealed a troubling issue: there was no agreement on which actions were feasible. Other barriers particularly related to switching to an electric private car, are the costs of needed infrastructure, the perceived nuisance of recharging cars, and the consumers' resistance to switching from fuel-run cars to electric ones. The results of the investigation show that while it is possible to achieve the emission targets, a range of political and technological changes are needed to be implemented. The study's findings indicate a consensus among energy experts from diverse sectors on the difficulties and prospects associated with low-carbon technologies and the objectives for reducing greenhouse gasses in Finland. However, there are disagreements and inconsistencies regarding the policies aimed at accelerating development. This is particularly evident in the debate over whether to employ incentives or regulations across various sectors. This highlights the need for continuous dialogue between policymakers and key stakeholders when developing new policies as it was proven that there is no one-size-fits-all solution suitable for all sectors.

Sillman and colleagues (2023) argue that the results apply to multiple other countries, especially in the European Union, in identifying critical factors in energy transition, and thereby helping policymakers. Furthermore, only a few studies regarding the application of the Delphi technique in energy transition investigations exist. With limited related research, this Finnish study is a great resource that offers insights for future studies regarding the Delphi Technique and energy transition feasibility planning.

2.4.2. The Delphi Technique as a Tool to Bridge Disagreement

During policy planning among policymakers, it is inevitable for disagreements to occur due to the different views of planners involved. Such differences also reflect differing values leading to delays in implementation and proper planning. A study by Kattritzi and Winskel (2020) highlighting the future of the UK's energy system presented how the planning created considerable disagreement among the experts involved. Some examples of these differing views are heating in the buildings and personal transport. For example, the

stakeholders disagree on whether changing consumer behaviour will play a critical role in the UK`s transport transition. Changes in consumer behaviour mean a decrease in travel, shared ownership and increased walking, cycling, and usage of public transportation. Hence, will not help encourage citizens to contribute to lower carbon emission goals. Kattritzi and Winskel's (2020) study demonstrates that applying the Delphi technique is useful in uncovering the scope and variety of expert disagreements. The findings suggest that increasing evidence or conducting reviews on insufficient information, such as using both qualitative and quantitative analysis and/or data gathering, can bridge expert disagreement. Moreover, developing scenarios that are considerate to different values and perspectives, while satisfying various needs, helps in better understanding everyone's viewpoints, thus lessening disagreements and uncertainties. Through the implementation of the Delphi technique, policymakers will be presented with evidence and consensus that will guide them in making more informed decisions that will benefit everyone involved in the process.

In the next chapter, the Urban Synergy Thinkers' proposal of how to effectively use the Delphi Technique in energy transition planning is discussed. Furthermore, the extension of the literature review chapter, incorporating the Thinkers' proposed methods and stages, also known as "The Big 5," is explained in chapter four. The terminology "The Big 5" is coined by the Urban Synergy Thinkers.

03

THE DELPHI TECHNIQUE IN ET PLANNING:

A PROPOSED SOLUTION

3. The Delphi Technique in ET Planning

Urban Synergy Thinker's Proposed Solution in Improving Energy Transition Planning

As cited earlier in this paper, there is a fundamental problem observed by the experts, particularly in accelerating the energy transition implementation in various countries. According to one of the lectures of Prof. Renou during this challenge, the following four-step method is the current mapping guide used in drawing up an energy transition plan for a metropolis (online lecture, March 12, 2024):

1. Diagnostics: This stage consists of drawing up a complete assessment of the data relevant to the metropolis in terms of energy transition.
2. Strategy: Defining the targets for reducing energy consumption and increasing renewable energy production.
3. Actions: The actions to be taken to achieve the targets defined in the strategy stage are identified.
4. Monitoring: This phase aims to identify any gaps between the results obtained and the initial objectives.

However, as demonstrated in Chapter One, the current method has several shortcomings, particularly the commitment of the various stakeholders in the transition. This can be especially seen in the public's difficulty in committing to such transition planning, especially if it is providing them more inconvenience than comfort.

Hence, the Urban Synergy Thinkers is proposing to adopt the Delphi Technique to improve the current energy transition plan, particularly under the second step, the "strategy." In this chapter, the discussion of how the existing four-step method in energy transition planning, which is mainly concerned with the technical aspects of the planning, can be enhanced by applying "The Big 5." The Big 5 is focused on how to understand the different needs of stakeholders involved in planning. The term "The Big 5" is coined by the Urban Synergy Thinkers. As explained in Chapter Two, the Delphi Technique has been successfully used in various fields due to its capacity to provide invaluable results through gathering the opinions of the various stakeholders. This often resulted in taking all accounts fully and proposing solutions that are suitable for a greater number of people.

3.1 The Delphi Technique Implementation Plan

Firstly, since the aim of the Delphi Technique is to effectively integrate the opinions of the various stakeholders into the decision-making process, it is deemed logical to apply the technique once the strategy, the second action in the traditional four-step method, has been established. By doing so, it will be easier to determine the necessary steps to move forward. Moreover, another benefit of using this technique in energy transition planning is that it can be implemented at any stage of the current plan.

Within this section, eight essential characteristics of the Delphi Technique that are integral to executing "The Big 5" successfully are identified. "The Big 5" are five key steps that are crucial in acquiring accurate data during energy transition strategy planning and can be repeated as needed. This will be further discussed in the following section. Nevertheless, it is imperative to underscore that these eight key characteristics must be upheld and established before engaging stakeholders using "The Big 5" method. These eight essential characteristics, while inspired by Niederberger and colleagues (2021), Drumm and colleagues (2022), Jayawardena (2022) and Toumia's (2022) study, are developed further by the Thinkers based on research, analysis, discussions, and gathering experts' opinions.

The eight essential characteristics of the Delphi Technique are the following:

- **Selection of panel experts** – The Thinkers suggest dividing the experts into two groups. First, experts and specialists who have broad knowledge in the area of energy transition, ecumenical factors affecting it, technologies required to implement it, technical barriers, legal presiders etc. The second group will include the citizens who will be mostly affected by the changes caused by the energy transition planning. This group can be the people who live in the metropolitan area, those who will be disturbed by the process of implementation, and those who will benefit from it the most. The said groups can potentially deliver vital information about their preferences and disagreements on the planning, compromises all parties can make, and services all stakeholders can provide to ensure participation in the planning and implementation phases.

- **Preparation of questionnaire** – Two sets of questions will be created, with each set being personalized based on the group that will be answering it. The language and content of the questions will be tailored to each group's specific needs. For instance, a citizen group will receive a more informal, jargon-free questionnaire with questions that allow for expressing emotions, feelings, and needs, while a specialist group will receive more specific questions with technical vocabulary and questions in ordinal (rank, i.e. satisfaction level from 5 to 1) and nominal format (labeled, i.e. yes or no).

- **Distribution of questionnaires** – The surveys will be made available online for both groups and anyone who volunteers can complete them during a specific timeframe. Additionally, a promotional effort through social media and in-person efforts, such as forums and gatherings in local or community offices or organisations, can be planned to raise awareness about the research and attract as many participants as possible.

- **Collection of responses** – The responses will be collected after a certain timeframe. In the case that further data is needed due to a lack of responses gathered in the first timeline, the data questionnaires can be redistributed. This is one of the many advantages of the Delphi Technique as it is modifiable and adaptable based on the needs of the projects.

- **Analysing responses** – The energy transition planning will progress based on the data gathered during the stakeholder engagement. In the case that further clarification or data is needed due to information gathered from initial data analysis, the data collection can be repeated as needed, based on the project's needs, funding, goals, timeframe, etc.

