



Deliverable D2.1: Local CET plans framework, including stakeholders mapping and Skills Gap Analysis

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1 Executive Summary

The present public **Deliverable 2.1 - Local CET plans framework, including stakeholders mapping and Skills Gap Analysis** is framed within the Work Package 2 “Skill Gap Analysis and Use Cases definition” of the Step-WISE project, whose goal is to assess the actual energy transition planning framework across the EU, in order to have a clear and comprehensive overview of policy framework, how local and regional strategies align and adopt those policy requirements, which stakeholders involved, available tools and methodologies and an understanding of challenges/barriers/knowledge/skills used by local and regional authorities as well as policy makers and urban planners concerning Clean Energy Transition planning (CETPs).

Specifically in this Deliverable called “D2.1 Local CET plans framework, including stakeholders mapping and Skills Gap Analysis” have the following specific objectives:

1. To understand different level of development of CETPs, related ambition and innovation as well as main tools and methodologies used at supporting local stakeholders in their development.
2. To evaluate governance structure at regional and local level, identifying and mapping relevant stakeholders, their roles, and the skills gap.

For a better fulfilment of both objectives, this deliverable is a two-part report:

- PART A: Literature analysis on current policy framework on energy EU, to fulfil objective 1.
- PART B: Stakeholder mapping and Skill Gap Analysis, to fulfil objective 2.

This document provides a critical evaluation of the development and strategic implementation of local Clean Energy Transition Plans (CETPs) across Europe, emphasizing the analysis on Use Case (UC) countries.

Part A assesses the alignment of local CETPs with European and national energy and climate targets, within the context of an evolving policy landscape. Through a systematic assessment, including a literature review and desktop analysis in UC countries, Part A aims to understand the ambition and responsiveness of local strategies towards achieving energy transition goals. This initial section offers an in-depth analysis of the energy transition within the European Union, tracing the evolution of policies and outlining the current policy framework. It identifies key actors, stakeholders, and EU-wide initiatives, providing a comprehensive overview of the macro-level dynamics influencing local CETPs. A country-specific analysis further delves into the energy policies of UC countries, offering a comparative perspective on policy frameworks and highlighting successful initiatives that demonstrate the varied approaches and challenges encountered in the energy transition process.

A major focus is placed on identifying the barriers and challenges to energy transition, categorized into economic and financial, technological, political and regulatory, and social and cultural factors. This segmentation is crucial for understanding the multifaceted obstacles that local CETPs must overcome to be successful. Moreover, the report evaluates tools and methodologies for energy transition, spotlighting analytical tools, policy assessment methodologies, and best practices. This includes a critical examination of the Step-WISE toolkit, aimed at enhancing the capacity of local and regional stakeholders to deliver, implement, and monitor CETPs effectively.

Drawing conclusions from the analysis, the report presents policy implications and recommendations, aiming to offer actionable insights for policymakers, stakeholders, and practitioners involved in local energy transitions. It argues for the need of robust methodologies and tools to support the development and implementation of CETPs, emphasizing the critical role of local strategies in achieving broader energy and climate targets.

In conclusion, Part A underscores the importance of local CETPs in the broader context of the European energy transition, highlighting both the challenges and opportunities that lie ahead. By providing a detailed evaluation of the current landscape, barriers, and supportive methodologies, the report contributes valuable insights towards enhancing the effectiveness and ambition of local CETPs in meeting the urgent demands of energy and climate targets.

Part B studies the relationships between the different stakeholders in their roles when implementing CETPs and their affinity to them and displays all these relations in a Sociogram. In addition, it directly evaluates the development and implementation of CEPTS in LRAs through a methodology of questionnaires and semi-structured interviews with LRAs and key stakeholders. This analysis has been carried out in the four Use Cases (Bulgaria, Cyprus, Mediterranean Islands and Spain) and a variety of LRAs and stakeholders have been sought in each of the UCs in order to be representative.

Part B has analysed the challenges and priorities for LRAs in their different contexts. It has also analysed the level of development and implementation of CETPs in the different LRAs in an attempt to further analyse the different factors that may influence their level of development and the barriers that hinder it in each case, and the reasons that lead municipalities to outsource the development, implementation or monitoring of CETPs.

This study also assesses the level of knowledge and skills needed to implement these plans and their measures and the current level of the technicians working with them, as well as the level of digital literacy and the use of digital tools in CETPs' own tasks.

With the results obtained from this study in Part B, they will serve to better define the Use Cases, to better understand their needs, especially their training and digital needs.

In conclusion, Part B stresses the importance of the increased support needed for local authorities to overcome their bureaucratic, financial and training barriers, thanks to which they will be able to develop better CETPs and implement more and better measures, not only for Climate Change mitigation, but also for adaptation and energy poverty.

Part A represents the culmination of Task 2.1 of the Step-WISE project. Task 2.1 was specifically designed to assess the current state of CETPs, focusing on their alignment with European and national energy and climate targets amidst the rapidly evolving policy landscape. Part B represents the culmination of Task 2.2 designed to assess the stakeholder mapping and skill gap analysis focusing in the development and implementation of CEPTS by LRAs.

The findings and recommendations presented in this report reflect a collaborative effort to address the complexities of local energy transitions, offering actionable insights that contribute to the broader objectives of the Step-WISE project and the sustainable energy future of Europe.

This Deliverable 2.1 "D2.1 Local CET plans framework, including stakeholders mapping and Skills Gap Analysis" sets the basis for the following tasks and phases of the Step-WISE project.

On the one hand the results from the analysis made during this study will feed the following activities, tailoring the identification and characterization of Use Cases, including Action Plans; and the Step-WISE toolkit requirements, which will be contained in the following deliverable D2.2 "Use Cases identification and characterization and Step-WISE toolkit requirements definition".

On the other hand, understanding LRAs aspirations, in terms of level of innovation, ambition and specific geographic context and needs, will help to better configure the overall Capacity Building Programme adaptive learning framework and material.

2 PART A: LITERATURE ANALYSIS ON CURRENT POLICY FRAMEWORK ON ENERGY EU

2.1 Introduction

2.1.1 Background and Context

The report emerges in a pivotal moment for the European Union's energy sector, driven by an urgent need to transition towards clean and sustainable energy systems. This transition is fundamental to achieving the EU's ambitious climate and energy targets, including significant reductions in greenhouse gas emissions, increasing the share of renewable energy, and improving energy efficiency across member states. The background of this report is set against the backdrop of these overarching goals, reflecting a concerted effort to address the complex challenges of energy transition at both the macro and local levels.

At the heart of the EU's energy transition strategy are the local Clean Energy Transition Plans (CETPs), which are instrumental in translating EU-wide objectives into actionable, region-specific strategies. Local CETPs are developed within the framework of national and European policies but are tailored to the unique contexts, resources, and needs of individual regions and municipalities. These plans are critical for mobilizing local stakeholders, leveraging regional strengths, and addressing specific barriers to clean energy adoption.

The development and implementation of CETPs are influenced by a rapidly evolving policy landscape, characterized by the introduction of new regulations, funding mechanisms, and technological advancements. This dynamic environment presents both opportunities and challenges for local authorities and stakeholders in developing and updating CETPs to align with higher-level targets.

Furthermore, the background acknowledges the diversity of Europe's regions in terms of economic, social, and environmental conditions, which results in varied levels of ambition and innovation in local energy strategies. The effectiveness of local CETPs is contingent upon a comprehensive understanding of these regional disparities, the identification of best practices, and the assessment of barriers that hinder the adoption of clean energy solutions.

To support the development and implementation of effective local CETPs, the report emphasizes the importance of a thorough analysis of current policy frameworks at both the European and national levels. It also highlights the need for an evaluation of methodologies and tools that can aid local and regional stakeholders in planning, implementing, and monitoring their energy transition efforts.

The background of the report sets the stage for a detailed investigation into the status of local CETPs across Europe, aiming to identify key factors that influence their development and effectiveness. It underscores the critical role of these plans in achieving the EU's energy transition objectives and provides a rationale for the comprehensive analysis that follows, focusing on policy frameworks, barriers to energy transition, and the tools and methodologies that support local and regional energy planning.

2.1.2 Objectives of the Report

The objectives of this report are multi-faceted, aiming to provide a comprehensive analysis and actionable insights into the development and implementation of local Clean Energy Transition Plans (CETPs) across Europe. The report sets out to achieve the following key objectives:

1. **Asses the Current State of Local CETPs:** To evaluate the level of development and the strategic approaches of local CETPs across Europe, with a special focus on selected Use Case (UC) countries.

This assessment aims to understand how local CETPs align with, and contribute to, achieving national and European energy and climate targets.

2. **Analyse Policy Frameworks:** To review and analyse the current policy frameworks at both the European and national levels that influence the development and implementation of local CETPs. This includes identifying the enabling conditions, as well as the regulatory and policy obstacles that affect the ambition and effectiveness of local energy transition strategies.
3. **Identify Barriers and Challenges:** To systematically identify the main barriers and challenges faced by regions in adopting and implementing CETPs. This involves evaluating the CETPs according to their level of ambition and innovation, and understanding the difficulties in updating these plans to align with evolving National and EU targets.
4. **Highlight Regions Without CETPs:** To identify the main regions across Europe that lack CETPs, thereby pinpointing specific areas that require focused attention within the project. This objective includes understanding the reasons behind the absence of CETPs and proposing strategies to encourage the development of these plans.
5. **Evaluate Tools and Methodologies:** To identify and evaluate the main methodologies and tools aimed at supporting the development, implementation, and monitoring of CETPs. This includes a critical assessment of existing tools and methodologies against the Step-WISE toolkit, to determine their efficacy in enhancing the capacity of local and regional stakeholders.
6. **Provide Recommendations:** To offer policy implications and recommendations based on the findings of the report. This includes suggesting actionable steps for policymakers, local authorities, and other stakeholders to enhance the development and implementation of CETPs, thereby ensuring that local strategies are effectively contributing to the EU's broader energy and climate goals.
7. **Enhance Stakeholder Capacity:** To contribute towards increasing the capacity of local and regional stakeholders to deliver, implement, and monitor CETPs effectively. This involves providing insights into best practices, benchmarking successful initiatives, and highlighting effective tools and methodologies that can support stakeholders in their efforts.

By achieving these objectives, the report aims to offer a valuable resource for policymakers, stakeholders, and practitioners involved in the energy transition, fostering a deeper understanding of the complexities and opportunities associated with local CETPs and their critical role in Europe's energy future.

2.2 Methodology

The methodology adopted in this report for analysing the development and implementation of local Clean Energy Transition Plans (CETPs) across Europe is comprehensive and multidimensional, designed to address the complex and varied nature of energy transition at the local level. This methodology encompasses a mix of qualitative and quantitative research techniques, ensuring a holistic understanding of the status, challenges, and opportunities associated with CETPs. The following sections detail the components of the methodology:

2.2.1 Literature Review

A thorough literature review forms the foundation of the research, involving the examination of academic papers, policy documents, EU directives, and reports from relevant energy and climate organizations. This review aims to gather existing knowledge on the development of local CETPs,

understand the policy landscape, and identify best practices and challenges in energy transition efforts across Europe. The literature review also helps in mapping the evolution of energy policies and the role of local CETPs within this context.

2.2.2 Policy Framework Analysis

The policy framework analysis involves a detailed examination of current European and national-level policies impacting the development and implementation of CETPs. This includes reviewing legal texts, policy directives, and strategic documents to understand the regulatory environment, incentives, and constraints faced by local authorities in pursuing energy transition goals. The analysis seeks to identify gaps between policy objectives and implementation outcomes, offering insights into how policy frameworks can better support local CETPs.

2.2.3 Stakeholder Mapping and Engagement

Stakeholder mapping is critical to understanding the ecosystem around CETPs, identifying key actors involved in their development, implementation, and monitoring. This process involves categorizing stakeholders into groups such as governmental bodies, NGOs, industry players, and community organizations. Engaging with stakeholders through interviews, surveys, and workshops enables the collection of diverse perspectives on the challenges, needs, and opportunities in developing and implementing CETPs. This engagement also provides valuable insights into the effectiveness of current methodologies and tools used in planning and executing local energy strategies.

2.2.4 Comparative Analysis and Use Cases

A comparative analysis of CETPs across different European regions and countries is conducted to highlight variations in approach, ambition, and effectiveness. This analysis includes the examination of specific case studies where CETPs have been successfully implemented, identifying factors that contributed to their success. The case studies are selected based on criteria such as innovation, stakeholder collaboration, and alignment with EU energy and climate targets, providing models of best practices that can be emulated in other contexts. Design and Distribution:

A comprehensive questionnaire was crafted, focusing on gathering detailed information about the relevant conditions in UC countries. This questionnaire aimed to capture a wide array of data, including policy environments, stakeholder engagement levels, barriers to implementation, and the presence of innovative practices within local CETPs. Responses from Step-WISE project partners, who filled out the questionnaire, provided a rich dataset for analysis. This primary data allowed for a nuanced understanding of the specific challenges and successes experienced by UC countries in developing and implementing CETPs. The insights garnered from the questionnaire responses were directly integrated into the comparative analysis of CETPs. This provided a unique, data-driven perspective on the varied landscapes of energy transition efforts across the UC countries, enriching the overall analysis with first-hand accounts and observations from those closely involved in the process.

2.2.5 Barrier and Opportunity Identification

Through the synthesis of literature review findings, policy analysis, stakeholder inputs, and comparative analysis, the methodology involves identifying the main barriers and opportunities for the development and implementation of CETPs. This includes economic and financial hurdles, technological challenges, political and regulatory constraints, and social and cultural factors. The identification of these barriers and opportunities informs the development of recommendations aimed at overcoming obstacles and leveraging strengths.

2.2.6 Tools and Methodologies Evaluation

An evaluation of existing tools and methodologies that support the development, implementation, and monitoring of CETPs is conducted. This includes a critical assessment of the Step-WISE toolkit, comparing it against other methodologies in terms of effectiveness, usability, and adaptability. The evaluation aims to identify gaps in existing tools and propose enhancements or new tools that could better support local and regional stakeholders.

2.2.7 Recommendations Development

Based on the comprehensive analysis, the methodology culminates in the development of recommendations for policymakers, stakeholders, and practitioners. These recommendations are designed to enhance the development and implementation of CETPs, addressing identified barriers, and capitalizing on opportunities.

The methodology's multidisciplinary approach ensures a robust analysis, capturing the complexity of local energy transition efforts. Through this structured approach, the report aims to provide actionable insights and recommendations that can contribute to the successful development and implementation of local CETPs across Europe.

2.3 Energy Transition in the European Union

2.3.1 Historical Context and Evolution of Policies

Section 2.3.1 notes on the EU's historical context and evolution of policies in terms of energy transition and climate change. It is important to know the historical evolution of the EU to better understand its ambition towards change. Movement in the climate change sector was initiated in 1972, by 1990 a set of climate goals were set and in 1992 these goals were made to be international. In 1997 the Kyoto protocol followed describing detailed goals for climate change and by 2008 the 20-20-20 package was released setting goals for 2020.

Recognised as one of the leading members in tackling global warming, the European Union's involvement in climate action has started in 1972, where the climate awareness for the environment was first presented during the United Nations Conference on the Human Environment in Stockholm, where the Stockholm Declaration and Action Plan for the Human Environment was adopted. The Stockholm Declaration was exemplar in exposing environmental problems and the rising concerns and initiating dialogues (1). On the aftermath of the conference the European Commission was tasked to provide the co-ordination work at a regional level, for a programme on environmental research (2). Following, the first actions towards the European Climate policy were initiated by the 1990 IPPC (Intergovernmental Panel on Climate Change) report which reported on the effects of Carbon Dioxide and of other Green House Gasses effect on the climate and the resulting impacts (3), where EU leaders agreed to keep the GHG emissions levels at 1990 levels by 2000. The IPPC was later updated with a supplement and presented at the UNCED (United Nations Conference on Environment Development) in Rio 'Earth Summit' 1992 (4). Main goal of the 1992 Summit was to generate a wide schedule including a new plan for international actions on the environment that would not only support policy creation but international cooperation and policy development for the next century. At the Rio Summit the United Nations Framework Convention on Climate Change (UNFCCC) was signed forming a treaty that allows the basis for international climate negotiations which the EU has also signed. Some of the main outcomes of the 'Earth Summit' was the Agenda 21, the Rio Declaration, the UNFCCC, the Convention on Biological Diversity, and the Declaration on the principles of forest management (4) (5).

- The main areas of climate policy were GHG reduction through Carbon dioxide and energy taxation, EU Member States GHG emission limitations were set in place by the SAVE Directive (1993) by enforcing energy audits to energy intensive companies, (5)
- promotion of renewable energy sources with the ALTENER programme which aimed at an EU community-wide promotion of RES (1993) and their placement in nation policies, other goals

were for RES to make up 8% of energy supply in 2005 and a 5% biofuel share in the road fuel market. The ALTENER programme has also provided funding and measures (studies, monitoring, etc.) to promote RES, (5)

- and energy efficiency improvement with the SAVE programme which made possible the implementation EE policies, later on the common standards for were released for hot water heaters, HVAC systems, lighting and others, and a labelling system for appliance EE was set in place (Energy Policy Act). (5) (6)

During the **1997** Kyoto Climate Summit, industrialised countries and transitioning economies agreed on a set of quantitative GHG emission targets, ‘the EU committed to 8% reductions of a basket of six GHGs during the commitment period 2008-2012’, and the Kyoto Protocol was adopted providing market-based mechanisms to implement mitigation of GHG emissions. Some of the mechanisms included in the Kyoto Protocol were the (7)

- International Emissions Trading: emission trading is a system that allows countries to sell and trade their emissions within the cap to each other. (8)
- Clean Development Mechanism (CDM): this mechanism permits countries with their own mitigation plans under the Kyoto Protocol to be able to execute mitigation planning in developing countries, these projects can earn the beneficiary countries CER credits which equal to a tonne of Carbon Dioxide. (9)
- Joint Implementation (JI): this mechanism allows countries with mitigation planning under the Kyoto Protocol to earn emission reduction units that equal to a tonne of CO₂ from mitigation plans in other countries. (10)

Next was the 20-20-20 package presented in **2008** by the European Commission, it included energy goals revolving around supply security, increasing market competitiveness and sustainability for the year 2020. The definite goals presented by the package were 20% reduction of Carbon Dioxide emissions compared to 1990 levels, 20% of energy consumption to be generated by RES, and 20% increase in energy efficiency to be achieved by 2020 (11). The initiative introduced the CARE package (12) to ensure the achievement of targets, it included the Renewable Energy Directive initiating targets for clean energy transition a reviewed directive on emissions trading, the Effort Sharing Decision to reduce GHG emissions and the Carbon Capture and Storage Directive, revolving around capturing carbon from the atmosphere and securely storing it. (5)

The overview of the European Union’s Climate Change Historical Involvement is presented in

Table 1

Table 1: Historical Context and Evolution of Policies

Year	Policy/Event	Context
1972	Stockholm Declaration and Action Plan for the Human Environment	EU initiates climate awareness during the United Nations Conference on the Human Environment. Stockholm Declaration sets the foundation for environmental dialogue and exposes rising environmental concerns.
1972-1992	Environmental Research Coordination by European Commission	Post-Stockholm, the European Commission takes regional coordination roles in environmental research, laying the groundwork for subsequent climate policies.
1990	IPPC Report and Commitment to GHG Emission Levels	The 1990 IPPC report highlights the impact of Greenhouse Gases (GHGs) on climate. EU leaders commit to maintaining GHG emissions at 1990 levels by 2002.

2.3.2 Current Policy Landscape

Section 2.3.2 delves into the current policy landscape shaping Europe's response to climate change. It begins with the Paris Agreement, a cornerstone international treaty ratified by the EU in 2016, committing members to significant reductions in greenhouse gases and continual improvement through National Determined Contributions. The narrative then shifts to the ambitious European Green Deal of 2019, which sets forth comprehensive initiatives aimed at drastically reducing emissions, enhancing biodiversity, and transitioning to a sustainable economy. Finally, the section introduces "Fit for 55," a legislative reinforcement of the Green Deal's targets, solidifying the EU's commitment to a 55% reduction in emissions by 2030 and a climate-neutral Europe by 2050.

2.3.2.1 Paris Agreement

Onto the current European policy Landscape, the Paris Agreement was approved by The Council of Europe and finally signed by the EU in 2016, it is a legally binding international treaty that states the efforts to hold the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels by the end of the century in order to prevent severe climatic impacts. The agreement is structured in a way where member parties must provide a national determined contribution plan every 5 years; the plan states what actions the party has taken to reduce its GHG emissions and their effort to build resilience to adapt to climate change. Each NDC a country provides must entail the increasingly ambitious actions that are taken for the agreement on a 5-year cycle. Although the Paris Agreement is legislation presented by the United Nations, its goals still play a role in European Policies, which is why it is mentioned. (13)

2.3.2.2 European Green Deal

Later on, in December 2019 the European Green Deal was launched by the European Commission and it encompasses the risks of climate change and the need to change. The Green Deal uses a package of initiatives with the goal of ensuring at least 55% less net GHG emissions by 2030 (compared to 1990 levels), the amount of 3 billion trees to be planted by 2030, and a climate-neutral Europe with no net emissions of greenhouse gases by 2050. Some benefits expected of the European Green Deal for the health of citizens and the future generation are fresh air, clean water, energy-efficient buildings, more public transport, cleaner energy, future-proof jobs, etc. The Green Deal consists of multiple initiatives for its execution, like Fit for 55, European climate law, EU strategy on adaptation to climate change, EU biodiversity strategy for 2030, Farm to fork strategy, European industrial strategy, circular economy action plan, batteries and waste batteries A just transition, clean, affordable and secure energy, EU chemicals strategy for sustainability and Forest strategy and deforestation. (14) (15)

2.3.2.3 European Climate Law

Following the European Green Deal, a new law was proposed by the European Commission in June 2021, which transformed the goal of the Green Deal into a legal obligation to be enforced in all European member states making it European Climate Law. The climate law had officially made the goal of 55% emission reduction by 2030 and climate-neutral Europe by 2050 a legal obligation, the limitation of 225 Mt of CO₂ equivalent and the aim of a higher volume of carbon sink by 2030. Further information for Fitfor55! is available in Section 3.4. (16)

2.3.2.4 Fit for 55

Presented in July 2021 Fit for 55 is a package of initiatives and rules on the sectors of energy, transport, emissions trading and reduction, and land use and forestry, instated by the European Union to aid the achievements of the European Green Deal and climate law with the reduction of emissions and the decarbonization of the economy. (17)

Key features of the EU sustainability policies are presented in **Table 4**

A number of initiatives were released through the 'Fit for 55' package, it is a climate law implemented by the European Union to translate the ambitions of the Green Deal possible by making the reduction of 55% of greenhouse gas emissions produced by the EU by 2030 an obligation. Various legislations have been implemented as part of the 'Fit for 55' package to ensure the achievement of the goal. (18)

- European Trading System (ETS): launched in 2005 the EU emissions trading system operates in a cap and trade way, where the cap is the limit of the amount of greenhouse gas emissions allowed by the system. The cap gets reduced every year for the goal of achieving EU climate goals. As the cap is conveyed in allowances where 1 allowance equals to 1 tone of CO₂eq emissions, every company must purchase allowances or trade with other companies. At the end of the year companies must produce all of their yearly allowances accountable for their emissions, if said companies cannot produce their allowances then they get fined. (19) This system makes it an obligation for polluter to pay and allows for over polluters to be punished, this financial burden causes companies to pollute less. The trading system works in trading phases and it is currently in its fourth phase that has already been revised in 2018 to be in line with the EU's 2030 climate and energy framework and due to the increasingly ambitious goals of EU the trading phase 4 has already been revised for a second time in 2021 in the 'Fit or 55' package. (19)
- Social Climate Fund (adopted in April 2023): is a fund that will provide support to individuals and families of low-income and micro businesses affected by the higher fossil fuel prices caused by the ETS. The fund has a budget of up to €65 billion and it will work by utilizing the profit generated by the ETS, member states can use the generated revenue by measuring and investing in increasing the energy efficiency of buildings, building renovations, decarbonization of heating and cooling in buildings and zero/low-emission mobility and transport. The fund will also provide temporary and limited direct income and energy tax exemptions to vulnerable groups. (20)
- Carbon border adjustment mechanism: focuses on the prevention of carbon leakage, where industries that have a high production of greenhouse gasses transfer their businesses outside of Europe to escape buying the ET System allowances. To combat this the EU has instated CBAM certificates, where companies importing outside the EU have to buy these certificates to cover the price difference that occurs when avoiding the ETS allowances. (21)
- Member states emission reduction targets: for the sake of achieving a 55% GHG emission reduction compared to 1990 levels by 2050 an effort-sharing regulation (ESR) has been implemented to update member states' emissions reduction targets for 2030. The ESR sets targets for each member state to cut GHG emissions in various economic sectors, such as road transport, agriculture, building, small industries, and waste as these sectors generate 60% of total EU emissions. New rules and targets state that each member state needs to achieve a 40% reduction of GHG emissions by 2030 in targeted sectors, aid will be provided for the member states with banking (in case less annual emission production, countries can use part of the surplus in next year), borrowing (in case of exceeding annual emissions production, countries can borrow from next year's quota) and trade (countries can buy and sell excess allocations between them). (22)
- Emissions and removals from land use, land use change, and forestry: concerns the GHG emissions and carbon removal in land use and forestry sectors, by capturing it in soil and forests. This revised rule sets a higher EU target for carbon removals to be completed by 2030. The existing targets where removal of 225 Mt of CO₂eq from the atmosphere yearly, in 2019 we achieved a 249 Mt removal and the new target set for 2030 is 310 Mt. The program uses a two-faced approach phase 1 is until 2025 with goal of EU member states to balance emissions and removals and phase 2 is from 2026 to 2030 which encompasses the new target removal of 310 Mt of CO₂eq in the atmosphere contributing to EU climate goals and more ecologically sound environment. (23)
- CO₂ emission standards for cars and vans: new targets for higher carbon dioxide emissions reduction for cars and vans have been set for the automotive sector in an effort to achieve EU

goals. The new regulation states that all new cars and vans should have net zero emissions by 2035. (24)

- Reducing methane emissions in the energy sector: stricter rules on the monitoring and reporting of methane emissions in the energy sector will be made in order to reduce methane emissions into the atmosphere. The new rules for the restriction of methane release into the atmosphere from the energy sector include, 1. measuring and reporting, where independent verifiers measure, report and verify methane emissions, regular monitoring of any equipment damage and leaks by companies and an inventory of inactive wells and coal mines will be made available to the public. 2. Reducing emissions in the EU, reductions will be made through the mandatory leak detection and repair at production plants, mitigation plans by member states, actions for emissions reduction for inactive or abandoned extraction sites. 3. Tracking energy imports, global monitoring tools are used to ensure the legitimacy of emissions from imports of fossil fuels and the obligation to trace emissions of energy imports. (25)
- Sustainable Aviation Fuels: reduction of emission production in the transport sector by increasing the use of sustainable fuels by aircraft and ships following the ReFuelEU aviation FuelEU maritime regulations. ReFuelEU aviation implements the increase of sustainable fuel share that suppliers distribute, the refuelling of aircrafts only when necessary, and the correct infrastructure for delivering, storage and refuelling sustainable fuels. FuelEU Maritime implements vessels of above 5000 gross tones to reduce the GHG intensity of the energy used on board and for power supply during mooring at the quayside to be onshore. (26)
- Alternative fuel infrastructure: the aim of this legislation is to ensure that the infrastructure for recharging or refuelling of various vehicles is sufficient for consumers. For road transport recharging stations will be available every 60 km on main roads, hydrogen refuelling stations will be available every 200 km on main roads, and at every urban node a refuelling station will be placed with the designed capacity to provide 1 tone of hydrogen per day at 700 bars. Liquefied methane refuelling points will at least be available on the main roads, also this new infrastructure will allow ad-hoc charging, electronic payments and information about pricing options. For the busiest seaports, at least 90% of container ships will allow shore-side electricity supply and most of the inland waterway ports will have at least one installation providing shore-side electricity. By 2025 all aircrafts next to the terminal will be supplied with electricity and all remote stands by 2030. (27)
- Renewable energy: a provisional deal on the renewable energy directive, combining elements from RepowerEU have a goal to increase the amount of renewable energy in the EU. Renewable energy like wind power solar power, biofuels, heat pumps, tidal power, etc. will reduce GHG emission from the energy sector and provide an alternative to fossil fuel imports. By 2030 buildings must share 49% of renewable energy, industries will have an annual 1.6% increase in renewable energy shares, hydrogen industry need to have a 42% share and heating and cooling technologies must have an annual increase of 0.8% by 2026, and a 1.1% increase by 2030. Transportation (marine) vehicles can have the option between a decrease of 14.5% in emissions intensity of transport fuel or at least a 29% increase in renewable energy shares, also an increase of 5.5% shares of biofuels and renewable fuels of non-biological order combined and at least a 1% increase of renewable fuels of non-biological origin. (28)
- Energy efficiency: to achieve a 55% reduction of GHG emissions by 2030 we must reduce energy consumption, with less energy consumption we have fewer GHG emissions, less pollution, more affordable energy for citizens, and reduced dependence on imported fossil fuels. New rules of this directive are compulsory final energy reduction in the EU, with a 40.6% decrease in primary consumption and a 38% reduction in final consumption. The new targets will be achieved if the public sector can contribute to an annual 1.9% reduction (public transport and armed forces excluded) and a renovation of buildings for an increased energy performance. (29)
- Energy performance of buildings: This directive will help buildings become more energy-efficient by encouraging property owners and constructors to follow new energy efficiency standards for

new and renovated buildings and energy performance certificates will be necessary for the development of all new buildings. Existing residential buildings will need to have at least a D energy performance class level by 2033, by 2040 all class levels need to be set by the country that will ensure the goal of zero-emission buildings for 2050, and by 2050 all existing residences need to be zero-emission buildings. Non-residential buildings will have a maximum amount of energy that can be used per square meter annually set by the member state. Buildings that will be an exception consist of historical buildings, places of worship or any religious activity, stand-alone buildings smaller than 50 m², military buildings, and industrial sites/workshops/non-residential agricultural buildings. (30)

- Hydrogen and decarbonized gas market package: to achieve 2050 goals we must reduce our fossil fuel consumption so in December 2021 the European gas market was reviewed by the commission. This directive was instated with an aim to progressively replace fossil gas in the EU by shifting from natural gas to renewable low-carbon gases, strengthen the security of gas supply and reduce dependency on imported fossil fuels. New rules of the directive are 1. creating a market for hydrogen by facilitating trade with non-EU countries, creating a European network of network operators for hydrogen, and a dedicated infrastructure for hydrogen. 2. Integrating renewable and low-carbon gases into the gas grid by facilitating access to the existing grid with the removal of cross-border tariffs, a certification system, and common terminology and rules on monitoring of quality of gas. 3. Engaging and protecting consumers by accessing smart meters, providing more transparent billing information, and a simpler way to change energy providers. 4. Increasing security of supply and cooperation by strengthening solidarity arrangements between EU countries to deal with crisis situations, certification of storage system operators, and integrating planning for electricity, gas, and hydrogen networks. These new rules will help facilitate the production of 10 million tons of renewable hydrogen and 40 GW of green hydrogen electrolyser capacity by 2030 and the maximum end date for long-term fossil gas contracts by 2049. (31)
- Energy taxation: This legislation ensures the taxation of motor and heating tools, this action will encourage companies, users, and consumers to use cleaner energy, it will facilitate a more sustainable industry and more environmentally friendly options. It is foreseen that the most polluting fuels will be taxed the highest, the minimum tax rates of aviation and maritime fuels will gradually increase, minimum rates of taxation will continuously be updated, and no difference between types of use of fuels and electricity. (32)

A list of 'Fit for 55' Initiatives is presented in **Table 2**

Table 2: Fit for 55 Initiatives and Programmes

Initiative	Description
European Trading System (ETS)	Launched in 2005, operates in a cap-and-trade manner, setting a cap on greenhouse gas emissions. Cap reduces annually, and companies must purchase allowances or trade them. Non-compliance results in fines, promoting emission reduction. Currently in its fourth phase, revised in 2018 and 2021 to align with EU's 2030 climate goals.
Social Climate Fund (adopted in April 2023)	A €65 billion fund supporting low-income individuals and micro-businesses affected by higher fossil fuel prices due to ETS. Utilizes ETS profits for building renovations, energy efficiency, and supports vulnerable groups with income and energy tax exemptions.
Carbon Border Adjustment Mechanism (CBAM)	Aims to prevent carbon leakage by introducing CBAM certificates. Companies importing outside the EU must buy certificates to cover the price difference from avoiding ETS allowances.

Member States Emission Reduction Targets	Implements the effort-sharing regulation (ESR) to update member states' emissions reduction targets for 2030. Targets set for various sectors with support mechanisms like banking, borrowing, and trading allowances between states.
Emissions and Removals from Land Use, Land Use Change, and Forestry	Addresses GHG emissions and carbon removal in land use and forestry sectors. Sets higher EU target for carbon removals by 2030, involving a two-faced approach until 2025 and from 2026 to 2030.
CO2 Emission Standards for Cars and Vans	Sets new targets for higher CO ₂ emission reduction for cars and vans. Requires all new cars and vans to have net-zero emissions by 2035.
Reducing Methane Emissions in the Energy Sector	Introduces stricter rules on monitoring and reporting methane emissions. Focuses on measuring and reporting, reducing emissions in the EU, and tracking energy imports to minimize methane release.
Sustainable Aviation Fuels	Aims to reduce emission production in the transport sector. Implements ReFuelEU aviation and FuelEU maritime regulations, focusing on sustainable fuel shares and correct infrastructure for aviation and maritime sectors.
Alternative Fuel Infrastructure	Ensures sufficient infrastructure for recharging/refuelling various vehicles. Specifies availability of recharging stations for road transport and hydrogen, with requirements for liquefied methane refuelling points. Focuses on ad-hoc charging, electronic payments, and information availability.
Renewable Energy	Aims to increase renewable energy in the EU. Sets targets for building shares, industrial increases, hydrogen share, and heating/cooling technologies. Provides options for transportation vehicles, including emissions intensity decrease or renewable energy share increase.
Energy Efficiency	Introduces rules to achieve a 55% reduction in GHG emissions by 2030. Targets compulsory final energy reduction in the EU, with specific reductions in primary and final consumption. Encourages public sector contributions and building renovations.
Energy Performance of Buildings	Encourages energy efficiency in buildings through new standards, performance certificates, and goals for achieving zero-emission buildings by 2050. Specifies requirements for residential and non-residential buildings.
Hydrogen and Decarbonized Gas Market Package	Aims to replace fossil gas in the EU. Focuses on creating a market for hydrogen, integrating renewable gases into the grid, and enhancing consumer engagement. Sets rules for smart meters, transparent billing, and security of supply. Aims to produce 10 million tons of renewable hydrogen and 40 GW of green hydrogen electrolyser capacity by 2030.
Energy Taxation	Ensures taxation of motor and heating tools to encourage cleaner energy use. Sets higher taxes on more polluting fuels, with gradual increases in minimum tax rates for aviation and maritime fuels. No differentiation between types of fuel use and electricity.

