Support Energy Efficiency Deployment with the Multiple Impacts CAlculation Tool

D 6.1 – The SEED MICAT Replication Methodology

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EXECUTIVE SUMMARY

This deliverable presents the **INSPIRE Replicability Methodology**, a robust framework for assessing the replicability of energy efficiency policies. This methodology enables policymakers to evaluate the potential of transferring successful policies to new contexts, while ensuring alignment with the **Energy Efficiency First** principle and the integration of **Multiple Impact Assessment tools** into policymaking.

The INSPIRE Replicability Methodology evaluates policies through five dimensions—**Sociocultural, Institutional, Technological, Environmental, and Economic (SITEE)**. Each dimension is assessed using a combination of **solution-specific variables** (representing policy characteristics) and **contextual variables** (reflecting local conditions in the target country). These variables are quantified through structured data collection and visualised via Cartesian diagrams, enabling the calculation of replication potential on a 0–100% scale. The methodology's mathematical approach ensures a clear ranking of policies based on their replicability potential, offering actionable insights for decision-makers.

A crucial element of this methodology is the **stakeholder engagement process**, which involves two key groups: stakeholders from **national showcases** (Germany, Italy, and Czech Republic) and those from **target countries**. National stakeholders are engaged in defining the integration of MIAs into policymaking, selecting meaningful energy efficiency policy, supporting variables definition for the SITEE dimensions, and validating replication scores. Target country stakeholders then assess the adaptability of policies to their unique conditions, in terms of socio-economic, institutional, technological and environmental characteristic. This phased participatory process ensures that the methodology remains grounded in real-world needs and diverse governance structures.

The **next steps** will focus on defining energy efficiency policy in the three national showcases, finalising the quantifiable variables for the SITEE dimensions, and expanding the replication analysis to additional target countries. This iterative process will ensure the scalability and adaptability of the framework, enabling broader adoption of energy efficiency policies across Europe.

By integrating the **INSPIRE Replicability Methodology** with a robust stakeholder engagement process, this deliverable lays the foundation for evidence-based, context-sensitive energy efficiency policy replication, supporting the EU's climate neutrality and energy efficiency goals.

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1. INTRODUCTION

The **Energy Efficiency First** principle is a guiding concept embedded in the EU's long-term strategy for **climate neutrality** by 2050. It advocates that the most sustainable and cost-effective energy is the energy that is not consumed. In practice, this means prioritising energy efficiency measures over energy supply increases, even from renewable sources. The SEED MICAT project aligns with this principle by showcasing how energy efficiency can deliver significant Multiple Impacts—ranging from **cost savings** and **job creation** to **public health improvements** and **environmental preservation**.

The **Multiple Impacts** (MI) of energy efficiency measures are central to achieving the EE1 principle. However, integrating these impacts into **policy frameworks** is a complex task, requiring robust tools that can capture the full range of effects, both **quantitative** and **qualitative**. The SEED MICAT project is designed to address this challenge by refining and expanding the existing Multiple Impact Assessments framework. It will allow policymakers to assess energy efficiency not only in terms of **cost-effectiveness** but also through its contribution to broader **societal goals**, such as **energy independence** and **resilience to climate change**.

1.1 Replicability and the need for adaptation

At the heart of WP6 is the goal of replicability - the ability to adapt and implement successful solutions in different locations to achieve similar results. However, as recognised within the project, replicability cannot be a simple "copy-paste" strategy. Each location, whether it is a country, region, or city, presents its unique challenges and opportunities. Local factors, such as **institutional frameworks**, **socio-economic conditions**, and **environmental characteristics**, play a critical role in determining the success of **energy efficiency measures**.

To ensure that the **replication methodology** developed by **SEED MICAT** is both robust and adaptable, the project employs a **quali-quantitative approach** developed by **ISINNOVA**, referred to as **INSPIRE**. This method integrates **quantitative data** from impact assessments with **qualitative insights** gathered from **stakeholders** in the field. By focusing on a **participatory process** that engages **national actors**, the project aims to capture the full complexity of each context and define the most replicable solutions accordingly.

The **SEED MICAT** project also recognises the importance of showcasing **INSPIRE methodology** in pilot countries. By working closely with three national showcases—**Germany**, **Italy**, and **Czech Republic**—the project will adapt and improve the method before extending the replicability analysis to eight additional **EU countries**. This iterative approach ensures that the INSPIRE framework

remains flexible and responsive to the needs of diverse governance structures and societal demands across Europe.

1.2 Purposes of INSPIRE replicability methodology

In the SEED MICAT project, the **INSPIRE replicability methodology** will be crucial in facilitating the broader application of the **multiple impacts assessments** and ensuring that the **EE1 principle** becomes more deeply integrated into **policy frameworks** in different context. Specifically, the methodology seeks to:

- **Assess** the replicability of **energy efficiency solutions** and **multiple impacts assessments** across different **governance structures**, accounting for local variables and **decision-making processes**.
- **Apply** the INSPIRE replicability methodology to ensure it remains adaptable to the specific needs of different national **policymakers**, providing them with the tools necessary to assess **climate neutrality pathways** and **energy efficiency measures**.
- **Fine-tune** the INSPIRE replicability methodology to deeply understand factors such as the **socio-cultural background** of stakeholders, as well as **governance** and **institutional triggers** and constraints, to ensure a comprehensive assessment of the broader **societal aspects** of including **multiple impacts assessments** of energy efficiency policy.
- **Engage stakeholders** at different contexts through a **participatory approach** that includes **workshops, interviews, and questionnaires**, ensuring the **replication process** remains grounded in real-world needs and challenges.

1.3 Glimpse into INSPIRE Replicability Methodology

INSPIRE is a **decision support tool** designed to assess the replication potential of various options—such as urban solutions, national policies, and specific technologies—within specific locations, including **cities, countries,** and **implementation sites**. It evaluates a comprehensive range of **local factors** influencing applicability, guiding users to select the most **suitable solutions** for their local context. The approach involves analyzing different dimensions through tailored tools, e.g.:

- **SITEE** assesses Sociocultural, Institutional, Technological, Environmental, and Economic dimensions, as defined in 3.3 Replicability Dimensions.

- **MEETS** evaluates Market, Effectiveness, Ecosystem, Time, and Side effects.

The quantification of these dimensions is calculated with the **mathematical approach** described in 3.1 The Mathematical Approach**.** This framework employs **Cartesian diagrams**, with variables positioned as follows:

- **Solution variables**: Factors characterising the solution itself, represented on the horizontal axis.
- **Context variables**: Factors inherent to the local context, represented on the vertical axis.