- **Gathering feedback and iteration** – Once the analysis is completed, the feedback will be evaluated to determine its quality and usefulness. The assessment will help in determining the direction for further questioning and identifying areas where more developed answers are needed.

- **Repeat Rounds** – In the next round of questioning, two groups of panel experts will be sought, similar to the previous round. The process may involve various steps necessary to achieve the goal of repeat rounds. This can be done via online distribution, collection, analysis, and feedback preparation. The timeframe and number of repeat rounds will depend on the responses and the project's needs. There is no specific timeline set or number of times this stage can be replicated. However, the Thinkers estimate that the process can be repeated around three to four times and may last for a month per round.

- **Final report with recommendations** – Once all the necessary information has been collected, a final report will be compiled. The report will provide an overview of the findings and offer recommendations based on the data collected.

Once the researchers are familiar with these eight essential characteristics of the Delphi Technique, the next crucial step is the implementation of "The Big 5."

3.2. The Big 5: The Crucial Stages of DT in ET

The Big 5, coined by the Thinkers for the presentation of the team's proposed solution to improving the energy transition planning, pertains to the crucial five-step method that researchers should take to ensure effective stakeholder engagement. The Big 5 is best applied during the "strategy" phase of the four-step method in the current energy transition planning being used as cited earlier. The Big 5 can be applied during public consultations with the citizens, community leaders, and industry players. The overview of The Big 5 is presented in this graph:

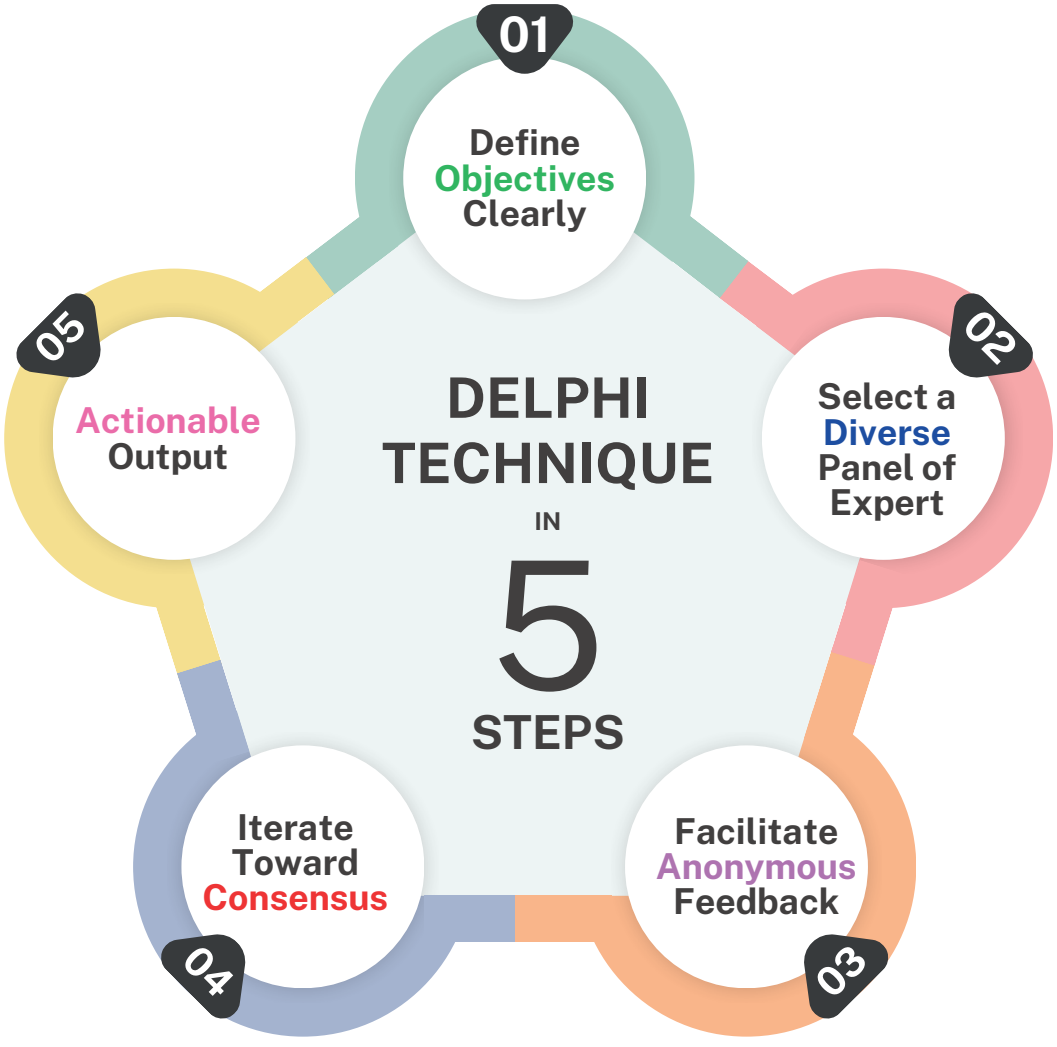


Fig. 4 : "The Big 5" graph

Step One: Clear Definition of Objectives

When engaging with stakeholders, it is important to clearly communicate the reasons for the engagement and provide detailed information so that they can make an informed contribution. This will help ensure that the engagement process is productive and effective. For instance, in a public consultation on shifting from gasoline to electric cars, it is necessary to inform the public that the consultation aims to ascertain their approval or disapproval of various propositions involved in the planning.

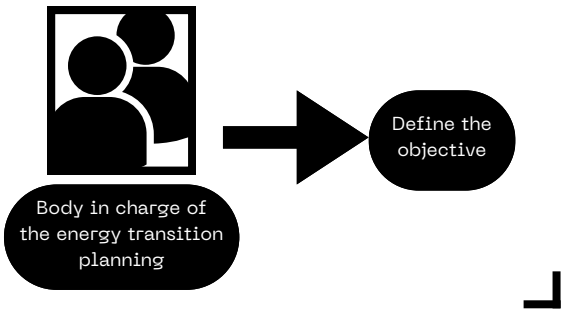
Step Two: Selection of Diverse Panel of Experts

Having a diverse group of both experts and citizens as participants in any public consultation is very important, especially regarding the energy transition that involves many stakeholders. This way, the solutions generated will be more inclusive and cater to the needs of the majority. For example, there should be experts who can explain the technical terms and policies to laypeople during public consultations.

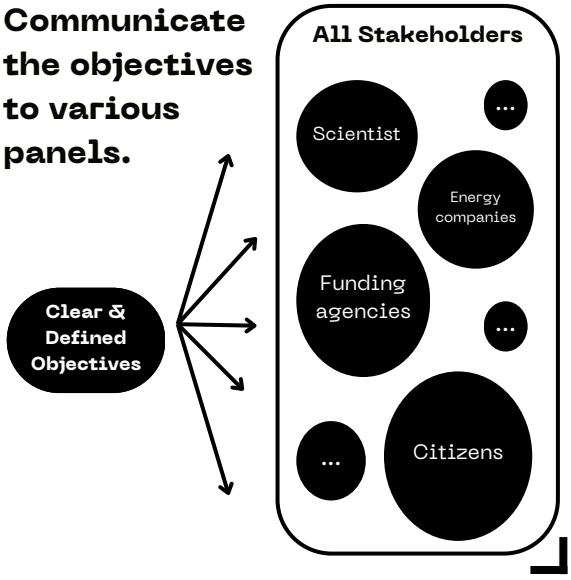
Step Three: Facilitation of Anonymous Feedback

To obtain reliable results, it is important to allow participants to provide honest feedback without any external pressure. This can be achieved by ensuring their anonymity, for instance, by allowing them to submit their responses online through surveys or emails. This way, stakeholders can feel comfortable to express their views without any fear of being influenced or judged.

