Maastricht University

**Integrated Sustainability Project Report**

# Shared Power, Shared Future: Cooperative Pathways to Inclusion in Beekdaelen's Energy Transition

Client: ImpulZ Energiecoöperatie Beekdaelen


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## Table of contents


**List of figures** **3**
**List of tables** **4**
**List of abbreviations** **4**
**1. Introduction** **5**
1.1. The client and the goal of the assessment 7
1.2. Structure of the report 8
**2. Methodology of the assessment** **9**
2.1. Phase 1: Defining the problem 9
2.2. Phase 2: Identifying possible options 10
2.3. Phase 3: Assessing possible solutions 11
2.4. Phase 4: Monitoring, evaluation & learning 12
**3. Phase 1: Defining the problem** **14**
3.1. Actor analysis 14
3.1.1. Formulating the problem 14
3.1.1.1. Existing situation 15
3.1.1.2. Desired situation 16
3.1.2. Identifying the actors 16
3.1.3. Mapping formal relations 19
3.1.4. Actors' problem formulation 21
3.1.5. Dependencies of actors 26
3.1.6. Dedication of actors 30
3.2. System description 31
3.2.1. Temporal boundary 31
3.2.2. Spatial boundary 32
3.3. Systems analysis 32
3.3.1. Means-Ends Analysis 32
3.3.2. Objectives Tree 33
3.3.3. Causal map 37
3.3.4. System diagram 39
3.4. Reformulation of the problem and central research question 43
**4. Phase 2: Identifying possible options** **44**
4.1. Intentional choices of the categories and the timeframe of the options 45
4.2. The implementation of the cream-off method and interpretations of the differences in scores 46
4.3. Key insights from the cream-off method 49
4.4. Finalization of the possible options through the cream-off method 50
**5. Phase 3: Assessing possible solutions** **54**
5.1. Three approaches to complete the MCA 56
5.2. Calculation process and the final outcome of the MCA 58
5.3. Sensitivity analysis 60
**6. Phase 4: Monitoring, evaluation & learning** **64**

6.1. Implementation plan 64
6.2. Recommendations on monitoring and evaluation 66
**7. Conclusions and critical reflections 69**
7.1. Reflection on assessment methodology 69
7.1.1. Phase 1 69
7.1.2. Phase 2 69
7.1.3. Phase 3 69
7.2. Reflection on project work and group collaboration 70
7.3. Reflection on interaction with the client 71
7.4. Reflection on the results: achieved versus intended outcomes 72
7.5. Learning from the project and the outcome 74
**Reference list 76**
**Appendices 82**

## List of figures

*Figure 1. Flow chart of the Sustainability Assessment steps and sub-steps*

*Figure 2. Formal relations of stakeholders*

*Figure 3. Power-Interest matrix among the stakeholders.*

*Figure 4. Means-ends analysis*

*Figure 5. Objectives tree*

*Figure 6. Causal map*

*Figure 7. Systems diagram*

*Figure 8. Outcome of the cream-off method (Option 17 to 19)*

*Figure 9. Outcome of the cream-off method (Option 1, 2 and 12)*

*Figure 10: Screenshot of a question in our online survey*

*Figure 11: Picture from the physical MCA workshop in Municipality of Beekdaelen*

*Figure 12. Overview of the scoring per criteria and in total*

*Figure 13. Overview of scoring and weighing*

*Figure 14. Overview of the sensitivity analysis applying 10% range*

*Figure 15. Overview of the sensitivity analysis applying 40% range*

## List of tables

*Table 1. Criteria to select actors for actor analysis*

*Table 2. Overview of the actors*

*Table 3: Actor's problem formulation*

*Table 4. Overview of actors, important resources, their replaceability, dependency, and critical actors*

*Table 5. Overview of dedicated and non-dedicated actors, and critical and non-critical actors*

*Table 6: Description of objectives*

*Table 7. System diagram elements explanation*

*Table 8. Possible Options Identified after the Cream-off Method*

*Table 9. Criteria to measure monitoring*

## List of abbreviations

CBS: Centraal Bureau voor de Statistiek
EMEC: Maastricht Energy Cooperative
GHG: Greenhouse gas
MCA: Multi criteria analysis
SA: Sustainability assessment
UN: United Nation

## Executive summary

This Integrated Sustainability Project, undertaken by students from Maastricht University, investigated strategies to help the expansion of ImpulZ Energiecoöperatie Beekdaelen and enhance participation in the local energy transition, with a specific focus on people with limited financial resources. ImpulZ, a community-based energy cooperative operating in Beekdaelen, Limburg, is dedicated to promoting sustainable energy practices and the generation of local green energy. However, the cooperative encounters obstacles such as limited community involvement, grid infrastructure limitations, and financial hurdles.

To address these challenges, the project employed a four-phase Sustainability Assessment (SA) methodology. The initial Problem Definition phase involved actor and system analyses to pinpoint key stakeholders and systemic barriers. Subsequently, the Option Identification phase generated 36 potential solutions through brainstorming and desk research, which were then refined to 9 promising options using a cream-off method. The Solution Assessment phase utilized a multi-criteria analysis (MCA) to evaluate these options according to their feasibility, implementation timeline, public acceptance, and cost-effectiveness. Stakeholder workshops and surveys emphasized the critical roles of clear communication, trust-building, and the development of low-barrier participation models. Finally, the Implementation Plan phase translated four prioritized solutions into actionable steps, including expanding personalized energy advising services, enhancing the clarity of energy bills and subsidies, forging partnerships with social workers to engage marginalized communities, and simplifying guidance on subsidies and investment opportunities.

The key recommendations from this project include short and mid-term actions. Importantly, the feasibility and prioritization of these recommendations are dependent on the scenario regarding grid congestion in the region. The implementation plan stresses the importance of monitoring progress through metrics such as membership growth and reductions in energy costs.

By prioritizing trust and lowering participation barriers, and considering the constraints of grid capacity, ImpulZ can effectively align its objectives with national sustainability targets while addressing the specific socio-economic challenges within Beekdaelen, thereby empowering all residents to actively contribute to a just and sustainable energy future.

# 1. Introduction

Climate change is a global issue that goes beyond national borders and requires international cooperation. World leaders gathered for the UN Climate Change Conference (COP) and reached the historic Paris Agreement in 2015, which set some long-term goals for every country voluntarily involved. The main targets include reducing global greenhouse gas (GHG) emissions to hold global temperature increase to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C above pre-industrial levels. Unfortunately, global warming has already exceeded the critical limit of 1.5°C, and international cooperation remains complicated due to geopolitical tensions (United Nations, n.d.)

Over 50% of the GHG emissions in the Netherlands originate from manufacturing and energy generation activities (Rijksdienst voor Ondernemend Nederland [RVO], 2022). “The country's housing energy system has developed around natural gas since its discovery in the 1960s” (Schepers et al., 2022, p. 13). Buildings emit $CO_2$ as heating and cooling demand large energy inputs, especially when they lack adequate insulation. As energy demand grows, gas reserves continue to decline. Natural gas remains the dominant heating source in the Netherlands, powering most gas boilers and district heating systems (Schepers et al., 2022, p. 13). Therefore, the Dutch government is actively promoting a transition to sustainable energy. However, encouraging every household to take part in this transition remains a challenge, as 48% of Dutch households are unable to do so due to inadequate insulation, financial constraints, or because they are not homeowners (Mulder et al., 2023, p. 1).

One of the major obstacles to the energy transition of the Netherlands is the grid congestion issue, and it is expected to slow down the energy transition from 2026. Grid congestion is a capacity shortage in the electricity network that transports and distributes electricity to users. The current electricity infrastructure in the Netherlands is insufficient to keep pace with rising demand for electricity. Dutch Energy Minister Rob Jetten said, “The electricity grid in all provinces is largely full, probably full or almost full,” in December 2022 (Pató, 2024, p. 1).

Previous studies have shown that the energy transition in certain regions of the Netherlands, such as Limburg, is more challenging than in others, largely due to the outdated housing stock, which causes poorer energy efficiency ratings. Notable, houses in these areas are often single-family homes and widely dispersed (Province of Limburg, 2021,

p.17). Addiotionally, around 70% of households experiencing energy poverty live in rental properties owned by housing cooperatives, many of which are poorly insulated houses that the residents cannot renovate (CBS & TNO, 2023).

### 1.1. The client and the goal of the assessment

Our client, ImpulZ, is an energy cooperative established in 2020, with the initiative of Beekdaelen Municipality and the participation of 15 volunteer residents. ImpulZ is still at the beginning stages with limited resources and around 35 members. It is located in Beekdaelen, a municipality in the province of Limburg, that has 35,812 inhabitants in 2025. (CBS, n.d.). ImpulZ can use government subsidies for certain solar projects, e.g., the SCE subsidy scheme (Subsidy for Cooperative Energy generation). Subsidy schemes from the municipality or national government can be used for non-generation projects such as energy coaches.

In the public energy cooperative structure, the cooperative is driven by the community, where the members collectively own and manage energy initiatives in their community area and influence energy production and consumption decisions according to the community's needs. This local control system promises economic benefits in the long run by generating energy with lower prices for community members. When profit is generated by energy transition, it can be reinvested within the community to ensure it meets the needs of the community (Morton, 2024).

There are two main topics that are highly relevant to this project: “energy transition” and “citizen engagement”– especially those citizens with limited financial resources. To begin with, “energy transition” refers to the shift from fossil fuels to renewable energy sources such as solar, wind, biomass, geothermal, and hydroelectric power. This transition is a critical systemic change to reach the national climate targets on time, and requires civil engagement and collaboration (United Nations Development Programme, 2025).

Parallel to the rest of the country, ImpulZ faces several technical and social obstacles to the energy transition of the Beekdaelen community and increase the members of Impulz. The first one is grid congestion in the province of Limburg, due to the arrival of many solar parks (TenneT, n.d.-a). This hinders the development of more large-scale renewable energy generation projects. Another obstacle is the uncertain legislative environment where energy cooperatives operate. Changes in subsidies and legislation create uncertainties for

investors, hindering long term planning and big scale projects (van Gastel, 2025). Another challenge is to ensure that people with limited financial resources participate in the energy transition, something highlighted by a board member of ImpulZ, during our first meetings, and issued to be our focus in this assessment.

Considering the two main topics for this project, we recognize that energy transition is a long-term goal, engaging people with limited financial resources should be implemented strategically. Therefore, we phrase the problem statement in a way that focuses on practical, short-term goal while bearing in mind to align with the long-term mission of ImpulZ.

The temporal boundaries for the project is 2 years (short-term). This decision is based on the gap between ImpulZ's current position and the vision to engage a large citizen base, helping towards achieving its long-term goal.

The spatial boundary of this project was determined as Beekdaelen. Beekdaelen is a sparsely populated municipality in the south of Limburg, consisting of multiple small towns. The unique economical, geological and sociodemographical features of Beekdaelen, results in the need for a context dependent solution.

In summary, the problem statement of this project, which also represents the central goal we aim to achieve, is "*How can ImpulZ increase the participation of citizens with limited financial resources in the energy transition in Beekdaelen within 2 years?*"

According to our client, the term 'citizens with limited financial resources' in this report refers to individuals who lack disposable income to participate in the energy transition, such as investing in home improvements or renewable energy-related facilities.