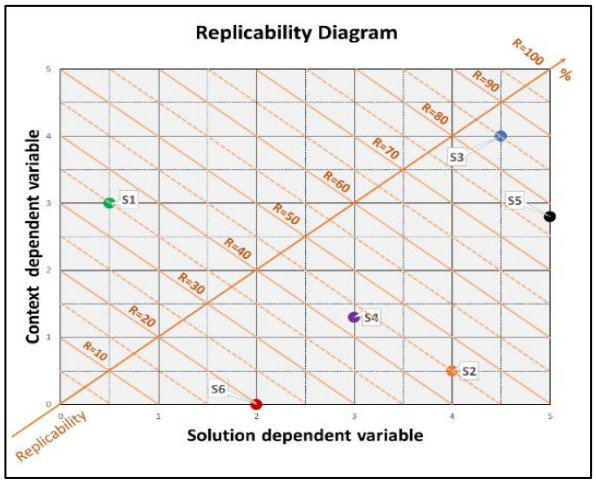

FIGURE 1: REPLICABILITY DIAGRAM

According to those variables, each solution is plotted as a **point** on the diagram. The **replication potential**, ranging from **0-100%**, is determined by the intersection of these points with iso-replicability lines (diagonal lines in the figure).

In INSPIRE, every dimension is rapresented through a **Replicability Diagram** composed by Solution and Contexts variables.

Here is an example for other previous ISINNOVA project (Table 1):

TABLE 1: SOLUTION AND CONTEXT VARIABLES IN PREVIOUS PROJECT

SITEE Dimension	SOLUTION Variables	CONTEXT Variables
SOCIO-CULTURAL	• User Interaction Independence	• Population Acceptance • Responsiveness to population needs
INSTITUTIONAL	• Public-Private Cooperation	• Responsiveness to institutional priorities • Responsiveness to institutional needs
TECHNOLOGICAL	• TRL[1] (or SRL[2]) • Interoperability/ Standardization Level	• Interest from Research/Industry/Private sectors to invest • Integrability in the existing infrastructure (hardware/software)
ENVIRONMENTAL	• $CO2_{eq}$ reduction	• Legal viability
ECONOMIC	• Investment Costs • Operation Costs • Revenues/Savings	• Affordability of the solution by the city

The **Context Variables** are informed through questionnaires addressed to institutions, **stakeholders**, citizens from the city/country targeted for replication, while the **Solution Variables** should be elicited from the industrial/private entities and local administrations **who implemented the solutions** or, alternatively, can be obtained through **desk research** activities and experts' estimations, as explained in chapter 2.4 Stakeholder Engagement Process.

Once all variables are calculated, a **Replicability Diagram** can be obtained for each dimension and the "dimensional" values of replication obtained are then averaged to estimate the **Overall Replication Potential** of the selected options in the specific context under assessment - e.g. city, country, etc. (Figure 3-4).

[1] Technology Readiness Level
[2] Solution Readiness Level

	Socio-Cultural Replication	Institutional Replication	Technological Replication	Environmental Replication	Economic Replication	Overall Replication Potential
Solution 1	?	?	?	?	?	?
Solution 2	?	?	?	?	?	?
Solution 3	?	?	?	?	?	?
Solution 4	?	?	?	?	?	?
Solution 5	?	?	?	?	?	?
Solution 6	?	?	?	?	?	?

FIGURE 2: EXPECTED RESULTS – OVERALL REPLICABILITY POTENTIAL

FIGURE 3: SOLUTIONS RANKING IN CITY X –

To conclude, INSPIRE's **multi-dimensional assessment** identifies key factors that may **limit or facilitate replication**, supporting users in selecting the most replicable options based on all relevant aspects of their local context. This comprehensive approach ensures that the chosen solutions are well-suited for **successful implementation** and **scaling**.

2. Conceptual Framework

2.1 Definition of Replicability

Replicability is not merely the mechanical reproduction of successful energy efficiency measures across different regions or countries. Instead, it is defined as the **adaptive implementation** of these measures, taking into account the unique characteristics and contextual factors of each location. **Replication**, in this framework, involves the nuanced and informed transfer of **best practices**, where solutions are customised to suit **local governance structures**, socio-economic conditions, institutional capacities, and environmental variables.

The **INSPIRE methodology** embraces the notion that replicability is far more complex than a "one-size-fits-all" approach. Each location possesses its own distinctive challenges, opportunities, and constraints. These variations can stem from differences in policy frameworks, cultural attitudes, levels of **technological readiness**, and geographical features. As a result, any attempt to replicate a solution must begin with a deep understanding of the **local context**. This understanding will inform how the original solution can be modified or tailored to fit the specific conditions of the target area.

2.2 Replicability as an Adaptive Process

In **SEED MICAT**, replication is viewed as an **adaptive process** rather than a mere duplication. The **INSPIRE methodology**, developed by ISINNOVA, ensures that the replication of energy efficiency solutions is conducted with careful consideration of **local variables**. This methodology incorporates both qualitative and quantitative dimensions, recognising that successful replication requires an integration of **data-driven insights** with **qualitative assessments** of institutional and socio-cultural factors.

Key to this adaptive approach is the principle that **context matters**. For instance, an energy efficiency solution that has proven effective in one country may need significant adaptation before it can succeed in another. This adaptation might involve adjusting the solution to fit the **regulatory landscape**, ensuring that it aligns with local economic priorities, or modifying it to account for the **technological infrastructure** available in the target country. By engaging with **national stakeholders** and using **participatory methods**, the **SEED MICAT** project seeks to capture these contextual nuances and ensure that each energy efficiency measure is customised for maximum effectiveness.

The **INSPIRE replicability methodology** adopts a twofold approach, designed to evaluate both the **policy-making process** and the local context in which energy efficiency measures are to be replicated. This approach ensures that each solution is not only assessed for its intrinsic effectiveness but also for its suitability within the specific national context, recognising the diversity of **governance structures, environmental qualities,** and economic factors across EU member states.

Together, these two dimensions provide a **comprehensive framework** for understanding the replicability potential of **energy efficiency measures**. By balancing **policy-driven insights** with **context-specific realities**, the **INSPIRE replicability methodology** ensures that solutions are adapted to meet the unique challenges and opportunities of each national context.

2.3 Objectives of SEED MICAT Replicability Analysis

The **SEED MICAT Replicability Analysis** has a **dual objective**, aimed at evaluating both the **replication potential** of national energy efficiency policies and the possibility of integrating **Multiple Impact analysis** into the policy-making process. These two objectives are closely interconnected, yet each focus on distinct aspects of the energy efficiency decision-making pathway.

First, we will evaluate the **replication potential** of **energy efficiency policies** by analysing the **economic, environmental**, and **technological aspects** of the measures identified in the national showcases. This potential reflects a policy measure's ability to be replicated in other nations while preserving its core characteristics—namely, its impacts and benefits, acceptability, and institutional alignment. In essence, it evaluates **the policy's capacity to achieve its intended outcomes across different contexts**. This will involve a detailed investigation of both the **inherent characteristics** of the policies under assessment and the **context-dependent factors** specific to the countries where replication is intended. By examining these dimensions through the INSPIRE Method, we thus aim to provide a comprehensive understanding of how policies that have proven successful in one national context can be adapted and implemented in others, ensuring that the specific economic, environmental, and technological conditions are fully accounted for.