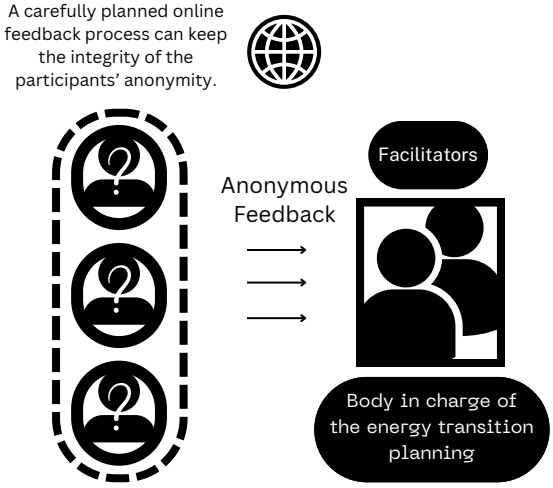
Who defines the objective?



Communicate the objectives to various panels.



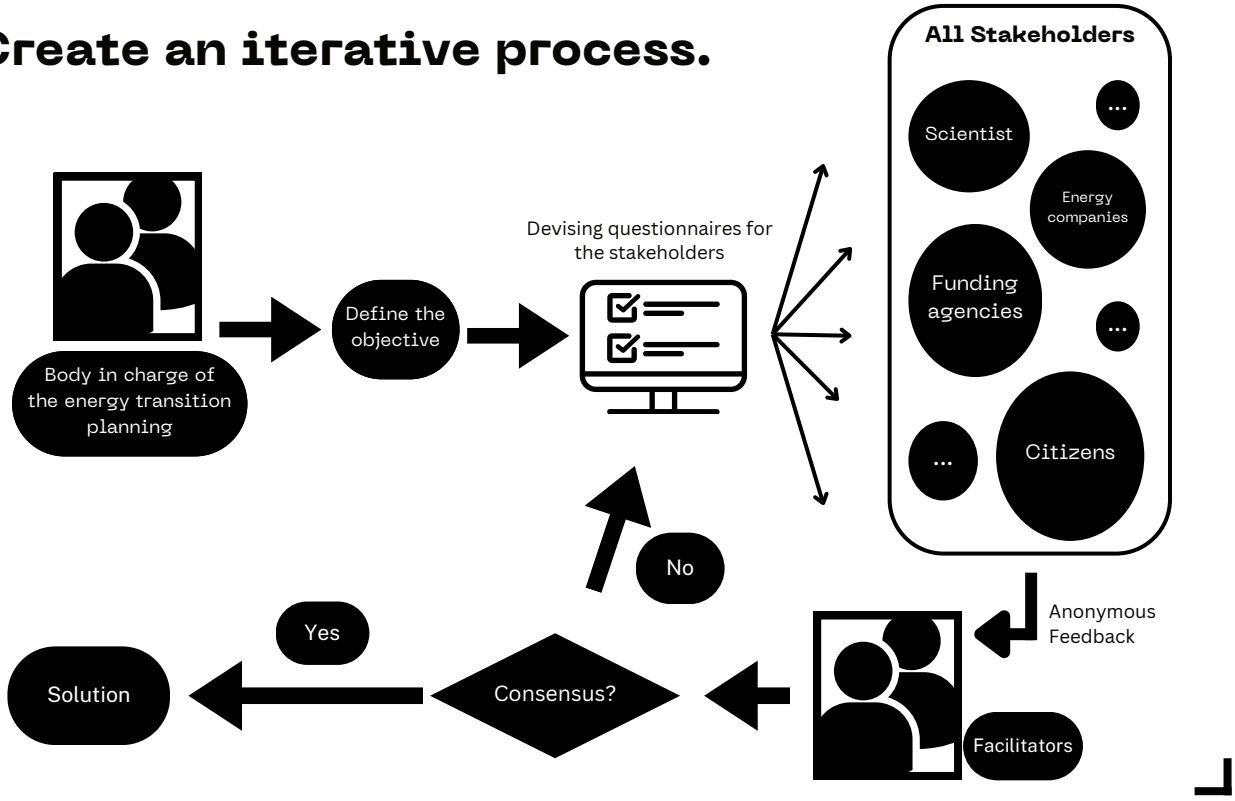
How to facilitate anonymous feedback?



Step Four: Iteration Towards Consensus

As previously mentioned in the "Repeat Rounds" section, it is crucial to plan another set of consultations to achieve a mutual understanding among all parties involved. Due to the variety of stakeholders, reaching a consensus in the initial round of questioning may prove to be challenging. At times, it may require more time to reach a dependable and effective agreement. For example, to achieve unbiased analysis, an extended survey deadline or a second round of surveys can be conducted if the first round gathers more responses from experts than the general public. This step allows for equal participation from all groups and ensures unbiased analysis during the planning.

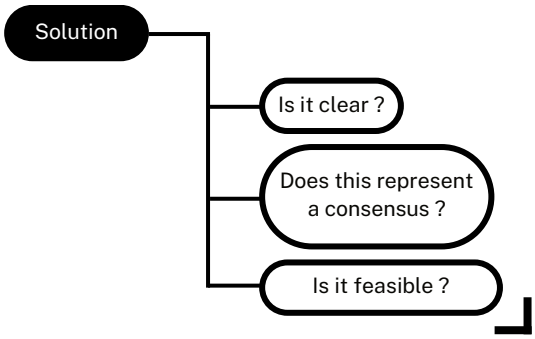
Create an iterative process.



Step Five: Actionable Output

The proposed solutions should take into account the information gathered from the public consultation. This will ensure that the sector can implement effective and sustainable changes by addressing the diverse needs of people. For instance, if small business owners have issues with paying energy fines that are the same amount as those imposed on larger businesses, policymakers may consider adjusting the planning process to ensure that energy fines are equitable for everyone.

Verification of the solutions.



04

"THE DELPHI EFFECT"

4. "The Delphi Effect"

Introduction

This chapter discusses the use of the Delphi Technique in real-world energy transition planning, specifically how "The Big 5" method was applied in four different projects. The section is divided into two parts: "Successful projects" and "Failed projects." The first part focuses on how the Delphi Technique was used as the primary tool in energy transition planning and how it led to positive results in developing energy strategic planning. Two different studies are analyzed to demonstrate the effectiveness of the Delphi Technique in metropolitan and national planning. The second part covers two energy transition planning projects that faced difficulties due to the lack of implementation of the Delphi Technique. The main objective is to showcase the challenges that these projects encountered by not utilizing the Delphi Technique in their planning. Additionally, this analysis also delves into the context of metropolitan and national planning.

4.1. Successful Projects

The following section presents two noteworthy energy transition plans from Kaunas, Lithuania and Ireland. These projects are invaluable examples of how energy transition planning should take place, particularly in the context of utilising the Delphi Technique. An example of metropolitan planning is covered in the Kaunas study, whereas the Irish study covers national ET planning. The findings and recommendations from these projects can be instrumental in informing future energy policies and strategies, thereby contributing to the global efforts towards a greener and more sustainable future.