The Energy Efficiency Directive (related to the 20-20-20 package) was set in place since 2012 to achieve energy efficiency targets. This directive makes it necessary for EU Members to reduce an extra 11.7% of energy consumption by 2030 compared to 2020 (5%) and not surpass 992.5 Mtoe primary energy and 763 Mtoe final energy. (33) Country members must set their indicative national contributions to achieve a 1.3% reduction by 2024-2025, 1.5% by 2026-2027 and 1.9% by 2028-2030. The new directive

proposed improved regulations aiming to combat energy poverty and vulnerable consumers, empowering consumers by raising awareness on energy efficiency and providing technical and financial advice to consumers. (34)

Purpose of the ERDF (European Regional Development Fund) is to provide funding for local authorities' projects, to promote economic, social, and territorial cohesion between the EU member states, and eradicate any region imbalance. Through the funding the ERDF aims to encourage investments in regions, and by 2027 to create a smarter and more economically competitive regions, greener and interconnected, and more socially conscious regions that focus on citizen aid, while becoming closer to the citizens. (35)

The Circular Economy Action Plan will provide the structure for sustainable growth in European Green Deal and reduce the depletion of natural resources. (36) The CEA plan focuses in promoting sustainable products in the EU market, providing cost-saving opportunities to empower consumers, introducing circularity in the economy for climate neutrality and long-term competitiveness. (37) The plan will also introduce the Circular Electronics Initiative to introduce circularity in the electronic and ICT waste, and also general waste such as plastics, textiles, construction materials, and others. (37) Another goal of the CEA plan is to have a positive impact on job opportunities and waste exports. (37)

Other than initiatives, climate transition programmes have been endorsed by European authoritative bodies.

An example is the EU **Covenant of Mayors** for Climate and Energy is an initiative Launched in 2008 and supported by the European Commission bringing together thousands of local governments that want to secure a better future for their citizens. (38) Each country that joins the Covenant of Mayors voluntarily commits to the EU Climate and Energy goals. (38) The Covenant of Mayors is structured to provide its members with the framework of local and energy actions following these four principles (39):

- Consistency and transparency,
- Flexibility and adjustability,
- Evaluation of the data, and
- Promotion and exchange of experience.

The main objective of this initiative is to encourage ambition and commitment toward the Paris Agreement, by continuing the reduction of greenhouse gas emissions, increasing resilience and preparation for the impacts of climate change, and addressing energy poverty. (40) The Covenant of Mayors will create decarbonized resilient societies with access to affordable, secure and sustainable energy by 2050.

Each joining member must create their own climate action plan of mitigation and/or adaption and/or energy savings that has the final goal of 55% reduction of GHG emissions by 2030 and climate neutrality by 2050, a strong resilient society against the changes of climate change and diminishing energy poverty. (38) Ways that local governments can achieve that by building on an **energy sprint**. The energy sprint was launched in 2022 by the Covenant of Mayors, the European Commission, and the European Committee of the Regions. It's based on the REPowerEU plan for energy savings, and it **has a goal on energy consumption reduction and protection against energy crisis**. (41)

Another programme is the **Energy Poverty Advisory Hub (EPAH)**, the purpose and vision of the EPAH is to lead the EU initiative to eradicate energy poverty and accelerate just energy transition of European local governments. This can be achieved by making access to energy services easier, and mainly by creating a central platform that will bring various stakeholders and authorities that want to

abolish energy poverty together. Ways to eradicate energy poverty showed in the EPAH website is by: (42)

- employing authorities and civil society organisations in Europe on energy poverty reduction and understanding social aspects related to energy poverty,
- making network for stakeholders interested in acting on energy poverty to collaborate and engage in dialogue with national and international events, workshops and digital training,
- Creating a support system for local authorities and civil society organisations to motivate stakeholders into taking action.

EPAH's main action will be to provide the central platform of energy poverty in the EU for local authorities and stakeholders wanting to take action in combating energy poverty in their communities. The EPAH will provide direct support, online training, and research results. (43) (44)

A list of European Initiatives/Programs is presented in **Table 3**

Table 3: European Initiatives/Programs

Initiative/Program	Description
Energy Efficiency Directive	<ul style="list-style-type: none"> ▪ Aims for extra 11.7% energy reduction by 2030. ▪ Sets country-specific reduction targets. ▪ Targets combatting energy poverty and empowering consumers.
European Regional Development Fund (ERDF)	<ul style="list-style-type: none"> ▪ Funds local projects for cohesion and development. ▪ Aims for smarter, greener, socially conscious regions by 2027.
Circular Economy Action Plan (CEA Plan)	<ul style="list-style-type: none"> ▪ Promotes sustainable growth and circularity in the EU. ▪ Focuses on sustainable products and introduces Circular Electronics Initiative.
EU Covenant of Mayors for Climate and Energy	<ul style="list-style-type: none"> ▪ Unites local governments for EU climate goals. ▪ Aims for 55% GHG reduction by 2030 and climate neutrality by 2050.

Table 4. Key features of EU sustainability policies

Policy/Initiative	Year Adopted	Key Features
Paris Agreement	2016	Legally binding international treaty aiming to limit global temperature rise with required National Determined Contributions (NDCs) every 5 years.
European Green Deal	2019	Targets a 55% reduction in GHG emissions by 2030 and a climate-neutral Europe by 2050, includes initiatives for biodiversity and a circular economy.
European Climate Law	June 2021	Transforms European Green Deal goals into legal obligations. Enforces a 55% emission reduction by 2030, climate neutrality by 2050, a CO ₂ equivalent limitation, and increased carbon sink by 2030.
Fit for 55	July 2021	Transforms European Green Deal goals into legal obligations with specific targets for emission reduction and carbon sinks.

2.3.3 Key Actors and Stakeholders

This section provides an overview of the key actors and stakeholders integral to the European Union's climate action and energy transition efforts. It details the roles and contributions of major entities, including the European Commission, European Parliament, Council of the European Union, national governments, the renewable energy industry, and citizens. Understanding these actors and stakeholders is crucial for comprehending the complex dynamics and collaborative efforts driving Europe's path towards a sustainable and environmentally responsible future. Key Actors for climate action are bodies of authorities responsible for establishing new ideas, proposing new laws, instating them and enforcing them.

2.3.3.1 *European Institutions:*

The European Commission, established in 1958 as the executive arm of the EU, plays a pivotal role in representing the EU globally, proposing legislation, implementing EU law, and managing budgets. (45) In the energy transition, the European Commission spearheads the European Green Deal, aiming for a 55% reduction in greenhouse gas emissions by 2030. (46) The Commission not only enforces Green Deal rules but supports Member States in their green transition through the 'Technical Support Instrument', aiding in the design of reform projects. (47) The European Parliament, another crucial actor, holds legislative powers, manages the EU budget, and supervises institutions like the European Commission. (48) It actively supports climate action, declaring a climate and environment emergency in 2019 and urging alignment with the 1.5°C goal. (49) Resolutions in 2020 and 2022 further emphasized climate ambition, sustainable mobility, circular economy, and financing the Green Deal. (50) (51) The Council of the European Union, responsible for adopting laws and coordinating policies, (52) endorsed climate neutrality by 2050, a 55% emissions reduction by 2030, and increased use of renewable energy (53). Recognizing the importance of green hydrogen and interconnected energy systems, the Council emphasized investment in decarbonization, the modernization of cross-border energy infrastructure, and sustainability criteria for projects. The Council's approval of the TEN-E Regulation and support for the renovation wave underline its commitment to greener energy infrastructure and buildings. (53) (54) Together, these institutions drive the EU's energy transition, aligning policies with ambitious climate goals and fostering sustainable practices across member states.

2.3.3.2 *National Governments*

National Governments are key actors as they have the responsibility of controlling and enforcing energy transition in their country, by abiding to European laws, setting their own targets for climate action and actively participating in EU initiatives meant for climate planning. When a national government abides to EU Climate Law, they set themselves to be aligned for carbon neutrality by 2050, and through following initiatives (Fit for 55, etc.) they can initiate energy transition in their own countries and aim for sustainability, climate adaptation and mitigation, and combating energy poverty. (55) Through policy interventions and specific measures, governments can aid a smooth energy transition integration. Some of the measures are new standards for the environment, increasing RES, applying regulations in the heating, lighting and other sectors. Investing in retrofitting of buildings to increase efficiency, providing funding to citizens for better public transportation, PV panels, better street lighting, and others, and more green technology. (47) Overall, the responsibility of governments is to construct action plans with clear goals and the way they contribute to them, provide funding in necessary sectors, encourage energy transition, and involve citizens in it, and take initiatives through actions. (55)

Stakeholders in climate change are considered communities, regions, and even industries that are the most affected by climate change and can benefit from climate transition.

2.3.3.3 *Renewable Energy Industry*

One of the main stakeholders is the Renewable Energy Industry, as it will benefit the most in this energy transition as it will allow for new job positions and increase in company profits. RES increase will decrease the financial burdens the fossil fuel industry acts on the economy and eventually contribute to overall savings in the long run while creating a more secure, efficient and reliable energy system. Renewable energy also plays a main role in energy transition allowing for the RES industry to be a key actor, as by 2021 21.8% of EU energy consumption was generated by RES and the RES shares will keep increasing, hitting goals. (56) Renewable energy sources are also very versatile, powering different energy sectors. (57)

2.3.3.4 *Consumers and Citizens*

Consumers and Citizens are also key stakeholders in energy transition as they will not only benefit the most from it, but will gain the power to influence it. From the many initiatives the EU has released, a lot of them have the best interest of consumers and citizens, mainly through the Energy Union which has a goal of providing to citizens and businesses secure, affordable and clean energy. (58) Citizens and businesses can have better building energy performance and energy efficiency and energy provided from RES. (58) More government regulations that will aid stakeholders in this energy transition through National Energy Climate Plans, the government has also launched non-legislative initiatives for cleaner and fairer energy transition. Through this energy transition, citizens can own more generation facilities, and become energy producers through renewables allowing them to generate, store, self-consume energy and overall benefit their community with affordable energy. Opportunities of investing in the energy market will become more available to the citizen allowing them to promote the energy transition. The overall goals of initiatives in this energy transition are to empower citizens to become informed producers, consumers, and retail investors. (59) The EU aims to achieve this movement of citizen empowerment through energy advisors, trusted intermediaries, trainings, etc., initiatives like the Energy Poverty Advisory Hub, and the European Climate Pact helps citizens with tools, guides and providing a concrete framework for citizens to follow. Increase of RES could transform the community into a Renewable Energy Community (60). REC allows the citizens to not only consumers but producers of clean, renewable energy at a lower cost.

2.3.3.5 *Financial Institutions:*

To provide a substantially successful energy transition, financial expertise is required, as with decarbonization capital will shift to low carbon technologies (61). Financial institutions play a big role in energy transition as they act as financial sponsors for renewable assets owners, advisors, and can provide capital at lower costs. Respectively energy projects are more attractive to financial institutions than traditional alternatives. Financial institutions can provide funding for renewable source projects and is important to them as RES investment are more beneficial than traditional energy sources (fossil fuels) (62). Financial firms can also benefit from a fast energy transition as it can generate bigger investments for banks but achieving energy transition in the medium term, financial risks for financial firms and banks become the minimum and maximum at a late-push transition. Overall, an energy transition is important to happen on time to avoid any financial risks and high costs in the long-run (63). Investments in the RES industry are necessary to achieve decarbonization goals

2.3.3.6 *Research and Academic Institutions:*

Research and academic institutions are the bodies that have generated the necessary knowledge to inform society on the impacts of climate change, how to combat it and the need for energy transition. These institutions are also responsible for any future sources, explorations and technological breakthroughs in the climate change sector (64). Universities and research centres have the ability to educate students to transform them into future innovators and participants in the battle against

climate change. These institution by providing knowledge on issues they can create a field for discussion that can generate solutions and through the scientific data they can further influence policymakers into acting. (65)

2.3.3.7 *Non-Governmental Organisations (NGOs):*

NGOs are non-profit organisations that revolve around the organisation's ideas, for energy transition NGOs the most important achievement is energy transition, therefore energy transition will greatly benefit energy transition NGOs. Non-governmental organisations play a big role in driving, promoting and advocating for energy transition while protecting human rights and are mainly involved in social and political transformation through society development, community acclimation and promotion of the organisations cause to citizen participation. Raising awareness and educating citizens and communities, advocating for policies for energy consumption reduction, creating the means for researchers and developers to innovate are some of the responsibilities of an NGO. Some examples of energy transition NGOS are Power For All, SNV, IRENA, and others. (66) (67) (68)

2.3.3.8 *Local Authorities and Municipalities:*

Local Authorities and Municipalities play the biggest role in promoting and enforcing energy transition to local communities and in general can manipulate transition in their communities. Local authorities/municipalities have the power to pass, enforce and monitor their communities' legislations on energy transition, the authorities can aid the communities by following initiatives and constructing local clean energy transition plans for them to follow (69). Through these plans the authorities can monitor the improvement and evaluate it, this way a clear picture of the energy transition can be painted and further enriched. Authorities can create funding projects for vulnerable citizens, combat energy poverty and create the means for a just energy transition (70). Some examples of Local Climate Action Plans are the Rome, Italy Resilience Strategy, The Green City Action Plan of Sofia, Bulgaria, the Spain: National Climate Change Adaptation Plan 2021-2030, and InnovaSUMP Action Plan for Nicosia, Cyprus.

The list of Key Actors and Stakeholders is presented in **Table 5**

Table 5: Key Actors and Stakeholders in Energy Transition

Key Actors/ Stakeholder	Roles and Contributions to Energy Transition
European Commission	Established in 1958, the executive arm of the EU represents the EU globally, proposes legislation, implements EU law, and manages budgets. In the energy transition, it leads the European Green Deal, aiming for a 55% reduction in greenhouse gas emissions by 2030. The Commission enforces Green Deal rules and supports Member States through the 'Technical Support Instrument,' aiding in the design of reform projects.
European Parliament	Holds legislative powers, manages the EU budget, and supervises institutions like the European Commission. Actively supports climate action, declaring a climate and environment emergency in 2019 and urging alignment with the 1.5°C goal. Resolutions in 2020 and 2022 emphasize climate ambition, sustainable mobility, circular economy, and financing the Green Deal.
Council of the European Union	Responsible for adopting laws and coordinating policies. Endorsed climate neutrality by 2050, a 55% emissions reduction by 2030, and increased use of renewable energy. Emphasized investment in decarbonization, modernization of cross-border energy

	infrastructure, and sustainability criteria for projects. Approved the TEN-E Regulation and supports the renovation wave for greener energy infrastructure and buildings.
National Governments	Control and enforce energy transition by abiding to European laws, setting climate action targets, and participating in EU initiatives. Abiding to EU Climate Law aligns them for carbon neutrality by 2050. Initiatives like 'Fit for 55' enable national energy transition, sustainability, climate adaptation, and mitigation. Governments implement policy interventions, set standards, invest in retrofitting, and fund citizen initiatives for a smooth energy transition.
Renewable Energy Industry	Benefits significantly from energy transition, creating new jobs and increasing profits. Renewable energy decreases financial burdens on the economy, contributing to overall savings. It plays a crucial role in achieving RES targets, accounting for 21.8% of EU energy consumption in 2021. Versatile and powers different energy sectors.
Consumers and Citizens	Key stakeholders benefiting from and influencing energy transition. Initiatives like the Energy Union aim to provide secure, affordable, and clean energy. Consumers gain power to influence through clean energy initiatives, government regulations, and non-legislative measures. Energy transition allows citizens to become energy producers, contributing to community energy, affordable energy, and a Renewable Energy Community.
Financial Institutions	Essential for a successful energy transition, providing financial support for renewable projects, capital, and expertise. Investments in the RES industry are attractive, reducing financial risks. Fast energy transition attracts more significant investments, minimizing financial risks for banks. Timely energy transition avoids financial risks and high costs in the long run. Investments in the RES industry are necessary to achieve decarbonization goals.
Research and Academic Institutions	Generate knowledge to inform society on climate change impacts, mitigation strategies, and the need for energy transition. Educate future innovators and participants in the battle against climate change. Provide data for discussions, solutions, and influence policymakers. Responsible for future sources, explorations, and technological breakthroughs in climate change.
Non-Governmental Organizations (NGOs)	Non-profit organizations advocating for energy transition and protecting human rights. Play a significant role in driving, promoting, and advocating for energy transition. Raise awareness, educate citizens, and advocate for policies to reduce energy consumption. Contribute to social and political transformation, community acclimation, and citizen participation. Examples include Power For All, SNV, and IRENA.
Local Authorities and Municipalities	Play a crucial role in promoting and enforcing energy transition at the local level. Pass, enforce, and monitor local legislations on energy transition. Construct local clean energy transition plans, monitor progress, and evaluate improvements. Create funding projects for vulnerable citizens, combat energy poverty, and ensure a just energy transition. Examples include Local Climate Action Plans from Rome, Sofia, Spain, and Nicosia.

2.4 Country-Specific analysis: UC Countries

2.4.1 Overview of UC Countries Energy Policies

In this section an overview of the Use Cases Energy policies will be made. The Use Cases used in the Step-WISE project include Bulgaria, Cyprus, Spain and Mediterranean Islands, such as, Crete, Cres (island of Croatia), and Malta. The overview will touch on the current energy policy of the UC country, its evolution, information on the countries energy production both through primary and renewable sources, ways the government aids Energy Transition, and the role of non-governmental organisations, and the private sector have in energy policy. The UC first analysed in the analysis will be Bulgaria, following is Cyprus, then Spain, and finally the islands Crete, Croatia, and Malta. This part of the deliverable is generated with feedback from experts in the respective countries analysed.

2.4.1.1 Use Case – Bulgaria:

Bulgaria in terms of energy policy has their targets aligned with European policies and goals for 2030 and overall, 2050. The current energy policies of Bulgaria include action in decarbonisation, energy efficiency, energy security, internal energy market, and research, innovation, and competitiveness. Bulgaria has raised the target for renewable source shares in gross final consumption to 27.09% by increasing the generating capacity of solar and wind power, and by increasing the presence of biomass in the electricity, heat and cooling, and transport sector. Bulgaria aims to increase energy efficiency by lowering dependency on energy imports, reducing primary energy consumption to 27.89%, and a 31.67% reduction in the final energy consumption by 2030. For energy security, Bulgaria prioritises the diversification of its natural gas supply by setting projects, such as, the IGB project, the IBS project, and participating in the construction of an LNG terminal in Alexandroupoli, and the gas infrastructure development of the Balkan Gas Hub. The internal energy market of Bulgaria is on road to get liberated with the protection of vulnerable consumers, and integration into the regional and wider EU market, and with Bulgaria planning to discontinue regulated electricity prices by 2025 while promoting competition. Lastly for the current energy policy in Bulgaria, for research, innovation and competitiveness, Bulgaria has plans in promoting scientific progress in innovative energy technologies and developing and participating in programs for the promotion of business innovation and digitalisation.

Energy policy in Bulgaria has been evolving for the past decade, the use of support schemes to guarantee RE production and consumption have been in place for years, another way that RE consumption and production was encouraged was through regulatory and administrative financial measures with the Energy from Renewable Sources Act, the Act utilises the measures re-leased by the European Commission in April of 2009 included in the Directive 2009/28/EC for the promotion of RE. The Energy Efficiency Act guarantees the implementation of a regulatory framework in line with European legislation to achieve Energy Efficiency goals by 2030, and the in terms of security in the electricity sector, Bulgaria employs its Energy Strategy with the revised Energy Act to implement goals of the Directive 2009/72/EC on the electricity market for its liberization and intersystem connectivity.

Bulgaria's primary energy production in 2022 was recorded to be 13154.9ktoe, about 44.8% was produced from solid fuels, 32.6% from nuclear energy, 21.3% from renewable energy, 0.5% from thermal energy, 0.1% from natural gas, and 0.7% from other type of fuels.

To increase their share of renewable sources in their gross final consumption to 29.9% for 2030 and 2050 as a national goal and achieving the European energy policy, Bulgaria will increase the share of RE to 30.33% in the electricity sector from 2021-2030 for the purpose of a decentralised production of electricity, integration of RE in the market affordable RE electricity prices, for the further promotion

of self-consumption and the creation of energy communities. An increase of 42.60% shares of RE in the heating and cooling energy sector for the purpose of introducing new generation biofuels, for the annual gradual increase of RE in the sector, and the introduction of innovative technologies. Lastly for the goals of RE, an increase of 14.2% in the transport sector by introducing new generation biofuels, renewable electricity supply to road and railroad transportation and the promotion of the overall use of electric mobility.

The government of Bulgaria supports energy transitions through various measures, one of them are assistance schemes for 2021-2030, which include preferential prices for the purchase of electricity from RE from plants of installed capacity of less than 1MW, preferential prices for the introduction of new installations with capacities of up to 30kW built on roof and façade structures of buildings connected to the electricity distribution network in urbanised area, and for contracts of 500kW and above 500kW that included for preferential prices that have ended, they will be provided a premium for the amount for electricity sold in the market. Other actions of the government in support of RE is the simplification of administrative procedures and procedures for the construction of energy facilities for RE production, legislative changes for the promotion of development of offshore energy facilities, creation of administrative service centres to help investors through the process of necessary documents, instruction and general information for acquiring permits for the production of RE facilities. Through the introduction of centralised heating with biomass or geothermal energy, solar thermal installations, heat pumps and geothermal systems, and individual biomass burning facilities for both industrial and residential buildings, at least 15% of the total amount of heating and cooling energy can be covered. Development of judicial changes to facilitate the probability of wind energy, and the design of the conditions for the implementation of future collaborative projects with other member states. The Republic of Bulgaria facilitates ET also through the design of the circumstances for issuing guaranteed of origins for renewable energy, biogas and green hydrogen, development of the regulatory framework for implementing the increased requirements under Directive 2018/2001 concerning sustainability standards and the reduction of GHG emissions, a new framework introducing obligations and regulations for fuel and energy suppliers will be developed to achieve ET goals, schemes for the promotion of RE energy use and renewable fuels (biofuels, renewable liquid and gaseous transport fuels, etc.), and local authorities will introduce their own measures in the framework of their long-term plans of their region to promote electric mobility and renewable transport. Moreover, the launch of requirements necessary for the integration of RE at a regional and local level, in planning and design, in construction and modernisation of urban infrastructures, industrial commercial or residential areas and transport and energy infrastructure, heating and cooling network, and fuel networks (taken from directly from expert). Finally, Bulgaria will promote the use of geothermal energy by setting and equipping the use of a manual for the procedure for the construction or construction of energy facilities for the production of electrical energy for renewable sources, and through investments available in the National Plan for Recovery and Sustainability will aid the promotion of renewables, the investments will be conducted for the digital transformation of the power grid, the support for new capacities for the production of electricity from renewable sources and for the storage of electricity, and the scheme to support green hydrogen and biogas production pilot projects.

NGOs (non-governmental organisations) in Bulgaria participate in research, initiation and development of projects, consultations and programs in sustainable energy development, implementation of ecological technologies, training, publications, dissemination of best practices, communication between citizens and institutions to allow for citizen participation in the implementation and raising citizens discussion and opinion in energy policy, and furthermore organise events and programs for all interested parties to participate.

Key Points of the overview in Bulgaria's climate policies can be found in **Table 6**

Table 6. Overview of Bulgaria's Climate Policies

Section	Main Points
Bulgaria's Current Energy Policy	<ul style="list-style-type: none"> Aligned with European policies and goals for 2030 and 2050, focusing on decarbonization, energy efficiency, energy security, internal energy market, and research, innovation, and competitiveness.
Evolution of Energy Policy in Bulgaria	<ul style="list-style-type: none"> Development of policies and measures since 2019 towards energy and climate sector alignment with EU target of climate neutrality by 2050.
Bulgaria's Energy Mix	<ul style="list-style-type: none"> Primary energy production in 2022: 44.8% from solid fuels, 32.6% from nuclear energy, 21.3% from renewable energy, 0.5% from thermal energy, 0.1% from natural gas, and 0.7% from other types of fuels.
Renewable Energy Initiatives in Bulgaria	<ul style="list-style-type: none"> Increase RE share in gross final consumption to 29.9% for 2030 and 2050, aiming for 30.33% in electricity sector, 42.60% in heating and cooling sector, and 14.2% in transport sector by introducing new generation biofuels, renewable electricity supply, and promoting electric mobility.
Government Support for Energy Transition	<ul style="list-style-type: none"> Assistance schemes for 2021-2030 including preferential prices for RE electricity purchase, simplification of administrative procedures for RE facilities construction, legislative changes for offshore energy facilities, creation of administrative service centres, introduction of central heating with biomass or geothermal energy, development of judicial changes for wind energy, and promotion of geothermal energy use. Facilitation of ET through the design of circumstances for issuing guarantees of origins for renewable energy, development of regulatory framework for sustainability standards, introduction of obligations for fuel and energy suppliers, promotion of RE energy use and renewable fuels, support for electric mobility, and promotion of geothermal energy use. Investments from National Plan for Recovery and Sustainability to support digital transformation of power grid, new capacities for RE production and electricity storage, and support for green hydrogen and biogas production pilot projects.
Role of NGOs/Private sector in Bulgaria	<ul style="list-style-type: none"> Participation in research, initiation and development of sustainable energy projects, consultations, training, publications, dissemination of best practices, communication between citizens and institutions, organization of events and programs for citizen participation, and raising public discussion and opinion in energy policy.

2.4.1.2 Use Case – Cyprus

Cyprus as current energy policy has a National Energy and Climate Plan which has goals in the decarbonization, energy efficiency and energy security sectors. This plan was adopted in 2019, it includes measures in RES for decarbonization, energy efficiency of buildings and industry, plans to

extract NG for energy security, internal infrastructures and connection with other grids for the internal energy market, development in research and innovation. A strategy is also in place by the Energy Service of the Ministry of Energy, Commerce and Industry of Cyprus which includes goals for the optimum utilization of Hydrocarbons, securing the energy supply of Cyprus and the optimal operation of the internal market, improving competitiveness, promoting economic growth and extroversion, consumer protection improving administrative departments, and enhancing efficiency and improving service efficiency of the ministry. Cyprus for energy efficiency of buildings has legislations that requires for all new buildings to be nearly Zero Energy Buildings, and the National Long-term Strategy for Renovation of Buildings which includes measures for the renovation of existing buildings. The measures include improved energy performance of building going through renovation to achieve an energy rating of A or B+ depending on the scale of the renovation, energy audits on large businesses every 4 years, financial incentives for installation of RES and upgrading of insulation in buildings, smart meters, and targets for renovation of public buildings and energy efficiency of public buildings.

Energy policy in Cyprus has had many updates in the last decade, some of the updates include higher standards for the efficiency of buildings, electricity regulation modified to allow for the possibility of energy communities, alignment legislations with European policy, and by 2024 the Energy Poverty framework of Cyprus is expected to be delivered.

Cyprus's main energy sources recorded in 2021 was 81.58% from conventional sources (non-renewable) and from 18.42% from renewable sources, over 41.34% is used for the heating and cooling and 14.84% for electricity production, and 7.19% for transport.

Cyprus's government has released initiatives and goals under the National Energy and Climate Plan, some goals include increasing RES use in heating and cooling by 0.8% annually for 2021-2025, and 1.1% for 2026-2030, 49% of RES in buildings by 2030, increase of RES in industry by 1.6% annually, and increase of RES shares in transport to 29% by 2030.

The government supports this energy transition in Cyprus through Virtual net-metering and net-billing schemes, funding for the installation of RES in households, especially the mountainous areas of Cyprus and for vulnerable groups, initiatives for RES increase in public buildings, and the simplification and streamlining of the RES installation process.

NGOs in Cyprus have increased the accountability in the NECP, consumers rights groups have brought energy poverty problems in the forefront along with the need for fair electricity prices for consumers and access to renewables. The private sector of Cyprus has participated in policy formation, lobbying and allowing the market conditions to develop energy technologies.

Key Points of the overview in Cyprus's climate policies can be found in **Table 7**

Table 7: Overview of Cyprus's Climate Policies

Section	Main Points
Cyprus's Current Energy Policy	<ul style="list-style-type: none"> ▪ National Energy and Climate Plan adopted in 2019 focusing on decarbonization, energy efficiency, and energy security. ▪ Goals for optimum utilization of hydrocarbons, energy supply security, internal market operation, competitiveness improvement, economic growth promotion, consumer protection, administrative department enhancement, and ministry service efficiency improvement.

	<ul style="list-style-type: none"> Legislation for nearly Zero Energy Buildings for new constructions, National Long-term Strategy for Renovation of Buildings including measures for existing buildings' renovation.
Evolution of Energy Policy in Cyprus	<ul style="list-style-type: none"> Updates in the last decade include higher building efficiency standards, modified electricity regulation for energy communities, alignment with European policy, and expected delivery of the Energy Poverty framework by 2024.
Cyprus's Main Energy Sources	<ul style="list-style-type: none"> In 2021: 81.58% from conventional (non-renewable) sources, 18.42% from renewable sources, with 41.34% used for heating and cooling, 14.84% for electricity production, and 7.19% for transport.
Renewable Energy Initiatives in Cyprus	<ul style="list-style-type: none"> Goals in National Plan include annual RES use increase in heating and cooling, 49% RES in buildings, annual RES increase in industry, and RES share increase in transport by 2030.
Government Support for Energy Transition	<ul style="list-style-type: none"> Through virtual net-metering and net-billing schemes, funding for RES installation in households, especially in mountainous areas and for vulnerable groups, initiatives for RES increase in public buildings, and simplification of RES installation process.
Role of NGOs/Private sector in Cyprus	<ul style="list-style-type: none"> Increased accountability in the National Energy and Climate Plan (NECP), raising awareness on energy poverty issues and fair electricity prices, consumer access to renewables, participation in policy formation, lobbying, and market condition development for energy technologies by the private sector.

2.4.1.3 Use Case – Spain

Spain's energy policy depends on the Strategic Energy and Climate Framework adopted in 2019 for the decarbonization of the Spanish economy, the framework consists of three key pieces: Climate change and energy transition law to facilitate progressive adaptation in Spain through a guide for the decarbonisation of the Spanish economy for 2050, the Just Transition Strategy that allows for fair support and treatment to the citizens and areas affected by the transition, and the National Energy and Climate Plan (2021-2030) which outlines targets for decarbonisation and energy efficiency and ways to achieve them. The updated National Energy and Climate Plan (2021-2023) outlines: a 32% reduction in emissions compared to the 1990 levels by 2030 by reducing 43% emissions from the diffuse sector, and 70% emission reduction from sectors subject to emissions trading, a 48% increase in renewable shares in the final energy use, an 81% increase of RE in electricity generation, a 44% energy efficiency improvement in the final energy, reduction of external dependence from 73% (2019) to 51% by 2030, an installed electricity capacity to be 214GW with renewable generation accounting 160GW and storage 22GW, 19GW of self-consumption by 2030, and achieving a 55% reduction in global warming by 2030. Some other documents included in the energy and climate framework are: The Long Term Decarbonisation Strategy, the self-consumption roadmap, National Climate Change Adaptation Plan, the energy storage strategy, national strategy against energy poverty, the renewable hydrogen roadmap, the biogas roadmap, roadmap for the development of offshore wind and sea energies in Spain, the roadmap for the sustainable management of mineral raw materials, planning of the electricity transmission grid Horizon 2026, the Recovery, Transformation and Resilience Plan (PRTR) and, within it, the PERTE for renewable energies, renewable hydrogen and storage.

Energy policy in Spain for renewables during the 2000's was influenced by the European RES policies providing support in the sector, and therefore successfully accelerating growth of renewables. Through the following years the acceleration reached its limits after economic challenges, allowing for conventional energy to be prioritised again. A timeline of the evolution provided by energy experts in

Spain note that since 1997 Spain has been constructing a regulatory framework in favour of RES, but in 2008 the government revised the framework and modified the schemes that supported RE. Because of this revision, the RE tariffs reduction and limitations on PV production in 2010, and the reduction of subsidies by law of parliament in 2012, resulting in the disorganisation of RE development. After a government change in 2019, RES have started developing again, mainly due to the Royal Decree 244/2019, which exempts energy consumed by renewable energy from charges and tolls, and applying new measures and regulations in favour of self-consumption, energy transition and energy communities. The government also provided policies in support of RE, with incentives for research, development and innovation, and the Next Generation EU funds which boosted energy transition process.

The primary sources of energy recorded in Spain 2021 where 42.4% from oils, 25.1% from natural gas, 16.6% from renewable sources, 12.6% from nuclear, 3.4% from coal and others, and the overall energy consumption was 118,345 ktoe.

Some initiatives released by the Spanish government for renewable energy are the PNIEC 2021-2023, the National Energy and Climate Action Plan of Spain, eventually increasing renewable energy to 74% in the electricity sector and 42% in the final use by 2030. The plan aims to achieve this by the development of a regulatory framework to promote private investments in RE and social participation in the sector for optimal integration of renewables, support for the development and innovation of renewable technologies, development of skills and knowledge that allow for job opportunities in the development of renewables, the establishment and incorporation of renewables in the industrial value chain. The PNIEC include reforms that outline the regulatory framework for the promotion of renewable, national self-consumption strategy, the development of energy communities to promote citizen participation in the energy transition, end the framework for innovation and technological development of renewable energies. Other parts of the Plan will encourage investments: for the development of innovative renewable energies integrated into buildings, production processes and their deployment in buildings, companies, the industry, environment, and public, and for the promotion and integration of sustainable energy to the islands via an Agenda for Energy Transition in the islands. Additionally, other policies such as the PERTE and ERHA centre on innovation and it contains actions such as: 25 measures (investment instruments) that will mobilise €3.5 billion of public funds and implement the development of technology, knowledge, industrial capacities, new business models, and 17 measures in four main areas of action that contribute to PERTE's goal. Lastly a system for the monitoring, and evaluation for knowledge and value chain in energy transition will be developed, to aid the public and state in line with the National and European framework and to allow for competitive calls for proposals to generate excellent projects that will include the generation of employment and social and gender impacts, including the impact on the supply chain, the impact on territorial cohesion, just transition and the demographic challenge; the degree of participation of SMEs and innovation (taken from questionnaire).

The Spanish government mainly supports the transition to renewables through the remuneration regime, granted by actions where bids are made for remuneration, and the economic regime for RE is awarded following a competitive procedure in which the bid variable is the price per unit of electricity, and the product to be auctioned is installed capacity, electricity, or combination of both. Subsidies are also available in connection with self-consumption and storage, the programmes included in these subsidies are Programme 1: implementation of self-consumption installations, with renewable energy sources, in the services sector, with or without storage of the energy generated, Programme 2: implementation of self-consumption facilities, with renewable energy sources, in other productive sectors of the economy, with or without storage, Programme 3: incorporation of storage in self-

consumption installations, with renewable energy sources, already existing in the services sector and other productive sectors, Programme 4: implementation of self-consumption installations, with RES, already existing in the residential sector, public administrations and the third sector, with or without storage, Programme 5: incorporation of storage in self-consumption installations, with RES, already existing in the residential sector, public administrations and the third sector, and Programme 6: implementation of thermal renewable energy installations in the residential sector. The Plan +SE is also available, and it includes 55 measures for the deployment of tax incentives for ET, with goal to integrate solutions to replace fossil fuels with RE and the reduction of external dependence. Lastly RE will receive aid in local taxes, be projects that include thermal or electrical use of solar energy to receive up to 95% refund on the taxes of construction, installation and works, the local council will refund up to 50% of property taxes for properties that have solar energy systems installed, and taxpayers that use or produce energy from RE installation will benefit from the same refund in the Economic Activities Tax.

Companies in Spain as they consume and generate energy play a role in ET, they can become an example by setting policies and actions, making a difference in the companies' operation and influencing consumers. NGOs like companies also play a role in ET by promoting energy efficiency, sustainable energy use practices, and combating energy poverty, releasing awareness raising campaigns, and generating and generating regulatory frameworks policies that not only have the consumers best interest in mind but the environments too.