Second, we will assess the **process of integrating Multiple Impact analysis** into the policy-making framework for energy efficiency. This part of the analysis will consider the **sociocultural** and **institutional factors** that influence how policymakers incorporate multiple benefits into their decision-making process. Currently, the inclusion of Multiple Impacts in the analysis of climate neutrality pathways is not widely implemented due to perceived **complexity** and a lack of readily available tools. Therefore, SEED MICAT aims to overcome these barriers by providing a structured approach to understand the inclusion of Multiple Impact considerations, helping to support better decision-making and policy outcomes at all governance levels.

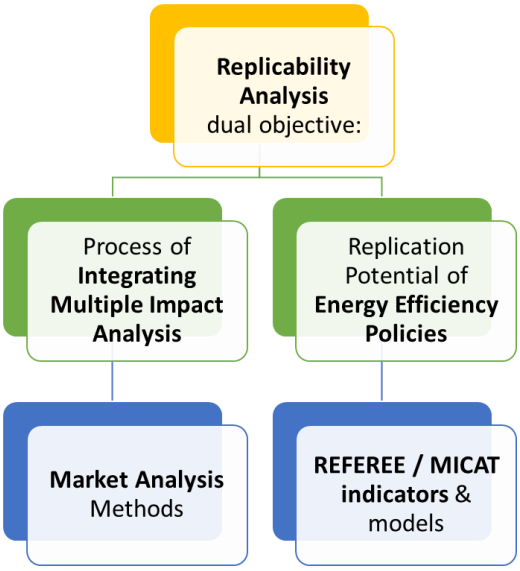

FIGURE 4 OBJECTIVES OF SEED MICAT REPLICABILITY ANALYSIS

Through this **dual analysis**, SEED MICAT seeks to not only enhance the replicability of energy efficiency policies but also to mainstream the use of

Multiple Impact assessments in energy policy decisions. This structured approach will ensure that both the practical aspects of policy replication and the broader socio-cultural and institutional dynamics are effectively addressed.

2.4 Stakeholder Engagement Process

The stakeholder engagement process within the SEED MICAT project is a vital component, ensuring that insights from key actors across different national contexts contribute to a robust and adaptable replication analysis. Stakeholders are divided into two primary groups: those representing the **SEED MICAT National Case Studies** and those associated with the **target countries**. Each group is engaged at strategic phases of the project to support the development, validation, and application of the replication methodology.

Stakeholders from the SEED MICAT national case studies play a pivotal role in shaping the methodological foundation of the project. These stakeholders are engaged at three crucial stages:

- **Phase 1**: **Defining the Process of Integrating Multiple Impact Analysis into Policy-Making**: In this initial phase, national case study stakeholders collaborate to establish the framework for integrating **MI analysis** into the broader policy-making process. Given the complexity of MI analysis, stakeholders provide insights into the **socio-cultural and institutional factors** influencing the feasibility and acceptance of involving Multiple Impact tools in policy assessments. Their contributions will guide the design of the MI integration process to ensure it is relevant and applicable within the national policy-making frameworks.

- **Phase 2: Selection and Initial Assessment of Energy Efficiency Policies**: In this phase, stakeholders collaborate with the SEED MICAT team and case study partners to **select energy efficiency policies** from the three national showcases that align with the project's objectives and national priorities. These selected policies undergo an **initial multiple impact assessment** using tools like **MICATool** and/or **REFEREE Tool**, providing a baseline understanding of their effectiveness and replication potential. This process ensures the chosen policies reflect a balanced consideration of local insights and broader applicability, preparing for the subsequent definition of quantifiable variables.

- **Phase 3: Defining Quantifiable Variables for Each of the INSPIRE Dimensions** (Month 18, May 2025): At this stage, stakeholders work with the SEED MICAT team to define **quantifiable variables** for **each of the INSPIRE dimensions** (Sociocultural, Institutional, Technological, Environmental, and Economic). Their expertise helps refine these variables, making sure they are measurable, contextually relevant, and accurately reflect both policy and context factors. This stage is critical for establishing a data-driven foundation, enabling SEED MICAT to capture the unique characteristics of each dimension and align them with the INSPIRE replication methodology.

- **Phase 4: Assessment of Replication Potential for Selected Energy Efficiency Policies** (Month 22, September 2025): In the final phase, national case study stakeholders validate the assessment of the **replication potential** of **selected energy efficiency policies** developed by ISINNOVA. By validating the replication potential at this stage, stakeholders contribute to a clear understanding of which energy efficiency policies are most adaptable across different national contexts, laying the groundwork for further analysis in the target countries.

Stakeholders from the target countries are engaged once the foundational analysis and variable definitions have been established with the SEED MICAT partners and national case study stakeholders. Their role is to provide data and information specifically to assess the **replication potential** of selected energy efficiency policies **within their own national context**. This stage follows the involvement of the national case study stakeholders and allows for a transfer of insights and best practices from the SEED MICAT case studies to the target countries.

Target country stakeholders assess how well the energy efficiency policies defined by the SEED MICAT case studies, can be adapted to their own unique socio-economic, institutional, and environmental conditions. They apply the quantifiable variables defined during earlier phases to **evaluate the feasibility of implementing these policies in their context**. Through this focused assessment, target country stakeholders provide critical data on context-dependent factors, enabling a nuanced analysis of replication potential that is specific to their local needs and resources.