4.1.1. Real-time measurement of traffic flows using innovative technologies to control the situation of "traffic jams" in the city – Kaunas, Lithuania (2018-2020)

The goal of the project is to create a real-time measurement of traffic flows using innovative technologies, such as a monitoring system for Kaunas City Municipality's communication system (MITA, 2022). This system includes monitoring and analysing the movement of traffic flows and their functional parameters, enabling the city to control its traffic congestion (KS, 2020).

The project aims to develop a real-time traffic monitoring system for Kaunas City Municipality. This system will enable assessing traffic flow performance and implementing measures to improve its functionality. According to the study, the selection and implementation of traffic management, safety and pollution measures at the moment are limited to identifying the causes, putting less importance on how to mitigate the cause of the problem. For example, in improving the emergency responses for traffic accidents, the city is using data from incidents that have already taken place. However, any measures to prevent accidents from reoccurring, such as implementing traffic safety measures in individual sections of several streets during peak traffic times, are lacking.

In 2018, after the pre-commercial purchase phase of the project, an innovative tool that appeared on the market was integrated into the system. This tool ensures the conditions for optimal use of the available streets, pedestrian and bicycle paths, and public transportation without reducing the communication possibilities amongst the transportation system users. These users can range from residents to business entities. Implementing the developed system significantly improved the existing transportation system's functioning, optimising its maintenance and development costs (KS, 2020).

Primary beneficiaries of stakeholders:

- Society and business – due to the improved state of communication in the city of Kaunas;
- Trade, services, real estate, business, etc. – due to the possibility to assess the attractiveness of individual parts of Kaunas and forecast possible customer flows, taking into account traffic intensity indicators;
- Kaunas City municipality administration – due to the likelihood of improvement in planning efficiently, especially in modernisation and transportation system development schemes.

The Delphi Technique was successfully implemented in the project:

Step 1: Clear Definition of Objectives
The project team clearly defined the objective of creating a real-time traffic flow measurement system to control traffic congestion in Kaunas City. This objective has been adapted to address the specific concerns of various stakeholders, including the municipality, businesses and residents, emphasizing the need to improve connectivity, safety and efficiency in the transport system.

Step 2: Selection of Diverse Panel of Experts
A diverse panel of experts was selected to participate in the Delphi process. The team included technical experts in traffic management, urban planning specialists, representatives from local businesses, transportation engineers, city officials, and community leaders. This helped each expert bring the individual perspective and expertise essential for designing a specific case, such as an effective traffic flow monitoring system.

Step 3: Facilitation of Anonymous Feedback
The Delphi Technique incorporated surveys and feedback mechanisms to facilitate open feedback. This anonymity provided a safe environment for stakeholders to express their opinions and concerns without fear of judgment or reprisal, ensuring uninhibited participation. At this point, the Delphi Technique fell short in one aspect as the surveys were only made available to the experts and local authorities, excluding the residents. As such, the opinions and views gathered were limited to the experts and local authorities, and the number of surveys completed was not disclosed publicly. Surveys were only mentioned as a fact, but no further details were given. It is worth considering to improve this aspect in future projects to avoid problems in planning.

Step 4: Iteration Towards Consensus
The Delphi Technique process involved four rounds of feedback and iteration. These included four joint meeting sessions where opinions, experiences and suggestions were shared. After each round, stakeholders' opinions were collated, summarized, and redistributed to the panel for further evaluation. This iterative process continued until a consensus or convergence of opinions was reached regarding the project's objectives, implementation strategies, and potential impacts.

Step 5: Actionable Output
After the end of the project and the analysis of the received data, several changes were made in the city of Kaunas. This made it possible to reduce the traffic flow, especially in the streets of the old town. Two-way traffic on the old town's streets was abandoned, significantly reducing traffic flow and heavy traffic during peak hours in the long term. A decision was also made to introduce regulated traffic intersections at critical intersections. It also strongly contributed to better traffic regulation in the central streets. Streets further from the city centre have been equipped with smart traffic lights that regulate traffic based on real-time data. Such traffic lights can adapt to the current traffic situation. Parking rates were increased to reduce the number of parked vehicles, and an alternative was offered – more frequent public transport and new bicycle paths. This allowed residents to adapt to changes more quickly and smoothly.

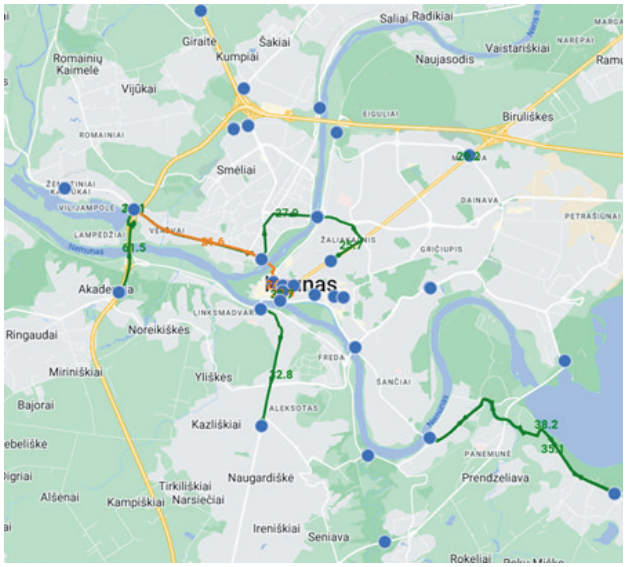


Fig. 5 : Places of real-time traffic flow measurement in the city of Kaunas

4.1.2. Ireland's Energy Efficiency Obligation Scheme Public Consultation

In 2021, Ireland's Department of Environment, Climate and Communications implemented a redesign plan for a new efficiency obligation scheme, or EEOS (Department, 2021). EEOS is an extension of the Energy Savings Obligation imposed in 2018, particularly catering to the requirements indicated in Article 7, in which such a saving scheme shall be extended from 1 January 2021 to 31 December 2030. The original Energy Savings Obligation had a target timeline of 1 January 2014 to 31 December 2020 (The European, 2018).

In EEOS, an obligated goal of 60,707 GWh cumulative final energy savings in Ireland by 31 December 2023 will be imposed. As such, new mandatory rules, like stricter energy savings requirements and higher fees, are being considered. In effect, various stakeholders in the Irish economy will be signi-

ficantly affected. These stakeholders vary from bigger industry players to smaller businesses and even residents. Hence, the Department has implemented a public consultation process to ensure that proper information dissemination will reach all the stakeholders involved, as well as gather the people's opinions and needs. The results to be gathered will be the basis of the final EEOS policy that was set to be approved by the Department's Minister by the last quarter of 2021.

In this public consultation, albeit not indicating that they have used the Delphi Technique, all the steps the working group followed were well aligned with the Thinkers' "The Big 5" method. The public consultation steps are as follows (Department, 2021):

Step 1: Clear Definition of Objectives
The first step that the working group took was strengthening the project planning or proposal by gathering detailed report analysis from independent economic and policy analysis documents. However, the main data that would complement the formation of new legislation was identified through public consultation. The Department's rationale was to avoid presuming the needs of all the stakeholders involved. The group was driven to formulate the legislation based on grassroots data. Hence, the public consultation was held from 4 March 2021 to 30 April 2021. Two online public sessions were scheduled to explain the EEOS scheme. The first session was held on the 31st of March, while the second one was on the 21st of April.

In each public session, the goals of holding such forums were clearly defined. These goals are the following: to give equal opportunity to all stakeholders to provide any comments or ask questions about the new scheme, to ensure that the information is accessible to all, and to guarantee that the process is as transparent as possible. However, one of the most crucial objectives of all was to inform the public that the final policy decision would have to be fair and proportionate for all stakeholders. Hence, these can only be achieved through public consultations and forums. These goals were adequately communicated: before, during, and after the forums were held. The post-forum consultation was through the contact details provided for concerns, questions, and suggestions. The summary and the presentation materials were also publicly available via the government website.