Key Points of the overview in Spain's climate policies can be found in **Table 8**

Table 8: Overview of Spain's Climate Policies

Section	Main Points
Spain's Strategic Energy and Climate Framework	<ul style="list-style-type: none"> ▪ Dependent on the Strategic Energy and Climate Framework adopted in 2019, comprising the Climate Change and Energy Transition Law, the Just Transition Strategy, and the National Energy and Climate Plan (2021-2030). ▪ Aims for a 32% reduction in emissions by 2030 compared to 1990 levels, a 48% increase in renewable shares in final energy use, an 81% increase in RE in electricity generation, a 44% improvement in energy efficiency, and reducing external dependence to 51% by 2030. ▪ Other documents in the framework include the Long-Term Decarbonisation Strategy, National Climate Change Adaptation Plan, renewable hydrogen roadmap, biogas roadmap, and more.
Evolution of Energy Policy in Spain	<ul style="list-style-type: none"> ▪ Influenced by European RES policies in the 2000s, leading to accelerated growth of renewables. ▪ Economic challenges later prioritized conventional energy, leading to revisions in RES support schemes and reductions in subsidies. ▪ Renewed focus on RES development since 2019, particularly due to Royal Decree 244/2019 and policies favouring self-consumption and energy communities.
Spain's Energy Mix	<ul style="list-style-type: none"> ▪ Recorded in 2021: 42.4% from oils, 25.1% from natural gas, 16.6% from renewables, 12.6% from nuclear, 3.4% from coal and others. ▪ Overall energy consumption was 118,345 ktoe.

Initiatives and Goals in Spain	<ul style="list-style-type: none"> ▪ PNIEC 2021-2023 aims for 74% renewable energy in the electricity sector and 42% in final use by 2030, with reforms promoting private investments, social participation, and skills development in the renewable energy sector. ▪ PERTE and ERHA initiatives focus on innovation and development of technology, industrial capacities, and new business models, with €3.5 billion of public funds mobilized. ▪ Tax incentives and subsidies available for RE, self-consumption, storage, and thermal renewable energy installations.
Government Support for Energy Transition	<ul style="list-style-type: none"> ▪ Government supports transition to renewables through remuneration regimes, competitive bidding procedures for RE projects, subsidies for self-consumption and storage, and tax incentives through Plan +SE.
Role of NGOs/Private sector in Spain	<ul style="list-style-type: none"> ▪ Companies play a role in energy transition by setting policies, influencing consumers, and promoting energy efficiency and sustainable practices. ▪ NGOs contribute by advocating for energy efficiency, combating energy poverty, and influencing regulatory frameworks for environmental protection and consumer interests.

2.4.1.4 Use Case Mediterranean Islands, Crete (Greece)

Crete as a Greek Mediterranean island follows policies Greece and of the EU directive, it currently has a National Energy and Climate Plan (NECP) adopted in 2019, which includes targets and measures for 2030 and has a goal of net-zero emissions in the country. Crete also follows National Climate Law, adopted in 2022, which sets quantitative goals to reduce the overall GHG emissions by 55% by 2030, 80% by 2040, and net-zero emissions by 2050, some of the emission reduction measures included in the Climate Law in electricity production is the termination of lignite-fire generation by 2028, in zero-emission vehicles requiring ¼ of company vehicles by 01/01/2024 to be hybrid, municipal emission reduction plans providing aid schemes with financial tools in energy savings, reduction of emissions from buildings through the prohibitions of the sale and installation of heating oil burners by 01/01/2025, etc. (some examples of actions have been included).

Evolution of energy policy in Crete consists of several laws, there also specific processes of RES licensing, development and production and the Greek Directive on the energy performance of buildings which was developed in 2010. Since all EU member states must produce a National Long-term Strategy for climate neutrality by 2050, Greece has adopted its long-term strategy in 2019, and its National Climate Law in 2022. The National Long-Term Strategy of Greece outlines four ways to achieve CN by 2050, and the National Climate Law has a goal to strengthen Greece's long-term climate ambition by introducing reforms to improve the efficiency and effectiveness in the function of its electricity market. Some of them reforms include actions such as joining the intraday European market (December 2022) to open the market and demand response (September 2022), additionally the opening of a NG spot market, Greece's gas market has transformed.

Concerning Greece's energy mix, it was recorded in 2021 that 20% of the total final energy consumption was covered by RE. A major change in the energy mix of Greece was the decline in the production of electricity through lignite-fired power plants, resulting to a reduction of production from 314 PJ in 2011 to 60 PJ in 2021, simultaneously renewable energy shares increased from 86 PJ to 136 PJ, this change has contributed to fossil fuel shares being reduced. Although there has been a

reduction in fossil fuel shares, they are still the major energy source of Greece, efforts to reduce GHG emissions have affected fossil fuels, causing them to reduce from 90% in the energy supply in 2010 to 82% in 2021. Specifically, in Crete the energy demand was recorded to be 3.371 GWh in 2023, the installed RE capacity is 283 MW, and conventional generation units have a 708 MW capacity and include steam, gas units and a combined thermal generation unit powered by heavy or light fuel oil.

Greece has adopted the Electra Program to improve energy efficiency of buildings by implementing measures in the use of the building and its mechanisms, the program additionally has plans for the renovation of buildings with energy performance C and H. Initiatives have also been set in taxation to promote renewable energy, taxations on CO₂ emissions are effective, but variation in tax rates due to fuel type, concession, and additional fees in the electricity bill reduce the motivation to save energy, causing inconsistent carbon price signals. Greece also pledges to eliminate fossil fuel subsidies, with records showing a 14% reduction in subsidies for oil-fired electricity generation (non-interconnected islands), and lower spending on heating allowances from 2015 to 2020, the subsidies Greece though are still the from the highest share in OECD countries. Lastly investments have been planned to promote domestic transmission and distribution capacity to support higher generation of RES, and the interconnection of the most populated Greek islands with the mainland electrical grid by 2030.

The Greek government supports energy transition through energy taxation, and efficient carbon emission tax rates, as mentioned above, and EU-national co-funded programmes for the development of pilot projects, mainly in small islands. However, there are some notable challenges that hinder ET still in these support schemes, such as lower taxation for diesel fuel, high tax rates for electricity and fossil fuel subsidies and fee exemptions for domestic marine shipping, ferries, fishing and domestic aviation.

The private sector in Greece claims high shares on the energy production pie, especially large companies supported by the state, small and medium sized companies focus on photovoltaics and energy communities take part in ET.

Key Points of the overview in Greece's climate policies can be found in **Table 9**

Table 9: Overview Greece's Climate Policies

Section	Main Points
Crete's Energy Policy	<ul style="list-style-type: none"> Aligned with Greek and EU directives, with a National Energy and Climate Plan (NECP) adopted in 2019 aiming for net-zero emissions by 2050.
Evolution of Energy Policy in Crete	<ul style="list-style-type: none"> Several laws in place, specific processes for renewable energy sources (RES) licensing, development, and production. Greek Directive on the energy performance of buildings developed in 2010. Long-term strategy adopted in 2019 outlines four ways to achieve climate neutrality by 2050. National Climate Law in 2022 strengthens Greece's climate ambition with reforms for electricity market efficiency. Reforms include joining the intraday European market, opening NG spot market, and transforming gas market.
Greece's Energy Mix	<ul style="list-style-type: none"> Recorded in 2021: 20% of total final energy consumption covered by RE. Decline in lignite-fired power plant production, reduction in fossil fuel shares (90% in 2010 to 82% in 2021). In

	Crete, energy demand in 2023 was 3.371 GWh, with 283 MW installed RE capacity and 708 MW conventional generation units.
Initiatives and Goals in Greece	<ul style="list-style-type: none"> ▪ Electra Program implemented to improve energy efficiency of buildings, including renovation plans for buildings with energy performance ratings of C and H. ▪ Taxation initiatives to promote renewable energy, effective CO2 emissions taxes, efforts to eliminate fossil fuel subsidies.
Government Support for Energy Transition	<ul style="list-style-type: none"> ▪ Government supports energy transition through taxation and efficient carbon emission tax rates, EU-national co-funded programs, mainly in small islands.
Role of NGOs/Private sector in Greece	<ul style="list-style-type: none"> ▪ Private sector, especially large companies supported by the state, claim high shares in energy production, while small and medium-sized companies focus on photovoltaics and energy communities.

2.4.1.5 Use Case- Mediterranean Islands, Cres (Croatia)

The energy policy of Cres (Croatia) is aligned with EU goals of the reduction of GHG emissions, RES share Increase, energy efficiency, secure energy supply and the development of an internal competitive EU energy market. The main actions Croatia is willing to take to achieve these goals is: strengthening the energy market to promote development in the energy sector, integrate the energy market in the international and especially the EU energy market, strengthening the security of energy supply by domestic production, energy interconnection and introduction of the Capacity Remuneration Mechanisms to increase production capacity, increasing efficiency in the energy production chain, increasing of RES shares for fossil fuel consumption and GHG emissions reduction, development in commercially innovative renewable technologies, and necessary funding for new technologies and management sectors of the country. Some policies that Croatia has are: the Integrated National Energy and Climate Plan for the Republic of Croatia (2019) for 2021-2030, the plan includes goals for RES share targets of 63.8% in the direct consumption of electricity, 36.6% in the gross energy consumption in heating and cooling, and 14.0% of gross energy consumption, and the Energy Development Strategy of the Republic of Croatia for 2030 and 2050, which sets the vision for low carbon energy, and energy transition of affordable, and secure and energy supply that doesn't overload the state budget.

Energy policy in Croatia has evolved through the integration of Croatia in the EU in 2013, once joined Croatia has initiated energy reforms to be aligned EU policies. During February 2020, Croatia adopted a new Energy Development Strategy until 2030 and 2050 an includes measures, as mentioned above. In 2021 Croatia has joined the international Powering Past Coal Alliance for countries whose future system will not depend on coal, the alliance is currently creating for members the conditions for the termination in the use of coal in the production of electricity, and therefore allowing for Croatia end the operation of its coal-fired thermal powered plan by 2033. In 2021 an LNG terminal started operations in the Croatian island of Krk, the terminal in Croatia has generated a north-south corridor for gas supply diversification and competition in Central and Eastern Europe and allowing for Croatia to transform from a gas importer to a gas exporter, reducing gas prices in Croatia, and paves the road for green transition in Croatia. From the 1st of August 2022 to the 31st of March 2023 the Croatian government adopted energy saving guidelines, saving gas consumption by 5% in Croatia during that period.

It was recorded in 2020 that Croatia imported 53.6% of its total primary supply, 71% of heating is generated by gas, and 14.4% of the electricity demand in Croatia is contributed through the Croatian-Slovenian co-owned Krško nuclear power plant (2022), 49% of Croatia's electricity generation is generated from hydropower plants, Croatia can domestically produce 82% (14bn kWh) of the country's own usage through electricity production facilities, and due to the expansion of the Krk LNG terminal to 2.9 billion cubic metres/ year, satisfying all of Croatia's gas needs.

The Croatian government has set various targets and initiatives for the purpose of accelerating RES use, updating the power and network system, and improving energy efficiency, it was noted by the experts that about €17.8 billion will be spent to update the Croatian energy sector, 75% for the improvement of the power system, €2.4 billion will be spent on the energy network, and a 2.3% of Croatia's GDP will be spent on energy efficiency till 2050. Croatia plans to invest in: the exploration of geothermal energy as a renewable source and the possibility of geothermal fields in the north of Croatia, enabling the installation of agrosolar plans on all agricultural areas, next to farms, and on ponds and other fish arms, and studies on the installation of floating wind and solar powerplants. For the promotion of renewables Croatia has also signed in (2020) the Memorandum Split for the goal of improving energy transition on islands, and proving support in the development of energy transition strategies on the islands, the Energy Strategy of the Republic of Croatia for the growth of renewable shares in the energy consumption, and the Recovery and Resilience Plan 2023-2024 to adopt legislation for the integration of RES and the systems necessary to support it.

RE energy transition in Croatia is facilitated through loans from the Croatian Bank for Reconstruction and Development, RES electricity generation is supported through feed-in tariff/premium, the subsidy scheme for low or zero vehicles supports transportation transition and biofuel use, funding for the procurement of RE systems through energy renovation programs and for households, the state also does not enforce taxes in the delivery and installation of solar panels on private residential buildings and premises and public building and premises. The government aids transition through the National Recovery and Resilience program (2021-2026) that has collected funds of about €670,450,000 for energy and digital transition, the Energy Efficiency Programme under the RRP provides investment priorities for energy efficiency and district heating systems by 2030 and up to 2050, providing support to 75 energy intensive firms that made commitments to improve their energy efficiency and RE use in industrial production, allowing also for new programs concerning building energy renovations, space and building urban green infrastructure and circular management. Lastly since the introduction of the system for the encouragement of RES and cogeneration in Croatia, until the end of 2019, it allowed for 1,374 contracts for purchase of RE electricity, yielding 950MW installed capacity.

Non-governmental organisations and the private sector have a role in implementing energy efficiency measures and programs for renewable resources, collaborations between NGOs and the Chamber of Economy for the curation of legal acts in the energy sector along with energy company representatives, finally as the investments for energy efficiency of buildings rely on subsidies and grants, it limits the chance for private investments.

Key Points of the overview in Croatia's climate policies can be found in **Table 10**

Table 10: Overview of Croatia's Climate Policies

Section	Main Points
Energy Policy in Croatia	<ul style="list-style-type: none"> <li data-bbox="564 1883 1361 1951">▪ Aligned with EU goals for GHG emissions reduction, RES increase, energy efficiency, and secure energy supply.

	<ul style="list-style-type: none"> Focus on strengthening the energy market, integrating with international and EU markets, and increasing security of energy supply. Plans include increasing RES shares, developing innovative technologies, and funding for new technologies. Integrated National Energy and Climate Plan (2019) with targets for RES share in various sectors. Energy Development Strategy for 2030 and 2050 aiming for low-carbon energy and secure supply.
Evolution of Energy Policy in Croatia	<ul style="list-style-type: none"> Integration into EU led to energy reforms to align with EU policies. Adoption of new Energy Development Strategy (2020) and joining international Powering Past Coal Alliance (2021).
Croatia's Energy Mix	<ul style="list-style-type: none"> Imported 53.6% of total primary supply in 2020.
Initiatives for Renewable Energy	<ul style="list-style-type: none"> Investment in geothermal energy, agrosolar plans, and floating wind and solar powerplants. Signing of the Memorandum Split for energy transition on islands and Recovery and Resilience Plan 2023-2024.
Government Support for Energy Transition	<ul style="list-style-type: none"> Loans from the Croatian Bank for Reconstruction and Development, feed-in tariff/premium for RES electricity generation, and subsidy scheme for low or zero emission vehicles. Funding for procurement of RE systems through renovation programs, tax exemptions for solar panels installation, and National Recovery and Resilience program.
Role of NGOs and Private Sector	<ul style="list-style-type: none"> NGOs and private sector involved in implementing energy efficiency measures and renewable programs. Collaborations between NGOs, Chamber of Economy, and energy company representatives for legal acts in the energy sector. Limitations for private investments due to reliance on subsidies and grants for energy efficiency of buildings.

2.4.1.6 Use Case - Mediterranean Islands, Malta

Malta's current energy policy includes the Low Carbon Development Strategy in which pathways based on the Marginal Abatement Cost Curve for climate neutrality in 2050 are identified, and the Integrated National Energy and Climate Plan for 2021-2030 which includes: decarbonization, from the reduction of GHG emissions and increase of RE shares to allow for a low carbon economy transition, secure energy supply through the diversification of energy supply and sources, the plan also instates policies and measures to increase the flexibility of the energy system.

The evolution of the energy policy in Malta over the last decade has developed since 2019, where Malta has initiated policies and measures in connection to the energy and climate sector, since Malta committed to the EU target of a climate neutral Europe for 2050. Malta in the pre-sent years has started shifting away from heavy fuel oil and gas oil to cleaner resources, halving the GHG emission intensity since 2017, recognising natural gas as a transition fuel, and RE sources for energy security.

The energy mix of Malta consists of 70% locally generated annual energy requirement, 20% im-ported through an interconnected electrical grid between Malta and Italy and 10% generated by RE systems, mainly PV panels, but has initiated a shift towards renewable energy sources and an electricity

interconnector with Sicily. Malta depends highly on energy imports (fossil fuels) making it vulnerable to global price developments, to economic growth risks and making it environmentally unsustainable. Through 2022 commitments Malta will adopt offshore renewable energy technologies and increase energy efficiency measures.

In terms of renewable energy initiatives, Malta has adopted the integrate National Energy and Climate Plan for 2021-2030, part of the plan is to increase shares of renewables in the gross final energy consumption to 11.5% by 2030, increase of shares in heating and cooling to 25.71% by 2030, and an increase of RE shares to 15% by 2030.

The Maltese government provides support to energy transition through financial support schemes and measures managed by the Regulator for Energy and Water Services and Malta Enterprises. Two other support schemes are available in Malta, the first one is a feed-in tariff for smaller PV installations and the second is for larger RES systems, for over 40kWp, that are being changed to a two-sided feed-in premium, other supports are the roll-out of smart metres, energy storage in households, and the governments promotion onshore renewables through grants for households.

Malta considers the involvement of public bodies as key processes under the regulation on the governance of the EU as it is noted in Article 11 of the Governance Regulation how important it is to give platform to stakeholders, for this reason the Maltese Authorities to plans to satisfy this by taking public consultation in the submission of the final draft of their NECP plan, and allow stakeholders to convey their comments.

Key Points of the overview in Malta's climate policies can be found in **Table 11**.

Table 11: Overview of Malta's Climate Policies

Section	Main Points
Malta's Current Energy Policy	<ul style="list-style-type: none"> ▪ Includes the Low Carbon Development Strategy identifying pathways for climate neutrality by 2050 and the Integrated National Energy and Climate Plan for 2021-2030 focusing on decarbonization, secure energy supply, and increasing flexibility of the energy system.
Evolution of Energy Policy in Malta	<ul style="list-style-type: none"> ▪ Development of policies and measures since 2019 towards energy and climate sector alignment with EU target of climate neutrality by 2050. ▪ Shift away from heavy fuel oil and gas oil to cleaner resources, halving GHG emission intensity since 2017, recognizing natural gas as a transition fuel, and increasing use of RE sources for energy security.
Malta's Energy Mix	<ul style="list-style-type: none"> ▪ Consists of 70% locally generated annual energy requirement, 20% imported through an interconnected grid with Italy, and 10% from RE systems, mainly PV panels, with plans for shifting towards renewable energy and an electricity interconnector with Sicily. ▪ Highly dependent on energy imports (fossil fuels), making it vulnerable to global price developments, economic growth risks, and environmentally unsustainable, with commitments to adopt offshore renewable energy technologies and increase energy efficiency measures by 2022.
Renewable Energy Initiatives in Malta	<ul style="list-style-type: none"> ▪ Integrated National Energy and Climate Plan aims to increase shares of renewables in gross final energy consumption to

Government Support for Energy Transition	<p>11.5% by 2030, heating and cooling to 25.71% by 2030, and overall, RE shares to 15% by 2030.</p> <ul style="list-style-type: none"> ▪ Financial support schemes and measures managed by the Regulator for Energy and Water Services and Malta Enterprises, including feed-in tariff for smaller PV installations, two-sided feed-in premium for larger RES systems, roll-out of smart meters, energy storage in households, and government grants for onshore renewables in households.
Role of NGOs and Private Sector	<ul style="list-style-type: none"> ▪ Key processes under the regulation on the governance of the EU involve public consultation, as noted in Article 11 of the Governance Regulation, with plans in Malta to allow stakeholders to convey their comments during the submission of the final draft of the NECP plan.

2.4.2 Comparative Analysis of Policy Frameworks

After analysing the energy policy state of each Use Case in the previous section, a comparative analysis of the Case studies and neighbouring countries will be made. In this section, energy policy of Use Cases and neighbouring countries will be made, the unique challenges faced by the Use Case when implementing energy policies, available collaborative energy policy projects with other Use Case countries, how the Use Cases regulatory framework facilitates or hinders energy transition, and what measure are in place to ensure sustainability.

2.4.2.1 Use Case – Bulgaria:

Bulgaria compared with other EU member states is behind in the economic, economic-energy and energy-environmental sector for sustainable development, therefore Bulgaria must strive in interconnected national goal and resolve its problem areas. The problem areas of Bulgaria are security in the energy sector, climate mitigation and clean energy, energy efficiency, resource and technological development of energy, development of the EU energy market and dependence of the energy market, and established problems of the energy market.

Bulgaria compared to other member states faces challenges in energy independency, since 70% of Bulgaria's gross energy consumption is imported, low competitiveness in the energy and electricity European market, low level of diversification of energy sources, and high risk of energy poverty due to high energy prices.

Bulgaria has several collaborations with other member states, an example is the corridor North-South connections between electricity networks in Central Eastern and South-Eastern Europe which includes projects between Bulgaria and Greece to strengthen the system in Bulgaria, and systems between Bulgaria and Romania to increase capacity. The other example corridor North-South connections between gas transmission networks in Central Eastern and South-Eastern Europe, which includes projects for gas expansion and development projects, the projects included are the IGB intersystem gas connection with Greece, the IBS intersystem gas connection with Serbia, and projects connected to the comeback, upgrade, and expansion of Bulgaria's transmission system.

Bulgaria plans to facilitate energy transition through the Integrated National Plan in the field of Energy and Climate 2021-2030, the plan will include updated targets according to the Law on Energy from Renewable Sources and the publication of the Draft Strategy for Sustainable Energy Development, that will be in line with other European projects such as the Climate Act, the Target 55 package and REPowerEU, to accelerate transition to CN and to strengthen resilience in the energy system. Additionally, a revision of Laws in Energy Efficiency is being processed to outline the structure,

management and function of the National Decarbonization fund, which funds the Integrated National Plan in the field of Energy and Climate.

The measures set by the Republic of Bulgaria to ensure energy security and sustainability include the use of local energy resources, following environmental law, development of network energy infrastructure, increasing intersystem energy connectivity, guaranteeing the sufficiency and sustainability of the national electricity system, diversification of NG supply sources and routes, and increasing network and information security of the energy system.

Key Points of Bulgaria's comparative analysis with neighbouring UC countries can be found in **Table 12**.

Table 12: Bulgaria's Comparative Analysis with UC countries

Section	Main Points
Bulgaria's Position Compared to EU	<ul style="list-style-type: none"> Behind other EU member states in economic, economic-energy, and energy-environmental sectors for sustainable development, necessitating efforts to address problem areas. Problem areas include security in the energy sector, climate mitigation and clean energy, energy efficiency, resource and technological development, EU energy market development, energy market dependence, and established energy market issues.
Challenges Faced by Bulgaria	<ul style="list-style-type: none"> Energy independence challenges due to importing 70% of gross energy consumption, low competitiveness in the EU energy and electricity market, limited energy source diversification, and high energy prices contributing to energy poverty risk.
Collaborations with Other States	<ul style="list-style-type: none"> Collaborations include projects under the corridor North-South connections for electricity and gas networks in Central Eastern and South-Eastern Europe, such as strengthening systems with Greece and Romania and developing gas transmission networks with Serbia.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> Integrated National Plan in Energy and Climate 2021-2030 to update targets in line with renewable energy laws and European projects like the Climate Act and REPowerEU. Revision of Energy Efficiency Laws to establish the National Decarbonization Fund structure, management, and function, supporting the integrated national plan.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> Utilization of local energy resources, compliance with environmental laws, development of energy network infrastructure, enhancing intersystem energy connectivity, ensuring sufficiency and sustainability of the national electricity system, diversification of natural gas supply sources and routes, and improving network and information security of the energy system.

2.4.2.2 Use Case – Cyprus:

In terms of energy policy, Cyprus compared to neighbouring UC countries has similar energy policies as a Member State it follows EU law, Cyprus has yet though to expand and deisolate its electricity market, setting plans for 2025, compared to other MS countries that are included in the energy

communities Cyprus is behind. Assessments conducted by the European Commission on the National Climate Plan of Cyprus also show how Cyprus is behind on all targets and lacks ambition.

Cyprus compared to other countries faces challenges because of its isolated electricity grid with no storage, which causes a cutback percentage of 2% annually, and forcing households with or that are installing PV panels to also install ripple controls and therefore allow system operators to cut production when it exceeds demand. Another challenge is due to unfair competitiveness between renewables and fossil fuels, as the Ministry gives hydrocarbons unfair advantage by providing more workforce and financial resources in the extraction of natural gas.

In terms of collaborating with other countries for energy projects, Cyprus does have collaborative projects such as the EastMed (2020) pipeline with the governments of Greece and Israel that will generate the connection of gas fields between Cyprus, Greece and Israel, the same countries later on signed and MoU for the Euro Asia interconnector, an undersea cable connector to connect the electrical grids of Cyprus, Greece, and Israel.

Through the regulatory framework of Cyprus there are various strengths and weaknesses that facilitate or hinder energy transition. The energy expert provided a clear table that records strengths and weaknesses found in the initiatives available in Cyprus (Table 13)

Table 13: Cyprus's Legislative Strengths and Weaknesses

Legislation/Policy	Weakness	Strength	Description
NECP	x		The actions and measures within the NECP are centralised, with responsibility for their implementation lying with central government departments and very little role given to local authorities.
Strategy for Renovation of Buildings		x	Provides several incentives to improve the energy performance of the building stock in Cyprus.
Sustainable Urban Mobility Plan	x		There is no legal requirement for the adoption and implementation of the measures in the SUMPs by local authorities.
Law 2013 (112(I)/2013) on the promotion of RES	x	x	Sets up a National Fund for Renewable Energy and Energy Efficiency, which aims to ring-fence funds for use in support/subsidy schemes for renewable energy and energy efficiency. However, the fund has never truly been ring-fenced, with the money in the fund often transferred and utilised in the central budget to cover gaps and shortfalls.
Law N. 73(I)/2016 on Public Procurement		x	Promotes green public procurement and sets out environmental & energy efficiency criteria for use in public procurement.
Urban Planning	x		There are no minimum standards related to green roofs, permeable pavements etc. within urban planning regulations.
Law 90/1972 on Urban and Regional Planning	x		Regulates the zones and siting of renewable energy systems. Prohibits the installation of

			small wind turbines for use in the home, as well as novel integrated-PV construction materials.
EU Structural Funds and Cohesion Policy		x	The 2021-2027 programming period emphasises the role of local authorities with 6% of the ERDF budget dedicated to sustainable urban development. In addition, 65% to 85% of ERDF and Cohesion Fund resources will be allocated to the priorities of a Smarter Europe and a Greener, carbon free Europe.

A final reason is the centralised regulatory framework of Cyprus can hinder ET is the governance system, the executive branch of the government consists of the Cyprus President and the Ministers of each government department, therefore local authorities have less power in the duties of their municipalities and cannot control their budget and income streams. The Council of Ministers controls the grants that provide the municipalities budgets, and therefore limiting the funding and financing of projects, and the municipalities' ability to take actions.

Cyprus plans to ensure energy security and sustainability via the NECP by completing the infrastructure required for LNG on time, exploiting the NG found in Cyprus exclusive economic zone, and the electrical interconnection with the European grid through the EuroAsia interconnector.

Key Points of Cyprus's comparative analysis with neighbouring UC countries can be found in **Table 14**

Table 14: Cyprus's Comparative Analysis with UC countries

Section	Main Points
Cyprus's Position Compared to EU	<ul style="list-style-type: none"> - Cyprus aligns with EU law in energy policies but lags in expanding and integrating its electricity market, with plans set for 2025. - Behind other MS countries in joining energy communities, lacking ambition in achieving targets as per European Commission assessments on Cyprus' National Climate Plan.
Challenges Faced by Cyprus	<ul style="list-style-type: none"> - Isolated electricity grid with no storage leads to a 2% annual cutback, requiring households with PV panels to install ripple controls for system operators to manage excess production. - Unfair competitiveness between renewables and fossil fuels due to hydrocarbons receiving more workforce and financial resources for natural gas extraction by the Ministry.
Collaborations with Other States	<ul style="list-style-type: none"> - Collaborative projects include the EastMed pipeline with Greece and Israel for gas field connection and the EuroAsia interconnector, an undersea cable connecting Cyprus, Greece, and Israel's electrical grids.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> - NECP actions centralized with little role for local authorities, Strategy for Renovation of Buildings offers incentives for energy performance improvement, Sustainable Urban Mobility Plan lacks local authority implementation, RES Law sets up a National Fund not truly ring-fenced, Green procurement promoted by Public Procurement Law, etc.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> - Centralized governance system limits local authority power, hindering municipal budget control and project financing, with the Council of Ministers controlling grants and funding allocation, thus limiting municipalities' ability to take action.

Cyprus's Position Compared to EU	- NECP aims to ensure energy security and sustainability by completing LNG infrastructure on time, exploiting NG in Cyprus' exclusive economic zone, and establishing electrical interconnection with the European grid via the EuroAsia interconnector.
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2.4.2.3 Use Case - Spain

Comparing Spain's energy policy with other European countries we can observe similarities with other countries such as France and Portugal, all three countries are committed to decarbonisation. Spain plans to achieve 100% renewable energy by 2050 through ambitious energy policy, and the termination of all coal plants by 2025, concluding that Spain's main road to energy transition is through renewables. France based its decarbonisation via a diversified energy mix, a share of nuclear energy, an increase in renewable sources, clean transport through the promotion of electric vehicles and a charging network to support them. Portugal like France plans to reduce energy emissions in the country by increasing the shares of renewables in its energy mix, with goals of 80% electricity consumption through renewables by 2030, and policies and measures to facilitate them. All three countries aim for decarbonisation through renewables and a reduction to fossil fuel dependence.

Challenges in ET for Spain are centred in the lack of efficiency in buildings, as more than half buildings were built before 1980 and therefore must be improved to meet energy efficiency goals. Another challenge is Spain's dependence on fossil fuels, and the use of Algeria as a substitute for Russian gas conveys that Spain must keep a healthy political relationship with Algeria. A final and major challenge is the highly ambitious goals of the PNIEC for RE seem to be difficult in implementation as for the achievement of targets, Spain must double its capacity.

Spain has various energy project collaboration with other countries, H2Med is an energy interconnection between Spain, France and Portugal that will generate a green corridor connecting the Iberian Peninsula with rest of Europe, the three countries have made agreements to ensure full interconnection with the European energy network, and Spain and France are collaborating to reform the EU electricity market and promoting interconnection between them to increase resilience, security of supply, and through the Trans-European Transport Network will allow for safe, ease and sustainable mobility of passengers and goods between them. A list of other projects between Spain and Portugal are the Common Cross-Border Development Strategy which will aid cross border cooperation for the inhabitants around the Spanish-Portuguese border, to achieve sustainability in the area, development of the Urban Agendas, cross-border management of protected areas, adaptation promotion and to transform the area into the central region in the peninsula. Second, the Interreg VI-A-Portugal cooperation programme is another collaboration between Spain and Portugal to create a working platform and promote the implementation of an electric vehicle charging network for both sides of the border, an additional goal of the programme is to deploy renewables in the cross-border area and inland waters, energy storage and the transition from electrical vehicle batteries to green hydrogen. Third, cooperation between the countries to strengthen the Iberian Electricity Market, by identifying storage needs in the peninsula and developing a regulatory framework to encourage new investments in line with European regulations and reinforcing energy connection between the two countries and the rest of EU, and cooperation on innovation in energy storage.

The regulatory framework of Spain hinders ET by allowing incentives to be managed by Autonomous Communities at a subnational level, meaning communities with less resources find policy implementation difficult, communities with greater resources and political presence can take initiative in implementation and set themselves as examples.

The Spanish government plans to achieve energy security and sustainability through the +SE Plan which aims to supply households the economy greater security via energy prices and increasing security of supply. Other objectives of the plan is to replace NG and fossil fuels with RE, strengthen strategic and energy autonomy, and protecting vulnerable households, consumers and businesses. The measures found in the plan concern the increase in the protection of consumers, protection of neighbourhood communities, of renewables, leadership in government and large companies, transparency in electricity and gas bills, tax refunds for solutions to replace fossil fuels with RE, solidarity with the EU, flexibility in electricity planning, and a green kit to finance energy efficiency and renewable measures in SMEs.

Key Points of Spain's comparative analysis with neighbouring UC countries can be found in **Table 15**.

Table 15: Spain's Comparative Analysis with UC countries

Section	Main Points
Spain's Position Compared to EU	<ul style="list-style-type: none"> ▪ Similarities with France and Portugal in commitment to decarbonisation through renewable energy. ▪ Spain aims for 100% renewable energy by 2050 with coal plant termination by 2025, while France focuses on a diversified energy mix and Portugal aims for 80% electricity consumption through renewables by 2030.
Challenges Faced by Spain	<ul style="list-style-type: none"> ▪ Lack of efficiency in buildings, particularly older structures, poses a challenge to meet energy efficiency goals. ▪ Dependence on fossil fuels and the use of Algeria as a substitute for Russian gas necessitates maintaining a healthy political relationship with Algeria. ▪ Implementation challenges for ambitious renewable energy goals outlined in the PNIEC, requiring a doubling of capacity.
Collaborations with Other States	<ul style="list-style-type: none"> ▪ H2Med project for energy interconnection between Spain, France, and Portugal to create a green corridor connecting the Iberian Peninsula with the rest of Europe. ▪ Agreements for full interconnection with the European energy network and collaboration on EU electricity market reform and interconnection between Spain and France.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> ▪ Incentives managed by Regional Authorities at a subnational level create disparities in policy implementation, with communities lacking resources facing challenges compared to those with greater resources and political presence.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> ▪ +SE Plan aims to increase energy price stability, replace natural gas and fossil fuels with renewables, strengthen strategic and energy autonomy, and protect vulnerable households, consumers, and businesses. Measures include consumer protection, tax refunds for RE solutions, transparency in energy bills, and financing energy efficiency and renewables in SMEs.
Spain's Position Compared to EU	<ul style="list-style-type: none"> ▪ Similarities with France and Portugal in commitment to decarbonisation through renewable energy. ▪ Spain aims for 100% renewable energy by 2050 with coal plant termination by 2025, while France focuses on a diversified energy mix and Portugal aims for 80% electricity consumption through renewables by 2030.

2.4.2.4 Use Case – Mediterranean Islands_ Greece, Crete

Greece compared with other neighbouring countries such as the neighbouring Balkan countries is a bit more ahead in terms of energy policy.

Greece faces challenges in energy policy implementation due to high dependence from Russian fossil fuels, up to 96% of hard coal imports, 41% of NG imports, and 21% of crude oil imports in 2021 where from Russia. These imports play a big role in the steel production industry of Greece (coal), electricity system (gas), and heating and cooling of buildings (gas), making it harder for Greece to reduce the imports and generally the dependence on Russian fuel. Challenges are also faced after the resurrection of the Greek economy and the end of the Covid-19 pandemic, causing the GHG emissions in Greece to rise after already completing the 2020 targets. Competition between potential investors, conflicting interests, public reaction towards large scale RES projects and the subsequence of the environmental and licensing restrictions pose as a challenge.

Greece plans to collaborate with other countries to increase interconnection capacity, integration in the European electricity market, and to transition to a net electricity exporter. To facilitate these goals, Greece plans to double the interconnection capacity with Bulgaria, Italy and North Macedonia, triple interconnection capacity with Albania and initiate interconnection with Egypt.

The overall regulatory framework of Greece is aimed to promote renewable energy for electricity generation, and renewable energy system use for heating, cooling and transportation. Greece has changed its support scheme for RE, to allow the increase for renewable energy deployment and to ensure low electricity prices as a way to facilitate ET. Plans to reduce the time required for licensing and permitting for RE, electricity infrastructure and storage are under way, and an Off-shore Wind Law has been approved to allow for 2 GW of offshore wind capacity by 2030.

The Greek NECP plans to ensure energy security and sustainability by reducing energy poverty by at least 50% by 2025 and to bring it below the EU average by 2030, in 2021 the Action Plan to Combat Energy Poverty, the plan provides a quantitative definition of energy poverty and a set of strategic measures to reduce it. The social tariff is also one of the main policy tools available to combat energy poverty, it gives socially, or economically vulnerable consumers discounted electricity rates. The Greek government additionally utilises the Energy Transition Fund (2021) to fund subsidies for electricity, natural gas, heating oil, and transportation fuels, an example was the dedication of €9 billion to energy subsidies and other measures to aid consumers pay utility bills.