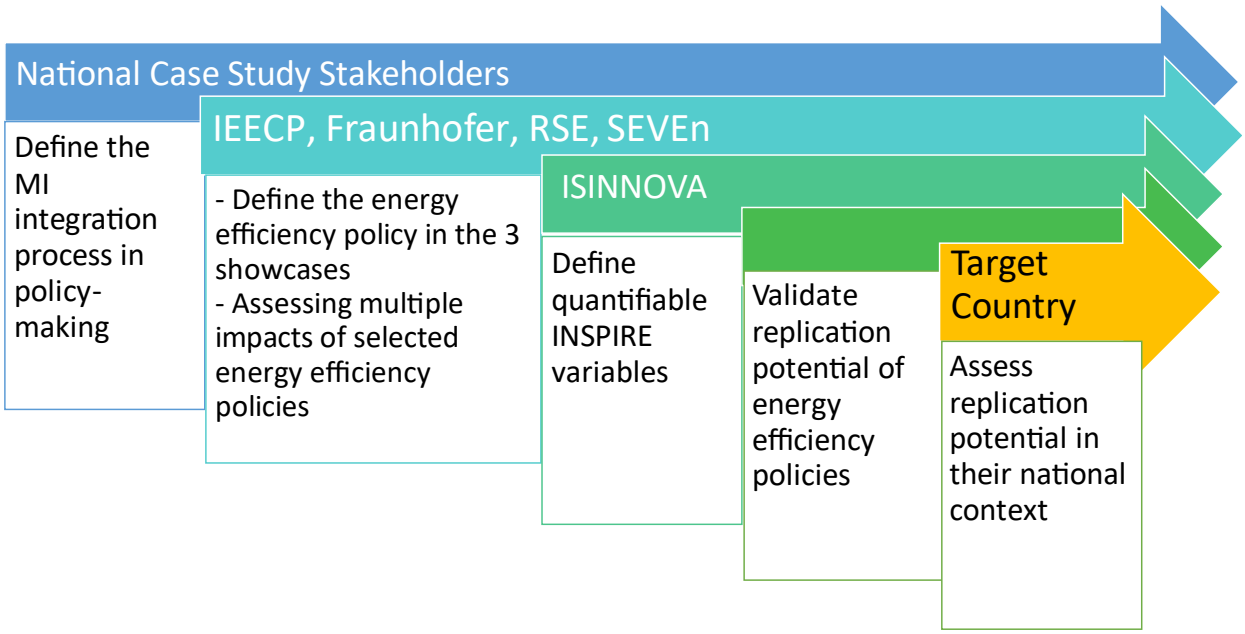

FIGURE 5 STAKEHOLDER ENGAGEMENT PROCESS

The stakeholder engagement process in SEED MICAT is designed to be progressive and iterative, with **national case study stakeholders** providing the foundational input and validation, which is then transferred and applied by **target country stakeholders**. This structured approach ensures that the **replication potential** of energy efficiency policies is rigorously assessed, benefiting from diverse

perspectives and insights. Through these phases, SEED MICAT can develop a robust and adaptable framework for **Multiple Impact integration** and policy replication across various European contexts, leveraging both local expertise and cross-national collaboration.

2.5 Criteria for Selecting Additional Target Countries

Selecting **appropriate target countries** for the SEED MICAT project is a vital part of guaranteeing that the replication methodology can be applied effectively. To achieve a balanced and impactful selection, three primary criteria are proposed: **connection with high-level policymakers**, **geographical coverage**, and **size of the country**. These criteria are designed to enhance the representativeness and effectiveness of the replication analysis while aligning with the project's overarching goals.

Connection with high-level policymakers. The possibility to engage and collaborate with high-level policymakers is essential for collecting adequate information and include a policy evaluation that can consider a wider range of influencing factors and consequences. This criterion ensures that the selected countries can act as **drivers of change**, providing the necessary political support to test, validate, and potentially implement the evaluated policy and its multiple impact assessment. SEED MICAT will prioritise target countries that demonstrate:

- **Strong institutional relationships** with policymakers who can influence and facilitate the integration of multiple impact assessments into national energy efficiency policies.
- An existing network of **decision-makers** and **stakeholders** actively involved in the formulation and implementation of energy efficiency measures.
- A commitment to **policy innovation**, evidenced by ongoing or recent reforms in the energy or climate sectors.
- **Willingness to engage** with the SEED MICAT team and provide detailed feedback in order to explore in depth the energy efficiency policy-making process in their country.

Geographical Coverage. To enhance the replicability of SEED MICAT across diverse contexts, the selection of target countries must ensure broad **geographical coverage**. This approach guarantees that the methodology is tested under a variety of **regional conditions**, enhancing its adaptability and relevance across the EU. This geographic characteristic includes:

- Representing a range of **climatic zones** and **environmental conditions** to account for varying energy demands and resource availability.
- Including countries from **different regions of Europe**, such as:
  - **Northern Europe**, where energy efficiency is often advanced but may require refinements for broader adoption.
  - **Southern and Eastern EU**, where unique socio-economic and infrastructural challenges exist.

- **Central Europe**, which may act as a bridge between diverse policy contexts.

Size of the Country. The country's **economic scale**, **population**, and **energy consumption patterns** are of significant importance in the selection process. Balancing the size of the selected countries ensures that the methodology is robust enough to address the **complexities** of large-scale policy replication while remaining **flexible** for smaller, more focused implementations. This method is designed to address the specific requirements of:

- **Large countries:** Offer opportunities to test the methodology on a broader scale, often encompassing diverse regional contexts within the same nation. This enables insights into **policy scalability** and **regional variability.**
- **Small** and **medium-sized countries**: Provide opportunities to assess how the methodology performs in contexts with **limited resources**, **smaller administrative systems**, and **different institutional capacities**.

By applying these criteria, SEED MICAT aims to select a diverse set of target countries that encapsulate the **wide range** of **challenges** and **opportunities** across Europe. This approach seeks to strengthen the **methodology's applicability** by addressing varied political, socio-economic, and environmental contexts. It also enhances stakeholder engagement by ensuring that the selected countries reflect the EU's diverse energy landscape, fostering broader **inclusivity** and **representation**. Ultimately, the selected countries will play a pivotal role in **validating** the SEED MICAT methodology, contributing to its refinement and ensuring its relevance for an extensive array of EU member states.

3. Methodology for Replication Assessment

3.1 The Mathematical Approach

The INSPIRE Replicability Methodology, developed by ISINNOVA, breaks down complex policy analyses into quantifiable elements, allowing for a clear and systematic assessment of whether a particular objective can be successfully replicated in a target country. The mathematical approach is explained by considering energy efficiency policies as research objects for the sake of simplicity.

The method is built into a mathematical method that works with two main types of variables: **Policy variables** and **Context variables**. These variables are analysed to estimate the replicability potential of a given solution in a different national context.

- **Policy Variables**: These variables are inherent to the specific **energy efficiency policy** under assessment. The values associated with these variables are independent of the context and reflect the characteristics of the policy itself. Policy variables can include factors such as the

technical complexity of the policy, its **environmental implications**, and its **economical requirements**.

- **Context Variables**: These variables are specific to the countries where the policy's replication potential is being evaluated. **Context variables** reflect factors such as the local **economic conditions**, **environmental priorities**, and **technological infrastructure** that may affect the feasibility of implementing the policy in that particular country. These variables are influenced by local governance, stakeholder engagement, and existing infrastructure, making them highly context dependent.

By analysing both policy and context variables, INSPIRE provides a **comprehensive assessment** of whether an energy efficiency policy that has been successful in one country can be adapted to another, taking into account both the intrinsic qualities of the policy and the unique conditions of the target country.

3.1.1 Graphical Representation Using Cartesian Diagrams

To simplify the complexity of this analysis, the mathematical approach is visually represented through **Cartesian diagrams**, which plot the relationship between policy variables, context variables, and replication potential.

1. Two-Axis Model **- Policy and Context Variables**: Each policy is represented as a point on a **two-axis Cartesian diagram** (Figure 3a). The **horizontal axis** represents the **policy variables**, and the **vertical axis** represents the **context variables**. This provides a straightforward visual representation of how well the policy aligns with the context of the target country.