Step 2: Selection of Diverse Panel of Experts
Both public forums were well-attended and represented by stakeholders and target audiences of each forum. The representatives in attendance were from the government, energy experts, and industry players, such as the Department of Environment, Climate and Communications (DECC), the Sustainable Energy Authority of Ireland (SEAI) and specialist consultants, Economic Consulting Associates Ltd (ECA). However, the policy document (Department, 2021) and the government website have not specified the number of members of the public who attended the sessions. The sessions were publicly advertised prior to their commencement. During the forums, Q&A sessions were held to accommodate discussions among those who attended. An email address was also provided for those interested in receiving updated news about the project, including planned sessions and workshops in the future. Whilst the effort to reach all stakeholders, disseminate the information, and hear various concerns regarding the scheme, it seems unclear whether the consultation process effectively reached a considerable portion of the Irish public. Nevertheless, although the lack in number of attendance despite ample advertising was beyond their control, other actions were implemented to compensate for this issue. Further discussion of this, as well as the timeline of the anonymous feedback, is in the fourth step.

Step 3: Facilitation of Anonymous Feedback
The anonymous public consultation was done via online survey and sending messa-

ges to the research's contact e-mail address. Here is a summary of the anonymous feedback process:

- The survey has 40 questions covering seven areas (Obligated parties, The EEOS Target, Delivery sub-targets, Delivery requirements, Nature of the target and compliance, Scheme improvements and cost information, and Information on bills)
- The email address provided for the public consultation is energy.efficiency@decc.gov.ie
- The consultation is open to all: from members of the public to industry stakeholders.

The survey and email gathered 42 responses from different stakeholders. Here is the summary:

- 32 answers gathered from the survey
- 10 answers gathered from the email
- The answers were gathered from the following stakeholders:
  - 12 from the Energy companies that could be obligated under the scheme
  - 5 industry bodies
  - 11 various entities in the supply chain
  - 2 local government and government departments
  - 4 non-governmental organisations
  - 8 Anonymous responses from the public

Step 4: Iteration Towards Consensus

Iterating towards a consensus was adequately observed in the department's public consultation process. First, they have conducted two public forums targeting different stakeholders. Several discussions were derived from the answers initially gathered from the public consultation simultaneously occurring. This was done to ensure that several concerns were answered while the public consultation was still open to the public. Second, the working group extended the survey and email deadlines to gather more information from every stakeholder. These actions clearly aligned with their goals set prior to the implementation of the public consultation, which is to ensure that the policy to be designed would be based on the needs of all stakeholders.

Public Consultation Details:

- The survey and email submission started on the 4th of March 2021
- The initial deadline was 5:30 pm on the 19th of April 2021
- The consultation process was extended until 5:30 pm on the 30th of April 2021

Public Forums Details:

The first forum

- It was held online on the 31st of March 2021, three weeks after the public consultation started.
- This forum was more directed to the members of the public.
- The forum was held to address stakeholder concerns raised in surveys and emails. Another purpose of the forum was to explain the analysis and rationale behind the proposals and hear the concerns of the attendees about the issues raised during the initial data gathered from the public consultations.

The second forum

- It was held online on the 21st of April 2021, three weeks after the first public forum.
- This forum was more directed to bigger stakeholders.
- One of the goals of this forum was to seek clarifications on issues raised by the stakeholders during the public consultation, as well as offer views on the proposals that are more customised to their needs.
- A Q&A session for the bigger stakeholders was held. The questions were submitted via email before the forum started.

Step 5: Actionable Output

The decisions reflected in the new policy scheme were founded on the responses obtained from the public consultation process. To ensure the satisfaction of all stakeholders' concerns and the analysis of their viewpoints, all regulations were meticulously designed. As a result, the new regulations were all-inclusive and considerate of all the stakeholders' needs.

For instance, households with low incomes would be receiving more assistance, while smaller stakeholders, such as small businesses, would be subject to fewer penalties.

Example one (Fig. 6): The majority of the answers gathered were positive.

Results: "The Minister has decided that, as proposed, the EEOS will cover entities across all the main energy markets – electricity, natural gas, liquid fuel and solid fuel," (Department, 2021, p. 7).

3 Obligated Parties

This section outlines the Minister's decisions on which entities will be obligated under the Energy Efficiency Obligation Scheme (EEOS) and how.

Question 3.1 Do you agree with our proposal that the EEOS should cover entities across all the main energy markets - electricity, natural gas, liquid fuel and solid fuel?

	Responses	Proportion
Yes	37	88%
No	2	5%
Don't Know/ No Strong Opinion	3	7%

Fig. 6 : Example One Ireland EEOS

Energy Poverty Delivery Requirements

Question 6.2 Do you agree with our proposed requirements for delivery under the Energy Poverty Delivery Sub-target?

	Responses	Proportion
Yes	12	29%
No	14	33%
Don't Know/ No Strong Opinion	16	38%

Fig. 7 : Example Two Ireland EEOS

Example two (Fig. 7):
Most of the responses collected indicated a lack of agreement on a specific proposal.

Some concerns from the stakeholders:
The policy is not inclusive enough as it does not provide support for individuals who are receiving welfare payments and living in homes with a BER rating of E1 or worse. Additionally, there is no support for those who rent their homes from private landlords.

Results (Department, 2021, p. 52):
The Minister has decided that savings from measures will be eligible under the Energy Poverty Delivery Sub-target where:
1. The measures have been delivered in an 'eligible energy poor home', which is a property:
    a. With a pre-works BER of an D2 rating or worse (i.e. > 250 kWh/m2/yr); and
    b. Which is occupied by a person in receipt of a Warmer Homes-eligible welfare payment or is owned by a Local Authority/Housing Association
2. The post-works BER reaches a B2 rating or better (i.e. < 125 kWh/m2/yr).

4.2. Failed Projects

The next section discusses two cases of energy transition plans from Lithuania and Ireland that did not use the Delphi Technique. These findings in these cases were observed to be complex and presented more issues than progress. The purpose of analyzing these plans is to determine whether it is reasonable to exclude the Delphi Technique in ET planning in the future. The Lithuanian study covers metropolitan planning, while the Irish study covers national ET planning.

4.2.1. Kaunas Air Quality Monitoring

Starting in January 2021, Kaunas residents can familiarize themselves with information about air pollution in their ward. Data from two dozen sensors installed in 20 places in Kaunas City (Fig. 9) are presented on a specially created platform orotarsa.kaunas.lt. The interactive map records the concentration of the main air pollutants, such as solid particles, carbon monoxide, ground-level ozone, nitrogen and sulfur dioxide, and the Air Pollution Level Index (OUI). Having access to these data allows the residents to assess the potential health risks in their environment (KS, 2022).

The data gathered from autonomously functioning measuring devices are presented on the map based on geoinformation technology systems (GIS) at orotarsa.kaunas.lt. It captures averages of the main pollutants that harm human health and the environment. These are solid particles (KD2.5 and KD10), carbon monoxide or fines (CO), ground ozone (O3), nitrogen (NO2) and sulfur (SO2) dioxides (ibid).

In creating an effective communication of information between the technical data and residents, the platform was designed in a simple form. For example, the platform consists of maps, tables, comparisons of indicators and a description of air pollutants easily understood by the public. The critical approach is not to overload people with complicated information.