### 1.2. Structure of the report

The introduction has outlined the relevant contexts of the energy transition and presented the client and the assessment's goal. Chapter 2 details the methodology employed, emphasizing the tools and the four-phase Sustainability Assessment (SA) framework that guided the research. The subsequent chapters then unfold in accordance with the SA phases. Chapter 3 elaborates on the actor and system analysis, explaining the determination of temporal and spatial boundaries and the formulation of the research question. Chapter 4 presents the potential options identified through brainstorming and desk research. Chapter 5 covers the assessment and interpretation of these options using multi-criteria analysis (MCA). Chapter 6 provides the implementation plan with

recommendations for the client, along with guidance on monitoring and evaluation. Finally, Chapter 7 offers a reflection on the assessment process, summarizing key learnings and acknowledging the project's limitations and challenges.

## 2. Methodology of the assessment

Sustainability Assessment (SA) is the process of finding approaches for decisions and policy-making that create a positive impact and create a sustainable development while meeting the needs of the present and the future (Bond, 2012). A SA should be strategic; interconnected between the various assessment methods; aligned with the three pillars of sustainability, their direct and indirect effects; and divided into four main steps (see Figure 1 below): (1) defining the problem, (2) identifying possible options, (3) assessing possible solutions, and (4) monitoring, evaluation, and learning (Bond, 2012).

One of the biggest strengths of an SA is its context-specific approach, which provides relevant suggestions that support effective and efficient sustainable decision-making. However, it also encounters some weaknesses, such as the difficulty of finding the right stakeholders and collecting the necessary data. Additionally, it is indicated that a lack of attention to the last phase can lead to a failure between the learning and the practice (Bond, 2012). The group addresses these limitations by engaging the critical stakeholders identified in Phase 1, as much as possible, to ensure the quality of SA; moreover, desk research is conducted throughout each phase to deepen the learning process and to support the options and final solution(s) in the later phases.

### 2.1. Phase 1: Defining the problem

The first phase of an SA starts by performing an actor analysis, which encompasses six sub-steps. The first sub-step focuses on (1) defining the problem, by analyzing and specifying the scope of the problem, as well as defining the gap between the existing and the desired situation (Bond, 2012; Enserink, 2022). This sub-step was based on information gathered from meetings with the client and document analysis of ImpulZ. Therefore, it was crucial to obtain a better understanding of the actors involved in the energy transition in Beekdaelen, where ImpulZ operates. In this way, the group identified a (2) list of stakeholders that were involved directly or indirectly in the context or have interest, and (3) mapped the formal relations, to understand how the actors interact within the system. After this step, it was relevant to (4) understand the different actor's perspectives, which we analyzed mainly through desk research and confirmed with the stakeholders through phone calls, email correspondence, meetings, a workshop organized in Phase 3, and the field work with citizens of Beekdaelen. Furthermore, the group (5) analysed the actors' dependencies

and dedication, by analysing their replaceability, level of dependency, and concluding about their criticality. The group also (6) categorized actors according to their dedication in the topic and performed a power-interest matrix to visualize their position. After analysing the actors involved in the system, it was necessary to demarcate the boundaries of the SA, i.e. temporal and spatial boundaries (Enserink, 2022).

The second analysis of Phase 2, system analysis, refers to a critical analysis of the problem, the system, and reformulating it. The group performed a means-ends analysis to identify how ImpulZ's main objective of increasing participation of people with limited financial resources in energy transition can be reached through different pathways. Then the group moved forward to the objectives tree to visualize the criteria through which the progress towards the client's objectives is measured. Furthermore, to illustrate the causal-effect relationships between the variables in context, the group conducted a causal map, and finally, a systems analysis to map the system variables and interactions. The group chose these methods, being aware of their pitfalls, such as the possibility of oversimplifying complex interdependencies, subjectivity, and high expertise necessary. However, we believe these methods complement each other, and are useful tools for understanding the problem and how the system works (Enserink et al., 2022). The methodology used for these steps was mainly desk research, brainstorming sessions, and reaching out to the client and other stakeholders upon necessity of confirmation.

### 2.2. Phase 2: Identifying possible options

Phase 2 focuses on finding detailed possible options and alternatives to achieve the research goal. The group started by using the output from Phase 1, especially the means-ends diagram and objective tree, and developed new ideas through desk research and personal knowledge. These methods were time and cost-efficient as the analysis depends on previous work. However, it might have limited some creativity or reinforced bias (De Haan, 2012), which was overcome by the use of the following methods: brainstorming sessions, further desk research, and reaching out to experts and the client to brainstorm the ideas. The question which guided the brainstorming sessions was the project's problem statement, which is target-driven to engage people in energy transition, particularly people with limited financial resources. The extensive possible options are clustered in categories according to their similarities. This approach required a high level of expertise as in the previous phase, there was the risk of oversimplifying the context due to its complexity

(Börjeson, 2006; De Kraker, 2017; Quist, 2016). To avoid these disadvantages, the group conducted further desk research and included other stakeholders' participation, for example, other energy cooperatives, to learn from their experiences and mistakes. The methods used include phone calls, email correspondence, meetings, a workshop organized in Phase 3, and the field work with citizens of Beekdaelen.

The next step of Phase 2 was narrowing down the options through the cream-off method to determine which options score best according to two broad and relevant criteria: feasibility and effectiveness. The result of the cream-off method determines the options we brought to Phase 3 for further assessment and gave us insights to phrase suggestions in Phase 4.

### 2.3. Phase 3: Assessing possible solutions

The identified options of Phase 2 were assessed and analyzed through multi-criteria analysis (MCA) in Phase 3. An MCA aims to evaluate the options against multiple context-relevant criteria, including quantitative and/or qualitative. The output of Phase 3 is the final solution(s) that we propose to the client in Phase 4.

This method is extremely important to determine the viability of the options based on the stakeholders' perspectives and expertise. In this way the group conducted three approaches to MCA. The first approach was a workshop in person with the representatives of key stakeholders such an energy cooperative, a network cooperative, a solar energy company, ImpulZ's board members, and the municipality of Beekdaelen. The second approach was a virtual format of the workshop, adapted to a digital survey, for stakeholders that could not be present. While the third MCA was conducted by reaching out to citizens in Beekdaelen with a survey. Both the first and the second MCAs had the goal of promoting stakeholders participation by involving them in scoring the options and weighting the criteria. While the third approach was simplified to merely scoring options in order to get citizens' perspectives on how they want to be involved in energy transition.

This method was chosen for its efficiency in terms of inclusiveness and to act accordingly with the goal of the project, while building trust, accountability, and transparency. As criteria would be different for different stakeholders, this method is crucial to guarantee that everyone has a voice in decision-making (Gasparatos, 2008; Stirling, 2006). After

converting the results of the MCAs, and analysing the highest options, the group performed a sensitivity analysis to understand their volatility and conclude about it.

### 2.4. Phase 4: Monitoring, evaluation & learning

In Phase 4, a monitoring, evaluation & learning plan was conducted for the client, specifically an implementation plan, with suggestions on how to design the follow-up phase of the assessment as well as a possible time frame – short-term (2 years) and medium-term (5 years). Additionally, the group suggested a monitoring plan, including criteria to analyze the progress of the project after the SA, and their periodicity, as the group will not be available to do it in hindsight.

Furthermore, the main purpose of this phase is to evaluate and critically reflect on the strengths and weaknesses of the SA process, and the final project's outcomes to understand what can change in the system in the short and long term. In this way, the group also reflected on the learning process, on the participatory process, the used methodology, the work with the client, and within the project group, which is a key aspect of the SA to the extent that it enables continuous improvement and adaptation, ensuring long-term impact (Morrison-Saunders, 2014).

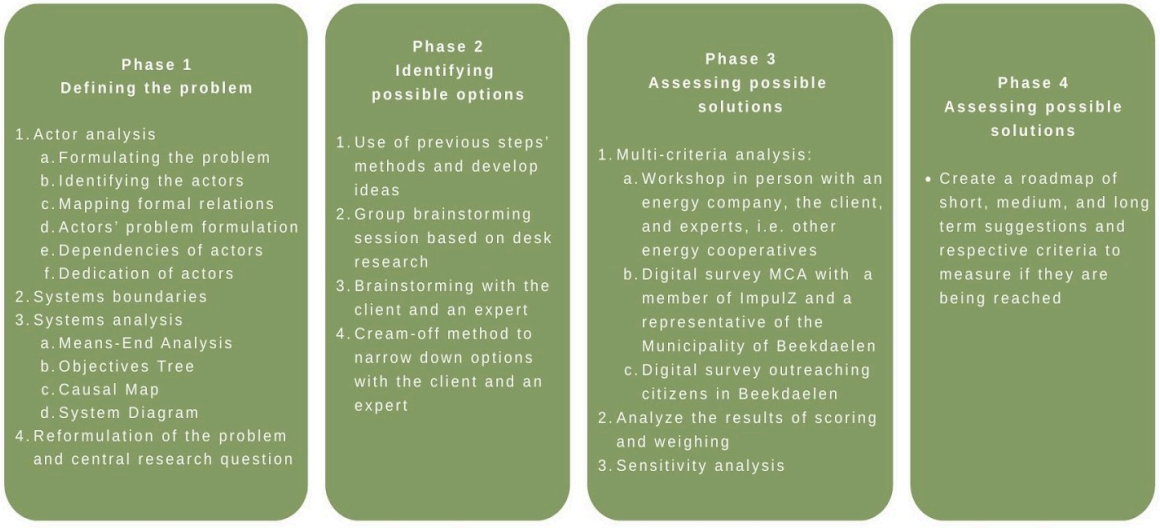


*Figure 1. Flow chart of the Sustainability Assessment steps and sub-steps*

# 3. Phase 1: Defining the problem

This chapter analyses and defines the problem by the development of: an actor analysis in which relevant actors, their relations, and their perspectives about the problem were analysed; and a system analysis, where system boundaries are established, as well as key components and causal relations, external factors, their trends and uncertainties. The base of this chapter came from the initial problem formulation prepared in the project plan, which was therefore revised and adapted to the new achieved knowledge and insights.

The initial problem definition was developed through the information and documents provided by the client, ImpulZ, regarding their business composition, missions, and general context of their operations as an energy cooperative in the energy transition. This includes the project description and our first client meeting with a board member of ImpulZ. Furthermore, the group had the opportunity to develop this problem definition during the project process by discussing the topic with other key stakeholders and understanding their concerns, particularly in the workshop performed in Phase 3 to assess possible solutions, but also through phone calls, email exchange, and reaching citizens in person.

## 3.1. Actor analysis

Actors and stakeholders are analyzed in this chapter to get a more holistic understanding of who is involved in the energy transition in Beekdaelen, their relationships, and their perspectives on the problem, goals, and interests. Mapping key players within the operating field helped us to identify possible weaknesses and strengths, and prepare for the next project phases. The actor analysis followed the six stages from Enserink et al (2022): formulating the problem, identifying the actors, mapping the relations and the different problem perspectives, analyzing the interdependencies, which were then combined, resulting in a revised and comprehensive problem formulation for the project.