2. Three-Axis Model **- Introducing Replication Potential**: A third axis is introduced to represent the **replication potential** (Figure 3b). This third axis introduces **iso-replicability lines**—diagonal lines that intersect the points representing different policies. The position of each policy on the diagram relative to these lines indicates its replication potential, with the intersection point determining the score. Policies closer to the higher iso-replicability lines have greater potential to be replicated, while those further away may face more challenges in adaptation. To summarise, in the Cartesian plane we have:

    - **Policy Variables (x-axis)**: Characteristics specific to the policy.
    - **Context Variables (y-axis)**: Country-specific conditions.
    - **Replication Potential (z-axis)**: The overall score (0-100%), determined by the intersection of policy and context variables.

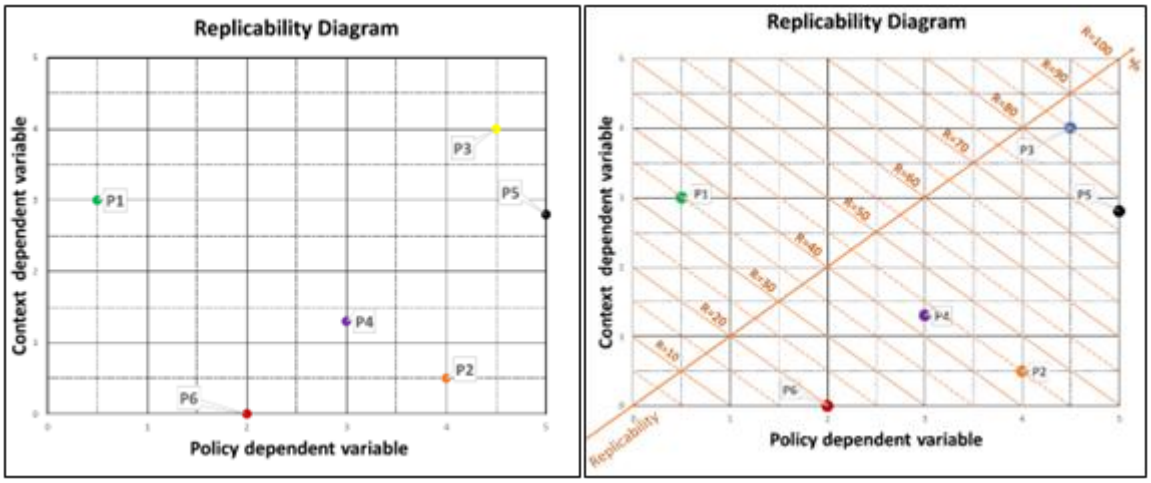

FIGURE 6 REPLICABILITY DIAGRAM

This visual representation enables policymakers to easily identify which energy efficiency policies have the highest likelihood of being successfully replicated in a new context, as well as to see where adjustments may need to be made to improve replication potential.

3.1.2 The Calculation of Replication Potential

The replication potential of each policy is expressed as a percentage, representing how likely the policy is to be successfully replicated in a new context. The method follows a **structured approach**, which calculates the replication potential for each dimension (e.g. SITEE - Sociocultural, Institutional, Technological, Environmental, and Economic). Figure 8 give a first comprehensive overview of how INSPIRE works and its wide application potential.

		Socio-cultural			Istitutional			Tecnological			Environmental			Economic			
		Average values of variables referring to the policy indicators	Average values of variables referring to the local context	Dimension overall average	Average values of variables referring to the policy indicators	Average values of variables referring to the local context	Dimension overall average	Average values of variables referring to the policy indicators	Average values of variables referring to the local context	Dimension overall average	Average values of variables referring to the policy indicators	Average values of variables referring to the local context	Dimension overall average	Average values of variables referring to the policy indicators	Average values of variables referring to the local context	Dimension overall average	Country replicability assesment - overall averages
Measure name	Code	[1-5] qualitativ	[1-5] qualitativ		[1-5] qualitativ	[1-5] qualitativ		[1-5] qualitativ or index	[1-5] qualitativ		[1-5] qualitativ	[1-5] qualitativ		[1-5] qualitativ	[1-5] qualitativ		
Measure 1	M1																
Measure 2	M2																
Measure 3	M3																
Measure 4	M4																
Measure 5	M5																
Measure 6	M6																

FIGURE 7 OVERALL REPLICABILITY POTENTIAL

Each dimension is represented by the solution/context diagram, where both axes are scaled from 1 to 5, corresponding to **predefined scoring levels**. The 1-5 range on both axes is designed to provide a consistent and comparable scoring mechanism across all dimensions. A score of **'1'** represents the lowest alignment or weakest performance on the variable in question, while a score of **'5'** represents the highest alignment or strongest performance. For example, in the **technological dimension**, the

solution variable "TRL" receives a score of 4, indicating that the solution is well developed but not fully mature. The context variable "Integrability in the existing infrastructure" receives a score of 3, indicating moderate compatibility with the current systems in the target country. When plotted on the graph, the x-axis value (4) and the y-axis value (3) intersect at a point corresponding to an **iso-replicability score** of approximately 60%. This percentage reflects the overall replication potential of the solution within that specific dimension.

These values are then averaged to produce an **overall replication potential** score for the policy under review. The following steps outline the mathematical process used in the calculation:

1. **Dimension-Specific Calculation**: For each of the five SITEE dimensions, the method calculates the replication potential based on the alignment between **policy variables** and **context variables**. A score (0-100%) is assigned to each dimension, reflecting the degree to which the policy and the context are compatible.

2. **Overall Replication Potential**: The scores for each of the five dimensions are averaged to produce an **overall replication potential** for the policy in the given context. This overall score reflects the **adaptability** of the policy across all relevant dimensions and provides a clear ranking of policies from the most replicable to the least replicable in the target country.

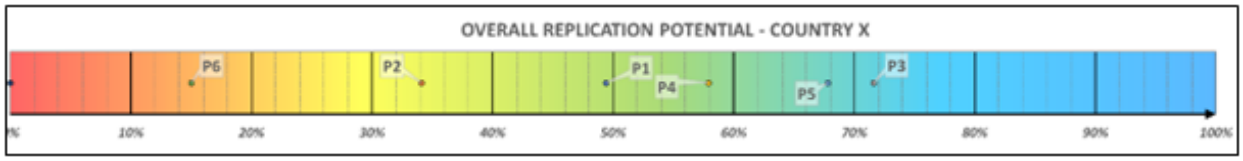

FIGURE 8 POLICIES RANKING

3.2 Selection of Energy Efficiency Policy

The selection of energy efficiency policies for the three national showcases serves as the foundation for subsequent replicability analysis. The selection criteria are delineated to achieve a balance between the necessity for both proven solutions and the value of innovative approaches, ensuring that the selected measures provide comprehensive insights into the replication potential across diverse contexts. By January, up to two energy efficiency measures should be selected for each of the three showcases, with the objective of including both a **best practice measure** and an **innovative or unusual measure,** where feasible.