Moreover, the information provided on the platform is updated twice per day. The daytime pollution is announced at 2:30 p.m. and 04:00 a.m. The results from the air sensors are presented visually on the maps in colour scales. Green means 'zero or very little environmental pollution,' yellow 'means moderate air pollution,' and red means 'heavy pollution.' Those who wish to analyse and compare data from different locations more closely can select a table, a graph of indicators, or a map of each pollutant on the platform. According to the International Air Pollution Level Index, the diagnostics on the platform can define air quality standards (ibid).

Ambient air monitoring in Kaunas has been carried out for almost three decades. Until now, specialists regularly monitored the condition of the city's main environmental components, collected data, and analysed ongoing changes based on the data of two existing air quality monitoring stations in Kaunas (KS, 2021). One station was established in Petrašiūnai, while the other station is in Noreikiškės, Kaunas district. However, these two points are not enough to reflect the situation of the whole city, as well as to measure its air quality. Hence, further development of automated measuring infrastructure is necessary. The ambient air quality is constantly changing due to variables inevitably present in the city, such as activities in the industrial and energy companies, transport, and heating of private houses. The situation intensifies at

the turn of the cold season as more heating is required. Thus increasingly affecting the ambient air quality in the city (ibid).

Experts in public health acknowledge the crucial importance of air quality indicators in relation to the overall well-being and health of residents. Higher levels of pollution can lead to severe illnesses. Therefore, implementing a new and more efficient air quality control system will act as a preventive measure to combat this issue effectively.

Delphi Technique was unsuccessfully and incompletely implemented in the project:

Step 1: Define Objectives Clearly
The project had the objective of enhancing the residents' awareness of air quality in Kaunas. However, if the Delphi technique had been used, it would have helped identify and address the specific needs and concerns of residents. The project could have also included additional objectives such as providing real-time data and educating residents about the health impacts of air pollution, thus empowering them to take action to improve air quality in their local communities. It is unfortunate that these aspects were not included. Projects like this one offer a great opportunity and platform to gather essential data about the environment and educate citizens of all age groups based on that data. The project could have included educational seminars, involvement of schoolchildren and students, and other similar activities.

Step 2: Select a Diverse Panel of Experts
While the project involved technical experts in air quality monitoring and data analysis from Kaunas Municipality and "Dicto Citius" Company, a broader panel of experts could have included public health professionals, environmental educators, community organisers, and representatives from local government and non-profit organisations. This diverse panel would have provided insights into engaging residents and maximising the impact of the air quality monitoring project.

Step 3: Facilitate Anonymous Feedback
During the project, there was no anonymous feedback facilitated, which was a critical part that ultimately failed. To encourage participation and feedback from residents, the project could have implemented anonymous surveys or feedback mechanisms on the air quality monitoring platform. This would have allowed residents to voice their opinions, concerns, and suggestions for improving the platform and its educational content without fear of judgment or reprisal.

Step 4: Iterate Towards Consensus
Through multiple rounds of feedback and iteration, the project could have gradually improved the air quality monitoring platform to meet residents' needs better. This iterative process would have involved refining the user interface, incorporating educational resources, and expanding outreach efforts to ensure widespread adoption and usage of the platform. However, these were not implemented resulting in the residents' disappointment when the project was completed and presented to them. The residents argued that they would have preferred to be informed about the project's goals, plans and results. Also, the sensors had problems at the beginning of the project, as they stopped gauging after a month. Communication from the municipality was not sufficient which added to the people's dissatisfaction. Once the technical hurdles were resolved, everything went smoothly. However, it is arguable that they could have been more effective in implementing this project.

Step 5: Actionable Output
The Delphi Technique would have ensured that the output of the air quality monitoring project went beyond just providing data and included actionable recommendations for residents to improve air quality in their communities. This could have included tips for reducing personal exposure to air pollution, advocating for policy changes to reduce emissions, and participating in

community clean-up efforts. Although the recommendations were helpful, they were limited to general advice about air pollution and possible health effects. Residents were not involved in the process, hindering them from experiencing activities involving air quality improvement in their surroundings. Knowledge is invaluable, but being able to experience the research process in practice is an invaluable venture that can motivate sustainable actions in the future.

Fig. 8 (above) : air quality measurement sensor

Fig. 9 (left) : Places of real-time air quality measurement in Kaunas (orotarsa.kaunas.lt)

4.2.2. Ireland's Planning and Development Bill 2023

The goal of this bill is to revise the law concerning the planning and development of houses in the country. More particularly, by repealing the Planning and Development Act 2000. This bill is formulated in response to the housing crisis in Ireland. The bill will enable the housing sector to build more houses faster through an easier permission process. The energy transition planning involved, or lack thereof, in this process, is solving the transportation link between major cities and new neighbourhoods that will be built, as well as involving the smaller environmental NGOs during the planning.

Step 1: Clear Definition of Objectives

1. The Department of Housing, Local Government and Heritage's main analysis was through a comprehensive Explanatory Memorandum and Regulatory Impact Analysis.
2. The main reviewer is the Attorney General and its working group.
3. In these documents, the main stakeholders involved in the consultation are limited to the following:

- The Joint Oireachtas Committee on Housing, Local Government and Heritage undertook comprehensive pre-legislative scrutiny over February and March and in May submitted a report with over 150 recommendations
- An Inter-Departmental group was facilitated involving Departments with a key consenting role, such as the Departments of Transport; Agriculture, Food and the Marine; and Environment, Climate and Communications as well as the Department of Public Expenditure and Reform
- Legislation Standing Group: an operational group involving An Bord Pleanála, the OPR, the EPA and local authorities was established to consider matters about operational and implementation matters.
- A Planning Advisory Forum was established in December 2021 consisting of a very wide stakeholder membership with representatives from a broad range

of sectors, including representation from the public sector, business, environmental, social and knowledge-based sectors, including environmental NGOs, the development sector, key state bodies such as Eirgrid, Irish Water, TII and enterprise bodies.

Overall, the message in this document is heavily implying legal and judicial jargon and there was no initiative to create a lay term that could be easily understood by the public. Hence, the objectives were understood only by a selected group of stakeholders.

Step 2: Selection of Diverse Panel of Experts

According to Hough and Elliot (2023), there was no public consultation held for the members of the public and citizens. Instead, a closed, invitation-only stakeholder group was established during the review process. It is worth noting that the majority of the members of the Planning Advisory Forum were from the industry and government sectors. The majority of the Planning Advisory Forum members were from industry and government.

Step 3: Facilitation of Anonymous Feedback

As it was very focused on bigger stakeholders, no anonymous feedback was implemented. The review, together with the feedback, was shared amongst the limited stakeholder group members only.

Step 4: Iteration Towards Consensus

The Irish media, in 2022, did its part to be the public's watchdog by bringing the attention to the people that "no public consultation" was done (Hough and Elliot, 2023). The media also explains the negative effects when people aren't consulted regarding this bill:

One of the proposed changes in the Bill is restricting the number and types of organisations that can access judicial review. This means that NGOs with fewer than 10 members won't be able to participate in judicial review. This means that smaller NGOs in the environmental and sustainable fields might not have a platform to advance such measures. Additionally, their viewpoints could be overshadowed by larger organizations that may not prioritize local issues as much as the smaller NGOs do.

The consultation and deliberations are still ongoing in the Parliament, continuously being scrutinised by the members of the committee. The latest debate was held on 22 February 2024 (Tithe, 2024). All information is available on the website of Houses of the Oireachtas (ibid).