### 3.1.1. Formulating the problem

The first stages of an actor analysis according to Enserink et al (2022) reflect the problem formulation in the concerned area of Beekdaelen, including its evolution and the

gap between the current situation and the desired one, which are further explored in this section.

#### 3.1.1.1. Existing situation

The existing situation in Beekdaelen was analysed in terms of socio-economic conditions, energy poverty and transition, while additionally examining ImpulZ's current role in the community.

While the poverty average in the Netherlands overall is at 3.1%, Beekdaelen has a low poverty rate of about 2% (Statistics Netherlands, 2024). Energy poverty differs from general poverty by considering additional variables such as the household's energy label, dwelling type, size, and reliance on social benefit support. In Beekdaelen, 6.1% of households fell into the energy poverty category of low income and high energy costs in 2020, double of the national average (Centraal Bureau voor de Statistiek, 2023a; Centraal Bureau voor de Statistiek, 2023b). However, about 23.2% of citizens in Beekdaelen are living in a home with low energy quality and few investment opportunities. Low energy quality in this sense means higher energy cost than the mean for that category and size of housing (Centraal Bureau voor de Statistiek, 2023a). This shows Beekdaelen as a rural area, where few citizens are poor, a significant number has high energy costs relative to their income, while many lack the means to invest against this due to the limitation of financial resources.

In this environment, ImpulZ is not able to evolve fast. Apart from the 35 members, there are also not many citizens involved in the energy transition overall. There is a local Regionale Energie Strategie initiative in Zuid-Limburg, that has so far installed solar panels on two businesses in Beekdaelen (RES Zuid Limburg, n.d.). Additionally, there is one solar park located in the region of Beekdaelen with 6000 panels generating enough electricity to power 512 homes (Beekdaelen, 2020), and two more parks in Silt and Jabeek are in the planning stage (Silt, n.d.; Beekdaelen, 2025a). The focus is on solar, as the local environmental law prohibits wind turbines currently (Beekdaelen, 2025b). Overall, this paints the picture of Beekdaelen as a municipality that is committed to sustainability, however due to the legislative environment and demographics of the municipality, they lack the power to make any meaningful change. Consequently, the citizens are not engaged a lot, among other factors due to the lack of capital and interest.

#### 3.1.1.2. Desired situation

To address the issues mentioned in the previous sub-section, the overall goal of ImpulZ for this project is to find ways to include more citizens with limited financial resources in the energy transition. As a community-focused cooperative, ImpulZ wants to find a path against injustices that arise from financial opportunities and mitigate the gap between the current situation and the desired one.

In parallel, this goal has emerged from global challenges as climate change and international goals such as the SDGs and the targets established under the Climate Agreement, particularly the target of reducing GHG emissions to hold global temperature increase to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C above pre-industrial levels (United Nations, 2025). Additionally, in the national level, the Netherlands is committed to these climate targets, and although over 50% of the national GHG emissions are from the manufacturing of goods and generating energy, and natural gas is still the most crucial energy carrier in the heating system, the Dutch government is promoting the energy transition (RVO Nederland, 2022). By 2030, it aims to generate 70% of all renewable electricity and reach zero carbon emissions by 2050 (RVO, n.d.). In the Province of Limburg, where Beekdaelen is included, an energy transition and suitable energy mix is being promoted, in order to achieve an equitable and resilient energy transition, gain energy independence, adapt to modern energy needs and reduce energy poverty, as compared with the national levels, Limburg faces a complex situation (*Energiebeleid En Ambities*, n.d.). Additionally the goal is to build community trust, ownership, and retain local wealth.

### 3.1.2. Identifying the actors

To identify actors and stakeholders, i.e. people who might have an interest or might be involved in the problem statement of the SA, the interest-based approach from Enserink et al. (2022) was used in a brainstorming session by the group, based on desk research and information gathered during discussions with the client. During the brainstorming session, criteria were established to understand what actors should be included in the analysis (see Table 1).

| Criteria |
| --- |
| Having interest in the process of increasing the participation of citizens with limited resources in energy transition |
| Being directly or indirectly involved in the process of increasing the participation of citizens with limited resources in energy transition |

*Table 1. Criteria to select actors for actor analysis*

Afterwards, the group discussed this with the client and a member of ImpulZ, and through a reputational approach and snowball sampling, more stakeholders were included to ensure a complete and holistic overview of actors network (Enserink et al., 2022). Both provided the group with contacts of stakeholders, such as Energie Samen – *"the national umbrella and advocacy organization for energy cooperatives",* in the client's words –, and a board member of Maastricht Energy Cooperative, the EMEC, who was able to give valuable insights into upscaling energy cooperatives, as EMEC already has 180 members and many projects implemented. Moreover, in Table 2, the actors were grouped and categorized according to their field, ensuring that the project included representative and diverse perspectives of the wide diversity of stakeholders. Upon this phase, the group contacted the actors through e-mail (see appendix A). The citizens were reached in person in Beekdaelen, as their contacts were difficult to find otherwise.

| **Stakeholder group** | **Actor** | **Function or organization** |
| --- | --- | --- |
| Client - ImpulZ | Board members | Chairman<br>Treasury<br>General board member |
| | Members of ImpulZ | - |
| | Energy coaches | - |
| Government | National government | - |
| | EU Institutions | European Parliament<br>European Commission |
| | Province of Limburg | - |

| | | |
|---|---|---|
| | Municipality of Beekdaelen | Department of Sustainability and Energy<br>Beekdaelen Sustainability Think Tank |
| Infrastructure | Energy suppliers | Van de bron (green)<br>Nuon (grey) |
| | Grid operators | Enexis |
| | Energy providers | - |
| Cooperatives | Energy Cooperatives | EMEC - The Maastricht Energy Cooperative |
| | Network Cooperatives | REScoop Limburg<br>Samen Om |
| | Cooperative energy supplier | Energie van ons |
| NGOs | Environmental NGO | Nature and Environment Federation Limburg |
| | | WoonWijzerWinkel |
| Citizens | Homeowners | - |
| | Rooftop owners (local businesses, facilities, etc.) | - |
| | Landlords | - |
| | Tenants | - |
| | Low-income households | - |
| Other | Housing corporations | - |
| | Local businesses | - |
| | Local newspaper | - |
| | Social workers | - |
| | Solar Companies | Volta Solar<br>PureSolar |

*Table 2. Overview of the actors*

### 3.1.3. Mapping formal relations

In the third stage of the actor analysis, the most important actors, their formal relations, and respective tasks were visualized and analysed in Figure 2. The formal diagram visualises the formal positions, relations, and tasks of the most influential or connected actors, which means that informal relations were not included in the diagram (Enserink et al., 2022). This diagram was performed based on meetings with the client, desk research on websites of the actors and documents found online.

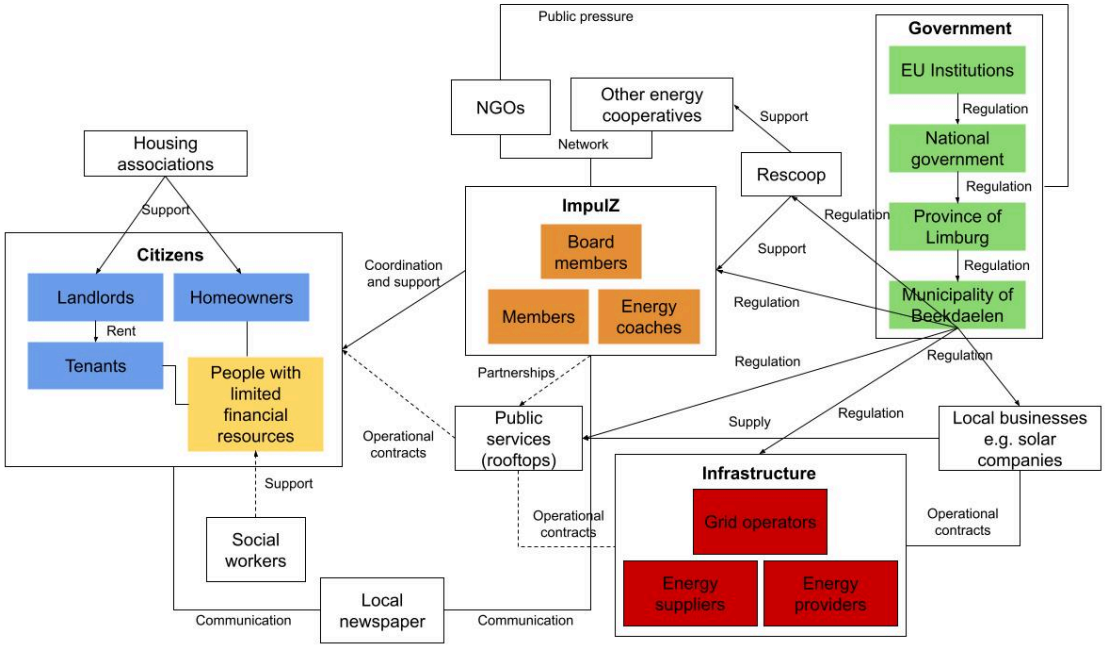


*Figure 2. Formal relations of stakeholders*

The squares in Figure 2 represent the four main clusters of stakeholders, i.e. the citizens (e.g. landlords, homeowners, and tenants), the client, the different levels of government, and infrastructure. The citizens are the most important cluster of actors, as they represent the target group, particularly *people with limited financial resources* (represented in yellow). Therefore, ImpulZ, depicted in orange, is composed of different actors that are individually relevant to the problem. Increasing the number of participants in the energy transition is the goal of the assessment, and ImpulZ's *energy coaches* play a key role

informing people about energy transition, as their job is to give citizens information on how to better save and use energy. The third main cluster named ‘government’ (in green), represents the different levels and describes how these establish policies and regulations regarding the energy transition hierarchically. Consequently the *Municipality of Beekdaelen* coordinates, monitors, and supports the other stakeholders to comply with the regulations. Lastly, ‘Infrastructure’ shows how the actors create and provide operational contracts.

The dotted arrows from public rooftops, located on schools or libraries, are an example of a solution for the problem that is already being applied in the Netherlands (UNFCCC, n.d.), and can play a crucial role in ensuring an inclusive energy transition, particularly in Beekdaelen where 28% of the households are rental properties and the tenants have a passive role, with limited decisions on the property (*Parkstad in Cijfers - Wonen - Beekdaelen*, 2023). In this way, the collective PV projects investment bypasses the requirement of individual property ownership and enables citizens to participate. This example shows how a project is dependent on many different stakeholders and therefore highlights the necessity for this clear overview beforehand.

Furthermore, the network between energy cooperatives represents a mechanism for capacity building, knowledge-sharing, and political advocacy, with potential to enhance technical and organizational abilities of smaller cooperatives like ImpulZ. The formal relations between NGOs and other stakeholders are similar in the way that it also functions as a networking mechanism but it differs in terms of acting as intermediaries between civil society, cooperatives, and institutions, supporting them with communication tools, education, and technical advice. NGOs also create public pressure on the different levels of government by advocating for inclusive energy policies, pushing for energy transition funding, and spotting gaps.

Overall, the formal relations diagram illustrates a system with strong dependencies, which is further developed in section *“3.1.5. Dependencies of actors”*, but by this analysis it is already possible to understand that ImpulZ is highly dependent on the three other groups of actors to successfully include citizens with low-income and create an equitable energy transition.