The inclusion of a **best practice measure** guarantees that the analysis is based on well-established policies or measures that have been proven to be highly effective in their original context. These measures will serve as a benchmark for effective implementation and offer valuable insights on replicability. Furthermore, they also serve as a reference point for evaluating the transferability of proven solutions to new contexts, particularly in terms of their scalability and alignment with local institutional, socio-cultural, and economic factors.

Concurrently, the selection of an **innovative or unusual measure** presents the possibility of investigating novel and less conventional approaches to energy efficiency. These measures are selected on the basis of their potential to challenge existing paradigms or address specific challenges that traditional policies may not fully resolve. Including such measures in the analysis enables the project to identify the conditions under which novel solutions can thrive and the potential barriers they may encounter.

The selection process will entail close **collaboration** with the **national case study** partners, who will contribute their considerable expertise and contextual knowledge to the task. Their input will guide the identification of policies that align with both national priorities and the overarching objectives of SEED MICAT. Furthermore, stakeholder engagement will be of critical importance in order to guarantee that the selected measures reflect the specific needs and expectations of the national context, while simultaneously fostering a sense of commitment and support for the subsequent stages of analysis and implementation.

By adopting this structured and **inclusive approach**, the SEED MICAT project ensures that the selected energy efficiency policies not only represent diverse perspectives and approaches, as well as providing a dynamic and versatile methodology for replicability. This dual focus on proven best practices and innovative solutions enhances the project's ability to generate **actionable insights** and promote the integration of multiple impact assessments into energy efficiency policymaking.

3.3 Replicability Dimensions

The INSPIRE replicability methodology is initially structured around five key dimensions—**Sociocultural/Socioeconomic**, **Institutional**, **Technological**, **Environmental**, and **Economic** —based on expert input from the consortium. It is important to highlight that the replicability assessment has focused on the analysis of energy efficiency policy. In particular, the first two dimensions adopt a specific angle of analysis with regard to the policy-making process, namely the adoption and application of the Multiple Impact Assessment (MIA) tools. These dimensions will be explored in detail to provide a holistic view of both the **policy** under consideration and the **context** in which it is to be replicated. Nevertheless, it's important to highlight that both the selection of these dimensions as well as their description serve as a **preliminary classification** and can be **refined or adjusted** after engaging with national stakeholders, selecting the specific energy efficiency policies, and defining the variables required for the assessment.

1. **Sociocultural Dimension**: The sociocultural dimension investigates the **psycho-cultural profile** of the stakeholders who are responsible for adopting and utilising tools for Multiple Impact analysis (like MICAT or REFEREE Tool). This analysis aims to define the characteristics of the **"user persona"**, identifying the values, beliefs, and behavioural tendencies that influence decision-making processes. Factors such as **attitudes towards MIAs**, **perceptions of its relevance**, and **openness to innovation** are critical in determining whether stakeholders are likely to engage with and adopt Multiple Impact Assessment tools.

In addition, this dimension explores the **motivation** and **challenges** that may drive or discourage the adoption of these tools, allowing for the development of tailored decision pathways. Understanding the psycho-cultural profile of stakeholders helps to ensure that the MICATool is presented in a manner that aligns with their priorities and concerns, thus enhancing the likelihood of its successful adaptation

2. **Institutional Dimension**: The institutional dimension focuses on identifying the **barriers**, **limitations**, and **triggers** that exist within the organisations responsible for implementing energy efficiency measures. This involves an analysis of the **existing institutional frameworks**, including the presence of alternative solutions, the **executive hierarchies**, and the channels through which information is communicated. By examining these institutional factors, SEED MICAT aims to map out the **decision-making process**, identifying where gaps or obstacles exist and how the MICATool can be positioned as a solution.

This dimension also seeks to uncover any **institutional inertia** or **resistance to change**, as well as potential triggers that could facilitate the acceptance of Multiple Impact assessment tools. It is essential to understand not only the formal structures but also the **informal mechanism** and **organisational cultures** that influence how decisions are made. By doing so, the adoption of the MICATool to assess energy efficiency measures can be analysed to be feasible and aligned with the institutional context of the target country.

3. **Technological Dimension**: This dimension examines the **level of technology** involved in the energy efficiency measure and the relative **readiness** within the **target country**. For the context, the analysis could focus on the existing **technological capacity, infrastructure** and level of digitalisation within the energy sector. This includes assessing the **integration** of smart technologies, the availability of **digital platforms** and the readiness of national energy systems to support technologically advanced energy efficiency measures.

INSPIRE replicability methodology ensures that both the solutions and the country's infrastructure are well-aligned, identifying any gaps or additional investments needed to enable seamless integration and effective deployment of energy efficiency measures within the local technological landscape.

4. **Environmental Dimension**: The environmental dimension explores the **physical and ecological characteristics** of the target country, such as its **climate**, **geographical features**, and **natural resources**. These factors play a critical role in shaping the feasibility and impact of energy efficiency measures. For instance, policies that are effective in one region may need to be adapted to account for differences in **climatic conditions** or **resource availability** in another.

INSPIRE replicability methodology ensures that environmental considerations are fully integrated into the policy design and implementation process. By tailoring solutions to the specific

environmental conditions of each country, the methodology enhances the sustainability and long-term effectiveness of energy efficiency measures.

5. **Economic Dimension**: The economic dimension evaluates the **financial feasibility** and **economic incentives** that can drive or hinder the adoption of energy efficiency policies, and the economic impact of the policy in terms of, for example, employment, industry value added and GDP. This includes assessing the **cost-effectiveness** of energy efficiency measures, the **availability of funding**, and the presence of **financial incentives or subsidies** that may encourage adoption.

Understanding the economic landscape of the target country is essential for determining the **viability** of implementing energy efficiency solutions. By analysing the economic drivers and barriers, the INSPIRE replicability methodology can be positioned as a cost-effective solution that aligns with the financial priorities of national governments and stakeholders.

3.4 Define the Integration of MIAs into the Policy-Making Process

The replicability assessment of the integration of Multiple Impact Assessments (MIAs) into the policy-making process is an innovative aspect of the INSPIRE Method, and it aims at providing policymakers with a **structured framework** to evaluate comprehensively the adoption process of energy efficiency policies. This integration addresses the growing demand for **evidence-based** decision-making process that accounts for economic, environmental, and societal dimensions, reflecting the **complexities** of modern governance systems. The SEED MICAT approach recognises the inherent challenges in embedding such assessments into policy frameworks, particularly given the diversity of governance structures, institutional priorities, and socio-cultural contexts across Europe.

In order to define the **integration of MIAs** in the policy-making process and to assess the socio-cultural and institutional replicability variables, the SEED MICAT project used a methodology based on two complementary tools: the **User Personas Framework** and the **User Experience Journey Map**. These methodologies were selected for their ability to analyse and distil the socio-cultural trait that characterise policymakers and institutional factors that influence the adoption of MIA tools. Together, they offer a **stakeholder-centric** approach that ensures the framework is rooted in the realities of those who design, select and implement energy efficiency policies.