Step 5: Actionable Output

1. The rules and wording in place are continuously being amended based on the suggestions made by the members of the Parliament. However, in the latest debate, it can be observed that public consultation was not amply held in the sense that the new legislation does not give priority to the people's well-being:
    a. Houses are planned to be built in certain areas in the country but the transportation link for the residents was not adequately planned.
    b. Deputy Steven Matthews stated that the legislation is more focused on zoning, pipes in the ground and roads. But not on what makes a house a home, such as community services, health, education, school places, and so on (Tithe, 2024).
    c. The Minister's response to that concern was "I am going to look at the wording and will work with members on that in advance of the Report Stage" (ibid). Since this bill is still under deliberations, the implementation is yet to be seen, as well as whether it will cause advantageous or disadvantageous results to the public.

2. Because of some controversies, particularly the judicial aspect of the proposed revisions, some aspects were re-inspected and came up with a more favoura-

ble solution in 2023 (Nagle, 2024):

a. Certain administrative conditions must be met for unincorporated residents' associations (URA) to have sufficient interest to initiate judicial review proceedings.

A new legal aid program called the Environmental Legal Costs Financial Assistance Mechanism (ELCFAM) is being suggested. It will provide financial assistance to applicants who are involved in judicial review and other environmental cases governed by the Aarhus Convention. This program will be subjected to means-testing, and the parties involved will be responsible for their own legal costs.

Overall, The Delphi technique in this project is working on the Parliament level as the Minister is obligated to review some rules that will benefit the public more than the bigger stakeholders. However, during the time of consultation, the Delphi technique was not applied in the sense that discussion was limited to a few stakeholder groups. Also, it was a closed consultation, therefore eliminating the element of anonymous feedback and iterative consensus. Finding the consensus has only started once publicised via deliberations in the Parliament. However, the way that the Irish judicial system works limits the implementation of the Delphi Technique. While the technique is effective in some cases, if a certain legislation is already established like this case presented, more likely than not, the Delphi technique can be argued to be a methodology not applicable in this scenario.

05

DISCUSSION & CONCLUSION

5. Discussion & Conclusion

This project proposes a solution that can feasibly augment the effectiveness of energy transition planning in the current global situation. Such a solution should correspond to solving the problems and challenges currently faced by various sectors in the world, particularly those in charge of energy and sustainability areas in their respective territories. Based on the analyses of literature and real-life reports presented in this paper, combined with the lectures given during the module challenge, talks held by experts who have implemented such planning in their communities, as well as the Thinkers' group discussions using information from their home countries, the following main problems hindering a faster energy transition in communities are identified:

- Lack of commitment or participation of stakeholders in complying with newly implemented energy transition legislation.
- The current planning method, the four-step method, can benefit from some modifications.
- Less focus on the human aspect in energy transition planning.

The Thinkers identified that what was lacking in all the failed projects analysed was the people-center approach, wherein all individuals' needs should be assessed prior to the finalization and implementation of a new energy transition policy. For example, in 2016, the technical and technological side of carpooling in Europe was thoroughly designed. However, the project was still not progressing at the pace expected (Delhomme & Gheorghiu, 2016). The study determined that the causes of these failures were limited car availability and poor information dissemination to the public. Hence, one of the main recommendations of the study was to focus on the "contextual factors and individual motivations that explain why people do or do not carpool," such as willingness (or unwillingness) to support eco-friendly initiatives, the type of benefits they will get in participating, gender sensitivity issues, and the freedom and flexibility that come with individual traveling (p. 3).

The Thinkers agree with this recommendation. The team believes that everyone involved in any energy transition initiatives should be empowered through accurate knowledge of why the project is being done, as well as the provision of avenues to address concerns that all stakeholders might have.

These ideas are vital because the stakeholders, including the general public, will be the most affected during the changes to be implemented. However, the most crucial factor to consider in ensuring that ET planning would work is to guarantee and sustain cooperation from all stakeholders. Hence, the Urban Synergy Thinkers present the idea of centralizing the human element in ET planning rather than the technical one. More specifically, the team presents the utilisation of the Delphi Technique during ET planning (aka DT in ET Planning).

The focus of improvement in this proposed solution is to include the Delphi Technique in the "strategy" phase, the second step of the four-step method currently being used in ET planning. The strategy phase provides an opportunity for the planners to define their targets through different research means. It is in this area that the Thinkers strongly argue for the use of the Delphi Technique in devising a strong proposal for action policy that is empirically supported and well-presented to all stakeholders involved, from policy conception to recommendation. The Delphi Technique is a useful tool that aims to find a consensus through numerous consultation processes before ultimately proceeding to implementing actions. The consultation seeks to identify the needs and opinions, as well as give clarifications to all the stakeholders that will be involved in the project, regardless of their expertise or status in society. Through the Delphi Technique, the ET policies produced by the local and national governments of a few countries, as discussed in Chapter Four, provided inclusivity and met the bespoke needs of different stakeholders. The full implementation of the DT in ET Planning is thoroughly explained in Chapter Three. The Thinkers strongly believe that incorporating "The Big 5" method during the consultation process is the most crucial step to implement in order to gather authentic, accurate, and dignified data.

However, the Delphi Technique has its limitations as well. The following insights are offered to reflect on how the proper or improper application of the technique can affect energy transition planning in the territories:

Stakeholders for effective decision-making a consensus for sustainable change

In both projects implemented in Kaunas and Ireland, involving a diverse panel of stakeholders through the Delphi Technique ensured that the perspectives and needs of various groups, including residents, businesses, technical experts, and local government officials, were considered. The principle of the Delphi Technique facilitates the step-by-step building of consensus among all stakeholders involved, leading to sustainable change. Through multiple rounds of feedback and discussion, divergent viewpoints can be reconciled, and mutually agreeable solutions can appear. In the event of insufficient consultation practices, the projects were stunted by ineffectiveness and stuck in a tedious deliberation process.

Adapt solutions to local community needs

The Delphi Technique allows for open and honest communication by receiving anonymous feedback from all project stakeholders. This enables project planners to adapt and fit their solutions to the specific needs and concerns of the local community. If the public hints at a lack of regard for their needs, it is likely that unwillingness to cooperate is guaranteed, possibly resulting in the failure of the project.

Empowering communities through participation

Accurately implementing the Delphi Technique empowers local communities by actively involving them in local decision-making. With volunteer input and generous feedback from residents, businesses, and other stakeholders, the projects have the potential to transform a community into an improved one, along with the increased well-being of its residents.

Maximizing project impact through collaboration

The Delphi Technique promotes collaboration and cooperation among all concerned stakeholders, maximising the impact of projects on the local community. The projects can benefit from collective problem-solving and innovation by bringing together diverse perspectives and expertise.

In conclusion, the Urban Synergy Thinkers argue that by prioritizing the human element over technical aspects in energy transition planning and leveraging methodologies like the Delphi Technique, the likelihood of incurring a more effective and sustainable change in any community via a people-centred ET policy can be guaranteed. It is considered a relatively new strategy in this field. However, the advantages of applying such a tactic can be observed in several projects presented in this report. Hence, the importance and ingenuity of using the Delphi Technique in ET planning are slowly being recognized by the experts. In hopes of contributing to healthier, more resilient societies in the future, the Thinkers propose this solution to help maximize the impact of energy transition initiatives, ensuring a brighter and more sustainable future for all, with lasting benefits that will echo through generations to come.