Key Points of Greece’s comparative analysis with neighbouring UC countries can be found in **Table 16**

Table 16: Greece's Comparative Analysis with UC countries

Section	Main Points
Greece’s Position Compared to EU	<ul style="list-style-type: none"> ▪ Greece is slightly ahead in energy policy compared to neighbouring Balkan countries.
Challenges Faced by Greece	<ul style="list-style-type: none"> ▪ High dependence on Russian fossil fuels, particularly hard coal, natural gas, and crude oil, poses challenges for reducing imports and dependence. ▪ Resurgence of the Greek economy and the end of the Covid-19 pandemic led to a rise in GHG emissions, complicating efforts to meet targets. ▪ Competition between potential investors, conflicting interests, and public reaction to large-scale RES projects present challenges.

Collaborations with Other States	<ul style="list-style-type: none"> Greece plans to increase interconnection capacity with Bulgaria, Italy, North Macedonia, Albania, and Egypt to facilitate integration into the European electricity market and transition to a net electricity exporter.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> Greece's regulatory framework promotes renewable energy for electricity generation, heating, cooling, and transportation. Support schemes for renewable energy have been changed to facilitate deployment and ensure low electricity prices. Efforts to reduce licensing and permitting time for RE, electricity infrastructure, and storage are underway. An Offshore Wind Law has been approved to allow for 2 GW of offshore wind capacity by 2030.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> The Greek NECP aims to reduce energy poverty by at least 50% by 2025 and bring it below the EU average by 2030. The Action Plan to Combat Energy Poverty provides a quantitative definition of energy poverty and strategic measures to reduce it. Social tariff and the Energy Transition Fund are utilized to fund subsidies for electricity, natural gas, heating oil, and transportation fuels to aid consumers in paying utility bills.
Greece's Position Compared to EU	<ul style="list-style-type: none"> Greece is slightly ahead in energy policy compared to neighbouring Balkan countries.

2.4.2.5 Use Case – Mediterranean Islands_ Croatia, Cres

Croatia like other neighbouring Use Case countries is gradually utilising other forms of primary energy, such as solar and NG and generally follows a transition to renewable methods. Croatia is unique compared to its western Balkan neighbouring countries, due to the fact that Croatia no longer has coal reserves. Additionally, compared to neighbouring countries the permitting procedures for renewable energy take longer and are more complex than average, this suggests that the legislative framework for renewables in Croatia is insufficient, and the lack of technological experts and technological capacity slows down the installation of renewable energies, resulting in delayed projects.

Unique challenges faced in Croatia include dependence on imports, limited diversification, high and unstable energy prices, increasing demand for energy, security risks in producing and transit countries, slow-paced energy efficiency, integration and interconnection of renewable in the energy market. An insufficient number of assessments is being conducted on products covered by eco-design and energy labelling, making it difficult to have clear picture on the standards of the products and possibly resulting to the loss of energy and CO₂ savings. Even though Croatia adopted a new legislative framework for the implementation RES in 2021, and the adoption of by-laws to reduce obstacles to renewables and to ease administrative procedures for renewable use, challenges appeared in the progression of self-consumption. Additionally, Croatia is more vulnerable to climate risks, due to medium and low capacities in climate change mitigation and adaptation (Commission's resilience dashboards).

Four collaborative projects are available with Croatia, the North Adriatic Hydrogen Valley 2023 is a collaborative project between Croatia, Slovenia, and Italy that consists of 17 pilot projects to facilitate the production of 5,000 tonnes of green hydrogen annually, for storage, distribution, and consumption. Another project is a Project of Common Interest, for the development of a smart grid with Slovenia and Austria 2027. A project initiated by the Croatian government plans to increase its LNG terminal capacity to 6.1 billion cubic metres annually by the end of 2025 by building the Ionian Adriatic Pipeline to allow exports from Bosnia and Herzegovina, Albania, and Montenegro, and further

expand the available pipeline system to Slovenia and Hungary. Lastly, Croatia joined the Alliance for Coal-Free Electricity Production, setting into action the termination of the last coal power plant by 2033.

To facilitate energy transition, Croatia has adopted new legislation in line with EU directives and generated a necessary framework to support ET, such as the national Hydrogen Strategy which incentivises the production and use of renewables and green hydrogen for the production of electricity in the industry and as another fuel. Changes in the Act on Biofuels for Transport created a legislative framework that promotes cleaner transportation for installing alternative fuels, and producing and consuming biofuels and hydrogen in transport, and financial incentives for the purchase of electric vehicles however not enough measures are applied to efficiently support the transition to renewable vehicles. Obstacles are present in ET of Croatia through the strategic planning and coordination, insufficient energy planning and financial support, complicated and lengthy procedures to acquire a permit, insufficient support and network limitations. The government suggests building on the existing regulatory framework and activities taking place. Additionally, the slow bureaucratic system prolongs decision making, incomplete legislative framework on permitting procedures for RES and the lack of staff and technical capacities slow down RE projects, making Croatia one of the slowest permitting EU member countries for project permitting.

Croatia has various measure in place to ensure energy security and sustainability, a series of them is the integrated planning of energy and supply security; construction and use of energy storage; improvement of the power and control system; development and maintenance of the central heat energy production system; construction of the UPP terminal; construction and improvement of the management of the gas transport system; development of the Adriatic oil and derivatives market of the optimization of storage capacity for oil and derivatives; research of potential hydrocarbon deposits in Slavonia, the Dinarides and the Adriatic; development of the transmission power network; development of the gas transportation system; elaboration of the regulatory framework for the active participation of network users in the electricity market; and the introduction of advanced consumption measurement systems and measurement data management. Croatia has also taken actions to protect households and businesses from rising prices by applying restrictions to exports in the internal market, already existing VAT cuts (spring 2022), the Autumn package (fall 2022), and export bans where all locally produced NG will be used for public service obligations. The authorities extended the energy measure package with reduced VAT rate on gas and other energy products, reduced tariff on fuel and social transfers to disadvantaged groups, they also extended the price caps on electricity, gas and fuels, stopped the price for heating from thermal power stations, and restricting the charges added into electricity prices and subsidies for farmers and fishermen. The government additionally approved a capital transfer of up to €0.9 billion to finance the price gaps, which the HEP the market price and the capped prices for electricity and gas are financed.

Key Points of Croatia's comparative analysis with neighbouring UC countries can be found in **Table 17**

Table 17: Croatia's Comparative Analysis with UC countries

Section	Main Points
Croatia's Position Compared to EU	<ul style="list-style-type: none"> ▪ Croatia, like neighbouring Use Case countries, is transitioning to renewable methods but faces unique challenges. ▪ Croatia stands out due to the absence of coal reserves compared to its western Balkan neighbours. ▪ Permitting procedures for renewables are longer and more complex, indicating an insufficient legislative framework and a lack of technological capacity, leading to delayed projects.

Challenges Faced by Croatia	<ul style="list-style-type: none"> ▪ Dependence on imports, limited diversification, high and unstable energy prices, increasing energy demand, security risks, slow-paced energy efficiency, and integration of renewables pose challenges. ▪ Insufficient assessments on products covered by eco-design and energy labelling hinder efforts to establish clear standards and may lead to energy and CO₂ savings losses. ▪ Challenges in the progression of self-consumption despite new legislative frameworks. ▪ Vulnerability to climate risks due to medium and low capacities in climate change mitigation and adaptation.
Collaborations with Other States	<ul style="list-style-type: none"> ▪ Collaborative projects include the North Adriatic Hydrogen Valley 2023 with Slovenia and Italy for green hydrogen production, a smart grid development project with Slovenia and Austria by 2027, an LNG terminal capacity expansion project to export to Bosnia and Herzegovina, Albania, and Montenegro, and joining the Alliance for Coal-Free Electricity Production to terminate coal power plants by 2033.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> ▪ New legislation aligns with EU directives and supports energy transition, such as the national Hydrogen Strategy incentivizing renewables and green hydrogen. ▪ Changes in the Act on Biofuels for Transport promote cleaner transportation but may lack sufficient measures to support the transition to renewable vehicles. ▪ Obstacles include strategic planning, coordination, insufficient energy planning and financial support, lengthy permitting procedures, network limitations, and slow bureaucratic systems.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> ▪ Measures include integrated energy planning, construction of energy storage, improvement of power and control systems, development of central heat energy production, construction of the UPP terminal, gas transport system improvement, optimization of oil and derivatives market, research on hydrocarbon deposits, power and gas network development, regulatory framework for electricity market participation, and advanced consumption measurement systems. ▪ Actions to protect households and businesses include export restrictions, VAT cuts, price caps on electricity, gas, and fuels, reduced tariffs, subsidies for farmers and fishermen, and a capital transfer to finance price gaps.
Croatia's Position Compared to EU	<ul style="list-style-type: none"> ▪ Croatia, like neighbouring Use Case countries, is transitioning to renewable methods but faces unique challenges. ▪ Croatia stands out due to the absence of coal reserves compared to its western Balkan neighbours. ▪ Permitting procedures for renewables are longer and more complex, indicating an insufficient legislative framework and a lack of technological capacity, leading to delayed projects.

2.4.2.6 Use Case – Mediterranean Islands, Malta

Comparing the energy policy of Malta to neighbouring countries we can observe that Malta has the lowest shares of renewables in energy consumption in the whole of the EU, this is also re-marked in the goals set by the Maltese government of an 11.5% renewable share increase by 2030 compared to

the 32% set by the EU. The energy efficiency endowment of 1.5 toe per capita of Malta in the EU is lower compared to 2030 goals, Malta also has a high dependence on im-ported fossil fuels and gas use in electricity production compared to other EU member states.

Challenges of energy policy implementation in Malta have been identified to be the lack of grid capacity and flexibility to support the increasing capacity required for renewable energies, and hindering the efficiency, reliability and security of the countries power supply, Malta also in terms of renewable energy has no onshore or offshore wind renewables installed and no plans to generate them have been made. Finally, the Maltese government still provides subsidies to fossil fuels specifically a 151% increase since 2015, challenging the promotion of renewable technologies and putting them at a disadvantage, especially as the subsidies are found in various sectors such as the agricultural, fishing, forestry, electricity, gas, steam and air conditioning, mining and quarrying, and professional, technical and scientific sectors.

The Maltese pans to collaborate with Italy and generate a second interconnector between the two countries by 2026, and a hydrogen gas pipeline interconnection with Gela (Italy) is being considered. Furthermore, Malta has agreed on a joint statement proposing the transformation of the Mediterranean Region as a central point for Green Energy during the MED9 (Croatia, Cyprus, France, Greece, Italy, Portugal, Slovenia Spain and Malta) EU Ministerial meetings and to allow offshore renewables and interconnections between EU and non-EU Mediterranean countries, and promoting the decarbonisation of the region and investments. Lastly, through the MoU project, collaborations between Malta and Libya have been made to investigate the prospect of an inter-connection for the supply of renewable electricity, sowing that Malta is willing to collaborate with non-EU countries.

Malta facilitates energy transition through their Recovery and Resilience Plan, including the new REPowerEU chapter has been released that includes additional reforms to accelerate the permitting of RE projects, and to make a necessity the installation of solar panels on the roof top of new buildings. The investments included in the new REPowerEU chapter also includes additional investments that concerns the upgrade and expansion of the electricity grid of Malta, with the use of batteries and storage as solutions.

Malta ensures energy security and sustainability by initiating measures to protect households and businesses from increasing prices by keeping retail prices stable to pre-crisis levels. Malta also provides free professional advice to households and small and medium sized businesses on energy efficient appliances, sustainable behaviour, and gives support schemes to encourage PV installations and battery storage. Through financial schemes Malta provides support to vulnerable and energy poor households to aid them in upgrading old and inefficient household appliances.

Key Points of Malta’s comparative analysis with neighbouring UC countries can be found in **Table 18**.

Table 18: Malta's Comparative Analysis with UC countries

Section	Main Points
Malta's Position Compared to EU	<ul style="list-style-type: none"> ▪ Malta has the lowest share of renewables in energy consumption in the EU, with the government aiming for an 11.5% increase in renewable share by 2030, compared to the EU's target of 32%. ▪ Energy efficiency endowment per capita in Malta is lower compared to 2030 goals, with high dependence on imported fossil fuels and gas in electricity production.
Challenges Faced by Malta	<ul style="list-style-type: none"> ▪ Challenges include the lack of grid capacity and flexibility to support increasing renewable energy capacity, hindering power supply efficiency, reliability, and security.

	<ul style="list-style-type: none"> Malta has no installed onshore or offshore wind renewables, and subsidies to fossil fuels have increased by 151% since 2015, posing a challenge to promoting renewable technologies.
Collaborations with Other States	<ul style="list-style-type: none"> Malta plans to collaborate with Italy to generate a second interconnector by 2026 and considers a hydrogen gas pipeline interconnection with Gela, Italy. Joint statement proposals during MED9 EU Ministerial meetings aim to transform the Mediterranean Region into a central point for Green Energy, promoting offshore renewables and interconnections between EU and non-EU Mediterranean countries. Collaborations with Libya via the MoU project investigate renewable electricity interconnection prospects, showing Malta's willingness to collaborate with non-EU countries.
Regulatory Framework for Energy Transition	<ul style="list-style-type: none"> Malta's Recovery and Resilience Plan includes a new REPowerEU chapter with reforms to accelerate RE project permitting and make solar panel installation on new buildings mandatory. Investments in the electricity grid upgrade and expansion with batteries and storage solutions are also included.
Measures for Energy Security/Sustainability	<ul style="list-style-type: none"> Measures include keeping retail prices stable to pre-crisis levels, providing free professional advice on energy-efficient appliances, supporting PV installations and battery storage, and offering financial support to upgrade old and inefficient household appliances for vulnerable and energy-poor households.
Malta's Position Compared to EU	<ul style="list-style-type: none"> Malta has the lowest share of renewables in energy consumption in the EU, with the government aiming for an 11.5% increase in renewable share by 2030, compared to the EU's target of 32%. Energy efficiency endowment per capita in Malta is lower compared to 2030 goals, with high dependence on imported fossil fuels and gas in electricity production.

2.4.3 Use Cases of Successful Initiatives

In this final part of the questionnaire, it was asked by the Use Case experts to provide information on successful energy initiatives generated by the initiative and policies in their countries. The experts provided information on whether there were successful energy initiatives in their countries, the key factors that contributed to the success of these initiatives, the obstacles or challenges faced during these initiatives and how they were overcome, their impact on local communities and the national energy landscape, and the ongoing or future planned initiatives that built on the successes.

2.4.3.1 Use Case – Cyprus:

Cyprus has achieved success through its energy initiatives, some successful initiatives in the Energy Efficiency field are the PEDIA – PDA project on the energy upgrade of schools to transform them to nZEB by activating funds of 7.5 million euros, the National Fund for household roof insulation and large-scale household renovations for the upgrade of buildings, and the National Fund for Energy Efficiency measures in local authorities. In the field of energy poverty Cyprus has found success through the tender to update the national definition of energy poverty, the Local Antenna of the EPAH and funding scheme where three local authorities have already benefited from this scheme, and the support to households for disabled people with the installation of rooftop PVs.

The key factors for initiative success in Cyprus where EU policy and funding, as some of the initiatives mentioned above (PEDIA and renovation projects) took funding from the PDA and Recovery and

Resilience funds. Additionally, the other factor to initiative success in Cyprus was the collaboration with important stakeholders (Union of Communities) and experts (CEA – Cyprus Energy Agency).

For the initiatives mentioned above, obstacles appeared as smaller communities do not have the capacity to apply for a grant, this was resolved by securing a budget for the CEA and help the communities with application processes. The main general obstacle in national funds is bureaucracy, reducing their accessibility to digitally illiterate citizens, and citizens that don't have sufficient capital to make investments before receiving a grant, this gradually gets resolved with changes from generated feedback.

The local communities and the national energy landscape of Cyprus have definitely been impacted by the initiatives, this is observed due to increase in RES and energy efficiency measures in households and institutions. Data show that there were 13,500 applications under the RES and Energy Efficiency fund resulting to €33 million for 2022-2023.

Future plans in Cyprus that build on initiative successes, is the expansion of the budget available in the PEDIA project to upgrade up to 25 more schools.

Key Points of Cyprus's successful initiatives can be found in **Table 19**.

Table 19: Cyprus's Successful Initiatives

Section	Main Points
Success in Cyprus' Energy Initiatives	<ul style="list-style-type: none"> ▪ PEDIA-PDA for school energy upgrades, the National Fund for household roof insulation and large-scale renovations, and Energy Efficiency measures in local authorities. ▪ Energy poverty initiatives include updating the national definition, EPAH's Local Antenna scheme, and supporting households with disabled individuals through rooftop PV installation.
Key Factors for Initiative Success	<ul style="list-style-type: none"> ▪ EU policy and funding, with initiatives like PEDIA and renovation projects benefiting from PDA and Recovery and Resilience funds. ▪ Collaboration with stakeholders like the Union of Communities and experts like the Cyprus Energy Agency (CEA).
Overcoming Obstacles	<ul style="list-style-type: none"> ▪ Smaller communities faced challenges in applying for grants, resolved by allocating a budget to the CEA to assist with application processes. ▪ Bureaucracy was a general obstacle in accessing national funds, addressed through changes based on feedback to improve accessibility, particularly for digitally illiterate citizens and those lacking sufficient capital upfront.
Impact on Local Communities and Energy Landscape	<ul style="list-style-type: none"> ▪ Increased adoption of RES and energy efficiency measures in households and institutions. ▪ 13,500 applications under the RES and Energy Efficiency fund, amounting to €33 million for 2022-2023.
Future Plans	<ul style="list-style-type: none"> ▪ Expanding the budget for the PEDIA project to upgrade up to 25 more schools, building on the successes of existing initiatives.

2.4.3.2 Use Case – Spain:

Spain has found success in initiatives relates with energy communities, such as the successful case of “ManzaEnergia” from the Lightness EU project, the CE Implementa Programme and CE Oficinas to promote the creation of Energy Communities, and the creation of the Spanish Observatory of Energy Communities. In relation with energy poverty is the release of the energy poverty report and the “Luz

para la Cañada” for struggling communities without electricity. Initiative successes in the decarbonisation sector the NetZeroCities initiative will help Spanish cities achieve climate neutrality by 2030, and the “Plataforma Ciudades” which will allow research centre such as the Polytechnic University of Madrid in collaboration with the Madrid City Council to develop Air Quality and Climate Change adaptation measures.

The initiatives available in Spain had success due the locality of the initiatives allowing for citizen and public bodies participation.

The main challenges/obstacles faced in the implementation of initiatives were mainly administrative and bureaucratic. Some examples of obstacles given from the ManzaEnergia initiative in Manzanares showcased that the variant level of citizen literacy and technological capacity can be challenging in educating and engaging with citizens of lower education level or the elderly. To overcome this obstacle, the engagement of the citizens was diversified by categorising the engaged in groups of similar background to allow for the better aid of the citizens with less energy and technical literacy. Another example of an obstacle was low data availability on energy poverty, making it difficult to find and recruit households that are energy vulnerable, to mitigate this a collaboration with Department of Social Services of the City Council to vulnerable households was helpful.

Initiatives such as the Manza Energia energy community has initiated at a local energy landscape the decentralisation, decarbonisation, and democratisation of energy, and it predicts to trans-form cities to fully independent and sustainable entities. At the national energy landscape, the project has contributed to decentralisation and has created a network that facilitates and pro-motes energy transition for communities. Furthermore, by allowing projects like ManzaEnergia influence citizens, a greater energy community production capacity based on renewables can be built, transforming the grid by changing the national electricity mix. Energy communities can also allow quality employment in depopulated areas.

Manzanares Energy community plans to further built on its success, as the successful results generated by the project have mobilised other municipalities to take action and replicate the project in their circumstances. Due to the successful results, stakeholders took interest to learn about the project and the City Council took place in the projects informational events. Lastly the creation of the National Observatory of Energy Communities and the Community Transformation Offices will facilitate the networking of energy communities and increase their numbers.

Key Points of Spain’s successful initiatives can be found in **Table 20**.

Table 20: Spain's Successful Initiatives

Section	Main Points
Success in Spanish Energy Initiatives	<ul style="list-style-type: none"> ▪ "ManzaEnergia" from the Lightness EU project, CE Implementa Programme, CE Oficinas, and the Spanish Observatory of Energy Communities, promoting the creation and support of Energy Communities. ▪ Releasing the energy poverty report and implementing "Luz para la Canada" to provide electricity to struggling communities. ▪ Decarbonisation initiatives like NetZeroCities and "Plataforma Ciudades"
Key Factors for Initiative Success	<ul style="list-style-type: none"> ▪ Success attributed to the locality of initiatives, enabling citizen and public body participation.
Overcoming Obstacles	<ul style="list-style-type: none"> ▪ Main challenges were administrative and bureaucratic.

	<ul style="list-style-type: none"> ManzaEnergia initiative highlighted challenges in citizen literacy and technological capacity, mitigated by categorizing citizens into groups for better engagement. Low data availability on energy poverty addressed through collaboration with Department of Social Services to identify vulnerable households.
Impact on Local and National Energy Landscape	<ul style="list-style-type: none"> Initiatives like ManzaEnergia have decentralized, decarbonized, and democratized energy at the local level, contributing to city sustainability and energy independence. At the national level, projects like ManzaEnergia have promoted decentralization. Energy communities contribute to renewable energy production, transform the national electricity mix, and provide quality employment in depopulated areas.
Future Plans	<ul style="list-style-type: none"> Manzanares Energy community plans to build on its success, mobilizing other municipalities to replicate the project. Interest from stakeholders and the City Council in learning about the project and its results. Creation of the National Observatory of Energy Communities and Community Transformation Offices to increase networking and the number of energy communities.

2.4.3.3 Use Case – Mediterranean Islands_ Greece, Crete:

Many of the Greek successful energy initiatives consist of the creation of various energy communities, such as the Minoan Energy Community, the Energy Community of Karditsa, the Energy Community of Sifnos and the Energy Community of Chalki. Also the “RenewME Renewable MaleviziEnergy Future” project of NESOI which aided the founding of Energy Communities with the technical study for the installation a 1MW PV park, the commission of efficient street lighting and a study for the renovation of the Town Hall for better energy efficiency, the project also conducted a feasibility study for the commission of an electric mini-bus, electric & hydrogen bicycles, and the assessment for the selection of the best intra-municipality routes for green vehicles. Additionally, the “SAVE Sustainable Actors for Viable Energy” project of NESOI, aided the storage of the electricity produced by Crete’s wind parks in decentralised devices, that will inject the storage electricity back to the grid peak demand periods. Two sport facilities of the municipality will be included as prosumers in the smart grid, therefore the stored electricity along with the electricity produced by PV panels will result to zero-energy facilities (along with their energy performance upgrade).

The key factors that contributed to initiative success is the support, cooperation and contribution of the local population and municipalities, the ethics and vision of the citizens, their high level of ambition for ET and the effective projects.

The main obstacles faced in the implementation of the initiatives is an unsupportive legal framework not providing the necessary aid to progress energy communities.

The national energy landscape has not been impacted yet due to the few amount initiatives implemented, the local communities though have showed high ambition and responsibility towards ET goals.

Although there are no available plans that built upon the successful initiatives, they are expected.

Key Points of Crete’s successful initiatives can be found in **Table 21**

Table 21: Greece's Successful Initiatives

Section	Main Points
Greek Successful Energy Initiatives	<ul style="list-style-type: none"> Creation of various energy communities like Minoan Energy Community, Energy Community of Karditsa, Energy Community of Sifnos, and Energy Community of Chalki. Projects like "RenewME Renewable MaleviziEnergy Future" aided in the founding of Energy Communities by providing technical support for PV park installation, efficient street lighting, energy-efficient town hall renovation, and feasibility studies for green vehicles. "SAVE Sustainable Actors for Viable Energy" project supported storage of electricity from Crete's wind parks in decentralized devices.
Key Factors for Initiative Success	<ul style="list-style-type: none"> Support, cooperation, and contribution of local population and municipalities, as well as the ethics and vision of citizens with high ambition for energy transition.
Overcoming Obstacles	<ul style="list-style-type: none"> Unsupportive legal framework lacking necessary aid for energy community progress.
Impact on Local and National Energy Landscape	<ul style="list-style-type: none"> Few initiatives implemented yet, so national energy landscape remains largely unchanged. Local communities show high ambition and responsibility towards energy transition goals.
Future Plans	<ul style="list-style-type: none"> No available plans.

2.4.3.4 Use Case – Mediterranean Islands _Croatia, Cres:

Some examples provided of the successful energy initiatives provided is the construction of Croatia's first large battery energy storage system in Šibenik by 2024, plans to exploit geothermal energy to heat towns (Bjelovar), and the electrification of marine transport by producing various electric marine vehicles. Additionally, the combined-cycle power plant EL-TO Zagreb part of the HEP (Croatia's power utility Hrvatska Elektroprivreda) Project will combine a gas and steam turbine to produce 50% more electricity than a traditional plant, the largest wind farm consisting of 18 wind turbines produces 170 GWh annually (powering 50,000 households) again constructed by HEP and not financed by a public support scheme, counties such as Sisak-Moslavina and Istria will receive priority support from the Just Transition Fund due to high GHG emissions, the NESOI project "Community-Supported Energy: A Step to Community SOLAR Islands" joints various Croatian islands to initiate the installation of a communal solar power plant on each archipelagos through a crowd-investment model and the education of the members on establishment and smooth cooperation, lastly the city of Križevci is recognised and certified as one of the top ten cities for separate waste collection and the fourth top for investments in education, the city implements group investments for RES projects founding their own energy cooperative and promoting ET.

One of the Key factors that contributed to the success of initiative and ET was HEP developing RES farms (an onshore wind farm and 5 small PV farms), in southern parts of Croatia, contributing to reduction of 66 kilotons of CO₂ emissions per year from the atmosphere and 28.8 GWh per year. The second key factor for the success of the city of Križevci was the crowd funding campaign motivating citizens to invest in solar power plants, providing citizens with subsidies for solar panel installations, renovation of buildings was executed, geothermal potential was investigated, electric/hybrid city vehicles were purchased and charging stations were built.

Obstacles and challenges found in Croatia for ET are found in the uncertainty of the legal framework where prosumers might overfeed the grid and therefore delaying household investments for PV

installations, and higher taxation in electricity than gas does not give the motive to consumers for a transition to electrical heating. In the case of the city of Križevci to achieve ET goals, it was required to adopt long term measures, work beyond the framework and their basic budget and had to follow measures that were not financially generous and were difficult, additionally due to increasing energy prices the use of geothermal well for heating public buildings and for other reasons poses as a future challenge.

Due to the initiatives implemented in the energy sector it is expected that the energy landscape will transition, where wind energy is expected to be 21.3% of the electricity production, solar energy will be 6.1%, and geothermal will be 0.8%, the shares of hydroelectric and high-efficiency biomass cogeneration and use of biogas for electricity generation will contribute to the future energy mix. The city of Križevci has been awarded the National Award for the Environment, and the Green Prix for the Energy and Climate Office which was the first of its type in Croatia which provides information and educates citizens in RE and the creation of a turnkey model for a solar power plant to provide citizens with a complete service of the plant production process. The office with the help of KLIK has informed 500 citizens about RES in less than a year, 50 solar power plant projects for households were created and registered, and 6 solar power plants for legal entities were registered to the public call of the Environmental Protection and Energy Efficiency Fund.

Investment plans under the RRP and the Just Transition Mechanism for the education and skill buildings of citizens on ET and will introduce new labour market policies for long term unemployed, and disadvantaged less employable people, and a voucher system for adult education. The RRP plans to release a National Skills Development Plan to promote the education of green skills in terms of energy and post-earthquake renovation. The implementation of the Railway Development Strategy 2022 will play a role in modernising the infrastructure and rolling stock to promote the rails as an alternative transport mode, and the possibility of electrifying the rails with the use of green hydrogen or battery-powered locomotives. Lastly if the city of Križevci continues their efforts to energy transition, a local economy that is resistant to various crisis, sustainable and locally managed will be developed, therefore more local energy sources will be developed.

Key Points of Croatia's successful initiatives can be found in **Table 22**

Table 22: Croatia's Successful Initiatives

Section	Main Points
Successful Energy Initiatives in Croatia	<ul style="list-style-type: none"> ▪ Construction of Croatia's first large battery energy storage system in Šibenik by 2024, plans to exploit geothermal energy in Bjelovar, and electrification of marine transport with various electric marine vehicles. ▪ Combined-cycle power plant EL-TO Zagreb by HEP will produce 50% more electricity than traditional plants. ▪ Construction of the largest wind farm in Croatia by HEP powering 50,000 households. - NESOI project for communal solar power plants on Croatian islands through crowd-investment model. ▪ City of Križevci recognized for separate waste collection and investments in education, implementing group investments for RES projects and promoting energy transition.
Key Factors for Initiative Success	<ul style="list-style-type: none"> ▪ HEP's development of RES farms contributing to CO₂ emission reduction. ▪ Crowd funding campaign in Križevci motivating citizens to invest.
Overcoming Obstacles	<ul style="list-style-type: none"> ▪ Uncertainty in legal framework for prosumers overfeeding the grid and higher taxation on electricity compared to gas are hindering household investments in PV installations.

Expected Impact on Energy Landscape	<ul style="list-style-type: none"> ▪ City of Križevci facing long-term measures, financial constraints, and challenges with increasing energy prices for achieving ET goals. ▪ Transition in energy landscape with wind energy expected to contribute 21.3% of electricity production, solar energy 6.1%, and geothermal 0.8%. ▪ Shares of hydroelectricity and high-efficiency biomass cogeneration contributing to future energy mix. ▪ Recognition of the city of Križevci for environmental efforts and establishment of Energy and Climate Office providing information and education on RE.
Investment Plans for Energy Transition	<ul style="list-style-type: none"> ▪ Investment plans under RRP and Just Transition Mechanism. ▪ Release of National Skills Development Plan to promote green skills education. ▪ Implementation of Railway Development Strategy 2022. ▪ Continued efforts in Križevci toward energy transition.

2.4.3.5 Use Case – Mediterranean Islands, Malta:

Malta plans to build on initiative successes by investing in the development of cross-border infrastructure to guarantee the security of supply and allow for RE imports. The Maltese government has released plans to invest in a second electricity interconnector with Italy and allow the import of renewable electricity and further decrease the GHG emissions generated locally. Investigations are being conducted for the possibility of green hydrogen imports from Italy through the Melita TransGas Pipeline project, which will not only allow the import of renewable gases but to aid in the deisolation of Malta from the trans-European gas network.

Key Points of Malta's successful initiatives can be found in **Table 23**

Table 23: Malta's Successful Initiatives

Section	Main Points
Malta's Plans for Initiative Success	<ul style="list-style-type: none"> ▪ Investment in cross-border infrastructure ▪ Plans to invest in a second electricity interconnector with Italy ▪ Investigations for green hydrogen imports from Italy

2.5 Barriers and challenges in energy transition

2.5.1 Economic and Financial Barriers

As the pace of the energy transition accelerates, it is imperative for the economic and finance sector to engage actively. This involvement entails providing capital investment, as well as concessional financing and grant payments, to ensure the adoption, sustainable growth, and balanced development of energy transition initiatives. (71) The interrelation between the economy and finance with the energy transition is pivotal, as it has the potential to yield profits for businesses, generate employment opportunities, and lower energy expenses for consumers. This section aims to elucidate the economic and financial barriers impeding this process. (72)

A principal economic and financial impediment to the energy transition is the **substantial initial capital outlay required for sustainable energy systems and energy savings measures**, in contrast to their fossil fuel counterparts. These elevated costs act as a deterrent to potential investors, producers, and consumers. The increased expenses are attributed to the greater resources and time needed for the development of renewable energy systems, which in turn escalates transaction and overall production costs. Furthermore, energy related investments are inherently more complex than traditional fossil fuel power plants, leading to higher establishment costs. This financial burden is particularly acute for

developing countries, where the cost of imported resources necessary for renewable energy projects significantly exceeds that of locally sourced materials. (73)

The **elevated initial costs associated with Renewable Energy Sources (RES) and the implementation of energy savings measures**, while offering substantial long-term benefits, initially render both less commercially competitive compared to traditional fossil fuels. This competitiveness gap leads to reduced immediate market advantages from the deployment of RES and energy efficiency initiatives. However, integrating both RES and energy savings strategies can ultimately lead to significant operational cost reductions, enhanced energy efficiency, and a more sustainable energy ecosystem, offsetting initial investments over time. (74), and deters potential investors in investing towards clean energy. (73) The market dynamics for Renewable Energy Sources (RES) and energy savings measures are significantly influenced by the entrenched competition from fossil fuels. Given that the fossil fuel industry has been well-established and integrated into the global market for decades, it presents a formidable **challenge to newer, clean energy technologies, which are still evolving and lack a diverse range of business models**. This historical dominance contributes to a smaller market share for clean energy solutions. Additionally, the lower cost of fossil fuels, compared to clean energy alternatives, further disincentivizes consumers from transitioning to renewable energy, thus maintaining fossil fuels as the predominant energy source for nations in the foreseeable future. (75) (73) **Subsidies on fossil fuels** can make the market for RES even more difficult and unfair, as subsidies overshadow, can make renewable energy economically weak, and reduce its promotion to consumers (73). Another barrier is the **lack of financing** in the RES sector due to the higher initial capital costs creating risky investments for investors and eventually discouraging them from investing (75). An additional factor contributing to the financing shortfall for both Renewable Energy Sources (RES) and energy savings projects is the economic condition of the country in question. Should the national economy be in a precarious state, it is likely that insufficient funds will be available for the investment in these initiatives, further complicating their implementation and growth. (73)

A list of the Economic and Finance Barriers in Energy Transition is presented in **Table 24**

Table 24: Economic/Finance Barriers to ET

Barriers to Energy Transition	Factors Contributing to the Barrier
High Initial Capital Costs	<ul style="list-style-type: none"> ▪ Higher costs of sustainable energy solutions compared to fossil fuel systems. ▪ Resource and time curation requirements increase transaction and production costs. ▪ Complexity of renewable energy plants lead to higher establishment costs. ▪ Imported resources in underdeveloped countries result in even higher costs.
Commercial Competitiveness	<ul style="list-style-type: none"> ▪ Overall, the higher cost of renewable energy makes it less commercially competitive. ▪ Smaller market benefits from renewable energy installation. ▪ Fossil fuel market established and integrated for decades, while clean energy technology is still new. ▪ Limited available business models for clean energy. ▪ Cheaper overall price of fossil fuels make them more attractive to consumers.
Subsidies on Fossil Fuels	<ul style="list-style-type: none"> ▪ Fossil fuel subsidies overshadow renewable energy, making it economically weak. ▪ Reduction in promotion to consumers due to unfair competition.
Lack of Financing	<ul style="list-style-type: none"> ▪ Higher initial capital costs create risky investments for investors. ▪ Discouragement of investors and financing institutions from investing.

- Economic status of the country contributes to the lack of financing.

2.5.2 Technological Barriers

This section addresses the technological barriers impeding both Renewable Energy Sources (RES) and energy savings initiatives, providing a **comprehensive overview of the obstacles within the technological and industrial sectors that challenge the progression of energy transition**. A significant hurdle is the **scarcity of technologies, resources, and infrastructure** critical for the development and support of both RES and energy savings measures. This deficiency hampers not only the growth and integration of renewable energy into regional energy systems, particularly in developing nations but also the implementation of effective energy-saving solutions. Moreover, for the successful incorporation of RES into a country's energy mix, as well as the adoption of energy efficiency practices, substantial **upgrades and modifications to the existing energy grid are essential**. These changes are necessary to accommodate the incorporation of renewable energy sources and to optimize the grid for enhanced energy efficiency, including the adaptation of transmission lines for remotely located energy plants. The limited availability of specific components and technologies needed for both renewable energy systems and energy-saving measures can lead to increased production and implementation costs. This issue is exacerbated when such components are not readily available locally and must be imported, presenting a significant obstacle to the widespread adoption of RES and energy conservation strategies. Addressing these technological and logistical challenges is crucial for advancing the energy transition and achieving a sustainable energy future.