The **User Personas Framework** was instrumental in understanding the **socio-cultural dimension** of MIA integration. By creating detailed personas for key stakeholders—such as policymakers, institutional leaders, and technical advisors—the project tries to identify the psychological, cultural, and social traits that shape their behaviour in the workplace. This analysis highlighted critical factors such as stakeholders' **openness** to innovation, their perceived relevance of multiple impact assessments, and the preferred **communication strategies** to engage them effectively. These insights allowed the project to define variables that quantify these socio-cultural factors, such as users' engagement levels and acceptance of analytical tools.

Complementing this, the **User Experience Journey Map** provided a dynamic perspective on the **institutional dimension**. By mapping the journey of stakeholders as they interact with MIA tools, this methodology uncovered specific institutional barriers, enablers, and triggers at each stage of the policy-making process. This mapping exercise revealed critical touchpoints where interventions could facilitate adoption, such as ensuring tool compatibility with existing processes, aligning with institutional **priorities**, and addressing **resource constraints**. It also highlighted areas where resistance or inertia could arise, allowing for the identification of strategies to overcome such challenges. The insights derived from this mapping exercise will be translated into measurable variables, such as institutional readiness and the adaptability of governance structures.

The aforementioned analytical frameworks were employed to structure both the **questionnaire** and the **stakeholder workshops** conducted during the three national meetings held in November in Prague, Berlin, and Rome. These frameworks provided a consistent approach to gather insights and facilitate discussions on the integration of MIAs into the policy-making process. Further detailed information on the workshop discussions and the questionnaires can be found in the attached **annexes**.

These tools were not only instrumental in exploring the socio-cultural and institutional dimensions but also in translating complex, qualitative dynamics into **quantifiable metrics** that align with the INSPIRE methodology. For instance, the integration of MIA tools required the identification of variables that could be systematically assessed across different contexts, ensuring that the socio-cultural and institutional dimensions became actionable elements in the replicability analysis. Examples of variables that might be identified and assessed in the SEED MICAT replicability analysis, include:

- **Socio-cultural variables**: Stakeholder willingness to adopt MIAs, alignment with cultural norms, and perceived relevance.
- **Institutional variables**: Organisational flexibility, availability of internal expertise, and the compatibility of MIAs with existing workflows.

By applying the User Personas Framework and the User Experience Journey Map, SEED MICAT ensured that the integration of MIAs into the policy-making process was both stakeholder-focused and context-sensitive. This approach provides a replicable model that can be adapted to diverse national contexts while maintaining its **relevance** and **applicability**. Ultimately, this framework strengthens the overall replicability methodology by ensuring that socio-cultural and institutional factors are not merely deducted but become deeply and structured investigated enhance the **robustness** and **adequacy** of the analysis results.

3.5 Variables Quantifying

To evaluate the **replication potential** of energy efficiency policies, each dimension of the **INSPIRE methodology** is quantified through carefully selected variables that represent the key

characteristics of both the policy under assessment and the local context. These variables are assigned numerical values ranging from **1 to 5**, based on responses collected through structured questionnaires. Table 2 below provides **illustrative examples** of potential variables for each dimension, highlighting how these might be applied to evaluate a policy's replication potential within a specific national context. The final selection of variables will be determined in the next phases of the project, in accordance with suggestions made by project partners and following a review by stakeholders.

The selection process for these variables must adhere to specific **criteria**. The initial step will be to identify the most significant indicators for each dimension, with consideration given to the data provided by the **MICAT tool**. MICAT generates absolute values for various impacts, but their interpretation requires expert judgment, as these values must be translated into qualitative scales reflecting their relevance to the target context (e.g., “not at all,” “slightly,” “moderately,” “very,” or “absolutely relevant/satisfactory”). To complement this analysis, it is proposed to use the **REFEREE tool**, which provides impact indicators in relative terms, measured against a baseline scenario. This dual approach—combining absolute indicators from MICAT and relative indicators from REFEREE—offers a more nuanced and intuitive understanding of the **policy impacts’ relevance**.

The following criteria should be applied when selecting the variables.

Relevance to the Dimension: Each variable must effectively represent its corresponding dimension (e.g., sociocultural, institutional, technological, environmental, or economic). Due to constraints in the **INSPIRE calculation method**, a maximum of two or three variables per dimension may be selected.

Data Availability in MICAT and REFEREE: Variables must be supported by indicators available in these tools, especially for the **environmental**, and **economic** dimensions. This ensures a consistent and comparable analysis across all dimensions.

Ease of Quantification: Variables should be measurable through **structured questionnaires** administered to relevant stakeholders, allowing for straightforward quantification and integration into the replication assessment.

In addition to variables representing the policies themselves, it is crucial to define **contextual variables** for each of the five dimensions. These variables capture the **local characteristics** that influence the possibility and feasibility of policy replication in a specific country. For example, in past applications of the INSPIRE methodology, contextual variables have been used to assess factors such as **population acceptance**, **institutional readiness**, or **technological infrastructure**. These elements ensure that the analysis incorporates both the internal dynamics of the policy and the external conditions that shape its implementation.

The examples and criteria outlined in this chapter serve as a foundation for the next stages of variable selection, ensuring consistency, relevance, and actionable insights for policy replication across Europe.

TABLE 2 POSSIBLE INSPIRE REPLICABILITY VARIABLES

Dimension	Solution Variables			Context Variables		
	Variables	**Definition**	**Quantification (0-5)**	**Variables**	**Definition**	**Quantification (0-5)**
Socio-cultural	New Job Creation	The extent to which the implementation and operation of the measure contribute to the creation of new jobs (MICAT).		Social Acceptance and relevance	The extent to which the local community and stakeholders accept and support the implementation of the measure, as well as its perceived relevance and benefits to the community. This indicator evaluates the social environment and the potential challenges or support for implementing the measure.	**1**: MIAs are seen as irrelevant to the local policy context, with little connection to current needs or priorities. **5**: MIAs are perceived as highly relevant and necessary for addressing critical local challenges or meeting strategic goals.
	Reduction in energy poverty	Estimation of people lifted out from energy poverty (MICAT)				
Institutional				Organisational Flexibility		**1**: Rigid organisational structures with limited ability to integrate new tools or adapt processes. **5**: Highly flexible organisations with an

						adaptive approach to integrating new methodologies.
				Compatibility of MIAs with Existing Workflows		**1**: MIAs are incompatible with current workflows; significant changes or investments would be required to integrate them. **5**: MIAs seamlessly align with existing workflows, requiring minimal adjustments for adoption.
Technological	TRL	TRL is a metric used to assess the maturity of a technology	It ranges from 1 (basic principles observed) to 9 (actual system proven in operational environment).	Technical Expertise and Personnel Availability	The degree of specialized knowledge, expertise, and availability at national and local level of qualified personnel required to assure a correct measure implementation.	
Environmental	Reduced mortality due to reduced air pollution Ton of CO2 saved	Reduction of deaths per year due to the improvement		Geoclimatic conditions	The extent to which local climatic and geographical conditions,	