### 3.1.4. Actors' problem formulation

While previous steps of this analysis focus only on the perspective of the problem owner, the fourth step aims to highlight the perceptions of the other stakeholders. This step was performed based on assumptions from desk research, phone calls and e-mail correspondence (e.g. with a member of ImpulZ and a board member of EMEC, the Energy Cooperative of Maastricht). These insights were later confirmed during the workshop with stakeholders in Phase 3, and while doing field work with citizens in Beekdaelen.

Table 3 below offers a structured overview of the problem perspectives of the different stakeholders involved in the energy transition in Beekdaelen. Even though the interests and motivations differ, there was a common point between the stakeholders: the recognition of the importance of including citizens, particularly the ones with limited financial resources in order to ensure an equitable energy transition; but also the difficulty of doing so. Particularly EMEC's representative strongly advocated that the energy transition should not split between the rich and the poor, instead it should benefit low-income people, without burdening them as they already struggle everyday with systemic constraints. However, he proposed a different approach to upscale energy cooperatives and therefore reach this goal: ImpulZ envisions increasing the participation first and therefore prioritizes expanding the reach to people. The plan is to later implement renewable energy projects with the support and investment of many people, while the EMEC representative believes that cooperatives should firstly implement renewable energy projects with a small and potentially wealthy group of participants to generate curiosity and return of investment. This can be used for further projects that people with limited financial resources can then participate in. This divide can be seen in the different options we presented to the stakeholders.

Most of the stakeholders' perspectives on the existing situation and causes aligned, particularly in terms of systemic limitations such as limited citizens' awareness and energy literacy, lack of trust, financial barriers, and lack of time and/or interest in the topic. This is exacerbated by the negative reporting of the media on the energy transition as well as the constantly changing legislative landscape that is very confusing. Pure Solar's representative highlighted the socio-economic aspect of people only tending to invest when benefits are obvious, as they have a risk-averse mindset. On a different point, EMEC and Pure Solar focused on technological and systems design problems such as the lack of local storage, concerned by the fact that centralized systems replicate inequality by concentrating control, i.e. without storage, the return on investment is unclear, and energy systems remain fragile and unattractive to consumers. They argued that this is a missed opportunity for community

empowerment and advocated that designing localized storage solutions would satisfy both social justice and technical reliable goals.

Although the overall perspectives align, there is a gap to the citizens' perspective which justifies the difficulty of reaching them, which can be seen firstly from the actor's interest. While every stakeholder in general is concerned by long-term sustainability and increasing participation, citizens are worried about economic related factors, such as affordability, stability, and autonomy, particularly the ones with limited financial resources. Their desired situation is to have lower energy costs without bureaucracy, and low-risk/accessible solutions. However, it is difficult for them to understand technical energy and energy transition concepts due to their complexity, which does not align with the citizens' limited literacy in these topics. These people are also skeptical and/or distrustful as they fear being tricked, once they do not have the necessary literacy to understand the legitimacy of the information. A particular segment of this actor are the immigrants, which besides the financial barriers, also face language constraints sometimes, resulting in being excluded from the energy transition.

Overall there is a broad consensus among stakeholders on the importance of an inclusive energy transition, even though they have different explanations to how the current state of the problem is reached, the causes, and the possible solutions. Even within the board members of ImpulZ, there are different perspectives on these topics. Nevertheless, bridging these different viewpoints and addressing the gap with citizens requires not only technical solutions but also simplified communication and trust-based engagement, which was explored in the following phases.

| Actors | Interests | Desired situation/objectives | Existing or expected situation and gap | Causes | Possible solutions |
|---|---|---|---|---|---|
| Board member Impulz - Problem owner | Long-term sustainability; Community engagement; Social justice; Organizational growth | Inclusive and equitable energy transition in Beekdaelen; Decrease energy poverty; Scale up ImpulZ through increasing members | No active projects; Not enough members to create projects; Difficulty to reach citizens with limited financial resources | Low engagement; Limited awareness; Lack of trust; Energy poverty; Systemic exclusion | Develop low-barrier membership models; Partnerships with social workers; Enhance outreach via partnerships |
| Chairman ImpulZ | Community engagement; Long-term sustainability | Increase overall participation; Scale up ImpulZ | People don't care to engage; Hard to involve low-income citizens despite efforts | Apathy; Misinformation; Different motivations | Increase community engagement; Improve communication channels; Targeted campaigns; Involve trusted intermediaries e.g. social workers |
| ImpulZ members | Social equity; Local empowerment; Long-term sustainability | Increase overall participation; Scale up ImpulZ through implementing renewable energy projects | Lack of projects and therefore members | Apathy; Misinformation; Different motivations | Develop low-barrier membership models; Enhance outreach via partnerships |
| EMEC - The energy cooperative of Maastricht | Long-term sustainability; Cooperative strengthening | Inclusive and equitable energy transition; Decrease energy poverty; Increase overall participation; Support ImpulZ upscaling with renewable energy | Poorer social groups are hard to reach; Lack of local storage; not enough human and financial capital to upscale; confusing legislative environment | Financial barriers; Systematic limitations | Change the focus; Minimal-entry membership; make profits through community ownership; Reinvest profits into reducing household |

| | | | | | |
|---|---|---|---|---|---|
| | | projects | | | energy bills |
| REScoop Limburg | Network solidarity; Long-term sustainability; Cooperative strengthening and growth | Inclusive and equitable energy transition; Decrease energy poverty; Increase overall participation; Support ImpulZ upscaling; Foster trust | Trust, involvement and awareness are low, especially from marginalized groups | Financial barriers; Systematic limitations; Lack of time and/or interest; Fear of being tricked | Built trust early; Co-create projects; Tailor outreach |
| Pure Solar | Economic return; Sector development; Storage advocacy; Long-term sustainability | Promote renewable energy and energy autonomy; Contribute to energy transition; Sell solar PVs | People only invests if financial benefits are obvious; Biased media; Distrust in government; Lack of local storage; difficult legislative environment | Misinformation; Government inaction; Risk-averse mindset | Provide clear information on legislation; Advocate for storage solutions; Offer financial guarantees and flexible investment models |
| Municipality | Economic development; Citizen welfare; Decentralization | Support inclusive energy transition; Stimulate local economy and create employment opportunities | Many citizens, e.g. tenants, can't participate; Low capacity of low-income households to invest or renovate | Rental housing; Poor insulation; Limited renovation ability; Inflexible types of membership | Partnerships with housing corporations; Funding support |
| Citizens | Affordability; Stability; Autonomy | Lower energy costs; Minimize bureaucracy; Low-risk and accessible solutions | Difficulty understanding the technical terms; Excluded from energy transition due to limited accessibility; Unaware; Skeptical or distrustful; Language constraints | Limited literacy in energy; Financial barriers; Systematic limitations; Lack of time and/or interest; Fear of | Pay-as-you-go models; Leasing models; Personal energy advice; Subsidy clarification; Solidarity tariffs; Diversify types of membership |

| | | | | | |
|---|---|---|---|---|---|
| | | | (for immigrants) | being tricked;<br>Language barriers | |

*Table 3: Actor's problem formulation*

### 3.1.5. Dependencies of actors

After shaping the bigger picture of the stakeholders and the problem context in the previous sections, this section focused on identifying which actors are the most critical. Table 4 below represents an overview of the actors most important resources, whether those are replaceable or not, and consequently, to which degree (from highly dependent to limited dependency) the problem statement depends on that actor. This examination gives insights into who is a critical actor, regarding including citizens with limited financial resources in the energy transition in Beekdaelen. According to Enserink et al. (2022), critical actors are the ones who have an unavoidable power to enable or hinder a decision.

Analysing Table 4, it is relevant to look at the main groups that reflect critical actors. Firstly the group of ImpulZ's actors, as their participation levels and different functions influence the project viability directly, particularly the energy coaches which have a specialized role to build trust and convey technical expertise. Furthermore, within the different government levels every actor was identified as a critical actor, except the EU institutions, as these are replaceable in the way that other funding sources can fill that gap, while the other levels of government are central to regulatory and policy alignment. Focusing on the infrastructure group, grid operations demonstrated to be a critical actor due to the monopoly in grid infrastructure, because according to the Dutch Law, there is a grid operation assigned to a specific company per region (in Limburg this company is Enexis Netbeheer), and no other operator may offer the same service in that zone (TenneT n.d.-b). On the opposite side there are the energy suppliers and providers, which have several alternative options in the market and are important for the project implementation, but due to the alternativity they are not crucial. Finally, naturally, the citizens group is composed of critical actors as they are the target of the assessment, and their consent and participation are crucial to proceed with an inclusive energy transition.

The analysis of actor's dependencies highlights that the success of including citizens with limited financial resources in the energy transition in Beekdaelen is highly dependent of core groups of critical actors, and reinforces the need to align and collaborate with these actors to foster an inclusive energy transition.

| Actors | Important resources from problem owner | Replaceable | Dependency | Critical actor |
|---|---|---|---|---|
| Board members of ImpulZ | Leadership; Strategic direction; Community mobilization | No | High dependency | Yes (Core organizational leaders, essential to coordination) |
| Members of ImpulZ | Volunteer participation; Legitimacy; Community mobilization | No | High dependency | Yes (Key do demonstrate community support and legitimacy) |
| Energy coaches of ImpulZ | Local energy advice; Community mobilization; Outreach to citizens | No | High dependency | Yes (Key intermediaries with citizens) |
| EU institutions | Policy frameworks; Funding programs | Yes | Average dependency | No (Indirect influence) |
| National government | Policy regulations; Legal frameworks; National funding; Sets national climate goals | No | High dependency | Yes (Policy authority in setting boudaries and legal enforcement) |
| Province of Limburg | Regional subsidies; Policy coordination; Aligns municipal policies with national goals | No | High dependency | Yes (Key for regional legitimacy, resources, and policy enforcement) |
| Municipality of Beekdaelen | Local policy implementation; Funding; Public support; Citizen access | No | High dependency | Yes (Directly implements local policies) |
| Energy suppliers, e.g. Van de bron | Provide access to renewable energy markets | Yes | Limited dependency | No (Not essential to project success) |
| Grid operators, e.g. Enexis | Provide and maintain energy infrastructure; Grid integration and capacity | No | High dependency | Yes (Essential for energy distribution, cannot be bypassed) |

| | | | | |
|---|---|---|---|---|
| Energy providers | Technical expertise; Technical installation | Yes | Average dependency | No (Can be substituted) |
| Energy Cooperatives, e.g. EMEC | Knowledge; Technical and organizational expertise | Yes | Average dependency | No (Supportive but not decisive) |
| Network Cooperatives, e.g. Rescoop Limburg | Knowledge-sharing; Advocacy for cooperatives | No | Average dependency | No (Supportive but not decisive) |
| Cooperative energy suppliers, e.g. Energie van ons | Local green energy distribution | Yes | Average dependency | No (Strategic but not critical) |
| NGO, e.g. WoonWijzerWinkel | Citizen guidance; Communication; Support | Yes | Limited dependency | No (Supportive but not decisive) |
| Homeowners | Access to rooftops; Energy investment decision | No | High dependency | Yes (Without them energy transition cannot proceed) |
| Landlords | Control over buildings | No | High dependency | Yes (Without them energy transition cannot proceed) |
| Tenants | End users; Awareness; Behavioral change | Yes | Average dependency | No (Not critical enabler) |
| Citizens with limited financial resources | The target group of the project; Their participation is essential; Essential for legitimacy and equity | No | High dependency | Yes (Without them the project fails to meet its social justice objective) |

| | | | | |
|---|---|---|---|---|
| Rooftop owners, e.g., businesses, schools | Insfrastrucuture for PV installations | Yes | Average to high dependency | Yes (Can provide energy to low-income households) |
| Housing associations | Access to social housing; Renovation decision; Energy-saving initiatives | Yes | Average dependency | No (Can enable the implementation of energy-saving measures but not essential) |
| Local businesses | Technical services, e.g. insulation, installation | Yes | Limited dependency | No (Operational and strategic but replaceable) |
| Local newspaper | Public communication; Raising awareness | Yes | Limited dependency | No (Informational and strategic but not essential) |
| Social workers | Trusted intermidiaries for marginalized groups | Yes | Average to high dependency | No (Supportive and strategic but not irreplaceable) |

*Table 4. Overview of actors, important resources, their replaceability, dependency, and critical actors*

### 3.1.6. Dedication of actors

To better understand the dynamics between ImpulZ Beekdaelen and its critical actors, it is essential to evaluate the levels of criticality, dedication, and support each actor provides. This analysis identified the degree to which ImpulZ depends on other actors (criticality), how committed these actors are to addressing energy transition issues (dedication), and whether their interests align with or oppose those of ImpulZ (support) (Enserink et al., 2022).