(76). The **absence of adequate operational, maintenance support, and the requisite training for personnel** significantly hampers both Renewable Energy Sources (RES) and energy savings initiatives. This deficiency can lead to inefficiencies in the operation and upkeep of energy systems, resulting in decreased efficiency, financial losses, and interruptions in energy provision. Such outcomes not only compromise the performance and reliability of RES and energy efficiency projects but also undermine confidence among investors and consumers, who may view these energy solutions as unreliable and fraught with financial risks. Addressing the need for comprehensive training programs and robust maintenance frameworks is crucial to enhancing the dependability and appeal of both renewable energy and energy efficiency measures, ensuring their successful integration into the energy landscape. (73) (75). A critical impediment to the advancement of Renewable Energy Sources (RES) and energy savings measures in various countries is the **lack of investment in research and development (R&D) within these sectors**. Enhanced R&D efforts are essential for expanding the knowledge base surrounding renewable energy and energy efficiency technologies. Such advancements can facilitate their seamless integration into existing energy supply systems and bolster their competitiveness against fossil fuels. Investing in research and development is paramount to uncovering innovative solutions that drive the efficiency, reliability, and cost-effectiveness of both RES and energy-saving strategies, thereby accelerating their adoption and impact on the energy transition. (75). A critical impediment to the advancement of Renewable Energy Sources (RES) and energy savings measures in various countries is the lack of investment in research and development (R&D) within these sectors. Enhanced R&D efforts are essential for expanding the knowledge base surrounding renewable energy and energy efficiency technologies. Such advancements can facilitate their seamless integration into existing energy supply systems and bolster their competitiveness against fossil fuels. Investing in research and development is paramount to uncovering innovative solutions that drive the efficiency, reliability, and cost-effectiveness of both RES and energy-saving strategies, thereby accelerating their adoption and impact on the energy transition. (77). Another significant technological challenge that affects both Renewable Energy Sources (RES) and energy savings initiatives is **the issue of energy storage**. Renewable energy systems, dependent on intermittent resources like sunlight and wind, can only generate electricity when these conditions are favourable. Consequently, to ensure the stability and proper functioning of electrical grids, and to match the supply and demand of electricity effectively, the development and integration of advanced energy

storage solutions, such as batteries, are imperative. These storage systems are crucial for mitigating network fluctuations and ensuring a consistent and reliable energy supply, thereby enhancing the feasibility and efficiency of both renewable energy and energy conservation efforts. (75)

A list of Technological Barriers in Energy Transitions is presented in **Table 25**

Table 25: Technological Barriers in ET

Barriers to Renewable Energy Development	Factors Contributing to the Barrier
Limited Resources	<ul style="list-style-type: none"> ▪ Limited resources hinder development and support of renewable energy (RE) technologies. ▪ Difficulty in integration, especially in developing countries. ▪ Need for updates to the overall energy grid for RE integration. ▪ Production costs increase due to the import of required parts.
Operation and Maintenance Challenges	<ul style="list-style-type: none"> ▪ Lack of operation and maintenance resources, including trained staff. ▪ Resulting inefficiencies, income loss, and energy supply disruptions. ▪ Perception of unreliability and risk, discouraging investors and consumers.
Absence of Research and Development	<ul style="list-style-type: none"> ▪ Lack of research and development hampers knowledge and integration in the energy supply system. ▪ Diminished competitiveness with fossil fuels.
Location Siting and Transmission Costs	<ul style="list-style-type: none"> ▪ Decentralized nature requires remote locations, leading to time-consuming and costly location siting. ▪ Creation of new transmission lines add to production costs.
Energy Storage Challenges	<ul style="list-style-type: none"> ▪ Renewable energy systems depend on resource availability (sun, wind), requiring energy storage. ▪ Batteries are needed to compensate for network fluctuations.

2.5.3 Political and Regulatory Hurdles

In this section, we explore the challenges within the political and regulatory framework that obstruct the progress of the energy transition, with a particular focus on the negative impact of ineffective policies, regulations, and government actions on the advancement of Renewable Energy Sources (RES) and the implementation of energy savings measures.

A major obstacle in this landscape is the enactment of government policies that do **not sufficiently advocate for the adoption and development of both RES and energy efficiency initiatives**. For an effective transition towards a blend of renewable and conventional energy sources, it is imperative for governments to introduce and enforce supportive and robust policies. Such policies are essential not only for reducing public apprehension towards renewable energy and energy conservation but also for building trust and facilitating their broader acceptance within the marketplace.

Furthermore, the growth of RES and energy efficiency projects is frequently **constrained by the taxation on imported components** necessary for the construction of renewable energy systems and the implementation of energy-saving technologies. This increases production costs significantly. The absence of government incentives, including fiscal policies and subsidies designed to encourage the adoption of RES and energy savings by the market and investors, severely limits the sector's expansion. Without these incentives to level the playing field with fossil fuels, both renewable energy and energy efficiency initiatives face challenges in gaining significant traction. Another critical concern is the **establishment of unrealistic goals** by governments regarding the deployment of RES and energy efficiency measures, resulting in a disconnect between anticipated and actual achievements. It is crucial for governments to set more realistic, achievable objectives and to back them with clear, effective policies. Additionally, the progress of both RES and energy efficiency projects is further

complicated by **administrative and bureaucratic hurdles**. These obstacles can delay the planning and authorization processes and impose restrictions on development, thereby slowing the momentum of the energy transition. To overcome these barriers, a unified effort to overhaul the political and regulatory frameworks is necessary, ensuring they provide robust support for the shift towards renewable energy and enhanced energy efficiency.

. (73) (75). A list of Political and Regulation Barriers in Energy is presented in **Table 26**.

Table 26: Political/ Regulation Barriers in ET

Barriers in Politics and Regulations	Factors Contributing to the Barrier
Ineffective Government Policies	<ul style="list-style-type: none"> ▪ Policies that fail to promote renewable energy hinder its adoption and implementation. ▪ Lack of balanced support for both renewable and conventional energy industries. ▪ Insufficient policies contribute to citizen fears and confusion, impacting trust and market instillation.
Taxation on Imported Parts	<ul style="list-style-type: none"> ▪ Taxation on imported parts and equipment for renewable energy plants increases production costs. ▪ Lack of regulations on fiscal incentives hampers market promotion.
Lack of Government Subsidies	<ul style="list-style-type: none"> ▪ Absence of subsidies for the renewable energy industry limits competitiveness with fossil fuels and impedes growth.
Unrealistic Goals and Policies	<ul style="list-style-type: none"> ▪ Governments are not setting accurate goals for renewable energy implementation. ▪ Lack of clear and precise policies affecting results.
Administrative and Bureaucratic Complexities	<ul style="list-style-type: none"> ▪ Administrative complexities slow down planning and impose restrictions on development. ▪ Delays in project authorizations and development.

2.5.4 Social and Cultural Factors

This section explores the social and cultural obstacles to energy transition, focusing on how attitudes and behaviours of citizens and municipal factors play a role. A significant barrier is rooted in **fear, primarily due to a widespread lack of understanding** and awareness about renewable energy, including its environmental and economic advantages, and concerns over its financial implications. This information gap fosters doubts about the reliability of renewable energy sources, hindering their broader acceptance and development. Additionally, there's apprehension regarding the **extensive use of remote lands for renewable energy plants**, which could potentially impact other sectors, notably agriculture. This apprehension may lead both public and private sectors to reconsider their stance on adopting renewable energy due to perceived environmental drawbacks. Another challenge is the **community's acceptance level** of renewable energy projects. While there may be a general openness towards renewable energy, resistance often emerges when projects are directly impacting local communities. This not-in-my-backyard (NIMBY) sentiment can significantly delay or block energy transition initiatives. Moreover, the scarcity of trained and experienced professionals capable of designing, operating, and maintaining renewable energy facilities further restricts the growth of renewable energy in communities. Overcoming these social and cultural barriers requires targeted educational initiatives to increase knowledge and awareness, strategic planning to minimize environmental and community impacts, and investment in professional training programs to build a skilled workforce for the renewable energy sector. (73) (75)

A list of Social and Cultural Barriers in Energy Transition is presented in **Table 27**

Table 27: Social/Cultural Barriers in ET

Social and Cultural Barriers to Renewable Energy Adoption	Factors Contributing to the Barrier
Fear Stemming from Lack of Knowledge	<ul style="list-style-type: none"> ▪ Fear based on inadequate knowledge and awareness of renewable energy. ▪ Lack of understanding of ecological and financial benefits. ▪ Concerns about the financial impacts of adopting renewable energy.
Land Depletion and Impact on Agriculture	<ul style="list-style-type: none"> ▪ Fear of large-scale land depletion for renewable energy plants. ▪ Concerns about the impact on other commercial sectors, especially agriculture.
Perceived Environmental Impacts	<ul style="list-style-type: none"> ▪ Public and private sectors have reservations about adopting renewable energy due to perceived environmental impacts.
Resistance to Community-level Effects	<ul style="list-style-type: none"> ▪ Citizens may accept renewable energy but resist its adoption if it directly affects them and their community.
Lack of Trained and Experienced Professionals	<ul style="list-style-type: none"> ▪ Absence of professionals for designing, operating, and maintaining renewable energy plants hinders community growth.

2.6 Tools + methodologies for energy transition

2.6.1 Analytical Tools and Models

The Step-WISE project aims to equip local authorities with the knowledge to create Clean Energy Transition Plans by introducing a digital simulation tool. An essential aspect of this initiative is to highlight existing publicly accessible tools that assess Local Climate Plans. These evaluation tools offer critical feedback to local governments, pinpointing areas where their plans may fall short in terms of policies, objectives, and actions. This feedback mechanism enables local authorities to enhance their strategies effectively. Among the tools available for such assessments are the EURO LCP Initiative, the Climate Change Assessment Tool (CCAT), and the Climate Policy Assessment Tool (CPAT). This section will outline the objectives of these tools, showcasing their role in supporting local authorities to refine and improve their climate action plans.

The **EURO-LCP Initiative**, founded by a collective of environmental and social scientists, is dedicated to evaluating the effectiveness of local climate planning across Europe. Since its inception in 2013, the initiative has been actively monitoring, updating, and enriching data on local climate strategies within European nations. It possesses the unique capability to examine the interplay between various levels of policies—national, regional, and local—and their attributes, such as urban size, economic capacity, geographic location within Europe, among others. The primary goals of the EURO-LCP Initiative include analysing the current status, quality, sufficiency, progress, and impact of local climate planning efforts. Additionally, it aims to disseminate its findings to a wide audience to promote the implementation of climate action, while also seeking to minimize the risks associated with inadequate adaptation and mitigation strategies in the pursuit of a sustainable and resilient urban Europe. A notable feature of the initiative is its interactive geographical map available on the EURO-LCP Initiative website. This tool offers users the ability to visually explore all the documented local climate plans, providing access to detailed information about each plan through interactive engagement with the map. (78).

The **Climate Change Assessment Tool (CCAT)**, developed by Zero Waste Scotland, is designed to support public sector organizations in adhering to the Climate Change Act 2009 of Scotland. This legislation mandates the reduction of greenhouse gas emissions and the reporting of these reductions to the Scottish Government. The CCAT enables organizations to evaluate their environmental practices over a period of up to five years, with annual reviews to monitor their progress comprehensively. This process not only highlights areas of achievement but also identifies where

improvements are needed. Upon completing the assessment, CCAT offers tailored action plans to organizations, guiding them towards the adoption of more sustainable practices. (79).

The **Climate Policy Assessment Tool (CPAT)**, crafted by experts from the International Monetary Fund (IMF) and the World Bank (WB), sets itself apart from earlier instruments by its restricted access; it is available only upon request by a government official through the office of their respective Executive Director. CPAT is designed to forecast the outcomes of climate mitigation strategies across over 200 nations, factoring in the effects on energy demand and prices, CO₂ and greenhouse gas emissions, among other variables, across a spectrum of policy mechanisms including taxes and subsidies. The primary objective of CPAT is to empower policymakers in crafting, evaluating, and enacting measures that not only expedite the energy transition but also address energy poverty. Capable of producing uniform cross-country forecasts concerning emissions, mitigation efforts, and more, CPAT stands out for its transparency and ease of use, demanding minimal prior knowledge and no external data for operation. (80).

2.6.2 Methodologies and Policy Assessment

The EURO-LCP Initiative employs a scoring methodology grounded in the 'Adaptation Plan Quality Assessment' (ADAQA) index, which delineates the calibre of planning based on six foundational principles: 1) the factual basis of the plan, 2) clearly defined goals, 3) specific measures outlined, 4) implementation strategies, 5) monitoring and evaluation mechanisms, and 6) the extent of societal participation. This approach is further refined through three supplementary sub-indices: ADAQA-1, ADAQA-2, and ADAQA-3. ADAQA-1 emphasizes the depth of the factual basis and the measures proposed, assigning 1 point for each option selected in these categories. ADAQA-2 focuses on the breadth of adaptation measures, also allocating 1 point for each option chosen. ADAQA-3 relies on expert judgment to evaluate the plan's coherence and fairness, considering risk management, measures, monitoring, evaluation, and public engagement without a fixed-point system for responses. Detailed guidelines for point allocation across these indices are outlined in the CC Adaptation Scoring Tool Guide, accessible on the initiative's website.

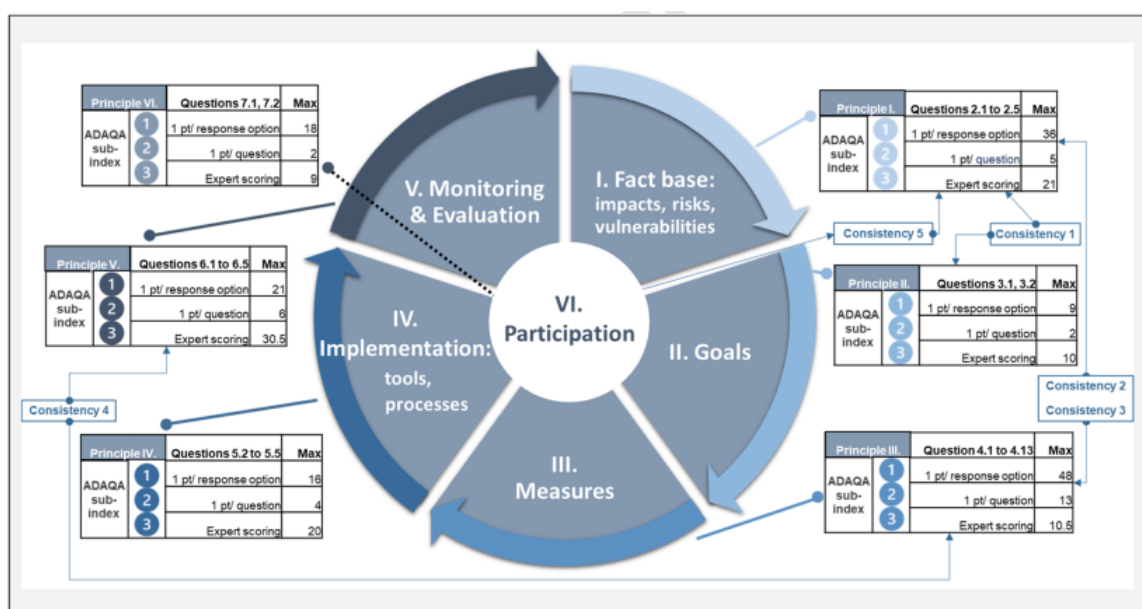


Figure 1. The ADAQA index construction rationale (81)

The EURO-LCP Initiative website features comprehensive guides designed to assist users throughout the assessment process. After registering for a new account and starting a new project, users are prompted to answer a series of questions related to the plan they wish to evaluate. These questions

are organized around the six key principles previously mentioned. Upon completing these questions, users can save their project, at which point an assessment is automatically generated, offering valuable insights into the plan's strengths and areas for improvement. (81)

The Climate Change Assessment Tool (CCAT) utilizes an Excel-based questionnaire format for its assessment, comprising 28 questions spread across five distinct topics. These topics include governance with 7 questions, emissions with 6 questions, adaptation with 6 questions, behaviour with 5 questions, and procurement with 4 questions. The questionnaire is designed with two types of response formats: the first format requires organizations to select one of five levels of achievement, ranging from 0 (baseline level of achievement) to 4 (indicating readiness for 2020 goals). The second format asks organizations to respond to statements about their processes, plans, and outcomes with either agreement or disagreement, or simply yes or no. The maximum score that can be attained is 122, signifying that an organization is well-prepared for climate change goals and adaptation activities set for 2020. The scores for each topic can reach up to 28, 30, 28, 20, and 16, respectively. After completing the assessment, the CCAT generates scores for the five topics and, based on the responses, creates a tailored action plan. This plan aims to guide the organization in identifying areas for improvement and developing specific strategies and actions to enhance their climate change preparedness and response. (82)

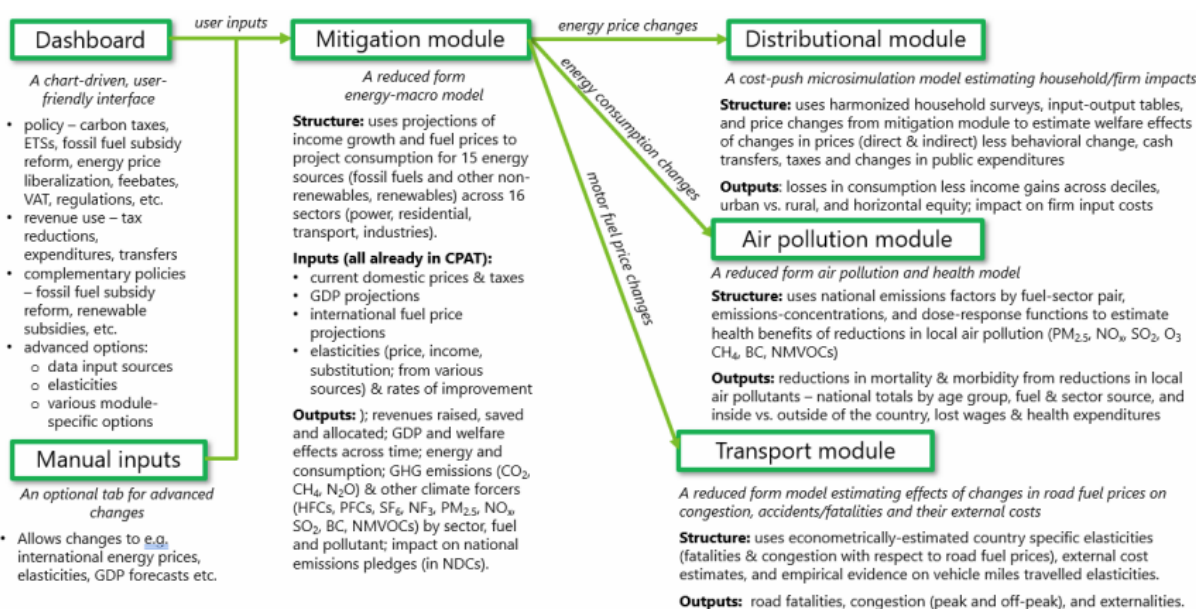


Figure 2. Overview of CPAT structure (83)

The Climate Policy Assessment Tool (CPAT) is an Excel-based model that incorporates four primary modules, each designed to analyse different aspects of climate policy impacts:

1. **Mitigation Module:** This foundational module serves as a macro-energy model, calculating the effects of climate mitigation policies on various parameters, including energy consumption, prices, greenhouse gas emissions, local air pollutants, revenues, GDP, and overall welfare.
2. **Distribution Module:** Operating as a cost-push microsimulation model, this module assesses the repercussions of changes in both energy and non-energy prices on economies and households, factoring in the net effect of revenues allocated for public investment, transfers, or reductions in personal income tax.

3. **Air Pollution Module:** This segment focuses on evaluating the health impacts associated with local air pollutants, such as fine particles and ozone, estimating their influence on premature deaths and diseases.
4. **Transport Module:** Dedicated to examining the effects of alterations in motor fuel prices on congestion, road accidents, and the external costs associated with transportation facilities.

Users interact with CPAT through a user-friendly dashboard interface, enabling them to input data reflective of their specific policy scenarios. Initially, information is entered into the Mitigation Module, where the tool assesses the policy's impact under a "business-as-usual" scenario across various metrics. The tool automatically generates all necessary charts using spreadsheet formulas. Subsequent modules can be assessed similarly, each producing its unique set of metrics.

By inputting data from policy scenarios, CPAT assists policymakers in evaluating, designing, and implementing strategies to lower greenhouse gas emissions, facilitating a just transition that supports both environmental sustainability and energy security. Although CPAT is not publicly accessible, a detailed overview of its structure and functionality is available through IMF Working Papers. (83)

2.7 Recommendations and Conclusions

2.7.1 Policy Implication Recommendation

The report's findings lead to several policy implication recommendations designed to enhance the development, implementation, and effectiveness of local Clean Energy Transition Plans (CETPs) across Europe. These recommendations aim to address the identified barriers and leverage opportunities, fostering a supportive environment for achieving the EU's ambitious energy and climate targets. The key policy implications and recommendations are as follows:

1. Strengthen Policy Coherence and Integration

National and EU Level Coordination: Policies at the European and national levels should be more closely aligned to provide a coherent framework that supports local CETP efforts. This includes ensuring that national energy policies are conducive to achieving EU-wide energy and climate goals, facilitating a seamless translation of these objectives into local action plans. **Cross-Sectoral Policy Integration:** Encourage the integration of energy transition policies with other sectors such as transportation, agriculture, and urban planning. This holistic approach can enhance the effectiveness of CETPs by leveraging synergies between sectors and addressing interconnected challenges.

2. Enhance Financial Support and Incentives

Increase Funding Opportunities: Expand funding mechanisms and financial incentives for local governments and stakeholders involved in the development and implementation of CETPs. This could include grants, loans, and other financial instruments tailored to support clean energy projects at the local level. **Simplify Access to Funding:** Simplify the application and approval processes for funding related to CETPs to ensure that local entities can easily access the financial resources needed to support their transition plans.

3. Foster Stakeholder Engagement and Capacity Building

Enhance Stakeholder Collaboration: Strengthen mechanisms for stakeholder engagement in the CETP development process, ensuring that all relevant parties, including local communities, industry, and NGOs, are actively involved and their perspectives are considered. **Capacity Building Programs:** Implement targeted capacity-building programs for local authorities and stakeholders to enhance their understanding of clean energy technologies, policy development, and project management. This includes training on the use of tools and methodologies for planning, implementing, and monitoring CETPs.

4. Promote Innovation and Knowledge Sharing

Support for Innovation: Encourage innovation in clean energy technologies and practices through policy support, research and development funding, and pilot projects. Innovative solutions should be

recognized and scaled up to contribute to the effectiveness of CETPs. Establish Knowledge Sharing Platforms: Create and maintain platforms for sharing best practices, lessons learned, and success stories related to CETPs. This can facilitate knowledge transfer and enable local authorities to learn from each other's experiences.

5. Address Regulatory and Administrative Barriers

Streamline Regulatory Processes: Review and, where necessary, streamline regulatory and administrative procedures that may hinder the development and implementation of CETPs. This could involve simplifying permit processes for renewable energy projects and removing unnecessary bureaucratic hurdles. **Adaptive Policy Frameworks:** Develop flexible and adaptive policy frameworks that can accommodate new technologies and changing market conditions. Policies should be regularly reviewed and updated to ensure they remain relevant and effective in supporting CETPs.

6. Emphasize Local Specificities and Flexibility

Tailored Approaches: Recognize the diversity of local conditions across Europe and allow for flexibility in how CETPs are developed and implemented. Policies should support tailored approaches that consider local resources, needs, and socio-economic contexts.

7. Support Research and Development (R&D) Activities

Increase investment in research and development activities focused on clean energy technologies and solutions. This should include both public and private sector funding, aimed at advancing technological innovation, reducing costs, and increasing the efficiency and scalability of renewable energy sources.

- **Foster Public-Private Partnerships:** Encourage partnerships between academic institutions, industry, and government entities to drive innovation in the energy sector. These collaborations can accelerate the development of cutting-edge technologies and facilitate the practical application of research findings in local CETPs.
- **Incentivize Experimental Projects:** Provide incentives for the implementation of experimental and pilot projects that explore new approaches to clean energy generation, storage, and distribution. Learning from these projects can inform policy development and the strategic direction of CETPs.
- **Enhance R&D Infrastructure:** Invest in the development of infrastructure necessary to support R&D activities, such as research labs, testing facilities, and innovation hubs. This infrastructure can serve as a foundation for the development of new technologies and the training of skilled professionals in the clean energy sector.
- **Promote Knowledge Exchange on a Global Scale:** Support initiatives that facilitate international collaboration and knowledge exchange in R&D. Engaging with global research networks can bring fresh perspectives, share best practices, and introduce innovative technologies and methodologies to local CETPs.

By prioritizing support for R&D activities, policymakers can ensure that local CETPs are built upon the latest scientific advancements and innovative technologies. This proactive stance on R&D not only enhances the effectiveness and sustainability of energy transition efforts but also positions Europe at the forefront of the global move towards a cleaner, more resilient energy future.

By implementing these recommendations, policymakers at the EU and national levels can significantly enhance the framework within which local CETPs operate, thereby accelerating the transition to clean energy across Europe. These policy implications aim to create an enabling environment that supports local efforts in contributing to the EU's energy and climate goals effectively and sustainably.

2.7.2 Conclusion/Input to Further Tasks of Step-WISE

The conclusions of the report draw together the insights and findings from a comprehensive analysis of local Clean Energy Transition Plans (CETPs) across Europe, highlighting the critical role these plans play in achieving the EU's ambitious energy and climate goals. The report underscores the importance of aligning local CETPs with broader European and national policy frameworks, while also acknowledging the unique challenges and opportunities that come with implementing these plans at the local level. Key conclusions from the report are as follows:

- **Significance of Local CETPs:** Local CETPs are essential instruments in the EU's energy transition, offering tailored approaches to clean energy development that reflect the specific needs, resources, and capacities of individual communities and regions. Their successful implementation is crucial for achieving EU-wide targets for greenhouse gas emission reductions, renewable energy adoption, and energy efficiency improvements.
- **Policy and Regulatory Frameworks:** The analysis highlights the necessity for coherent and supportive policy and regulatory frameworks at both the European and national levels. Such frameworks should facilitate, rather than hinder, the development and implementation of local CETPs, providing clear guidelines, financial support, and incentives to drive forward local energy transition efforts.
- **Barriers to Implementation:** The report identifies several barriers to the effective implementation of CETPs, including economic and financial constraints, technological challenges, regulatory and administrative hurdles, and socio-cultural factors. Overcoming these barriers requires concerted efforts from policymakers, stakeholders, and the community at large.
- **Role of Stakeholder Engagement:** Active engagement and collaboration among all stakeholders involved in the energy transition process are vital for the success of local CETPs. This includes local authorities, energy providers, businesses, NGOs, and the wider community. Effective stakeholder engagement ensures that CETPs are both ambitious and achievable, reflecting the collective vision and commitment to a sustainable energy future.
- **Need for Enhanced Support and Capacity Building:** The report emphasizes the importance of providing targeted support and capacity-building initiatives for local authorities and stakeholders. This includes technical assistance, access to best practices and case studies, and training in the use of tools and methodologies for planning, implementing, and monitoring CETPs.
- **Innovation and R&D:** Supporting innovation and research and development activities is critical for advancing clean energy technologies and solutions. The report advocates for increased investment in R&D, fostering public-private partnerships, and encouraging pilot projects that test new approaches to energy generation, storage, and distribution.
- **Flexibility and Tailored Approaches:** Recognizing the diversity of local contexts across Europe, the report concludes that CETPs must be flexible and tailored to the specific conditions and needs of each region. Policies and support mechanisms should allow for this flexibility, enabling local authorities to develop and implement plans that best suit their unique circumstances.
- **Global Knowledge Exchange:** The report acknowledges the value of engaging in global knowledge exchange and collaboration, allowing local stakeholders to learn from international best practices and innovations in clean energy. Such exchange can enhance the effectiveness of CETPs and accelerate the energy transition process.

In conclusion, the report asserts that local CETPs are indispensable to Europe's energy transition, providing a critical link between high-level policy objectives and concrete actions on the ground. Achieving the EU's energy and climate targets will require a concerted and collaborative effort across all levels of governance, with local CETPs at the forefront of this endeavour. By addressing the identified barriers, leveraging opportunities for innovation, and fostering a supportive environment for local energy transition efforts, Europe can move closer to realizing its vision for a sustainable, clean energy future.

3 PART B: STAKEHOLDER MAPPING AND SKILL GAP ANALYSIS

3.1 Introduction

To address the challenges and emergent problems that Local and Regional Authorities (LRAs) face in Europe regarding clean energy policymaking, especially in rural, isolated or vulnerable areas, it is crucial to understand the situation of the technical and political teams. That is, insofar the skills, resources at their disposal, and governance models are adequate in order for them to design, implement and evaluate Clean Energy Transition Plans (CETPs). In this sense, this study sets the baseline for the Step-WISE project, which will boost the capacities and ability of LRAs in (Bulgaria, Cyprus, Mediterranean Islands and Spain) to put forward innovative energy policies in a timely, well-informed, and impact-oriented manner.

The most appropriate Clean Energy Transition Plans for local and regional authorities are the Sustainable Energy and Climate Action Plans (SECAPs).

The Sustainable Energy and Climate Action Plans (SECAPs) stand as the cornerstone for local and regional authorities aiming to navigate the Clean Energy Transition effectively, deeply intertwined with the ambitions and framework provided by the Covenant of Mayors. This initiative, which rallies cities and regions to commit to ambitious climate and energy targets, promotes SECAPs as a comprehensive tool not only for setting goals but for embodying a collective journey towards sustainability.

At the heart of SECAPs lies a recognition that the path to a sustainable future is multifaceted, blending the urgent need for climate action with the strategic deployment of renewable energy resources. This approach transcends mere policy-making, embedding itself in the fabric of communities by tailoring strategies to the unique environmental, economic, and social landscapes of each locality. Such customization ensures that initiatives resonate with local needs and harness specific opportunities, thus optimizing the impact of these plans.

Even if they have not developed one, LRAs know what such plans are. This is why we asked about them directly in the questionnaires and interviews, in order to have a better understanding with the study participants of the type of plans we were referring to.

3.2 Methodology

The research required for this deliverable has been based on several phases and different typologies of research. In order to meet the objectives of this diagnosis, the methodology was structured around: (1) the consolidation of a local CET Plans framework; (2) a stakeholder mapping; (3) skills gaps analysis; (4) questionnaires aimed at stakeholders and LRAs; and (5) interviews to dig into the barriers and baseline of LRA technical and political teams.

3.2.1 Stakeholders mapping

The organizational structure, collaboration and cooperation mechanisms among stakeholder groups (institutional, social, economic and educational) involved in energy planning at different levels (National, regional and local levels) have been assessed following a sociogram structure. That is, clustering stakeholders in a map according to their role and activities while also taking into account different geographical and political context as well as energy target's ambition (See Annex 02: Stakeholders mapping template). This map of stakeholders and its relations reveals the existing needs of LRAs in their alliance with private and social actors, as well as potential collaboration challenges and opportunities regarding the public-private partnerships in energy and climate policymaking.

3.2.2 Skills gap analysis

Based on the stakeholders' mapping, the analysis focused on the specific knowledge, skills, and capacities that each stakeholder group, especially Local and Regional Authorities, must properly drive the energy transition. These have been organised to strategically understand the weaknesses that technical and political teams have when not only designing local policies, but also implementing them (including budgeting) and evaluating. The latter is a fundamental aspect that has been analysed, to understand the ability of Local and Regional Authorities to learn from their policies and understand the level of multi-dimensional impact (social, environmental, economic) that ways of launching projects/policies have.

3.2.2.1 LRAs Questionnaire and Other stakeholders Questionnaire

An on-line questionnaire was launched to start engaging relevant stakeholders involved in the CETPs development, to understand the skills that their role requires, evaluate building capacity needs to cover any potential technical, legal and/or social capacity skills gap as well as identify main barriers they face when initiating the energy transition planning (but also implementing and evaluating)¹.

In order to reveal the most fundamental challenges of LRAs regarding CETPs, and the skills they have and lack to respond to the energy and climate problems in their regions and localities, a questionnaire was designed following 4 building blocks: (1) Identification & characterisation; (2) Energy context; (3) Energy planning and measures; (4) Skill and digital gaps.

With a similar structure but aimed at looking not only at the shortcomings of LRAs in planning and implementing CETPs, but also at their interrelationships and roles in this planning, the questionnaire was designed for the other stakeholders.

3.2.2.2 LRAs and Consultants Interviews

Leveraging on the questionnaire responses, direct interviews with local stakeholders of each Use Case were organised, to dig into capacities they would require. To delve deeper into the challenges, existing skills and gaps of LRAs, an interview guide was organised in 6 pillars: (1) Local/Regional

¹ The questions differed somewhat depending on whether the respondents were LRAs or other stakeholders, as can be seen in Annex 03: LRAs Questionnaire and Annex 04: Other Stakeholders Questionnaire.

challenges in energy policymaking; (2) Past, current and envisioned public policies; (3) Training and capacities; (4) Digital tools; (5) Workflow and (6) Future recommendations.

Interviews were conducted not only with LRAs but also with some consulting firms that also develop such schemes (See Annex 06: Interview script for local and regional authorities).

3.3 Heterogeneity of Europeans LRAs and stakeholder mapping

In order to delve into the skills gaps and relevant stakeholder groups that influence or relate to CETPs, a total of 65 responses were obtained from the questionnaires, 28 of which corresponded to LRAs (43%) and the remaining 37 responses corresponded to other stakeholders (57%). The distribution of responses among the use cases is shown in **Figure 3**:

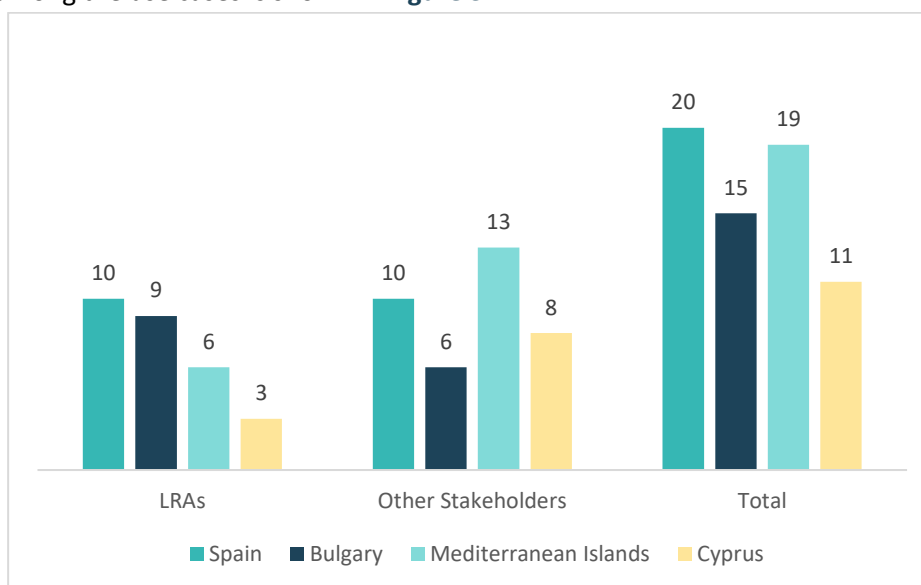


Figure 3. Total responses to questionnaires by UC.