		of air pollution (MICAT).			such as temperature variations, precipitation patterns, wind conditions, seismic activity, and terrain, affect the implementation and operation of the measure.	
	Reduction in air pollutant					
	Ton of CO2 saved					
Economic	Impact on energy intensity	Energy intensity (kWh/Euro,) is measured as primary energy consumption per unit of gross domestic product (MICAT).		Access to financing and government support	The degree of availability and accessibility to financial resources and government support necessary for the implementation of the measure. This includes grants, subsidies, loans, and policy incentives	
	Impact on GDP					
	Impact on employment	Impact of energy efficiency measures on the employment trend (MICAT)				
	Import dependence	Calculates the % decrease of the dependence from the import of oil,				

	gas and coal (MICAT).				

5. Next Step

The next steps in the SEED MICAT-INSPIRE methodology are designed to build on each phase progressively, ensuring a robust and adaptable framework for assessing the replicability potential of energy efficiency policy. Moving forward, the methodology will be implemented in distinct, carefully planned steps, engaging both national case study stakeholders and target country representatives. The following section outlines the steps to be taken.

1. Selecting Energy Efficiency Policies for the Three Showcases (By January 2025)

Energy efficiency policies will be selected for each of the three national showcases, with the aim of including up to two measures per country: one best practice and one innovative or unconventional measure. This selection will be conducted in collaboration with the national case study partners, ensuring the policies reflect both national priorities and the goals of the SEED MICAT project. The chosen policies will serve as the foundation for further analysis and replication efforts.

3. Assessing the Multiple Impacts of Selected Policies (Month 16, March 2025)

Once the energy efficiency policies are identified, their multiple impacts will be assessed using tools such as the MICATool and REFEREE. This stage will quantify the social, environmental, and economic impacts of the selected policies, providing a baseline for understanding their effectiveness. This assessment will also validate the relevance of the policies for replication and identify key areas for improvement.

4. Defining Quantifiable INSPIRE Variables (Month 18, May 2025)

Building on the earlier analysis, SEED MICAT will define quantifiable variables for the INSPIRE framework's five dimensions: Sociocultural, Institutional, Technological, Environmental, and Economic (SITEE). These variables will be developed in collaboration with national case study stakeholders and will serve as the basis for calculating replication potential. The objective is to ensure that the variables are measurable, contextually relevant, and reflective of both policy characteristics and contextual factors.

5. Validating the Replication Potential of Energy Efficiency Policies (Month 22, September 2025)

The next step involves validating the replication potential of the selected energy efficiency policies using the INSPIRE methodology. National case study stakeholders will review the calculated

replication scores to ensure their accuracy and relevance. This validation step is essential for identifying the policies most suitable for replication across different national contexts.

6. Assessing Replication Potential in Target Countries (Following Month 22)

With the methodology validated, target country stakeholders will assess the replication potential of the selected energy efficiency policies within their specific national contexts. This stage will involve applying the quantifiable variables defined earlier to evaluate how well the policies align with the socio-economic, institutional, and environmental conditions of the target countries. The results of this assessment will provide critical insights into the adaptability and transferability of the policies.

7. APPENDICES

Stakeholder Questionnaire

In the context of the SEED MICAT replication methodology, assessing the replicability potential of incorporating multiple benefits tools into energy policy assessment requires a comprehensive evaluation of the entire decision pathway. The socio-cultural dimension is crucial for understanding how stakeholders might perceive and adopt tools like MICAT, which assess Multiple Impacts of energy efficiency measures. To explore this, the methodology involves creating detailed user personas for the key decision-makers who will engage with the tool. This includes identifying the psycho-cultural profile of these stakeholders, understanding their motivations, beliefs, and behavioural tendencies when it comes to adopting new decision-making tools.

Questions

1. Which organisation are you working for?

_____

2. What is your highest level of education?
   - High school diploma
   - Bachelor's degree
   - Master's degree
   - Doctorate
   - Others: _____

3. What is your occupation and job role?

_____

4. Are you responsible for managing or allocating any budget or funds within your workplace?
   - Yes
   - No

4b. If yes, what is the range of the budget?

- Less than €10.000
- €10.000 – €25.000
- €25.000 - €50.000
- €50.000 - €100.000
- €100.000 - €200.000
- More than €200,000

Goals and Motivations

5. What factors/considerations influence you when allocating resources (money, time, other staff) in your job?

_____

_____

6. What values guide your decision-making process?

_____

_____

Sources of Information

7. What books, blogs, magazines, or websites do you regularly read for information, professional development, industry trends, or researching services?

_____

_____

8. What conferences or events do you attend to learn about new solutions*? *namely, innovations or tools in the energy domain, specifically relevant methodologies that could enhance sustainability or energy performance.

_____

_____

9. Who are the experts, institutions, or references whose opinions you trust?

_____

_____

Personal Information

Email _____

Where are you located? _____

Please indicate your age

- Below 30
- 30-40
- 40-50
- 50-60
- Above 60

Replicability Workshop

The objective of this workshop is to engage **national energy agency stakeholders** in identifying **socio-cultural** and **institutional factors** that influence the **adoption** of **Multiple Impact tools** like MICATool in **policymaking**. The workshop will address **organisational barriers** and **decision-making processes** within institutions, identifying both **resistances to change** and **potential triggers** that could facilitate the **replicability** of the adoption of Multiple Impact tools in the policymaking process. Additionally, by exploring the socio-cultural profiles of users, we aim to align **MICATool** with **stakeholder priorities** to enhance its **acceptance**.

To investigate **your relations** with the process of **adopting multiple impacts tools**, we apply the **User Experience Map.** It highlights yours **needs, challenges,** and **motivations**, ensuring that examinate policy are also aligned with **socio-cultural trait**.

- **How do you find out about the policy support tool?**
- How do you become aware of multi-impact tools for cost-benefit quantification in energy efficiency policy analysis?
- Who informs you about such tools (colleagues, experts, consultants)?
- Where do you first encounter these tools (conferences, reports, online)?

- **What are you aiming to achieve when you start analysing the multiple impacts of a policy?** E.g. validate the relevance of the tool for which specific policy goals? check the compatibility of the tool with which other institutional instrument? anticipate implementation challenges, improve transparency, etc
- Who do they consult with (internal teams, external advisors)?
- What information or resources do they seek out first?
- Which departments or roles are involved in the early decision-making process?

- **What key outcomes do you want to achieve from using the tool?**

E.g., ease of integration into which existing processes? simplify reporting requirements, optimise resource allocation, etc.

- What platforms or events facilitate these interactions (webinars, support calls, pre-defined process)?