Analysing Table 5, it becomes clear that the only actor in the opposition to energy transition is the grid operator, Enexis. As explained in the section before *(3.1.5. Dependencies of actors*), Enexis holds a legally protected monopoly and can enable or block renewable energy projects based on grid capacity in Limburg.

Most governmental actors, except the EU institutions, are critical due to their regulatory power, while they generally support the transition as ImpulZ, their focus is not the same, which means that they are non-dedicated actors in this context. The same logic applies to the citizens group of actors, except the tenants, which often are not allowed to decide on the rental property. These actors are critical while non-dedicated actors. However, according to their testimonials, the group concludes they cannot be classified as either supporters or opponents of the energy transition. Instead, these actors would stand neutral largely due to limited awareness of the potential benefits, which highlights the need to targeted outreach them to shift their position towards active supporters. Figure 3 represents a power-interest matrix that helps visualizing the positions of these actors according to their power or level of interest in energy transition.

| | **Dedicated actors** | | **Non-dedicated actors** | |
|---|---|---|---|---|
| | **Critical actors** | **Non-critical actors** | **Critical actors** | **Non-critical actors** |
| **Similar supportive interests and objectives** | Board of Impulz; Member of ImpulZ; Energy coaches of ImpulZ | Energy Cooperatives; Network Cooperatives; Cooperative energy suppliers; Non-Profit Organizations | National government; Province of Limburg; Municipality of Beekdaelen; Homeowners; Landlords; Citizens with limited | EU institutions; Energy suppliers; Energy providers; Tenants; Housing associations; Local businesses; Social workers; Local newspaper |

| | | | | |
|---|---|---|---|---|
| | | | financial resources; Rooftop owners | |
| **Opposition or conflicting interests and objectives** | Grid operators | - | - | - |

*Table 5. Overview of dedicated and non-dedicated actors, and critical and non-critical actors*

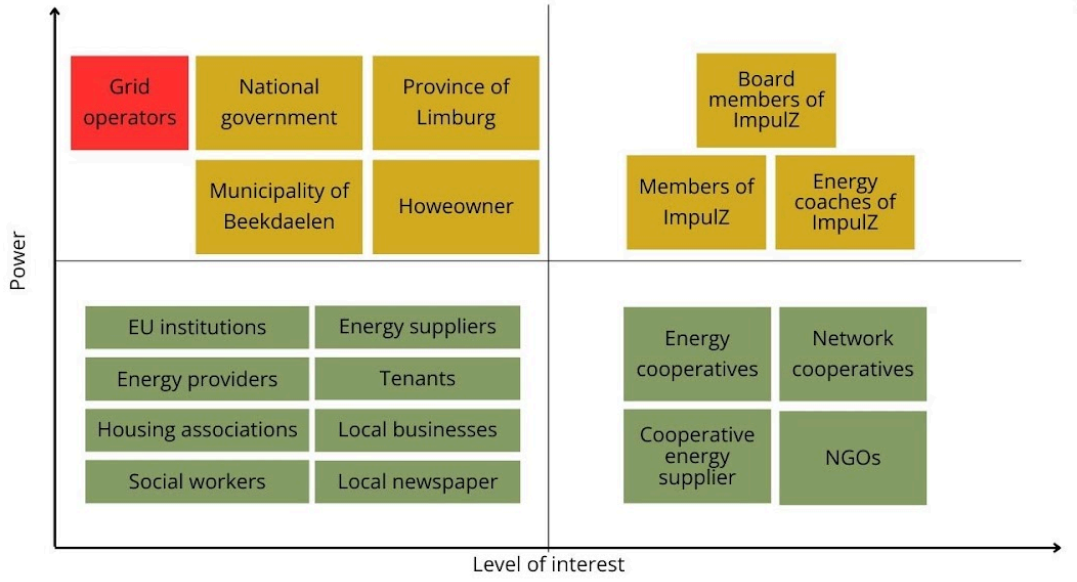


*Figure 3. Power-Interest matrix among the stakeholders.*

### 3.2. System description

The section aims to integrate the problem description and the systems boundaries before conducting a systems analysis.

### 3.2.1. Temporal boundary

The primary temporal boundary of this project is 2 years. As the problem statement is focusing on increasing the participation in the energy transition in Beekdaelen, the focus should be on achieving this goal strategically in the short-term and then shift the focus on the implementation of renewable energy projects in the medium-term, i.e. in 5 years. ImpulZ can then support the Netherlands in realising the goal of generating 70% renewable electricity by 2030 (RVO, n.d.). This 2 years temporal vision can not only provide ImpulZ with clear and practical suggestions for its near-term development but also allow them to strategize for their mission in the energy transition in a medium and longer term throughout this period.

### 3.2.2. Spatial boundary

The spatial boudary of the project is Beekdaelen, as it is where ImpulZ operates as a local cooperative and has established strong ties with the municipality. By analysing the unique economical, geological, and sociodemographical features of Beakdaelen, it is possible to conclude that there is the need for a context dependent solution, which makes setting the spatial boundary within Beekdaelen realistic and contextually appropriate for this project. Furthermore, considering the temporal boundary of the project (2 years), and ImpulZ is still in its early stages, starting at the local level can help establish a solid foundation for fulfilling its role and advancing its goals in the energy transition.

## 3.3. Systems analysis

After the actor analysis and defining the system boundaries, it is crucial to explore and understand the system that this research is part of. However, this analysis considers a limitation as it can never be totally completed due to the complexity of considering all potential factors in a system (Enserink et al., 2022).

### 3.3.1. Means-Ends Analysis

According to Enserink et al. (2022), a means-ends analysis outlines the limitations of a system, and is the first step towards both defining the problem and finding ways to intervene in the current situation to achieve the desired one. Figure 4 outlines why, on a

higher level, the problem is ultimately important to the client (in black) and how these ends could be reached (in green).

The top objective focuses on the desired situation of the client, which is to contribute to an energy-neutral system and act accordingly to the energy transition needed in the coming years. In this way ImpulZ wants to help build a bridge between this need for sustainability and the technical expertise and help achieve the national goals (*Onze Focus - Impulz-Beekdaelen*, 2024). This objective was understood by investigating the documents and the client's website and confirmed during meetings with the client by asking *why* they want to increase participation of citizens in energy transition (Enserink et al., 2022).

Furthermore, the second step of the means-ends diagram was to reflect on *how* the main objective can be achieved, which can be seen on the lower layers of means (in Figure 4, in green). This was an iterative process developed through desk research, document analysis of researching successful examples, and the participation of actors, e.g. board members of ImpulZ, EMEC, Rescoop, etc. Within the nine actions (in the lowest row), it is possible to understand how, for example, clarifying energy bills and tariff structures, expanding energy coaching, or connecting energy coaches with social workers, can lead to a decrease of misinformation, for some actors mentioned (see section *3.1.4. Actors' problem formulation*). Citizens, particularly the ones with limited financial resources do not have literacy in energy transition, are not interested, and do not have time to care about it, which generates mystification, stigmatization, and skepticism regarding energy transition. These actions would clarify the benefits of participating in energy transition and therefore increase participation, and consequently, contribute to achieving the national goals.

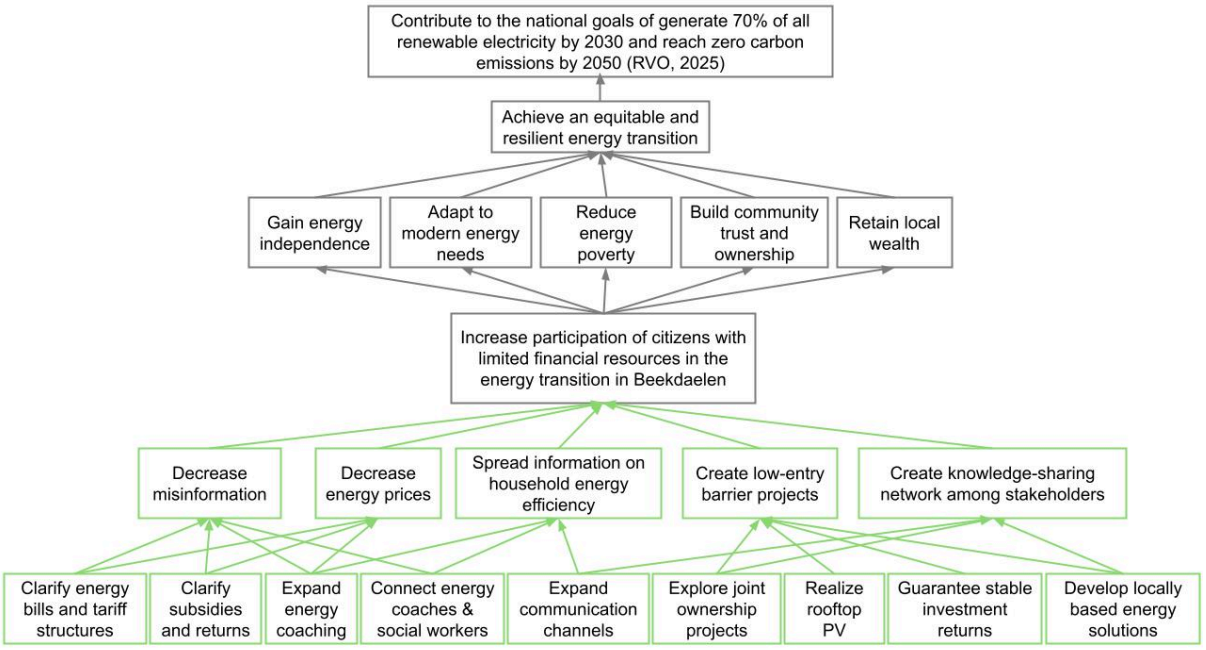


*Figure 4. Means-ends analysis*

### 3.3.2. Objectives Tree

The objectives tree is the second step of the systems analysis, and is meant to get to the essence of what exactly the client wants to achieve and avoid, by identifying criteria to measure the progress towards reaching the main objective. While the means-ends diagram determines what problem the project should focus on, the objectives tree defines the criteria to evaluate the possible options for the problem (Enserink et al., 2022). In this way the main objective of the assessment to “Increase participation of citizens with limited financial resources in the energy transition in Beekdaelen”, as wished and confirmed several times by the client (see Figure 5 below). After defining the main objective, the group identified four objectives and fourteen sub-objectives, or objective specialization (which description can be seen in Table 6), that will help the client to assess if the objectives have been met. They always have a desired direction outlined such as “high” or “short”.