Spain has obtained the highest number of total responses: 20 responses, 31% of the total, followed by the Mediterranean Islands with 19 responses (29% of the total). Within the latter, 6 responses from LRAs have been received from 4 different countries: Italy (4), Malta (1) and Croatia (1). In third place is Bulgaria with 15 responses (23% of the total), and finally, there is Cyprus, with 11 responses, 17% of the total received.

3.3.1 Heterogeneity of Europeans LRAs

When looking for LRAs to consult, the approach was to reach out to diverse municipalities in order to achieve representativeness. Among the variables to be considered were rural/urban classification, population density, diversity of regions in the Use Cases and the existence or not of CETPs.

Within the LRAs responses, initially, we considered it important to separate the responses by urban and rural municipalities. Of the total number of municipalities surveyed, 16 were urban (57%) and 12 were rural (43%). 71% of technical and political officers that answered the questionnaire were directly involved with energy and climate policies, which indicates a strong representativeness of areas/departments responsible for these actions related to CETPs.

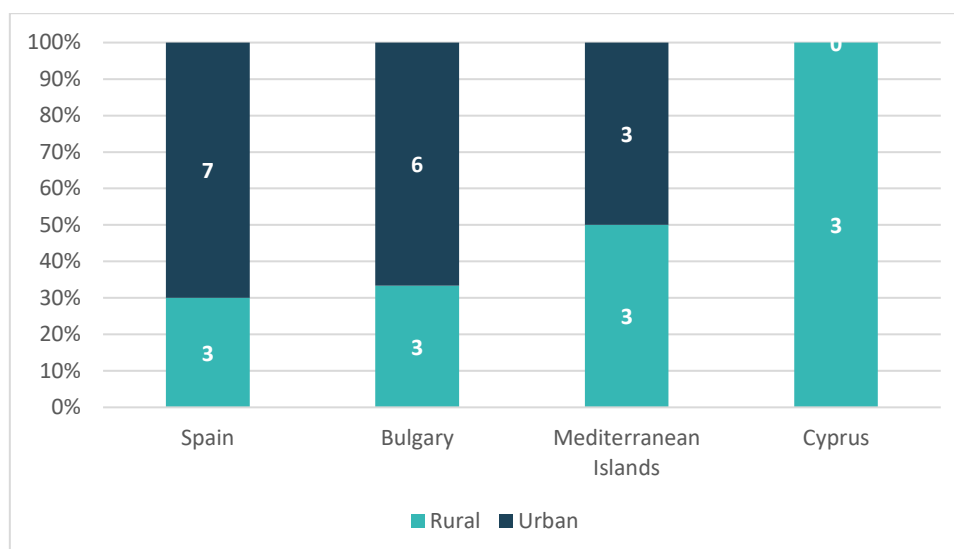


Figure 4. Rural/urban distribution of responses

The **Figure 4** shows the distribution between urban and rural municipalities within each use case. Spain has the highest number of urban municipalities (70%), followed by Bulgaria (67%) and the Mediterranean Islands (50%). All responses received from Cyprus correspond to rural municipalities, where some are not even called municipalities but communities.

3.3.1.1 From the interviews

The interviews allowed for a more in-depth analysis, delving into the challenges or unresolved questions that derived from the questionnaires. In this sense, the interviews covered a diverse typology of LRAs, including rural and underdeveloped urban, and also at different stages of the CETPs development (with a SECAP and without one). In **Table 28** there are the general characteristics of the LRAs and consultants interviewed.

Table 28: Municipalities and Consultancies interviewed.

Use Case	LRAs and other stakeholders	Population	Density (inhabitants/Km ²)	Rural/Urban	CET Plan
UC Bulgaria	Consultancy	N/A	N/A	N/A	N/A
	Municipality A	10,000-15,000	20-40	Urban	SECAP
	Municipality B	5,000-10,000	75-125	Urban	no
UC Spain	Municipality C	125,000-150,000	4,000-6,000	Urban	no
	Municipality D	2,500-3,000	60-80	Rural	SECAP
	Municipality E	200-400	15-25	Rural	no
	Municipality F	100-200	2-5	Rural	no
	Consultancy	N/A	N/A	N/A	N/A
UC Cyprus	Community	400-800	500-1000	Rural	no
	Consultancy	N/A	N/A	N/A	N/A
UC Mediterranean Islands	Island Municipality A(Croatia)	2,000-4,000	8-15	Urban	SECAP

	Island Municipality B (Italy)	10,000-15,000	240,000-250,000	Urban	No
	Island Municipality C (Malta)	10,000-15,000	5,000-10,000	Urban	No

3.3.2 Stakeholder mapping

From the questionnaires, it is possible to know the type of departments of the LRAs that usually work on this type of plans. It is possible to see a trend, as you can see in **Figure 5**, in the type of department that is usually in charge of these plans. In most cases there is usually a department that can be called sustainability, environment, ecology, ecological transition, or there can be a department for energy (and climate in some cases). Or it can be done by the territorial or spatial planning departments.

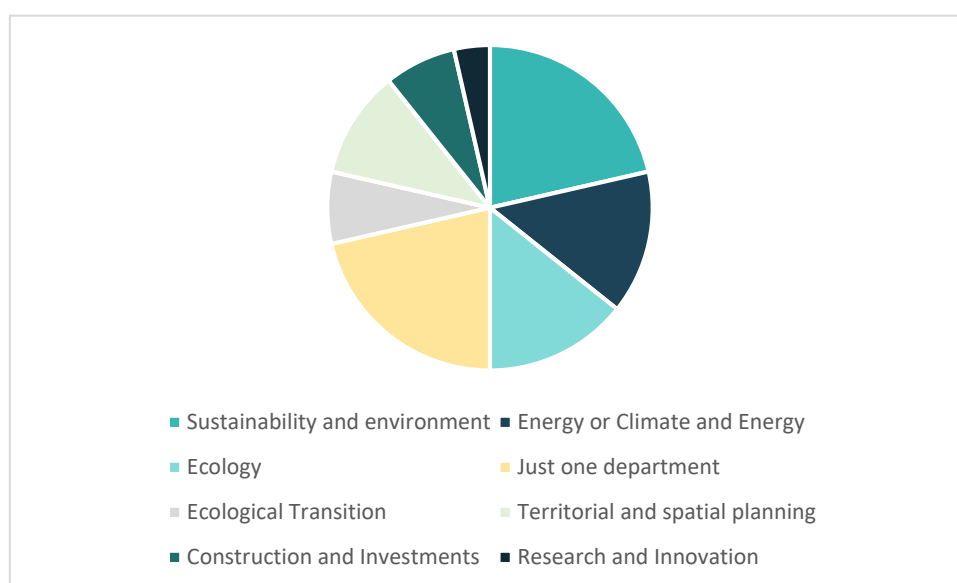


Figure 5. Departments in charge of developing CETPs

When asked about other departments that support the elaboration of these plans, 5 of the 29 LRAs highlight that this type of plans is cross-cutting and work with all departments of the municipality. Others (23%) are too small and have only one department. Others do comment on specific departments such as Traffic, Social Welfare, Urban Planning, Industrial Engineering, Mobility, Social Action, Architecture and Spatial Planning, Ecology; Administrative, Legal and Information Services, Services, Revenue, Social Services, Intervention, Finance Department, Business Development and European Policies Department, Building, Housing, Employees, Planning and Public Works, Education and Culture, Procurement of Outsourced Services and, Strategic Development.

The Mediterranean Islands, have a particular situation and are often dependent on a regional or national institution and report working with external entities such as energy suppliers and universities.

Apart from LRAs, other stakeholders have been identified in relation to their relevance in the design, implementation, and evaluation of CETPs. That is, stakeholders that have important knowledge and play a key role in developing or implementing energy policies, and groups that are affected by the policies that are in place. These socioeconomic and private stakeholders play shed light on the

necessary skills and needs that LRAs require to put in place impact-driven Clean Energy Transition policies.

Following the five Helix model, 5 stakeholder groups were taken into account: public sector, social actors (including NGOs and grassroots representatives), economic entities or representatives (especially in sectors related to the energy transition), educational (mainly academia), and cultural (mainly media).

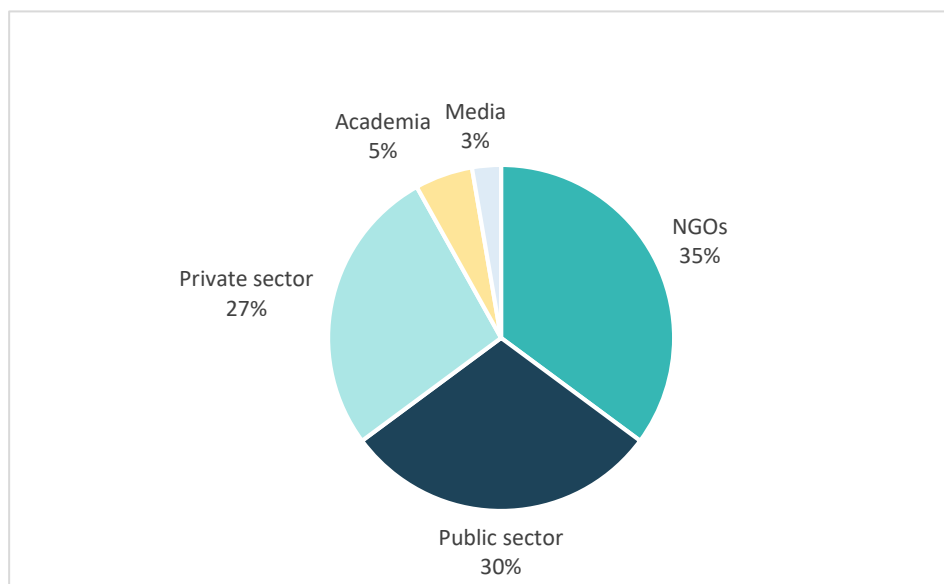


Figure 6. Type of stakeholders related to CETPs

As the **Figure 6** shows, NGO is the sector with the highest representation (35%), followed by the public sector entities (30%) and private sector organisations (27%). Regarding their scope, answers show that the vast majority have a national scope (68%), while those with a regional or local scope split the remaining 32% equally. **Table 29** shows types of these stakeholders.

Table 29. Types of other stakeholders

Private	Academia	NGOs	Public Sector
Energy suppliers	Research Institutes	Sustainable platforms	Regional Public Entities
Consultancy firms	Biodiversity/Conservation Institutes	Industry Associations	Energy Agencies
Financial Institutions	Universities	Environmental Foundations	Ministries of Environment
Energy communities		Ecologists organizations	National Energy Saving Institutes
Waste management company		Engineers Professional Associations	State mining companies

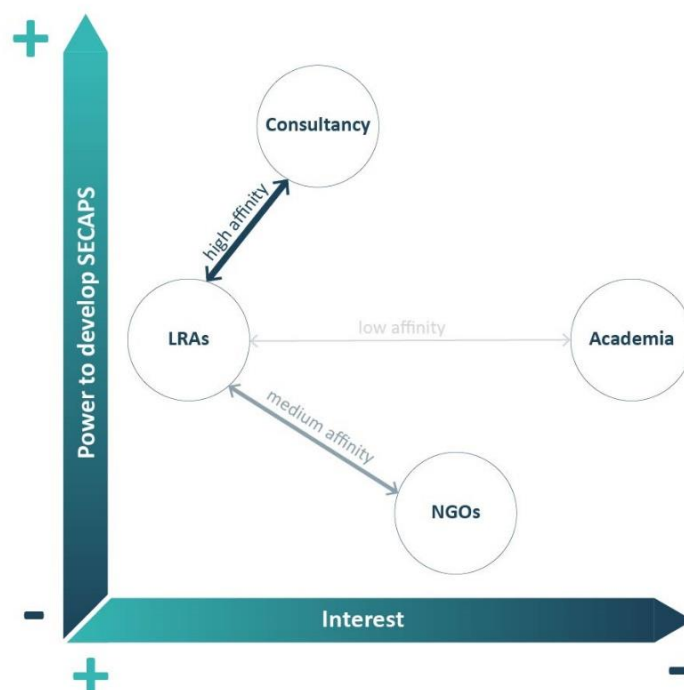


Figure 7. Stakeholders sociogram

In order to understand the relationship between these different stakeholders and their affinity with the CETPs, it can be seen in **Figure 7** that the LRAs, specifically the local authorities, have the greatest interest in developing SECAPs of the entities that relate to them and intervene in these plans, in fact their only mission is to bring out public policies. And the consultancy firms have the greatest power, capacity and interest to develop them and a high affinity with them. The Academy would have medium power, low affinity, and their interest is more theoretical than practical. Finally, NGOs would have a social interest but not so focused on public policies; and medium affinity but low power to develop SECAPs.

In the first place, the relationship with consulting firms was revealed at first in the questionnaires to LRAs. This is also that has been analysed by different academic authors, such as Marianna Mazzucato².

This and the relationship with other stakeholders were revealed with the questionnaires to socioeconomic stakeholders (NGOs, academia, private entities), and then - and most importantly - dug deeper in the in-depth interviews.

3.4 LRAs Challenges and priorities

3.4.1 Analysis at aggregate level

To assess the skills needed, it is first important to understand the energy and climate challenges, as well as the priorities of LRAs. The necessary skills depend on the mission that public authorities have in relation to what and how to tackle emerging and future risks and threats.

Both LRAs and other stakeholders selected all the issues that stood out as most challenging in their contexts.

² Mazzucato. M, Collington. R (2023) *The Big Con*

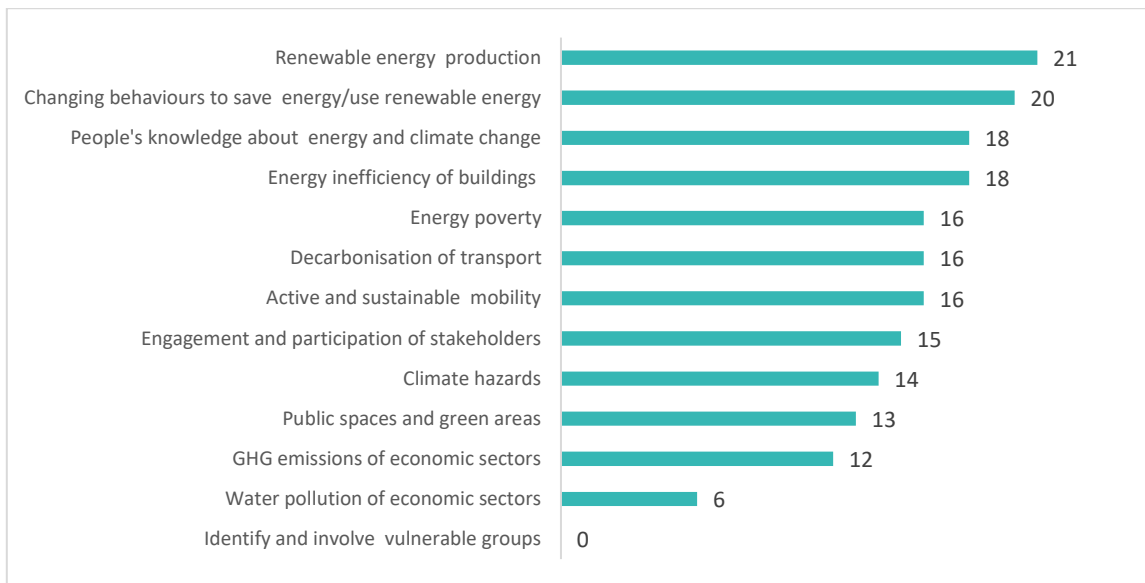


Figure 8. Major Challenges identified by LRAs

At the aggregate level, the most relevant challenges that LRAs identify as most relevant are: 1) renewable energy production, 2) changing behaviours to save energy/use renewable energy, 3) people's knowledge about energy and climate change; and 4) energy efficiency in buildings. This shows there is an ample focus on energy production, implying needs related to skills that allow an understanding of financing models to invest in renewables, different energy sources, design of installation projects, knowledge on the regulatory frameworks, amongst others. Interestingly enough, there is a very significant interest on the sociocultural dimension of the energy transition, that is, the necessary awareness raising in order to shift behaviours. This dimension tackles how to communicate CETPs, as well as forward engagement strategies so that local and regional stakeholders get involved in public-private partnerships, and well-informed decision making in day-to-day practices of consumption but also shared self-consumption of renewable energy, amongst others.

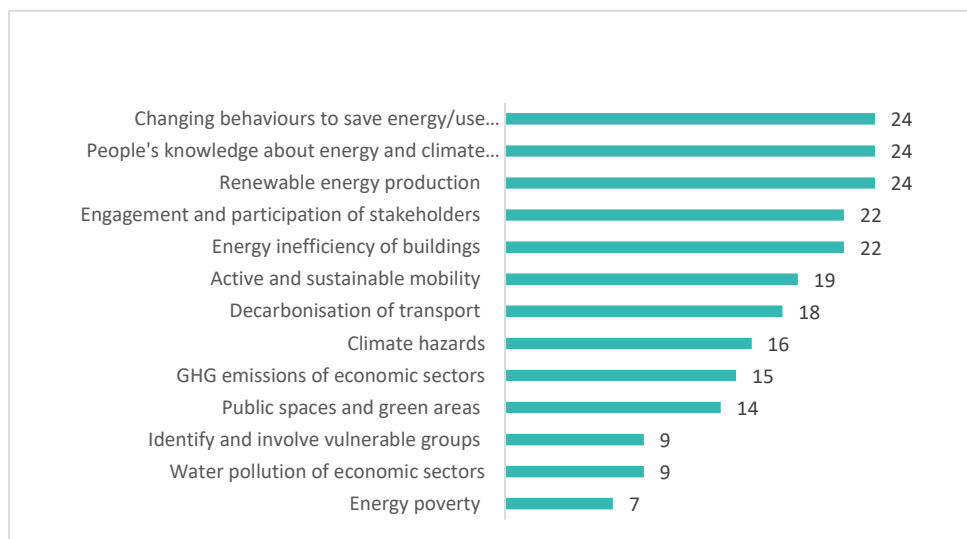


Figure 9. Major challenges identified by other stakeholders.

As **Figure 9** shows, when other stakeholders were asked about the main climate and energy challenges in their areas of influence, the top 3 challenges are the same as those identified by the LRAs, i) Renewable energy production, ii) Changing behaviours to save energy/use renewable energy and iii) People's knowledge about energy and climate change. This reinforces the priorities established.

In addition, challenges are analysed based on the distinction between urban and rural LRAs.

Table 30. Major challenges identified by rural and urban LRAs

Urban

1. Changing behaviours to save energy/use renewable energy
2. Energy inefficiency of buildings
3. Renewable energy production

Rural

1. Renewable energy production
2. Public spaces and green areas
3. People's knowledge about energy and climate change

As shown in the table above, renewable energy production appears as the most important challenge, in both rural and urban LRAs. However, on the one hand, for urban authorities, the next main challenges are related to behavioural changes and the energy inefficiency of buildings; on the other hand, rural authorities prioritise public space and green areas, as well as people's knowledge regarding energy and climate change are ranked. This could be related to the need of rural authorities to improve their public spaces, being more underdeveloped, and so public lighting or public charging points of electric cars have still a lot of room for innovation.

Finally, municipalities were asked about other challenges not included in the above, and responses included the creation of energy communities, energy storage and food security. First, energy communities and energy storage are connected to the priority of increasing the production of renewable energy and changing behaviours in the energy system, by adding new actors (local and multi-dimensional) and also new practices (innovating in the storage to increase the potential of renewable energy). Secondly, food security is connected to climate adaptation, and the need to bridge adaptation and mitigation is fundamental to pave the way for transformative policies, in the sector of agriculture or transport, for instance.

3.4.2 Analysis at Use Case level

It is also interesting to look at the responses at the Use Case level. The table below shows the top three challenges for each of Spain, Bulgaria, Mediterranean Islands and Cyprus.

Table 31: Major challenges identified by countries.

Spain

1. Renewable energy production
2. Energy inefficiency of buildings
3. People's knowledge about energy and climate change

Bulgaria

1. Changing behaviours to save energy/use renewable energy
2. Energy inefficiency of buildings
3. Climate hazards

Mediterranean Islands

1. Renewable energy production
2. Changing behaviours to save energy/use renewable energy
3. Decarbonisation of transport

Cyprus

1. Public spaces and green areas
2. Active and sustainable mobility
3. Renewable energy production

Unsurprisingly, renewable energy production is the major challenge (Spain, Mediterranean Islands and Cyprus) and behavioural changes still have a significant relevance (Bulgaria and Mediterranean Islands). Energy inefficiency in buildings appears as a major concern (Spain and Bulgaria) and decarbonisation of transport (Mediterranean Islands), sustainable mobility (Cyprus), public space and green areas (Cyprus) and climate risks (Bulgaria) are also considered as relevant challenges.

3.4.2.1 From the interviews

From the interviews we can extract that in general, urban LRAs have challenges like GHG and water pollution in industry processes that are not a challenge in rural areas for not having industry there. Other priority more common for urban LRAs are the sustainable transport with measures such as cycleways or electric buses, that will help reduce air pollution and traffic in the city.

In **Spain**, although LRAs have a high priority on renewable energy production and energy efficiency in buildings, the energy and climate knowledge of the population rises in importance. Transport for some municipalities is important because recently there has been a significant decline in active mobility. In some cases, energy poverty was mentioned as a challenge to overcome, although curiously in smaller rural villages this was not a problem because they could make use of traditional forest resources. Moreover, two of the four Spanish municipalities interviewed mentioned the creation of Energy Communities as a challenge, given the lack of knowledge on the regulatory framework in Spain and Europe, and the lack of skills to bridge technical and social elements needed; and one small rural municipality mentioned the problem of water treatment due to the lack of a treatment plant.

When talking to consulting firms it is easy to notice the high connection with LRAs and CETPs. They are very knowledgeable and have a high interest in developing these types of plans.

The key informant interviewed as an energy and climate consultant for diverse public authorities considers the main challenges for LRAs to be energy efficiency in residential buildings and sustainable mobility. Regarding energy efficiency in buildings, *“The population is not able to make the investment in both rehabilitation and solar panels. The municipalities do not have the technical and economic capacity to comply with the ambitious commitments they have in this regard”*. Regarding mobility, *“The replacement of vehicles in the short term may be easier but changing the general model (which is what should be done) is more complicated due to the characteristics of the population's way of life. The car culture is difficult to change”*. From this experts' experience, the lack of skills of LRAs can be summarised in: i) raising funds or providing sufficient budgeting for energy policies; ii) technical knowledge related to energy efficiency; and iii) social knowledge regarding the engagement and awareness needed for a new energy culture (around transportation for instance).

In **Bulgaria**, it is mentioned as a challenge the reduction of GHG emissions from the use of coal and other fossil fuels for heating and power generation. This is striking because the use of coal in some countries of Europe like Spain has already been phased out. In some rural municipalities in Bulgaria

the effects of climate change are already becoming challenges for them, in particular a “*decrease in the amount of water and frequent cases of drying up of wells, damage to crops, withering or failure of trees and an increase in the risk of forest fires. At the other extreme are periods of intense rainfall or strong winds, which also damage crops and vegetation*”. In fact, for LRAs in Bulgaria, managing the energy sector includes strategies for adaptation to climate change, which is increasingly interesting as mitigation only projects seem to be less impactful in the population. The Mediterranean Islands also shared as challenges the ones related to climate change effects like sea level rise or heat effect, which is posing novel problems that affect economic sectors that depend on it, amongst others. In other cases, some municipalities in Bulgaria have also stated to have faced challenges such as power outages, shortage of energy resources or risks of energy dependence, so one of their priorities is the Security of Energy Supply.

Some medium cities (Municipality A) with a SECAP planned, have a wider vision of the climate and energy challenges, taking into account not just the energy performance, consumptions and savings, but also adaptation to climate change, social justice and local governance and cooperation. The same way, they have a more complete understanding of the variety of approaches and solutions approaching these challenges: “*The combination of different approaches and solutions will lead to a complex and comprehensive approach to the development of an energy policy at the local level*” for the Municipality A.

On the contrary, in small rural areas in **Cyprus**, the main priority are the Community buildings (e.g. school), which become a challenge for them because these old buildings might be better in terms of insulating properties but much harder to upgrade. For these small and very rural municipalities, the approach is first of all economic because the funding “*is hardly enough to meet current needs, so it’s not possible to undertake energy renovations or any other innovation*”. The same economic approach stands out in the small and disconnected Spanish Municipality F to cover the bare necessities.

The challenges in the **Mediterranean Islands** have a somewhat different perspective; There is a high dependence on diesel for transportation, which is why they are planning on the use and production of green hydrogen on the island. In some cases in which the Island is also touristic, Island Municipality A, there is a problem with the wastewater and the ferries. They can also have difficulties with the transportation by the sea.

The municipalities with more tourism include the "services" and the reduction of traffic reduction, aspects among their priorities, which the others do not.

Expert from a Consultancy firm in Cyprus highlighted the challenge of the sustainable mobility. “*There are different needs depending on the area of the municipality – e.g. coastal areas have issues with tourism, mountainous regions have consumption issues in the winter, mainly due to the fact that they are using fossil fuels.*”

3.4.3 CET Plans

As part of the questionnaire, LRAs were by the type of Clean Energy Transition Plans (CETPs) they have developed, or if they have not developed any at all. At the aggregate level, the responses were:



Figure 10. Clean Energy Transition Plans

As can be seen from **Figure 10**, according to the questionnaires, of which we had 29, were a total of 18 LRAs count with a SEAP or SECAP, while the remaining 10 respondents have answered that they do not have one but are interested in developing a CET policy (36%). The majority of the respondents, 12 LRAs claim to have a SECAP (43%), 2 municipalities claim to have a SEAP (7%) and another 4 LRAs claim to have another type of energy and climate related plan (14%).

It is appropriate to look at the development of climate and energy related plans at the Use Case level.

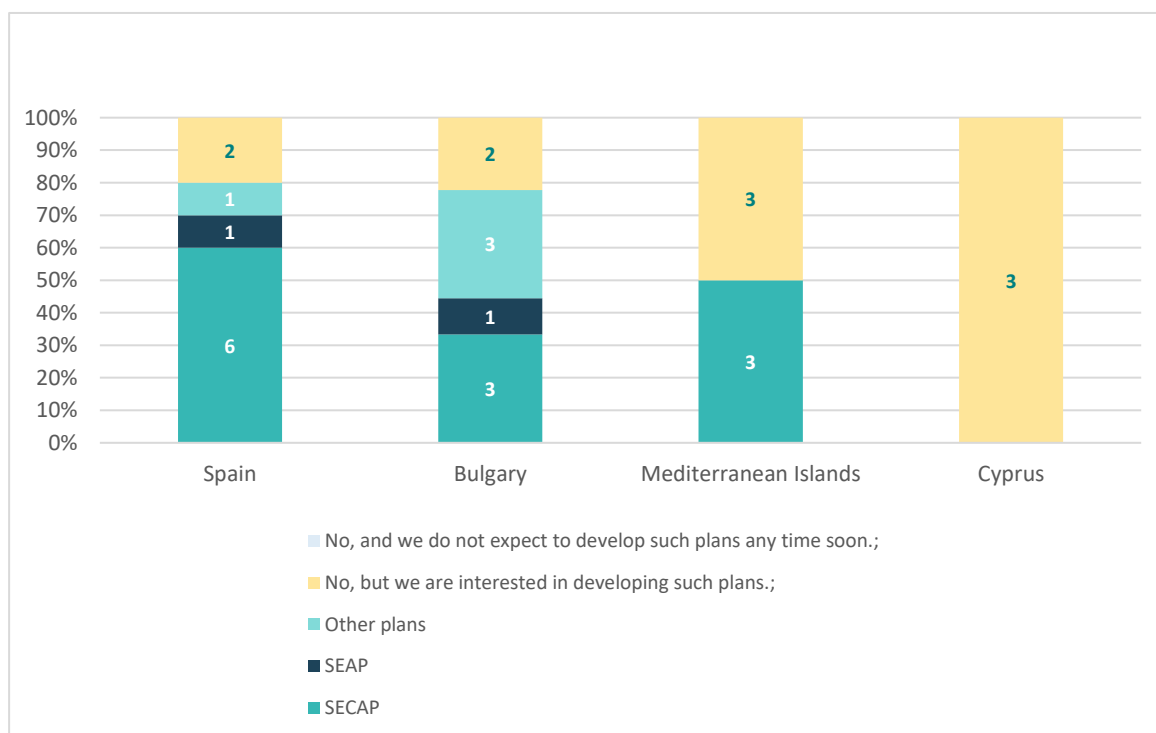


Figure 11. CETPs in the LRAs by UC

As can be seen from **Figure 11**, Spain is the UC with the highest number of municipalities with energy and climate plans (8 in total), followed by Bulgaria (7 in total) and the Mediterranean Islands (3 in total). Cyprus is the only UC where none of the surveyed LRAs have plans. Additionally, it is noted that municipalities in Spain and Bulgaria have developed SECAPs (6 and 3, respectively) and SEAPs (1 for each). Within the Mediterranean Islands, 3 municipalities declare to be in possession of a SECAP.

Finally, the number of energy and climate-related plans is analysed according to the type of LRA, i.e. whether it is a rural and urban municipality.

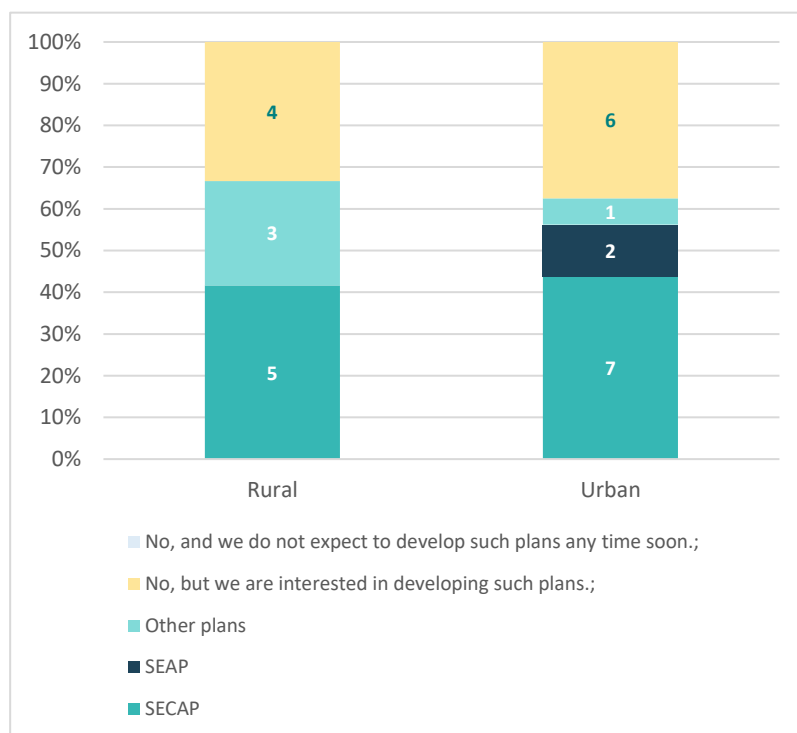


Figure 12. CETPs by the type of LRA

It does not seem that the type of municipality is a variable in the elaboration or not of this type of plans or in the type of policies they have worked on. Among rural LRAs, 8 answered in the affirmative (5 SECAPs and 3 with other plans), while 4 of them answered in the negative. Among urban LRAs, 10 municipalities said that they have an energy and climate plan (7 SECAPs, 2 SEAPs and 1 with other plans), while 6 of them answered that they do not have a plan but are interested in developing one.

3.4.3.1 Subcontracting

Regarding the LRAs that have a climate and energy transition plan, it is interesting to analyse to what extent did they have the skills and ability to design it or if they needed to subcontract some part of it. Only 14% of the LRAs had developed the policy exclusively with its internal staff, while in 36% of the cases they have outsourced it. Still, 50% of the municipalities responded that the plans have been developed by a combination of both. At the Use Case level, municipalities in Spain and Cyprus agree in having outsourced in most cases, while municipalities in Bulgaria and the Mediterranean Islands have mostly done so through a combination of external consultant and internal staff within the LRA.

When asked about the reasons for outsourcing this task, 42% of the municipalities answered that it was due to a lack of expertise in energy and climate issues, 24% attributed it to a lack of resources (including economic and material, not only human), and 21% considered that there was a lack of expertise in the development of such plans. Finally, only 11% responded that it was a lack of specific tools. This reveals **the skills gap in mainly on i) identifying the energy and climate problems and having the technical and social competencies to address them (socioenvironmental knowledge); ii) knowing how to design a local policy (strategic planning); and iii) material resources, mainly economic.** The lack of tools was less regarded as important, as it necessarily needs to be at the service to a deep understanding of the energy problems in the local/regional context. At the Use Case level, municipalities in Bulgaria, Cyprus and the Mediterranean Islands stated the lack of energy and climate expertise as the main reason, while Spanish municipalities answered that the main reason for outsourcing was related to the lack of resources.

Moreover, other stakeholders have been consulted about their involvement in developing climate and energy transition plans for LRAs. At the aggregate level, the responses are as follows:

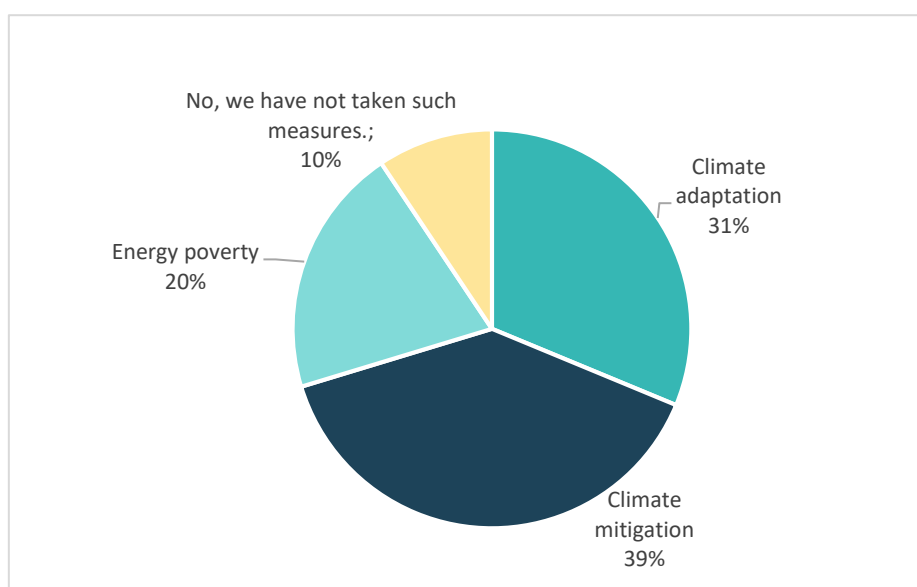


Figure 13. Participation of other stakeholders in energy and climate change measures.

In conclusion, it is possible to affirm that the participation of other stakeholders is high, given that 59% say that they have been involved in the elaboration of this type of plans. This is in line with the answers given by the LRAs regarding the importance of subcontracting in the elaboration of their plans.

According to the consulting firms interviewed, LRAs' reasons for outsourcing SECAPs to them are:

- Major expertise and experience in the energy planning field.
- Continuous communication and joint cooperation with the municipal experts.
- Continuous support for the municipality in implementing the SECAP, not just “handing over” a document.
- Offers a more integrative and outward-looking vision.

3.4.3.2 Status of implementation

In addition, LRAs have been consulted on the status of implementation of the plans or actions/measures detailed above. The responses are shown graphically in **Figure 14**.