06

BIBLIOGRAPHY

6. Bibliography

Court, V. (2024, February 14). Low carbon energies still depend on fossil fuels, slowing the energy transition. *Polytechnique insights.* Retrieved May 06, 2024, from https://www.polytechnique-insights.com/en/columns/planet/synergy-between-fossil-and-decarbonized-energies-a-brake-on-the-energy-transition/

Delhomme, P., & Gheorghiu, A. (2016). Comparing French carpoolers and non-carpoolers: Which factors contribute the most to carpooling?. T*ransportation Research Part D: Transport and Environment, 42*, 1-15. https://doi.org/10.1016/j.trd.2015.10.014

Department of the Environment, Climate & Communications. (2021, October). *Ireland's Energy Efficiency Obligation Scheme: Summary of responses to public consultation and policy decisions on scheme design*. Retrieved March 05, 2024, from https://www.gov.ie/en/consultation/11050-public-consultation-on-the-energy-efficiency-obligation-scheme-eeos/

Drumm, S., Bradley, C., & Moriarty, F. (2022). 'More of an art than a science'? The development, design and mechanics of the Delphi technique. *Research in Social and Administrative Pharmacy, 18*(1), 2230-2236. https://doi.org/10.1016/j.sapharm.2021.06.027

von der Gracht, H. A. (2012). Consensus measurement in Delphi studies: Review and implications for future quality assurance. *Technological Forecasting and Social Change, 79*(8), 1525-1536. https://doi.org/10.1016/j.techfore.2012.04.013

Hough, A. & Elliott, G. (2023, March 24). We could improve our planning law - instead the public is being excluded. *The Journal*. Retrieved March 25, 2024, from https://www.thejournal.ie/readme/planning-and-development-bill-6025130-Mar2023/

Jayawardena, M., Heijndermans, M., Meiers, M. W., Watkins, R., Butscher, J., Feng, S., & Berrah, N. (2022). *Delphi Technique: How Expert Panels Predict Emerging Opportunities and Challenges in Renewable Energy*. IEG Methods and Evaluation Capacity Development Working Paper Series. Independent Evaluation Group. Washington, DC: World Bank. Retrieved March 25, 2024, from http://documents.worldbank.org/curated/en/488611645129021327/Delphi-Technique-How-Expert-Panels-Predict-Emerging-Opportunities-and-Challenges-in-Renewable-Energy

Kattritzi, M., & Winskel, M. (2020). When experts disagree: Using the Policy Delphi method to analyse divergent expert expectations and preferences on UK energy futures. *Technological Forecasting and Social Change, 153*, 119924. https://doi.org/10.1016/j.techfore.2020.119924

Kauno Miesto Savivaldybė (KS). (2020, August 25). *Projektas „Transporto srautų matavimas realiu laiku, taikant inovatyvias technologijas, siekiant suvaldyti „kamščių" situaciją mieste"*. Retrieved May 6, 2024, from https://www.kaunas.lt/investicijos/informacija-apie-vykdomus-es-projektus/projektas-transporto-srautu-matavimas-realiu-laiku-taikant-inovatyvias-technologijas-siekiant-suvaldyti-kamsciu-situacija-mieste/

Kauno Miesto Savivaldybė (KS). (2024, February 5). *Oras*. Retrieved May 6, 2024, from https://www.kaunas.lt/aplinka/oras/

Kauno Miesto Savivaldybės Administracija (KS). (2021, January 28). *Nuo šiol bus aiškiau, kokiu oru kvėpuoja kauniečiai: startavo moderni stebėjimo sistema*. Retrieved May 6, 2024, from https://www.kaunas.lt/2021/01/28/nuo-siol-bus-aiskiau-kokiu-oru-kvepuoja-kaunieciai-startavo-moderni-stebejimo-sistema/

Kauno Miesto Savivaldybės Administracija (KS). (2022, August 4). *Kauno oro kokybės stebėsena – duomenys tiesiai į kompiuterių ir išmaniųjų įrenginių ekranus*. Retrieved May 6, 2024, from https://www.kaunas.lt/2022/08/04/kauno-oro-kokybes-stebesena-duomenys-tiesiai-i-kompiuteriu-ir-ismaniuju-irenginiu-ekranus/

Khodyakov, D., Grant, S., Kroger, J., & Bauman, M. (2023). *RAND Methodological Guidance for Conducting and Critically Appraising Delphi Panels.* RAND. https://doi.org/10.7249/TLA3082-1

Métropole Rouen Normandie. (2019, November 25). *Le Plan Climat Air Énergie Territorial (PCAET)*. Métropole Rouen Normandie. Retrieved March 25, 2024, from https://www.metropole-rouen-normandie.fr/environnement-engagements-de-la-metropole/le-plan-climat-air-energie-territorial-pcaet

Mokslo, Inovacijų Ir Technologijų Agentūra (MITA). (2022, November 3). *Transporto srautų matavimas realiu laiku, taikant inovatyvias technologijas, siekiant suvaldyti „kamščių" situaciją mieste*. Retrieved May 6, 2024, from https://mita.lrv.lt/lt/veiklos-sritys/programos-priemones/ikiprekybiniai-pirkimai/paskelbti-pirkimai/transporto-srautu-matavimas-realiu-laiku-taikant-inovatyvias-technologijas-siekiant-suvaldyti-kamsciu-situacija-mieste

Nagle, D. (2024, January 16). Review of Planning and Development Bill 2023. *Mason Hayes & Curran*. Retrieved March 25, 2024, from https://www.mhc.ie/latest/insights/review-of-planning-and-development-bill-2023

Nasa, P., Jain, R., & Juneja, D. (2021). Delphi methodology in healthcare research: How to decide its appropriateness. *World Journal of Methodology, 11*(4), 116-129. https://doi.org/10.5662/wjm.v11.i4.116

Niederberger, M., Köberich, S., & DeWiss Network. (2021). Coming to consensus: the Delphi technique. *European Journal of Cardiovascular Nursing, 20*(7), 692–695. https://doi.org/10.1093/eurjcn/zvab059

Sillman, J., Hynynen, K., Dyukov, I., Ahonen, T., & Jalas, M. (2023). Emission reduction targets and electrification of the Finnish energy system with low-carbon Power-to-X technologies: Potentials, barriers, and innovations – A Delphi survey. *Technological Forecasting & Social Change, 193*(122857). Elsevier. https://doi.org/10.1016/j.techfore.2023.122857

Sustainable Energy Authority of Ireland. (2023). *Energy Efficiency Obligation Scheme (EEOS) Guidance document.* Retrieved March 25, 2024, from https://www.seai.ie/publications/EEOS-Guidance-Document.pdf

The European Parliament and the Council of the European Union. (2018, December 11). Directive (EU) 2018/2002 of the European Parliament and of the Council of 11 December 2018 amending Directive 2012/27/EU on energy efficiency (Text with EEA relevance). *Official Journal of the European Union*. Retrieved May 06, 2024, from https://eur-lex.europa.eu/eli/dir/2018/2002/oj

Tithe an Oireachtas. (2024, February 22). *Select Committee on Housing, Local Government and Heritage debate.* Retrieved March 25, 2024, from https://www.oireachtas.ie/en/debates/debate/select_committee_on_housing_local_government_and_heritage/2024-02-22/2/

Toumia, A. (2022). Delphi technique between the easy theoretic and the difficulty application in scientific research and future studies. *Technium Soc. Sci. J., 37*, 749. https://doi.org/10.47577/tssj.v37i1.7603

United Nations Climate Change. (2016, November 20). *The Paris Agreement.* United Nations Climate Change. Retrieved May 06, 2024, from https://unfccc.int/process-and-meetings/the-paris-agreement#:~:text=The%20Paris%20Agreement%20is%20a,force%20on%204%20November%202016.