Figure 5 clearly outlines measurable objectives, however, the interconnectedness and potential trade-offs between them might not be visible, i.e. an option that scores high on cost-effectiveness might involve complex bureaucracy, which can lower its performance on administrative simplicity, and consequently public acceptance. These interdependencies suggest that there is no option that will satisfy every objective, which means there is the

need to prioritize during the weighing process of Phase 3. Additionally, not every criteria is quantitative, e.g. trust in ImpulZ and communication effectiveness, once being a social problem it is important to include subjective relational and social factors, often underestimated in technical energy transition projects.

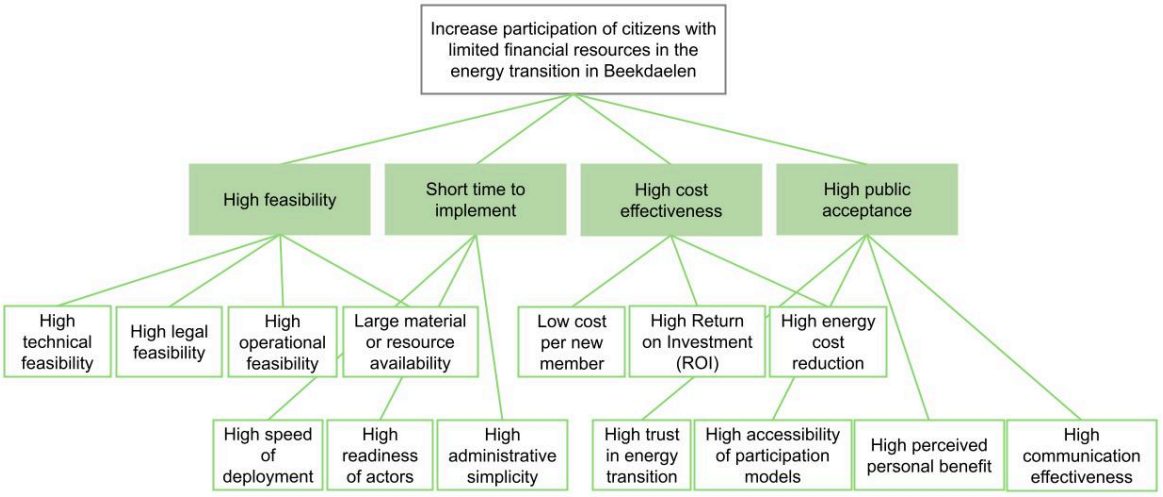


*Figure 5. Objectives tree*

| | Objectives | Description | Indicator |
|---|---|---|---|
| **Main objective** | *Enable ImpulZ to increase participation of citizens with limited financial resources in the energy transition in Beekdaelen* | | |
| **Objectives** | Increase feasibility | Is this technically possible? | Number of similar projects in EU |
| | Decrease time to implement | Is the time frame attractive for people with limited resources? | In years |
| | Increase cost effectiveness | Is the money well spent?<br>Consider the attractiveness of the option based on the expected benefits and costs. | Number of new members / Cost (In €) |
| | Increase public acceptance | How many people are partaking in projects and therefore accepting ImpulZ? | Number of new members |
| **Objective specialization** | Technical feasibility | Is the technology available and/or there are proven examples? | Number of similar projects in EU or in the Netherlands |
| | Legal feasibility | Does it comply with existing regulations and laws? | Number of legal constraints to implementation |
| | Operational feasibility | Is the implementation process manageable for ImpulZ and partners? | Number is partnerships and internal capacity |
| | Material and resources availability | Are materials (e.g. solar panels, insulation) accessible and affordable? | % of required materials/services that can be sourced from suppliers within a 100 km radius |
| | Administrative simplicity | Are bureaucratic processes short and straightforward? | Number of approvals required |

| | | | |
|---|---|---|---|
| | Speed of deployment | How fast can the project be implemented? | Estimated implementation duration (in months) |
| | Readiness of actors | Are partners ready to act? | Hours it takes for actors to response |
| | Cost per new member | What is the average cost to include one citizen? | Cost (In €) / New members |
| | Return on Investment (ROI) | Will the solution pay off in savings or other returns? | Payback time or ROI |
| | Energy cost reduction | How much will the project reduce the energy bills? | € / monthly cost |
| | Trust in energy transition | Do citizens trust in energy transition? | Number of renewable energy projects |
| | Accessibility of participation models | Are participation options easy to understand and join? | Number of entry barriers |
| | Perceived personal benefit | Do members see the value of participating? | % of target group who believe participation |
| | Communication effectiveness | Are outreach efforts clear and inclusive? | Communication channels used; Audience reached |

*Table 6: Description of objectives*

### 3.3.3. Causal map

After investigating the means and criteria needed to achieve solutions for the client, the next step was to identify the factors which influence these objectives in a causal map, seen in the Figure 6 below. After adding the objectives from the objectives tree in the causal map, the group reflected on *"Which factor influences objective X?",* and therefore *"What factors change if objective X changes?"* (Enserink et al., 2022). The causal mechanisms derived from a combination of the information gathered in meetings with the client and stakeholders, documents provided by the client, and desk research.

Figure 6 should be analyzed from the inner variable, which represents the main objective, to the outer variables, i.e. the factors that affect if the objectives change. Surrounding the inner variable, there are the objectives developed in the previous section (*3.3.2. Objectives Tree*), and the respective specific objectives. Every causal relationship is defined by an arrow labelled as "+", which represents a positive correlation, i.e. an increase in one factor results in an increase in other factor, and "-", which represents a negative correlation.

It is observable how factors sometimes add towards the same variable, such as 'energy transition literacy' and to criteria such as 'high public acceptance', underlining their importance when examining points to intervene in this system. For example, expand and personalise energy advising services and creating partnerships between energy coaches and social workers who work with lower-income people, leads to increase energy transition literacy of this target group, which consequently increase trust in energy transition, people would undertand the benefits of joining, leading to higher public acceptance, and therefore increase participation. This reflects a reinforcing feedback loop that would expand even more the energy advising services and partnerships, and attract more people to foster energy transition. These feedback loops and leverage points are important when creating a solution for the client.

Despite the efforts of several actors in making the system go in the right direction, there are power dynamics and external factors in the system, such as the grid congestion, delaying the progress of energy transition, and limiting technical feasibility. This highlights that while community-focused initiatives are crucial, institutional barriers must also be addressed to achieve the main goal.

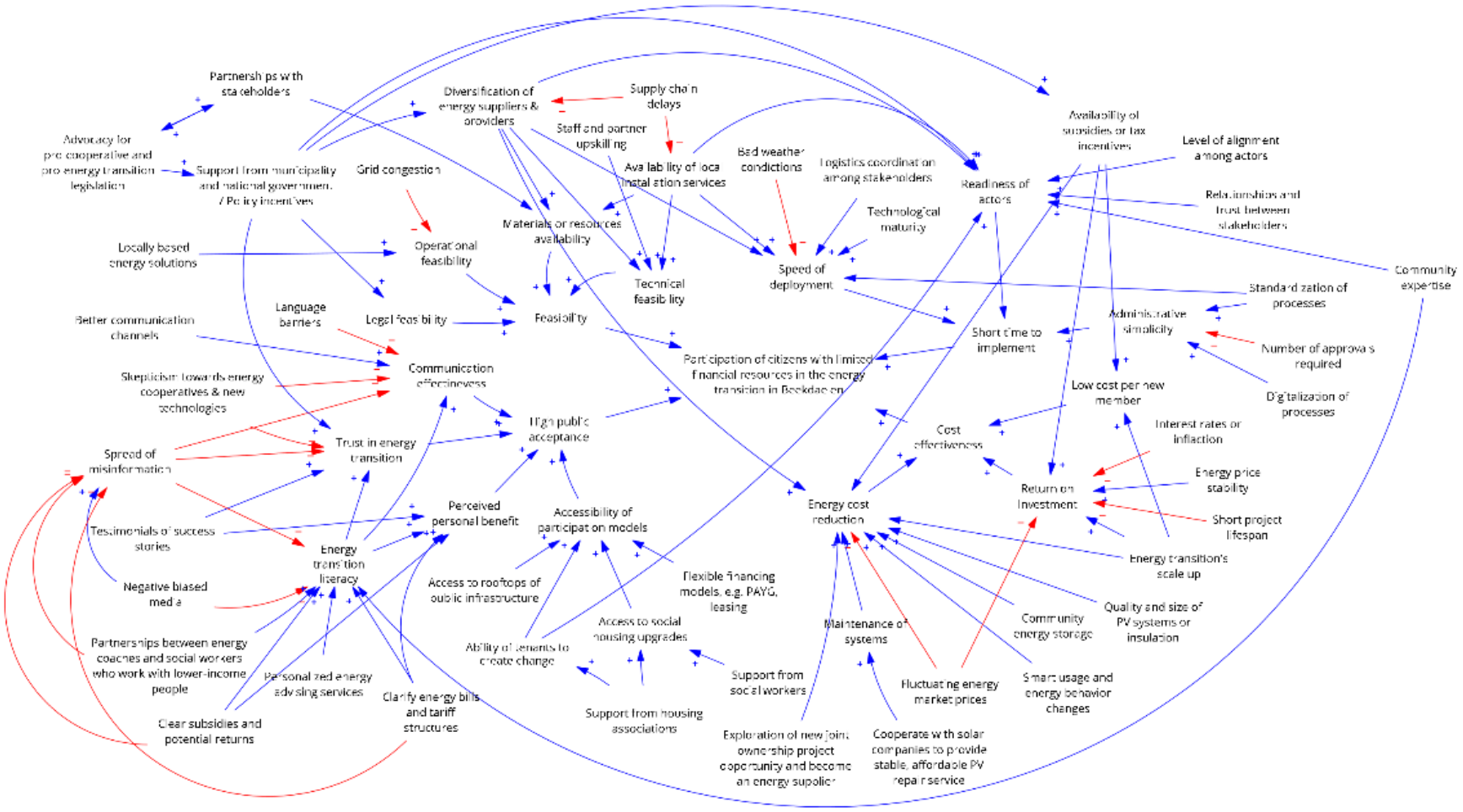


*Figure 6. Causal map*

### 3.3.4. System diagram

In the last step of the system analysis, the group gathered external and internal factors of the system, the means and the criteria identified in the previous steps, and mapped them to create an overview of interactions. This step aims to summarize the demarcations of the system by showing what elements are relevant for analysing the problem (Enserink et al., 2022). Visible in Figure 7 are how the five *means*, worked out in the means-ends analysis, affect the four objectives (now referred to as *criteria*), worked out in the objectives tree, the most important external and internal factors from the causal map play in this system. This shows the impact the means have towards achieving the objectives of the client and therefore their critical role in the further steps of the project. Every element explanation can be found in Table 7.