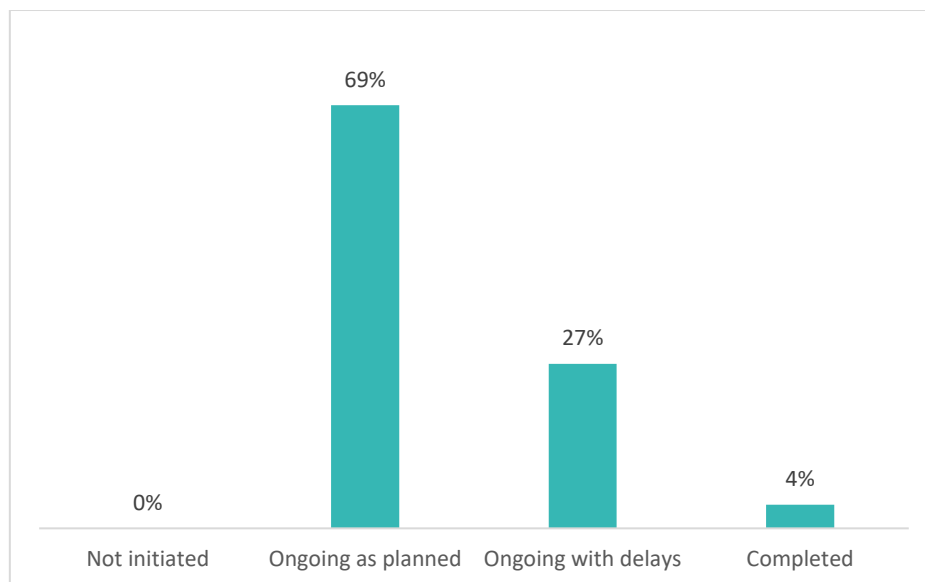


Figure 14. Status of the implementation of the plans and actions

It can be concluded that 96% of the measures are in full implementation, while those that have not yet started and those that are completed are a minority (4%). Within these measures, a significant majority is developing as planned.

3.4.3.3 Monitoring and evaluation

Another key aspect of CET policies is the monitoring and evaluation; this last phase of every public policy allows for LRAs to learn whether their actions have impact, if the objectives aimed at were achieved, what challenges continue to exist or have even increased, and how barriers have emerged or throughout the implementation learnings to overcome them have been developed.

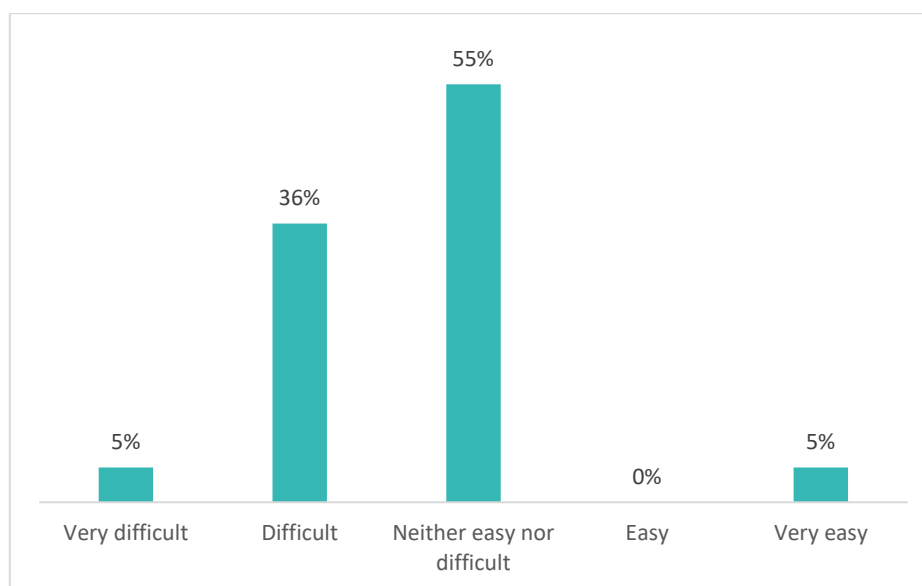


Figure 15. Feeling of difficulty in monitoring.

The responses seen in **Figure 15** indicate that monitoring and evaluation is not an easy task for LRAs (only 5% answered that the monitoring scheme is very easy for them). Most of the municipalities answered that monitoring is neither easy nor difficult (55%), although 41% reported some difficulty in carrying out these tasks.

3.4.3.4 From the interviews

Most of the LRAs interviewed did not have SECAPs: only one in Spain, Bulgaria and in the Mediterranean Islands had SECAPs in place. Other LRAs had other plans or strategies, but all were interested in designing one.

And even with plans in place, the implementation of the measures in these municipalities with SECAPs has many difficulties. In the case of Island Municipality A, SECAP was done as part of a two countries collaboration project. *“The lead partner followed a methodology that did not consider”*. The result is that they are proceeding quite slowly in the implementation of actions, *some measures are very vague even regarding, for example, the effect of climate change on health*. Municipality D developed as well the SECAP together with the regional government. As we are seeing, this may help when it comes to making the plan but makes it difficult when it comes to implementing it.

In addition, a Clen Energy Transition Agenda (CETA) has been developed for some joint Mediterranean Islands, while two separate SECAPs have been made. There is no possibility to make a single Joint SECAP immediately and this was a big limitation because it is actually a homogenous territory.

Regarding to monitoring, technicians are usually in charge of monitoring progress of the plans, normally when requested report from Covenant of Mayors, but there are no specific system, mechanisms or tools to do so. Just one Mediterranean Island Municipality is on a process to develop a more structured monitoring system. The main challenge is that everyone should have access to environmental data.

According to an expert from a Cypriot consultancy, *“Usually there is no monitoring mechanism in LAs. Many times, the consultant ends up doing it, but only if asked. They are not so much interested in monitoring. Some LAs have started to work on it but there are gaps in data collections as well as in monitoring”*.

To do that, “The municipality needs to appoint a team that is responsible for data collection and there has to be a platform for the analysis and collaboration between departments”.

3.4.4 CET Measures

The questionnaire asked LRAs that have a climate and energy transition plan about the type of actions or measures included in them, and asked for 3 categories: climate adaptation, climate mitigation and energy poverty.

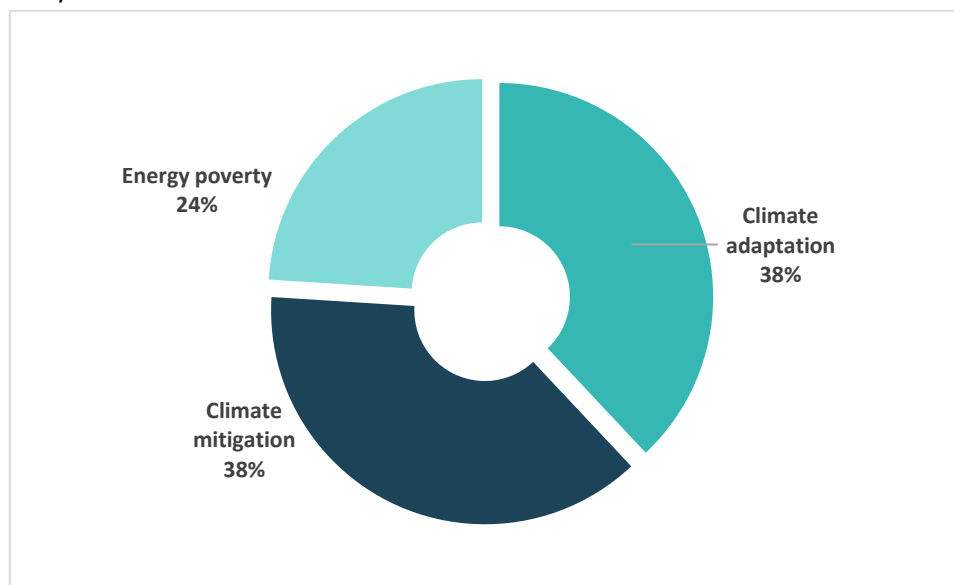


Figure 16. Actions or measures contained in energy and climate related plan.

Figure 16 shows that the plans elaborated by the LRAs mostly include actions and measures aimed at adaptation and mitigation (38% each), while a somewhat smaller part has measures aimed at combating energy poverty (24%).

For those LRAs that do not have an energy and climate plan, they have been asked about other actions or measures they have implemented. Responses can be grouped into the following categories:

- **Energy Optimization:**
 - Study of purchasing electricity from the free energy market.
 - Seeking additional financing for energy efficiency (EE) and renewable energy (RES) projects.
 - Expansion of heat transmission networks to biomass heating plants.
 - Initial steps towards developing "intelligent" infrastructure in municipal buildings.
- **Participation in International and National Programs:**
 - Participation in projects under international and national programs.
 - Preparation for "green" public procurement.
- **Improving Energy Efficiency in Buildings:**
 - Upgrading street lighting to energy-efficient systems.
 - Enhancing energy efficiency in public and residential buildings.
 - Installation of electric charging stations and photovoltaic systems in public buildings and schools.
- **Renovation and Climate Change Adaptation Projects:**
 - Renovation of municipal buildings.
 - Participation in climate change adaptation efforts.
 - Collection of data on thermal stress and air pollution.

- **Legislation and Regulations:**
 - Amendment of tax by-laws.
 - Optimization of heating operating periods.

3.4.4.1 *From the interviews*

Most of the municipalities interviewed, whether with SECAP, or with another type of plan or strategy, have implemented measures.

The distribution of measures collected in the interviews differs with the distribution mentioned in the questionnaires. In other words, all have implemented mitigation measures, but only three (two in Spain and one in Bulgaria)) mentioned measures related to adaptation and one with respect to energy poverty.

The type of measures that are most frequently repeated in all the municipalities, with or without CET Plans are energy efficiency in buildings, lighting and installation of renewables.

In the case of the small rural municipality (but near a big City) in Spain they do not have SECAP but the “Sustainable Development Strategy”, however they have implemented many different measures for such a small municipality. Measures, in addition to those mentioned above, such as:

- Electrical vehicle charging station
- Ecological agriculture
- Reforestation
- Water treatment with green filters
- Traditional use of forest resources

Other measures commented by other municipalities are:

- Energy efficiency in transport systems and low emission zone (Municipalities in Bulgaria and Spain)
- Energy efficiency in industrial production and stimulating innovation (Municipality in Bulgaria)
- Use and production of green hydrogen for transport, electrification of port docks (Mediterranean Islands)
- Water pollution (Mediterranean Island))
- Network and participation (Spain and Mediterranean Islands)

The only municipality that claims not to have implemented any energy and climate measures is the one rural community in Cyprus . They have some ideas for energy upgrades of the local school, pre-school and the old Coop building and they did some social actions for vulnerable households.

Something that has been seen on some occasion is that the Energy Communities help to accelerate the implementation of measures in the municipalities, which also include the sometimes-forgotten social base. This is also something that some municipalities have commented that they are planning to implement soon in Spain and Mediterranean Islands

Most of the municipalities have received support from Next Generation funds for both energy efficiency measures and the installation of renewable energies. But many other subsidies have also come from regional bodies. This helps the decision to take the measures, although the municipalities encounter difficulties due to bureaucratic procedures and delays in payments.

3.5 Well-founded issues on barriers hindering CET Plans

LRAs have been asked about the main barriers that hinder the development of their CET plans. The responses can be found in **Figure 17**

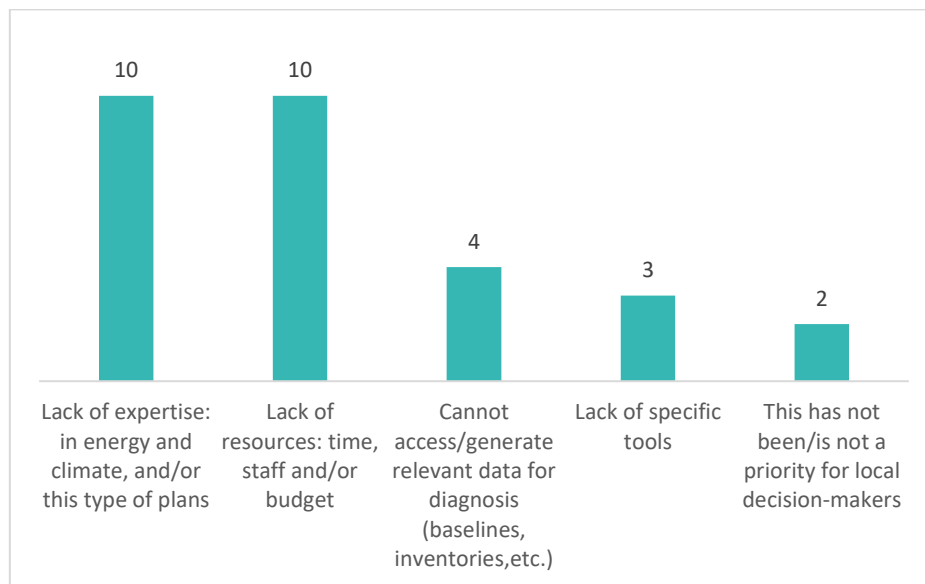


Figure 17. Barriers hindering CET Plans, identified by LRAs

As can be seen, the main barriers related to lack of expertise and lack of resources (10 responses each). On the other hand, the development of these plans is a priority for the authorities, as this explanation received the fewest responses (only 2).

3.5.1 Barriers by UC

When analysing the main barriers at the level of each UC, Spanish and Mediterranean municipalities stated that the main obstacle was the lack of resources (time, staff or budget), while Bulgaria and Cyprus agreed that the main barrier for not developing their energy and climate plans was the lack of expertise in these thematic areas.

In relation to other stakeholders' opinions, they have been asked about the main internal barrier of the municipalities when designing, implementing or monitoring a CET plan. The answers can be found in the following figure.

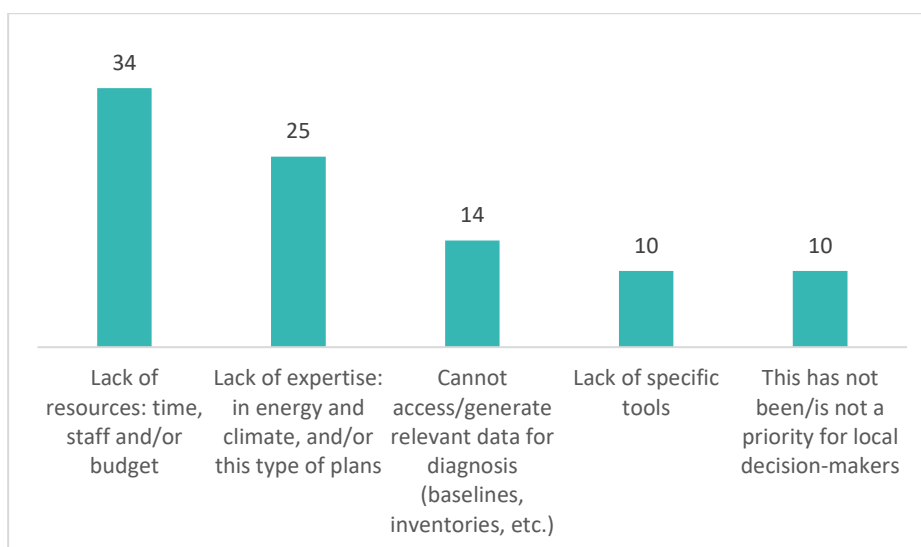


Figure 18. Barriers hindering CET Plans, identified by other stakeholders.

According to **Figure 18**, the other stakeholders agree with the LRAs regarding the order of barriers but consider lack of resources to be the main barrier. In addition, the other stakeholders have been asked to detail what specific tools are missing in the LRAs. The most common responses relate firstly to the lack of access to specialised software or platforms for data collection, analysis, and visualisation, and secondly to the lack of coordination structures within LRAs and between different levels of government.

3.5.2 From the interviews

A barrier that has been repeated, more so in larger municipalities, usually in cities, is **the low level of coordination and poor organizational structure**, that results in the sectorial and disaggregated initiatives. Some of the consulting firms also agreed that this barrier is relevant. *“Having a SECAP requires priority (time and budget) and coordination. There is no strategic vision”*, mentions the technician of a municipality in one of these cities. According to one of the consulting companies, this also occurs in cities with a good budget for measures and commitment. So, the plan is approved but *“they do not have a global vision of a climate plan and there is a lack of an integrating vision between the different policies”*, says the Spanish consultancy. *“The main challenge is lack of overall energy and climate vision and governmental leadership for the development of SECAPs for the local communities. Even though, there is some recognition of the importance of these topics and their ‘practical’ importance to the local communities, the policy development and implementation processes related to them are not a top priority for the local administrations. There is lack of continuity between the programmes for energy and climate, there is lack of sync between the different municipal strategic documents.”* says the Bulgarian consultancy. According to the Cypriot consulting firm, compared to other strategies, *“SECAPs are not a priority”*.

Administrative and political rotation is also a common difficulty. So, the staff changes, and it is difficult to establish continuity.

In some cases, there is a **lack of political willingness** to implement the measures. *“The technical side has a very different vision from the political side. If policy makers are not aware of this, no progress can be made.”*

Even having designed a SECAP,, one of the main problems is the **lack of sufficient financial resources** for the development and implementation of the SECAP. *“Measures to reduce greenhouse gas emissions and improve energy efficiency often require significant investments that municipalities cannot always afford in their municipal budgets”.*

In addition to the above barriers, a Municipality with SECAP mentioned the following:

- **Lack of technical capacity:** The lack of sufficiently trained personnel and technical experts in the field of energy efficiency and renewable energy sources is a serious obstacle to the development of the SECAP and the implementation of the measures.
- **Lack of data and analysis:** In order to develop an effective SECAP, data and analysis on the current state of the energy sector and the climate are needed. Lack of data makes the planning and decision-making process difficult.
- **Lack of public awareness and engagement:** Insufficient awareness and engagement of the local community is an obstacle to the successful development and implementation of the SECAP. The active participation and support of citizens, the business sector and non-governmental organizations is essential for the successful implementation of the measures.

More rural and **disconnected municipalities** like the Cypriot Community or a municipality of “emptied Spain” often express **economic and staffing barriers** because that would really be the first one to be solved.

Specifically, the problem hindering the implementation of actions with Cypriot Communities is that there is no staff often. At the same time, they are more flexible than Municipalities so *“if the President of the Council decides for something to be done, there is less bureaucracy to achieve it”.* Cypriot consultancy says: *“Municipalities could potentially prepare strategies themselves, but Communities (smaller in scale) don’t have the expertise”.*

The barriers in the Islands have a different perspective: The greatest challenge on Island Municipality concerns the lack of technical personnel who could work on the island. *“The problem is not funding but it is difficult to find qualified personnel on the island”.*

When they are highly valuable territories, it may happen that, there is an enormous state and environmental heritage that is disproportionate in comparison to the budget available to implement interventions.

Overcoming all these financial, technical, structural and social barriers will require coordinated and synchronised efforts from all stakeholders.

3.6 Skills Gap

It is interesting to know how informed and trained the technicians of the municipalities are, where they get their information from and where they are trained, in order to prepare a better training programme adapted to their needs.

The information for the CETPs management, as well as news or subsidies they mostly get it from methodological and internet resources, but also from in-house staff, as you can see in **Figure 19**

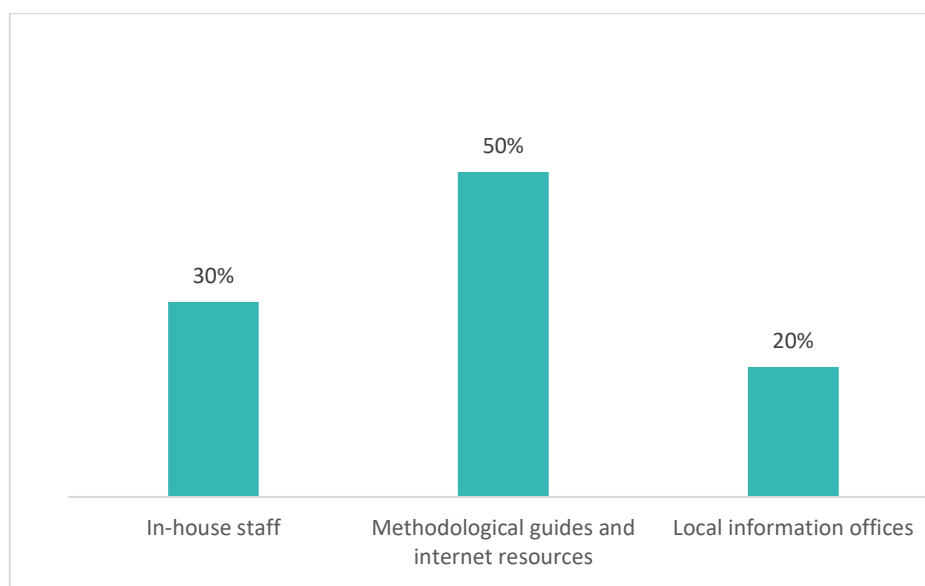


Figure 19. Main information sources

Stakeholders were asked about the skills needed to develop CET plans. This was an open question where they could express openly with no restrictions.

As you can see in **Table 32**, the most important skills needed according to the stakeholders in their questionnaires are the **Knowledge of European, national and local policies and law regulations** related to these plans, suggested 7 times.

Another of the most frequently repeated needs was to understand **the framework of the energy and climate problem**, knowledge of the predictions and effects of climate change or some background knowledge on environment and relate it to the local context. This answer was suggested till 6 times in similar ways.

This also refers to get a *“high level of knowledge of the problem and the causal relationships in it. Not only professional, but also personal commitment and attitude to the topics. Realizing the enormous potential for systemic change and overcoming current inequalities during the energy transition.”*

Communication skills such as the ability to inform, raise awareness and guide or the ability of using simple and understandable language, was also one of the most repeated requirements, with 5 suggestions related to it.

Without specifying, the need to acquire **technical skills** was also repeatedly mentioned. And related to this was the need to be updated **know-how of the new technologies**.

In particular, being able to work on assessing the **energy performance of both buildings and transport** was one of those technical skills that was repeatedly required.

Another technical issue that was required and somewhat related to the previous one was the specific **training on climate change, mitigation, adaptation and energy poverty measures, Carbon Footprint Assessment** and in-depth knowledge of the **decarbonization process**, as well as the **benefits derived from the measures**, such as economic savings, together with GHG emissions and water savings.

Without being technical or related to the issue of CET Plans such as energy, other competences required are more related to leadership, teamwork, and interdepartmental work. *“Such policies need*

to be approached from a holistic perspective, involving several departments of the public administration, and therefore require skills that are conducive to this interdepartmental work and a willingness to make it happen.”

Also, as a recurring competence would be networking, stakeholder engagement and cooperation, which is related to “*Learning, listening and sharing knowledge and experience between stakeholders*”.

Other skills with a couple of mentions were: Critical, judgment and strategic thinking; Data collection and analysis; Effective design of public fundings and schemes, and policy analysis; Local group dynamisation skills and empowering the population.

It is also interesting to show some, which although only mentioned once, could be interesting to point out: Perseverance and continuous learning; Risks assessment; Design principles; Digital and media literacy; economic analysis.

Although they are not really skills, it was also mentioned that they would be useful: Having the right staff and a specifically designed path to achieve those objectives, and Creation, support and development of local businesses that favour local transition.

Table 32: Repeated skills needed for CET Plans

Skills	Nº repetitions
Knowledge of European, national, and local policies and law regulations	7
Environmental, Energy and Climate Change framework	6
Communication skills	5
Technical skills and updated know-how of the new technologies	5
Assessment of Energy performance of buildings and transport	3
Networking, stakeholder engagement and cooperation	3
Team-work and multidisciplinary and interdepartmental work	3
Leadership and knowledge of leading experience/projects in energy transformation	3
Carbon Footprint Assessment and In-depth knowledge of the decarbonization process	2
Specific training on climate change, mitigation, adaptation, and energy poverty measures	2
Benefits derived from the measures (economic savings, GHG emissions and water savings)	2
Critical, judgment and strategic thinking	2
Data collection and analysis	2
Effective design of public fundings and schemes, and policy analysis	2
Local group dynamisation skills and empowering the population	2

3.6.1 From the interviews

Usually there are no training programmes included in the municipalities. They are the technicians of the municipalities who voluntarily train and update themselves for the best development of their tasks. It has been seen on more than one occasion that many of the training activities received by the interviewees were organized by the regional organizations.

Just one of the Mediterranean Islands Municipalities claimed to have a capacity building program, targeting municipalities and local stakeholders to understand and read scientific data, maybe because the island they have two levels of government: central and local.

The themes of the trainings attended by the interviewees were:

- Sustainable Development Goals/Environmental issues/Water management and ecology (Spain and Bulgaria)
- Budget/incentives Management (Spain)
- Energy transition (Energy consumption and savings)/ EU Climate Action-policies and measures (Spain and Bulgaria)
- Circular Economy (Spain and Bulgaria)

Other some less frequent topics would also be: Sustainable Mobility, IT System migration, GIS, Digital Skills, Participation processes and green administration.

There seems to be a good knowledge about the existing incentives, perhaps what is needed is more knowledge on how to speed up the procedures.

Energy consulting firms are more up to date in the knowledge of solutions and tools applicable to SECAPS. They are also trained and updated by attending courses and congresses. *“Doing SECAPS all the time forces you to research and keep up to date”.*

A Cypriot consultancy comments that *“Especially for newer topics, such as adaptation, energy poverty, and air pollution, there is not enough expertise”.*

3.7 Digital gap

The findings from this part of the study will help to understand the specific needs of LRAs and stakeholders involved in CETPs for the development of a useful, practical and simple Step-WISE digital tool and how to prepare the training to introduce the tool to future users.

LRAs were asked about their proficiency with digital tools. More than half of the LRAs (57%) report having a **basic knowledge of digital tools**. 39% answered that their knowledge was medium and just 4% answered that their skills are advanced.

Analysing the results by UC, the following results were obtained:

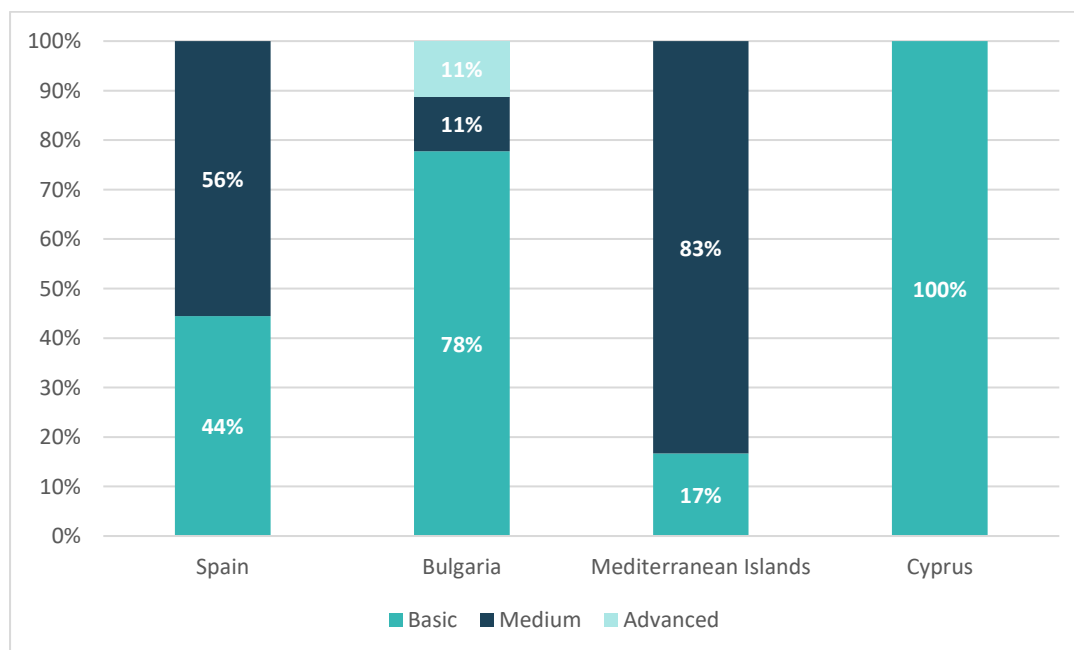


Figure 20. LRA's proficiency with digital tools, by UC

As can be seen in **Figure 20**, Spain and the Mediterranean Islands show a higher percentage of medium digital skills (56% and 83%, respectively), while in Bulgaria and Cyprus, basic knowledge is in the majority (78% and 100%, respectively). Only Bulgaria has declared advanced skills in one of its municipalities.

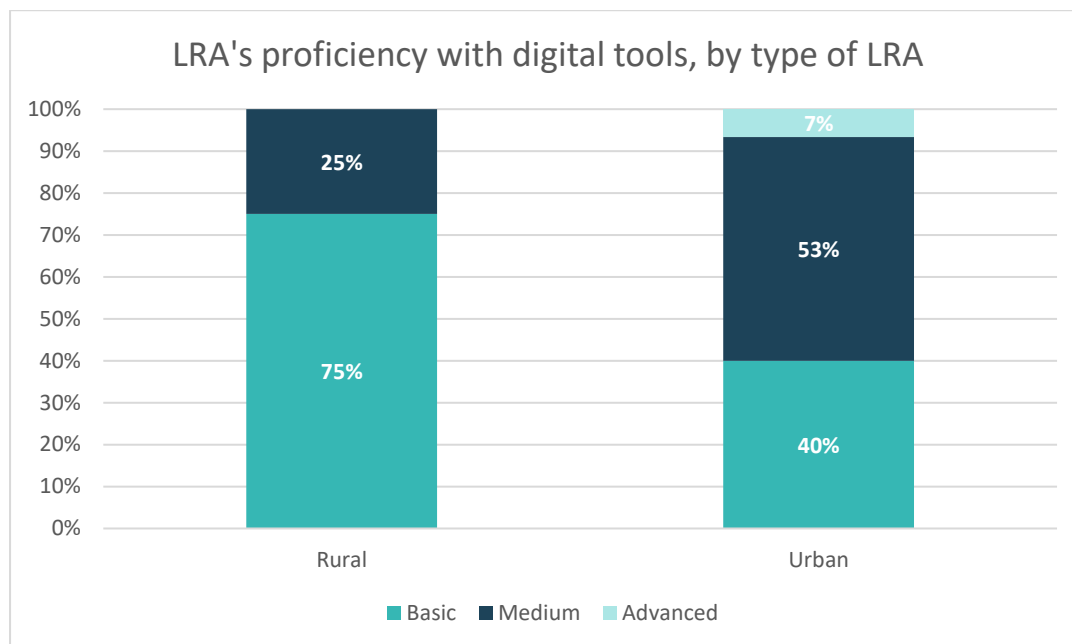


Figure 21. LRA's proficiency with digital tools, by type of LRA

Analysing the responses by type of LRA, as shown in **Figure 21** it is observed that rural municipalities have basic competences in digital tools in 75% of the cases, while urban municipalities report 40% of basic skills. In the latter case, medium skills are the largest share, with 53% of the surveyed municipalities, and only 7% correspond to advanced skills.

Based on this, it is clear that rural municipalities need more support in digitisation and in improving digital skills, and that they will need simple tools and procedures, as they are not as skilled.

Related to this, LRAs were then surveyed regarding the use of modelling tools and, specifically, the reasons why they do not use this specific type of tool.

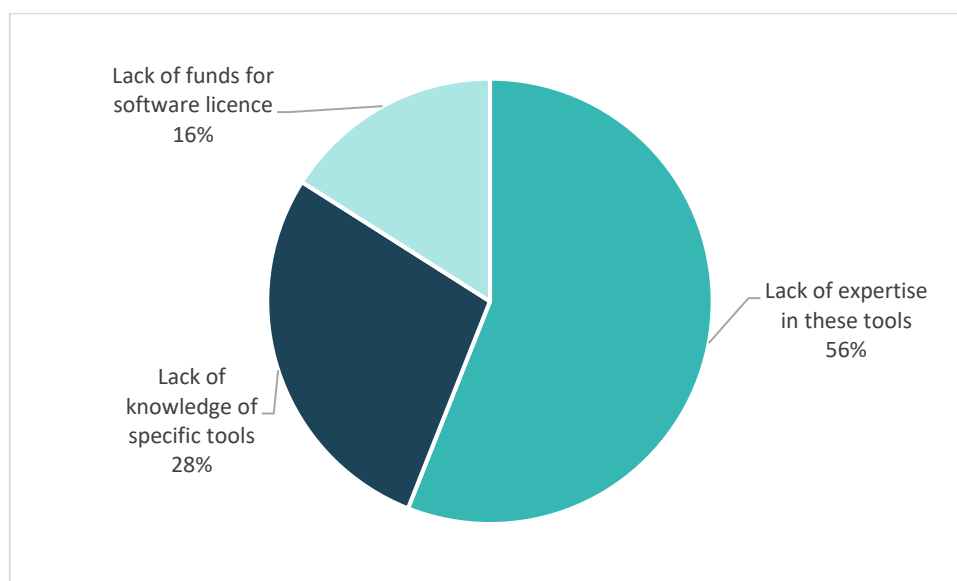


Figure 22. Reasons why LRAs don't use modelling tools.

As **Figure 22** shows, the main reason for the 56% of the cases is the **lack of expertise in the use of these tools** (56% of cases), followed by lack of knowledge (28%) and lack of funds to acquire the corresponding licences (16%).

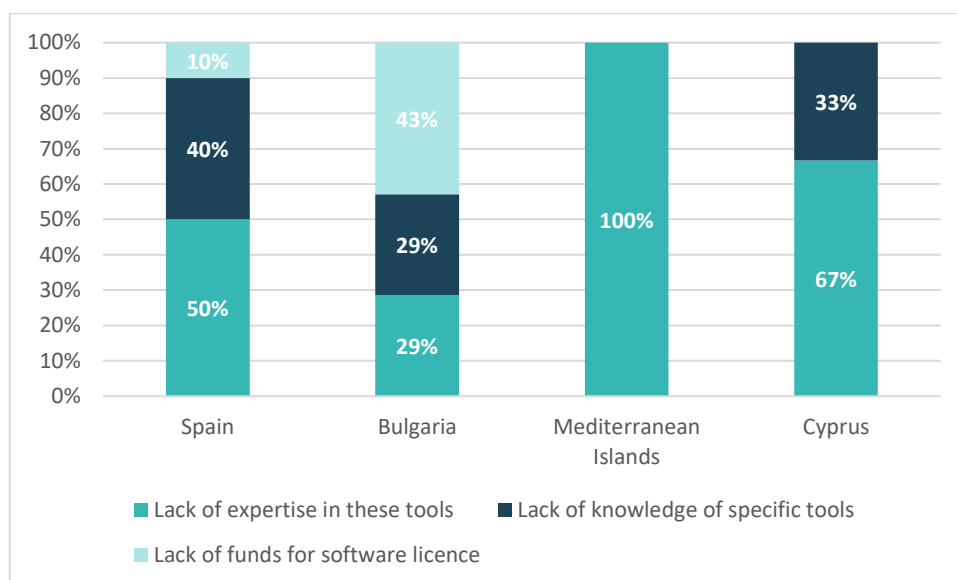


Figure 23. Reasons why LRAs don't use modelling tools, by UC.

Disaggregating the responses by UC, as shown in **Figure 23**, shows that lack of expertise is the main reason for not using modelling tools in Spain (50%), Mediterranean Islands (100%) and Cyprus (67%). The latter 2 did not state lack of funds for the acquisition of software licences as an obstacle, while Spain (10%) and mainly Bulgaria (43%) did.

3.7.1 From the interviews:

All municipalities report using the **computer** (laptop or desktop) for all tasks from performing complex tasks that require large resources such as data processing, for working with office software such as word processing, spreadsheet programs and presentation software, or to create content such as

articles, presentations, and documentation, but also for email and calendar management, and for online meetings, video conference calls and trainings.