The system demonstrates that participation can not only be increased by improving ImpulZ's organizational structure, as it is dependent on social, institutional, technical, and economic conditions. Those internal factors as energy transition literacy or trust must align with the external factors such as policy incentives, however they are out of ImpulZ's control. While it is not possible to control grid congestion, tenant law, or inflation, and their potential block progress, adaptation strategies can help to open a window in the regime, and reach the landscape. For example, internal factors like energy transition literacy, coordination between stakeholders, or accessibility of participatory models influence more than one criteria, e.g. public acceptance and feasibility, which represent high leverage intervention points that has space to improvement in the system.

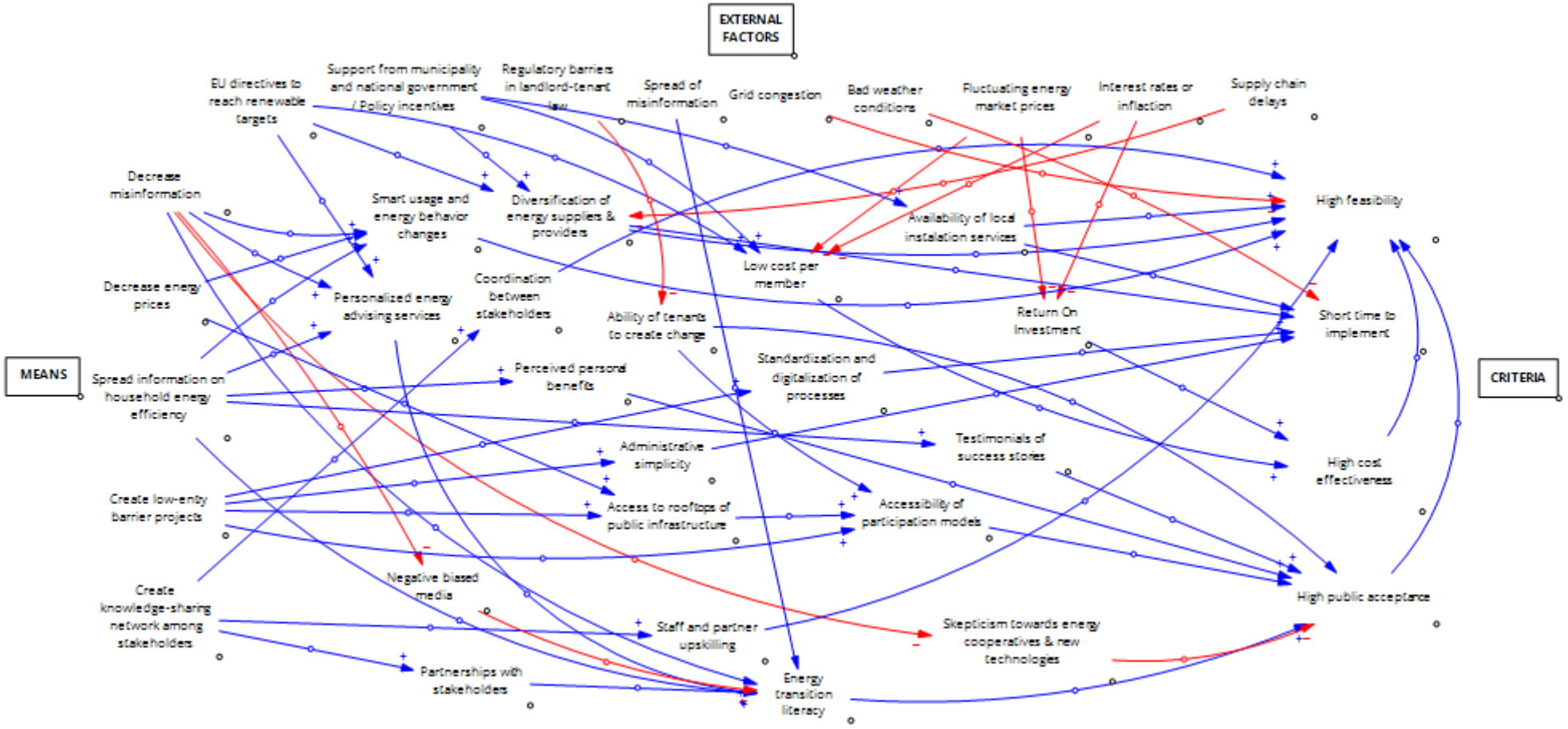


*Figure 7. System Diagram*

| Category | Element | Explanation |
|---|---|---|
| Means | Decrease misinformation of energy transition | Increase understanding and trust of energy transition and clarify possible misunderstandings |
| | Decrease energy prices | Reduce or stabilize energy costs to make participation more financially attractive |
| | Spread information on householder energy efficiency | Educate citizens on how to reduce energy consumption at home |
| | Create low-entry projects | Design initiatives with minimal financial or bureaucratic barriers to attract participation |
| | Create knowledge-sharing network among stakeholders | Establish systems for local actors to exchange experiences |
| Criteria | High feasibility | The technical, legal, and organizational criteria to implement the project |
| | Short time to implement | The speed at which a solution can be realized |
| | High cost effectiveness | The level of benetial results with relatively low input or cost |
| | High public acceptance | The degree of public supports, i.e. people who want to participate in the project |
| External factors | EU directives to reach renewable targets | Legal obligations and goals set at EU level pushing member states to foster energy transition |
| | Support from municipality and national government / Policy incentives | Political and financial regulations through laws, funding, and alignment |
| | Regulatory barriers in landlord-tenant law | Legal constraints that limit tenants rights to change the property, e.g. initiating building upgrades |
| | Spread of misinformation | Fake or misleading information that distorts public understanding of the energy transition |
| | Grid congestion | Limited capacity in electricity networks that hinder the integration of new energy sources |

| | | |
|---|---|---|
| | Bad weather conditions | Adverse climate conditions that for example delay installations or reduce solar production |
| | Fluctuating energy market prices | Unpredictable market trends impacting household bills |
| | Interest rates or inflation | Macroeconomic conditions that affect affordability |
| | Supply chain delays | Shortages or slow deliveries of materials and equipment that might delay project timeline |
| Internal factors | Smart usage and energy behavior changes | The adjustment of energy consumption patterns in more efficient ways |
| | Personalised energy advising services | Offer tailored support and capacitate households to make informed decisions regardin energy |
| | Diversification of energy suppliers & providers | Multiple energy actors that increase energy resilience |
| | Coordination between stakeholders | Effective collaboration between the different stakeholders |
| | Negative biased media | National or local press that spread misinformation and distorts public understanding of the energy transition |
| | Partnerships with stakeholders | Active collaboration between local actors to co-implement solutions |
| | Perceived personal benefits | Individual understanding of tangible value from participating, e.g. savings, comfort, control, |
| | Ability of tenants to create change | Legal and practical empowerment or rights of tenants to influence energy decisions in the properties |
| | Administrative simplicity | Practical and easy to follow systems, low-barriers or bureaucracies in participating |
| | Access to rooftops of public infrastructure | Ability to use municipal buildings, e.g. schools, libraries, for collective solar installations |
| | Staff and partner upskilling | Training actors to improve technical knowledge and service delivery |
| | Energy transition literacy | General understanding of what the energy |

| | | |
|---|---|---|
| | | transition is and how it works |
| | Low cost per member | Reducing expenses per participant through scale or efficiency |
| | Standardization and digitalization of processes | Using uniform, digitalized systems to simplify and speed up implementation |
| | Accessibility of participation models | How easy it is for different groups, e.g. low-income, elderly to engage |
| | Availability of local installation services | Presence of trained professionals to carry out installations efficiently |
| | Return On Investment | Financial return for the cooperative regarding the initial input |
| | Testimonials of success stories | Positive word-of-mouth that builds trust and motivates others to join |
| | Skepticism towards energy cooperatives & new technologies | Doubt or distrust in energy transition |

*Table 7. System diagram elements explanation*

### 3.4. Reformulation of the problem and central research question

The actor analysis confirmed that ImpulZ is highly dependent on the three core groups of actors, i.e. government (except the EU institutions), infrastructure (particularly grid operators), and citizens (except the tenants) to successfully achieve the project goal, due to their control over essential resources, which creates the need to align and collaborate with them. However they have different perspectives about the problem. While some believe there should be a distinction between low and high income citizens, others focus on the socio-economic aspect, arguing that people will invest only when benefits are clear and the risks are low. They also point out the need for local energy storage systems to avoid concentration of power and foster community empowerment. And citizens, the main target group of the assessment, are primarily concerned with economic factors, e.g. affordability, stability, and autonomy, and find energy transition concepts difficult to understand, which leads them to skepticism and distrust.

The actor and the system analysis confirmed the boundaries of the assessment established in the beginning and where and who the critical actors are that can intervene, and the ones that even with a lower influence can support achieving the goal in the outlined and complex system.

Although there are some differences, there is a common agreement between the actors: the importance of including citizens with limited financial resources to ensure an equitable energy transition. They highlighted the challenges of achieving this goal in the current situation, which we aim to lessen in order to bridge the gap towards the desired situation. Therefore, the problem formulation should focus on strengthening cooperation with critical actors, leveraging municipal and provincial authority to increase public engagement. Therefore, and with the client's goal in mind, the group formulated the central research question of the project: *"How can ImpulZ increase participation of citizens with limited financial resources in the energy transition in Beekdaelen, within 2 years?"*

# 4. Phase 2: Identifying possible options

This chapter outlines the process of identifying potential options to address the research question analyzed in Phase 1, the options will be evaluated in Phase 3. To map possible options, the group referred to the means-ends diagram from Phase 1 and extended the options through an extensive desk research and a brainstorming session. The options were then categorized based on the goals they aim to achieve.

The team ultimately identified 34 potential solutions, grouped under five overarching goals (the “ends” in the means-ends diagram), which we phrase as *“category”* to avoid confusion, that support the core research objective: increasing local participation of citizens with limited financial resources in the energy transition in Beekdaelen.

These options were subsequently presented to key stakeholders for validation and refinement. However, due to time constraints and limited availability, feedback was obtained from two stakeholders: a representative of our client and a member of EMEC. While the client expressed overall satisfaction with the proposed options, he refrained from giving detailed feedback. No options were added or deleted at this point. The representative of the energy cooperative in Maastricht offered valuable insights based on practical experience.

In response to their suggestions, two additional options were developed and included in the final list: Option 35, applying for funds via de Bank for Municipalities (BNG), and Option 20, realising rooftop PV-installations smaller than 100kWh. In total, 36 potential options were formulated, categorized under five primary goals and one additional goal outside the means-ends diagram identified by the group *(see Appendix B)*. It should be noted, however, one option can contribute to multiple ends. In the list of the 36 options, we categorize them based on the main goal they support to achieve.