They also use the **phone** (smartphone) to communicate through various messaging applications, e-mail and phone calls and to manage their calendar, tasks and reminders. As well to access online platforms for information sharing and communication and for navigation and information search on the go.

Most of them said they do not use the **tablet**, except for the Bulgarian Municipality with SECAP, which uses it for reading e-books, magazines and articles, to participate in online trainings and webinars, for data visualization and presentations in a convenient and portable format.

Most use basic software such as the Microsoft office package. Only 3 use some software different from the basic Microsoft Office one: The small but connected Spanish municipality Spanish municipality with SECAP and one of the Mediterranean Islands (Island Municipality C). The software tools they use are for:

- Agroecological management,
- Geographic Information System (GIS)
- Energy metering display of the photovoltaic panels, both generation and consumption.

There were a few attempts, but they were unsuccessful or gave problems.

In one of the Mediterranean Islands (Island Municipality A) , a digital tool was made available that was developed by a Croatian company that they were trying to sell at the European level, where this municipality was a test, but they stopped using it.

The main challenge in Island Municipality C is that everyone should have access to environmental data. They are trying to reach homogeneity of data sharing in order to allow also the Energy Supplier, to get a bigger and real overview.

The Bulgarian consultant said that a *“major challenge is the data collection – data sets are not readily available, some of them are not public (for example, the ones of the utilities), and for some sectors data is not being collected regularly and its full specifications (for example, the residential sector and personal vehicles). There aren’t also special software tools and solutions to process the data – in most cases, this is done through excel sheets. Last, but not least - low levels of cooperation with energy data providers”*.

Despite their great experience and knowledge, the consulting firms interviewed do not seem to have a very advanced use of digital tools and software. They usually work with their own excel calculation methodologies and GIS. The Bulgarian Consultancy works also with CoM platform and the Spanish Consultancy does not work with software tools for the development of SECAPs because it does not see them as useful when it comes to further implementation from the municipality that does not have the tool.

In some communities or remote rural areas found in Spain, Cyprus and Bulgaria, it should be noted that there may even be problems with power and even telephone cuts.

3.8 Recommendations and Conclusions

3.8.1 Stakeholder mapping and Skill gap analysis study Conclusions

Compiling the main points covered in this stakeholder mapping and skill gap analysis study (Part B), the main **conclusions** are as follows:

Stakeholder mapping. Coordination.

- When there are different departments in the local authority or rural community, usually is the Environmental/Ecology, Climate/Energy or Spatial Planning department which develops the CETPs at local level, especially SECAPs. The development of CETPs is an activity that should be covered in a cross-cutting manner with all departments, but in most municipalities, it is only a few departments that each administration usually works with it and in an uncoordinated manner.
- Consultancy firms have the greatest power, capacity, and interest to develop CETPs and a high affinity with the local entities. On the other hand, NGOs have a high interest but low power to develop CETPs.

LRAs major challenges

- The main energy and climate Challenges nowadays have proved to be consistent for the LRAs and for all other stakeholders. First of all is the renewable energy production. This shows there is an ample focus on energy production, implying needs related to skills that allow an understanding of financing models to invest in renewables, different energy sources, design of installation projects, knowledge on the regulatory frameworks, amongst others.
- On the other hand, the other main challenges identified are: Changing behaviours to save energy and the use of renewable energy, and people's knowledge about energy and climate change. Both have a social and communication dimension on how to raise social awareness of climate issues and highlight the benefits of implementing decarbonisation measures to achieve behavioural changes and how to bring energy and climate knowledge to the public.
- From the interviews, the issue of energy communities also emerged as a challenge for LRAs. Some have already started the process and others are just beginning but with a broad interest in pursuing them.
- Climate effects are problems that are already occurring and are a concern especially in Bulgaria and the Mediterranean Islands, in addition to security of energy supply concerns.
- Small rural areas often have an approach to economic challenges because they do not have large budgets, with which they can only cope with basic needs.
- However, the challenges of LRAs will depend very much on the context of each locality, whether rural, urban or island.

CET Plans

- In developing CETPs, the local SECAPs are essential, and each context is different, so these plans will have to be tailored to their particular needs.
- According to the questionnaires, 62% of the LRAs surveyed have developed some form of CETPs. Most, 66% of them, have a SECAP.
- In half of the cases local authorities carry out CETPs by subcontracting a part and doing the other part with in-house staff. However, a significant proportion of them subcontract the entire CETP. Countries like Spain or Cyprus tends to outsource in most cases, while municipalities in Bulgaria and the Mediterranean Islands have mostly done so through a combination of external consultant and internal staff within the LRA. The main reason for outsourcing was due to a lack of expertise in energy and climate issues and the second reason due to a lack of resources (human, economic and material).
- When it comes to implementing CETPs, it is positive that all have been initiated and the vast majority go ongoing as planned. Only a few are ongoing with delays, and very few have been completed.
- Although many CETPs go as planned, local authorities do encounter difficulties in getting them implemented.
- Regarding to monitoring, technicians are usually in charge of monitoring progress of the plans, normally when requested report from Covenant of Mayors, but there are no specific system, mechanisms, or tools to do so.

Measures implemented

- All municipalities have implemented some kind of energy and climate-related measures. The most common type of measures implemented by municipalities are related to mitigation, especially energy efficiency in buildings or lighting or renewable energy production.
- Incentives, especially Next Generation funds, are widely used to facilitate the financing of measures, most of them granted through regional authorities. Procedures for applying for them are not as streamlined as they should be to support LRAs more effectively.

Barriers to CETPs development

- Although the most selected barriers to the development of CETPs in the questionnaires were the lack of resources (time, human and financial) and lack of expertise on energy and climate issues, when entered in depth and without giving options, the barriers that stood out were those that had to do with the level of coordination and global vision. Especially in larger municipalities, there are multiple departments, in some cases doing similar tasks or working on the same plan but each working independently.
- Administrative and political rotation is also a common difficulty. So, the staff changes, and it is difficult to establish continuity.

Skill and digital gaps

- The information for the management of this plan(s), news or subsidies they mostly get it from methodological and internet resources, but also from in-house staff, usually Municipalities do not have a training program for their employees. Technicians are voluntarily self-trained in order to be able to perform their tasks in the best possible way.
- Main skills needed for the CETPs development resulted to be: Knowledge of European, national and local policies and law regulations, Framework of Climate Change effects, related to the local context; communication skills to raise awareness, know-how of new technologies related with energy performance of buildings and transport; training on climate change, mitigation, adaptation and energy poverty measures.
- Digital skills are mostly basic in the LRAs, especially in rural areas. The material used by the municipalities participating in the study for the development of the CETPs is quite basic: Computer (either desktop or laptop) and in some cases they work with the smartphone for some tasks. Normally no software beyond the basic Office package is used. Only in some specific cases a GIS or even an energy metering display has been found. The main reason for LRAs not using modelling software is the lack of expertise in these tools.
- Remote areas, in addition to a digital gap, may have problems with the security of power supply, and even telephone services.

3.8.2 Recommendations from LRAs and other stakeholders

During the study, recommendations made directly by LRAs and stakeholders were also collected.

According to one municipality with SECAP, **certain barriers could be overcome** as follows:

- Lack of coordination: *“By establishing partnerships between different administrations, public and private organizations, the barrier of lack of coordination is overcome”*. They manage to achieve this by organizing workshops, joint projects and sharing resources and expertise.
- Lack of funding: *“Although this can be a more complex barrier, it is also surmountable by seeking external sources of funding, such as grants, loans or public-private partnerships. Also, the optimization of the budget and the redirection of funds to priority projects presents a barrier”*.
- Political Will: *“Raising the awareness and commitment of political leaders and managers has succeeded in supporting faster adoption and implementation of the SECAP. This is achieved by presenting the importance and benefits of energy and climate measures in relation to economic development, public health and community well-being”*.

Overcoming the barriers requires commitment and cooperation from the various stakeholders in the community.

Recommendations were also made **for the next steps of the Step-WISE project**:

- Employ interactive learning methods such as workshops, case studies, games and discussions to engage participants and provide them with practical skills and tools. This was a repeated request from the participants, that the trainings should be useful and very practical.
- Provide resources for long-term monitoring and evaluation of training effectiveness to ensure that participants acquire the necessary knowledge and skills.
- The training that helps to understand how to develop and implement effective policies to ensure a sustainable and adaptive approach to Climate Change effects.
- There needs to be separate training for the admin staff (maybe to help with applications) and the technical staff, but also involve politicians and councilors.
- The main topics of interest to them include energy efficiency, renewable energy sources, climate change adaptation, waste management, sustainable transport, etc. to provide comprehensive training on all aspects of the energy transition and the fight against climate change, as well as searching for funding and bring energy communities work to municipal level.
- Some of the LRAs mentioned to be interested in data bases related the energy and climate for different sectors (public and residential buildings, transport, industries, wastes) to be designed and provide to the municipalities – suitable for different scenarios modelling.

Bulgarian consultancy considers that *“The programme needs to be designed as a cooperation process with the local authorities and a well-balanced programme with theoretical and practical part”*.

From the Consultancy in Cyprus, *“Especially for communities, find the priorities they should have based on the data and focus on how to take advantage of available funding (e.g. European projects, structural funds)”*.

4 Final Conclusions

Derived from the results of the study in Part A: “Literature analysis on current policy framework on energy EU” and Part B “Stakeholder mapping and Skill Gap Analysis” of this deliverable, it is possible to draw a number of substantially converging conclusions and recommendations.

Tailor local CETPs to the context

Local CETPs like Sustainable and Energy and Climate Action Plans (SECAPs) are essential instruments in the EU's energy transition, it will therefore be imperative to focus support on providing tailor-made approaches to clean energy development that reflect the specific needs, resources and capacities of individual communities and regions.

Simplification of administrative and bureaucratic procedures

In relation the recommendation “Enhance Financial Support and Incentives” in part A (2.7.1) it has been seen that in many cases incentives exist, but it is difficult to access them or, more specifically, to deal with all the bureaucratic issues involved in obtaining them. In many cases, there is neither staff nor time for this type of task. Moreover, the time taken to acquire this type of incentives is not conducive to the proper implementation of it. Therefore, the support, simplification and facilitation of the acquisition of these incentives should be reinforced.

This would be linked to the recommendation “Address Regulatory and Administrative Barriers” 2.7.1)of Part A, so that not only the administrative procedures for the award of grants are improved, but the whole streamline of regulatory and administrative procedures that may hinder the development and implementation of CETPs.

Effective support

In addition to incentives from the European Union or other European, national, or regional bodies, which will enhance decision-making, there is another type of support to promote CETPs, in particular SECAPs.

The Covenant of Mayors and other European and regional institutions, as intermediaries, should do more monitoring, not only to support local authorities and rural communities in developing SECAPs, but also to ensure that the measures are implemented, especially those measures that do not refer to mitigation, but to adaptation and energy poverty measures, which tend to be more frequently forgotten at present in the CETPs found.

Global and coordinated vision

One of the main barriers is the lack of global and coordinated vision in developing and implementing CETPs. Especially in larger municipalities, there are multiple departments, even other external entities, doing similar tasks or working on the same plan but each working independently. Therefore, it is necessary to strengthen the interdepartmental work of local authorities, actively engage stakeholders and to strengthen the support and connection of regional authorities in planning and supporting the development of CETPs. This is closely related to recommendation 1 of part A “Strengthen Policy Coherence and Integration”.

Stakeholder Engagement and Knowledge Sharing

It is possible to say that those municipalities that are more connected to other experiences are more advanced in the implementation of the measures than more disconnected municipalities. Strengthen mechanisms for stakeholder engagement in the CETP development process, as mentioned in the third

recommendation of Part A, will be very positive for all LRAs when developing their plans and programmes.

Experience sharing is also requested by some LRAs during interviews. Having platforms such as the one recommended in recommendation 4 of part A would facilitate the exchange of experiences and knowledge so that this can take place, but it could also be interesting to have a networking event and to share success stories in the training programme of the Step-WISE project.

Capacity Building and digital tools

Part A of the report emphasizes the importance of providing targeted support and capacity-building initiatives for local authorities and stakeholders, including technical assistance, access to best practices and case studies, and training in the use of tools and methodologies for planning, implementing, and monitoring CETPs.

There are currently no training programmes for local authorities, who are the ones who ultimately work at the local level in the municipalities in the development of such plans as SECAPs. Training to support local authorities is organised in most cases from authorities and agencies at regional level, but there does not seem to be a structure to promote and organise local authorities to be trained. It would be advisable for local councils to plan training programmes so that technicians are trained in all the topics that have been identified as necessary for the development of CETPs, so that everyone is equally trained in the competences necessary for the correct development of these CETPs.

Main skills needed for the CETPs development are the knowledge of European, national and local policies and law regulations related to energy and climate, Framework of Climate Change effects, related to the local context; communication skills to raise awareness, know-how of new technologies related with energy performance of buildings and transport; training on climate change, mitigation, adaptation and energy poverty measures.

Special support is needed in rural areas because of their greater digital gap, both in the use of software and tools.

4.1 Present and future of Step-WISE steps

The insights and findings from this deliverable which were part of tasks **T2.1 (Understanding the status of local Clean Energy Transition Plans)** and **T2.2 (Stakeholders' mapping and Skills Gap Analysis)** within the Step-WISE project, are poised to significantly contribute to the progression of **Task 2.3 (Use Cases agreement and Steering Groups definition)** and **Task 2.4 (Local CETPs assessment and Step-WISE toolkit requirements codification for alignment)** of the Step-WISE project, which focuses on the Use Cases definition, local CETPs assessment and Step-WISE toolkit requirements codification for alignment. The comprehensive analysis conducted in this report becomes a critical groundwork for identifying the specific knowledge, skills, and capacities stakeholders need to effectively drive the energy transition. The identified barriers, best practices, and recommendations for enhancing local CETP implementation from Part A (Task 2.1) fed into the design of the online questionnaire for Task 2.2, ensuring that questions were aligned with real-world challenges and opportunities. The responses from these questionnaires served as the basis for the semi-structured interview that was used as a methodology to delve deeper into the capacities required for effective collaboration and energy transition planning. Ultimately, the conclusions drawn from this deliverable will serve as a critical resource for tailoring the subsequent activities in the Step-WISE project, including refining the Step-WISE toolkit according to stakeholders' needs (T2.4) and configuring the **Capacity Building Programme (WP3)**. By providing a detailed assessment of the current landscape and outlining actionable recommendations, this report lays the groundwork for a targeted and informed

approach to stakeholder engagement and skills development, essential for advancing the objectives of the Step-WISE project and ensuring a successful energy transition across Europe.

ANNEXES

Annex 01: Questionnaire for country-specific analysis of energy policies in UC Countries

Questionnaire for Country-Specific Analysis of Energy Policies in UC Countries

We invite you to complete the following questionnaire, which is designed to gather insights for a Country-Specific Analysis of Energy Policies in UC Countries. Your expertise and feedback are invaluable to our study. Kindly provide your answers and any additional comments in the spaces provided below.

Name:	
Position/Title:	
Organization/Institution:	
Contact Information:	

1. Overview of UC Countries' Energy Policies:
 - 1.1 What is the current energy policy in your country?
 - 1.2 How has the energy policy evolved over the past decade?
 - 1.3 What are the primary sources of energy in your country?
 - 1.4 Are there any significant renewable energy initiatives or goals set by the government?
 - 1.5 How does the government support the transition to renewable energy (subsidies, tax incentives, etc.)?
 - 1.6 What role do non-governmental organizations and private sectors play in shaping energy policy?

2. Comparative Analysis of Policy Frameworks:
 - 2.1 How does your country's energy policy compare with neighbouring UC countries?
 - 2.2 What unique challenges does your country face in implementing its energy policies?
 - 2.3 Are there any collaborative energy projects with other UC countries?
 - 2.4 How does your country's regulatory framework facilitate or hinder energy transition?
 - 2.5 What measures are in place to ensure energy security and sustainability?

3. Use Cases of Successful Initiatives:
 - 3.1 Can you provide examples of successful energy initiatives in your country?
 - 3.2 What were the key factors that contributed to the success of these initiatives?

3.3 Were there any significant obstacles or challenges faced during these initiatives? How were they overcome?

3.4 What was the impact of these initiatives on local communities and the national energy landscape?

3.5 Are there ongoing or planned future initiatives that build upon these successes?

Thank you for your time and contribution!

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Annex 02: Stakeholders mapping template

Stakeholders mapping workshop

Use case

<h3>ONGs</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>Youth</td><td>Energy & Climate, Transport</td></tr><tr><td>Labour</td><td>Consumers, neighbours</td></tr></table>	Youth	Energy & Climate, Transport	Labour	Consumers, neighbours	<h3>LRAs</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>Economy, commerce</td><td>Env, water, waste</td></tr><tr><td>Transport, infr, building</td><td>Energy</td></tr></table>	Economy, commerce	Env, water, waste	Transport, infr, building	Energy	<h3>National institutions</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>Economy, commerce</td><td>Env, water, waste</td></tr><tr><td>Transport, infr, building</td><td>Energy</td></tr></table>	Economy, commerce	Env, water, waste	Transport, infr, building	Energy
Youth	Energy & Climate, Transport													
Labour	Consumers, neighbours													
Economy, commerce	Env, water, waste													
Transport, infr, building	Energy													
Economy, commerce	Env, water, waste													
Transport, infr, building	Energy													
<h3>Media</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>General</td><td>Energy</td></tr><tr><td>Environment</td><td>Social and Economy</td></tr></table>	General	Energy	Environment	Social and Economy	<h3>Academia</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>Economy</td><td>Technological</td></tr><tr><td>Transport</td><td>Energy</td></tr></table>	Economy	Technological	Transport	Energy	<h3>Private companies</h3> <p><i>Description and role in the CETP</i></p> <table border="1"><tr><td>Financial</td><td>Technological</td></tr><tr><td>Transport</td><td>Energy</td></tr></table>	Financial	Technological	Transport	Energy
General	Energy													
Environment	Social and Economy													
Economy	Technological													
Transport	Energy													
Financial	Technological													
Transport	Energy													

Annex 03: LRAs Questionnaire

This questionnaire will allow us to better understand the needs of local authorities in the design of clean energy plans and the use of digital tools. Your answers will contribute to the development of the next phases of the European project "Step-WISE" in order to better support you in the preparation and delivery of these plans. It will only take a few minutes. Thank you very much for your time.

1. Information and training

2. Name of the municipality:
3. Is this municipality urban or rural?
 - a) Urban
 - b) Rural
 - c) Other type:
4. What department or equivalent do you work in?
4. What is your position or role within this department?
5. Is your department responsible for developing energy and climate related plans?
 - a) Yes
 - b) No, the department responsible for it is:

Energy context

6. What are the main challenges related to energy and climate change in your municipality or territory? Please indicate your level of agreement or disagreement with the following statements:

Main challenges are...	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Energy inefficiency of buildings					
GHG emissions of economic sectors (primary and manufacturing/construction)					
Water pollution of economic sectors (primary and manufacturing/construction)					
Decarbonisation of transport					
Active and sustainable mobility					
Public spaces and green areas					
Renewable energy production					

Climate hazards (extreme natural or human-induced events, e.g., heatwaves, floods, droughts, fires)					
People's knowledge about energy and climate change					
Engagement and participation of stakeholders					
Changing behaviours to save energy/use renewable energy					
Energy poverty					
Identify and involve vulnerable groups					

7. Do you have (the municipality or territory) any other major challenge(s) not mentioned above?
- Yes. Please specify:
 - No

Energy planning and measures

Next, you can select one or more answers depending on the question. If the topic addressed in a question does not apply to your case, please select the option "Does not apply".

8. Do you have one or more energy and climate related plans? Please, select all the options that apply:
- Yes, a SEAP
 - Yes, a SECAP
 - Yes, other(s). Please specify:
 - No, but we are interested in developing such plans.
 - No, and we do not expect to develop such plans any time soon.
9. Why don't you have an energy and climate related plan? Please select all the options that apply:
- Lack of resources: time, staff and/or budget.
 - Lack of expertise: in energy and climate, and/or this type of plans.
 - Cannot access/generate relevant data for diagnosis (baselines, inventories, etc.)
 - Lack of specific tools. Such as:
 - This has not been/is not a priority for local decision-makers.
 - Other reason(s). Please specify:
 - Does not apply.
10. This or these plans were prepared by:
- An internal team from the municipality.
 - A subcontractor
 - A combination of the two answers above.
 - Does not apply.

11. Why did you outsource (completely or partially) the development of this or these plans?
Please select the main reason:
- Lack of time and/or staff
Lack of expertise in energy and climate
 - Lack of expertise in this type of plans
 - Lack of specific tools. Such as:
 - Other reason(s). Please specify:
 - Does not apply.
12. Your energy and climate related plan(s) contain the following set of actions or measures? Please select all the options that apply:
- Climate mitigation (cutting greenhouse gases from main sources such as power plants, factories, cars, and farms)
 - Climate adaptation (taking action to prepare for and adjust to the current and projected impacts of climate change)
 - Energy poverty
 - Other(s). Please specify:
 - Does not apply.
13. If you don't have an energy and climate related plan, or in addition to (outside of) these plans, have you taken any (other) actions or measures for energy transition, decarbonisation, to address climate change, etc.?
- Yes. Please specify:
 - No
14. What is the status of the implementation of these measures?
- Not started
 - Ongoing as planned.
 - Ongoing with delays
 - Completed
 - Does not apply.
15. The monitoring of the energy and climate related plan(s) and/or the measures (within a plan or not) has been:
- Very easy
 - Easy
 - Neither easy nor difficult
 - Difficult
 - Very difficult
 - Does not apply.
16. What other departments of this municipality have participated, are participating or would participate in the preparation, approval, implementation and/or monitoring of this or these plans?

Skill and Digital Gaps

17. Where do you usually get the information for the management of this plan(s), news or subsidies? Please select the main source:
 - a. In-house staff
 - b. Methodological guides and internet resources
 - c. Local information offices
 - d. Other(s). Please specify:

18. How would you rate your proficiency with digital tools:
 - a. Basic: consult e-mails, office package (Word, Excel, PowerPoint), search for information on the internet.
 - b. Medium: advanced Office Suite, platform management.
 - c. Advanced: handling of simulation tools. Please, specify what tools:

19. How would you rate the average proficiency of your colleagues in your department:
 - a. Basic: consult e-mails, office package (Word, Excel, PowerPoint), search for information on the internet.
 - b. Medium: advanced Office Suite, platform management.
 - c. Advanced: handling of simulation tools. Please, specify what tools:

20. If you don't use energy modelling tools, please select the main reason:
 - a. Lack of knowledge of specific tools
 - b. Lack of expertise in these tools
 - c. Lack of funds for software licence
 - d. Energy modelling tools aren't helpful in develop and implement energy and climate related plans
 - e. Other(s). Please specify:
 - f. Does not apply.

21. When using digital tools do you use them in your local language if the option is available?
 - a. Yes
 - b. No

22. Please share with us any additional information on the topics covered in the questions above:

Annex 04: Other Stakeholders Questionnaire

This questionnaire will allow us to better understand the local needs and opportunities related to energy and climate in the territory where you are located and/or operate. Your answers will contribute to the development of the next phases of the European project "Step-WISE" so that this project better supports local authorities in the preparation and delivery of clean energy plans that benefit the entire municipality.

We need information about local municipalities. Answer to the best of your knowledge. It will only take a few minutes. Thank you very much for your time.

1. Gender of interviewee
 - a. Male
 - b. b) Female
 - c. c) Non-binary
 - d. d) I prefer not to say

2. Name of the organisation:

3. Scope of your organization?
 - a. National b) Regional c) Local

4. Your organisation is part of which of the following groups?
 - a. Public sector at national or regional level
 - b. Private sector
 - c. Academia
 - d. NGOs
 - e. Media
 - f. Other. Please specify:

5. Your organisation focuses on which of the following sectors or topics? Please select all the options that apply:
 - a. Farming, forestry, fishing and extractive industry
 - b. Manufacturing industry
 - c. Energy Supply
 - d. Water supply, waste management, decontamination
 - e. Construction
 - f. Commerce and hostelry
 - g. Transport and storage
 - h. Information design and communication
 - i. Financial activities and insurances
 - j. Real estate
 - k. Legal activities
 - l. Business and economic activities
 - m. Consultancy, specify type of services:
 - n. Architecture
 - o. Research and development
 - p. Administrative and auxiliar services
 - q. Education
 - r. Sanitary and social services

- s. Artistic and entertainment
- t. Other(s). Please specify:

6. What department or equivalent do you work in?
7. What is your position or role within this department?
8. What are the main challenges related to energy and climate change in your context?
Please indicate your level of agreement or disagreement with the following statements:

Main challenges are...	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Energy inefficiency of buildings					
GHG emissions of economic sectors (primary and manufacturing/construction)					
Water pollution of economic sectors (primary and manufacturing/construction)					
Decarbonisation of transport					
Active and sustainable mobility					
Public spaces and green areas					
Renewable energy production					
Climate hazards (extreme natural or human-induced events, e.g., heatwaves, floods, droughts, fires)					
People's knowledge about energy and climate change					
Engagement and participation of stakeholders					
Changing behaviours to save energy/use renewable energy					
Energy poverty					
Identify and involve vulnerable groups					

9. Are there any other major challenges related to energy and climate change in your context that have not been mentioned above?
 - a) Yes. Please specify:

b) No

Next, you can select one or more answers depending on the question. If the topic addressed in a question does not apply to your case, please select the option “Does not apply”.

10. Does your organisation know of any local plans related to energy and climate?
 - a) Yes. Please specify:
 - b) No

11. Has your organisation participated in any way in the preparation and/or implementation of these local plans?
 - a. Yes, we have been highly involved.
 - b. Yes, we have participated in some activities.
 - c. No, we have not been informed about this/invited to participate.
 - d. No, we prefer not to participate.
 - e. I don't know.
 - f. Does not apply.

12. Has your organization taken any actions that are part of the following sets of measures related to energy and climate change? Please select all the options that apply:
 - a. Climate mitigation (cutting greenhouse gases from main sources such as energy generation, industry, transport, and agriculture)
 - b. Climate adaptation (taking action to prepare for and adjust to the current and projected impacts of climate change)
 - Energy poverty (to address or alleviate it)
 - d. Other(s). Please specify:
 - e. No, we have not taken such measures.

13. Are these actions or measures related to any national, regional, or local plan?
 - a. Yes. Please specify:
 - b. No
 - c. I don't know.
 - d. Does not apply.

14. Has your organisation needed, or does it need any guidance or other support from local authorities to take such measures?
 - a. Yes. Please specify:
 - b. No
 - c. I don't know.
 - d. Does not apply.

15. According to your organisation's experience with and opinion of local authorities, what are the main internal challenges of these authorities when designing, implementing and/or monitoring a plan or measures related to energy and climate change? Please select all the options that apply:
 - a. Lack of resources: time, staff and/or budget.
 - b. Lack of expertise: in energy and climate, and/or this type of plans.

- c. Cannot access/generate relevant data for diagnosis (baselines, inventories, etc.)
 - d. Lack of specific tools. Such as:
 - e. This has not been/is not a priority for local decision-makers.
 - f. Other challenge(s). Please specify:
16. What skills and competences do you identify as fundamental to elaborate energy and climate policies?
17. Please share with us any additional information on the topics covered in the questions above:

The end. Thank you!

Annex 05: Informed Consent form

INFORMED CONSENT FORM

Read this consent form carefully and ask as many questions as you like before you decide whether you want to participate in this research study. You are free to ask questions at any time before, during, or after your participation in this research.

Project Information

Project Title: Step-WISE: This project has received funding from the European Union's LIFE Program for Research and Innovation under Grant Agreement no. 101120859

Principal Investigator: Alexandra Zanasi

email: Alexandra.zanasi@iesve.com Organization: Integrated Environmental Solutions Ltd

Location: Helix Building, West Of Scotland Science Park, Glasgow G20 0SP

1.

PURPOSE OF THIS RESEARCH PROJECT

The Step-WISE mission is to increase capacity of Local and Regional Authorities to initiate an effective energy transition through development of Clean Energy Transition Plans. The goal is the process easier, quicker and more accurate via a Step-WISE toolkit which will allow administrations at all levels to have a digital baseline model of their area/region, use physics-based energy simulation to evaluate different energy scenarios, prioritise interventions in time, and build dynamic Clean Energy Transition Plan to monitor progress towards targets. As a potential user and contributor to this toolkit we ask your participation in a interview to better understand the main needs we should address with the toolkit. Step-WISE, co-funded by the European Union, started in December 2023 and will last 2.5 years.

2. PROCEDURES

The principal investigator will firstly carry out an unstructured interview to discuss your experience on Clean Energy Transition Plans. This interview is expected to take roughly 1 hour.

The collected information will be used to design a capacity building programme and to guide the development of software solutions within the Step-WISE project that best meets the identified needs.

The session will be recorded to allow IES and Traza staff members who are unable to participate to listen to the session and benefit from your comments, as well as to thoroughly analyze this session after its end.

The results of several sessions will be aggregated to deduce general results and will be fully pseudonymised in the analysis phase to avoid identification of responders.

To aid analysis the interview will be translated via automatic tools compliant with GDPR data protection laws.

3. POSSIBLE RISKS OR DISCOMFORT

This project contains no identified risks. Any new information developed during the project that may affect your willingness to continue participation will be communicated to you.

4. FINANCIAL CONSIDERATIONS

There is no financial compensation for your participation in this research.

5. CONFIDENTIALITY

Your identity in this study will be treated as confidential. The results of the study, including your responses or any other data, may be published for scientific purposes but we will not give your name or include any identifiable references to you.

However, any records or data obtained as a result of your participation in this study may be visualized by the funding body (the European Commission) or by the persons conducting this project, provided that such inspectors are legally obligated to protect any identifiable information from public disclosure.

The security of the cloud based platform where data will be stored will be ensured in terms of storage, transfer and use of data. Good practices will include a separation of data layers including techniques such as pseudonymisation before making the data available for the research which will be carried out in the project. To ensure security of data transfer all data in transit will be encrypted. Additionally, all sensitive data access will be logged to ensure that any reading of personal data is tracked and can be matched to a specific user and purpose. The data will be stored in EU servers.

In case of a security breach, you will be informed as soon as it has been detected, including an overview of all data affected by the breach, and all access tokens must be revoked (e.g. forcing a password change to all platform users).

To ensure the maximum standard of data protection and confidentiality, the Data Protection Officer of IES Ltd, reachable at data.protection@iesve.com will be available to all subjects involved in the research.

6. TERMINATION OF RESEARCH STUDY

You are free to choose whether or not to participate in this study. You will be provided with any significant new findings developed during the course of this study that may relate to or influence your willingness to continue participation.

7. AVAILABLE SOURCES OF INFORMATION

Any further questions you have about this project will be answered by the Principal Investigator.

8. AUTHORIZATION

I have read and understand this consent form, and I give my consent to participate in this research project. I understand that my interview will be recorded. I grant IES and Traza permission to use this recording, for the purpose of understanding the main needs of stakeholders in the renovation process.

I will treat all information shared by the principal investigator during the session as confidential, and will not disclose it without the express written consent of the principal investigator.

I understand that I will receive a copy of this form. I voluntarily choose to participate, but I understand that my consent does not take away any legal rights in the case of negligence or other legal fault of anyone who is involved in this study.

Participant Name (Printed or Typed): _____

Participant Signature: _____

Date: _____

Annex 06: Interview script for local and regional authorities

Objective: Interviews intend to reveal the skills gaps and barriers of LRAs in Clean Energy Transition planning (including LRAs with and without SECAP, with different levels of implementation of their SECAP, with different socio-environmental contexts).

The interviews follow a *semi-structured* to make results comparable amongst LRAs but also allow for context-sensitivity as well as enable the spontaneous and unplanned insights to emerge from the interviewer and interviewee.

Tips for the interviewer:

- Start saying thank you.
- Reminds the interviewee that this conversation will be recorded.
- Have in front of you the answers that this person has given in the questionnaires in order to build on his or her answers, which we will go into more detail.
- Take notes during the interviews, writing down concrete quotes that may be of special interest or significance.
- Let the interviewee talk freely, create a safe space for them to express their doubts or weaknesses. Remind him or her to speak clearly and not too fast.

1. LOCAL/REGIONAL CHALLENGES IN ENERGY POLICYMAKING

- Related to the key energy and climate challenges in your municipality (remind them the ones they checked in the questionnaire), which ones are the most important and why? In case we talk to a consultancy firm, they should consider a SECAP in a municipality where they have encountered more difficulties.
- Indicate the name of the municipality.
- What are the priorities in the municipality?
- What kind of approaches and solutions do they require? (economic, educational, social, communication, technologies, etc.)
- At what stage at you are at approaching these key challenges? What is missing?

2. PAST, CURRENT AND ENVISIONED PUBLIC POLICIES

- For LRAs without SECAP:
 - Do you plan to design a SECAP?
 - What are the most prominent barriers?
 - Which barriers are the easier to solve and how?
 - Do you have any measures, actions or projects related to energy and climate change? How do you assess their ability to address issues? Have you experienced problems with designing or implementing solutions for the energy crisis?
- For LRAs that had a SECAP designed by an external consultant and For energy consultants:
 - Why did you hire an external entity to design your SECAP? (For consultants, Why do you think the LRAs hire you?)
 - Do you have in-house the expertise to adapt the SECAP, implement it, evaluate it and design future revisions? Can you highlight some key strengths and weaker points?
 - Are there any lack of tools or capacities missing within the labour force of your department and/or institution?
- For all LRAs with SECAP (designed by themselves or externally) or for consultants
 - What kind of measures have been implemented? All related with mitigation? Adaptation? Energy poverty?

- Are there any delays with the implementation of actions? If yes, why? If no, what is working well?
- Are you monitoring the impact or following up on what actions are being implemented, with what budget, etc. How? Could the data collection, visualising and analysis be improved? (If yes, how?). (Note to the interviewer: If not answered, ask about the use of technological tools, the knowledge they have on monitoring and evaluation, financing, bureaucracy, etc.)
- Have you received any subsidy for the implementation of any of these measures (within a plan or not)? (Note to the interviewer: check about grants, bureaucracy)

3. TRAINING AND CAPACITIES

- In the City Council, do you receive any training? What topics or capacities do they / have they covered? What is the frequency of training programs you receive?
- Is everyone trained compulsorily or is it voluntary? (Note to the interviewer: if voluntary, ask who tends to attend, looking to see if political teams, technical teams, different departments are also engaged) Is there any incentive for participation in these trainings?

For consulting firms. Do you know if the LRAs are receiving training, how often? In this training, do you know if they are training all the staff compulsorily or each one is trained voluntarily? Which categories or type of public employees are trained? Are they themselves also trained?

4. DIGITAL TOOLS

- During a regular workday for what tasks do you commonly use these devices?
 - computer
 - Phone
 - Tablet
- Could you tell us which software you mostly use when working on energy transition plans?
 - For each software could you tell us on what device you use it the most? (pc, phone, tablet...)
 - Are you overall satisfied with the software?
 - What do you like about the software?
 - What would you like to change?
- Do you feel the hardware provided for your work is adequate and up to date with the requirements of the software you use?

WORKFLOW

- During energy transition plans what is your role and in which phases do you have most input?
- For each phase could you highlight something that is currently working well and what is an area that could be improved?
- Is there someone involved from beginning to end on the project? Which is the role/postition of this person in the organization?
- How do you manage internal communication, in particular when people leave or join a project?

5. FUTURE RECOMMENDATIONS

In the EU project Step-WISE, we are going to design a training program to offer municipalities, and strengthen your ability to design, implement, and assess energy and climate policies. Do you have any recommendations? What would you be interested in? What would throw back your participation?

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