## 4.1. Intentional choices of the categories and the timeframe of the options

Notably, during the brainstorming session, the group recognized and agreed that “expanding ImpulZ’s member base and sustaining its operations before a stable foundation is established,” while not directly aligned with the project's primary direction or scope, are essential prerequisites for ImpulZ to fulfill its mission of increasing local participation in the energy transition. Therefore, in addition to the five main categories, Options 28 and 36 were included under a separate category: “*Other: Diversify ways to attract people to join ImpulZ and maintain its operations before a strong and stable member base is built.*”

Moreover, although the project timeframe — two years — represents a relatively short-term vision, the team deliberately chose not to restrict the brainstorming process to this timeframe. This decision was informed by the team's awareness of the gap between ImpulZ's current stage of development and its long-term ambitions. On one hand, ImpulZ's mission of contributing to the energy transition — also central to the project's research question — is inherently a long-term goal. On the other hand, there is a clear need for ImpulZ to identify and implement robust short-term strategies to sustain and expand its operations, as reflected in the project's temporal boundary. Although there may appear to be a misalignment between these two perspectives, it is only through stable shortterm development that the cooperative can continue to contribute meaningfully to its long-term objectives. Therefore, the team adopted an approach that formulates potential options without imposing a strict time frame, while still keeping the project's two-year scope in mind.

In summary, the group formulated the potential options with the understanding that the primary focus of this project is to deliver actionable solutions for ImpulZ within a two-year timeframe. However, the options were not strictly confined to that period. This intentional flexibility allowed the group, ImpulZ, and the stakeholders involved to engage in a broader dialogue about aligning short-term plans with the long-term mission at the heart of the organization. The process also enabled the team to provide more holistic and forward-looking recommendations for ImpulZ's future development.

### 4.2. The implementation of the cream-off method and interpretations of the differences in scores

After the options were finalized and categorized, we narrowed down the options with the two stakeholders through the *cream-off* method. The cream-off method is chosen as it is both straight-forward and time-efficient for filtering the most potent options, meanwhile, it combines and balances different stakeholders' perspectives through a consistent scoring system.

The group propose two criteria for the cream-off method: (i) *Feasibility*: How easily can the option be realised, e.g. cost, timespan or implementation effort; and (ii) *Effectiveness*: How much can the option address the main goal of the project, namely, increasing participation in local energy transition. The stakeholders are asked to score every option in a scale of 1 to 10 (e.g., 1 would be the less feasible option and 10 the most feasible

option), based on the two criteria. We then added up their scores, including the scores for both feasibility and effectiveness, for the final selection of options, which will be elaborated later on. The result from the cream-off method can be found in the Appendices *(see Appendix C)*.

The group chose this scoring approach for two main reasons. First, it is essential to incorporate and balance diverse perspectives when filtering options, ensuring that a broad range of possibilities is carried forward for further assessment. For this reason, we did not assign different weights to the scores from the two stakeholders, even when their evaluations showed significant discrepancies. Second, both criteria are equally important in practice. Thus, the group opted to combine the feasibility and effectiveness scores when selecting the final options, rather than prioritizing options with the highest score in either category alone. While some options may score exceptionally high in one dimension and relatively low in the other, these should still be considered. These options may be easy wins or unexpectedly effective if well executed, provided clear guidelines and performance monitoring are in place in the final phase. These options may be easy wins or unexpectedly effective if well executed, provided clear guidelines and performance monitoring are in place in the final phase.

When calculating the scores and selecting the final options, we observed wide disparities in stakeholder evaluations. On a scale from 1 to 10, some options received scores that differed by 6 points or more between the two stakeholders.

For example,

(1) Service-based energy provision models: Option 17 to Option 19 (contributing to category 4: Create low-entry barrier projects)

| | Feasibility | | Effectiveness | | |
|---|---|---|---|---|---|
| Option | ImpulZ | EMEC | ImpulZ | EMEC | Total Score |
| 17 Energy as service | 7 | 1 | 8 | 2 | 18 |
| 18 Pay-As-You-Go energy models | 5 | 2 | 9 | 2 | 18 |
| 19 Leasing models | 9 | 1 | 8 | 1 | 19 |

*Figure 8. Outcome of the cream-off method (Option 17 to 19)*

For Option 18, “Pay-as-you-go energy models”, the stakeholders expressed significantly different views regarding its effectiveness (score difference = 7). Our client perceived the option as highly effective (score = 9), while the EMEC held the opposite view. We hypothesize that this divergence stems from differing

interpretations of what constitutes meaningful participation.

While the Pay-As-You-Go model may seem effective for ImpulZ, given its appeal to citizens with limited financial resources and its potential to increase membership if the service is restricted to members; a more mature energy cooperative like EMEC may distinguish between active and non-active members. That is, this model does not require active engagement in cooperative activities, and participants may act more like consumers than contributors. As a result, the model may fall short in fostering deeper involvement in the local energy network.

A similar divergence can be observed in the scores for Option 17, “Energy as a Service,” and Option 19, “Leasing Models.” Since the core concepts of these three options are closely related, we believe the same reasoning applies to the differences in their effectiveness scores. However, in the cases of Options 17 and 19, there is also a significant difference in the feasibility scores (a score difference of ≥6), which is not observed for Option 18. This may be because Options 17 and 19 explicitly eliminate the need for upfront investment by citizens and shift the financial and operational burden to the energy cooperative. While ImpulZ does not perceive these options as unfeasible, the EMEC, likely drawing from greater experience with similar initiatives, may be more aware of the hidden costs associated with such models. These include monetary expenses, the time required to build partnerships, and the broader challenges involved in developing the necessary infrastructure to implement the options.

(2) Clear Communication and Personalized Guidance for Energy Use: Option 12 (contributing to category 3: Spread information on household energy efficiency); and Option 1 and Option 2 (contributing to category 1: Decrease mystification)

| | Feasibility | | Effectiveness | | |
|---|---|---|---|---|---|
| Option | ImpulZ | EMEC | ImpulZ | EMEC | Total Score |
| 1 Clarifying energy bills and tariff structures | 8 | 10 | 3 | 10 | 31 |
| 2 Clarify subsidies and potential returns | 8 | 9 | 5 | 10 | 32 |
| 12 Expand and improve communication channels | 8 | 8 | 4 | 9 | 29 |

*Figure 9. Outcome of the cream-off method (Option 1, 2 and 12)*

For these three options, stakeholder scores diverged significantly with regard to effectiveness (score differences ≥5). While our client rated these options as less effective, the EMEC evaluated them very highly (scores ≥9).

This discrepancy initially appeared paradoxical, especially given that these options closely align with the energy coaching services ImpulZ currently offers. However, the group interpret the difference as follows: ImpulZ has previously attempted similar approaches but experienced limited outcomes, which may have led to a sense of disappointment or skepticism about the impact of these options. In contrast, EMEC, with its larger member base and more advanced stage of development, has likely already passed through the growth phase that ImpulZ is currently navigating. They may have come to recognize the critical importance of the issues addressed in Options 1 and 2, namely, the importance of clarifying energy bills, tariff structures, energy-related subsidies, and potential returns of participating in energy projects.

Furthermore, while ImpulZ has struggled to effectively reach target audiences through current communication channels, such as the local newspaper and its official website, and therefore considers Option 12 (“Expand and improve communication channels”) to be less effective in increasing participation among citizens with limited financial resources, EMEC emphasizes the strategic value of improved outreach and communication.

### 4.3. Key insights from the cream-off method

We also derived several valuable insights from applying the cream-off method. First, we observed that when consulting two stakeholders about the proposed options, the EMEC provided more practical and detailed suggestions. For example, they recommended implementing rooftop PV installations with a capacity of no more than 100 kWp and highlighted the potential of applying for funds via the Bank for Municipalities (BNG), even specifying the minimum loan threshold. In contrast, our client expressed general satisfaction with the diversity of our proposed options but offered few critical suggestions or new ideas. This contrast suggests that ImpulZ may not yet have developed a comprehensive understanding of the various options or gained in-depth experience with specific implementation strategies.

Regarding overall scoring, we noticed more pronounced disparities between the stakeholders' assessments of the effectiveness of the options. Although there were also differences in their evaluations of feasibility, these were less frequent. The most significant differences in effectiveness scores occurred when the EMEC assigned extreme scores (e.g., 1, 2, or 9, 10). We attribute this to the Cooperative’s decade-long experience (Sfeervol

Meerssen, 2024), which has likely provided them with deeper practical insights. These insights appear to inform their strong convictions about the effectiveness of certain approaches, particularly those that align with the core mission of energy cooperatives: promoting citizen participation.

As noted, we identified substantial scoring discrepancies on two groups of options:

(1) Service-based energy provision models
(2) Clear Communication and Personalized Guidance for Energy Use

For the first group, differences appeared in both feasibility and effectiveness scores. Our client rated these options as moderately to highly feasible and effective, whereas the EMEC viewed them less favorably. The divergence in feasibility assessments may stem from differing awareness of hidden costs or effort required for implementation. ImpulZ may lack the empirical experience to fully grasp these challenges, while the Cooperative's hands-on knowledge of technical and financial barriers may lead them to conclude that such options are nearly unfeasible. Regarding effectiveness, we recognize that levels of engagement vary: expanding membership does not automatically translate to deeper participation. This may explain the differing evaluations, highlighting the need for ImpulZ to clarify the type of citizen participation they wish to foster.

For the second group — options focused on clear communication and tailored advice — differences emerged primarily in the effectiveness scores. While the EMEC emphasized the value of clear information, personalized energy advice, and dedicated communication channels, our client assigned relatively low effectiveness scores to these elements. This suggests a potential underestimation of communication strategies within ImpulZ. Given the Cooperative's emphasis, we believe ImpulZ should reflect on its past communication and outreach methods, reassess their significance, and consider allocating more resources to strengthen them. Local context will always shape the most effective communication approaches, but strategic refinement in this area could enhance both reach and impact.

It should be noted, though, that EMEC and ImpulZ are at different development stages and were established in different areas, which implies different social, economic, and local contexts. While it can be helpful for ImpulZ to learn from other mature energy cooperatives, it is not suggested nor possible to apply the same perspective or approaches from other energy cooperatives in the case of ImpulZ. In this phase, we thus decided to bring

those diverse ideas and options to the next phase for a more in-depth discussion and assessment.

### 4.4. Finalization of the possible options through the cream-off method

Through the cream-off method, the group gathered insights from two stakeholders' points of view regarding the feasibility and effectiveness of a total of 36 options. After calculation, 9 options, which represent the top quartile (top 25%) of all options, were identified and brought to the Phase 3 (see Table 8). Acknowledging that the outputs of Phase 1 cannot be complete or perfect, we revisited them after selecting the potential options to advance to Phase 3. Incorporating insights gained from Phase 2, we refined the Phase 1 outputs, including the means-ends diagram and the actor analysis, to enhance clarity and ensure alignment.

Another point to mention is that to avoid confusion, we will refer to the options by the numbers assigned to them in Table 8 in the following sections.

| Number | Option |
|---|---|
| 1 | Clarifying energy bills and tariff structures |
| 2 | Clarify subsidies and potential returns |
| 3 | Explore a new joint ownership project opportunity and become an energy supplier |
| 4 | Expand and personalize energy advising services |
| 5 | Expand and improve communication channels |
| 6 | Partnerships between energy coaches and social workers who work with lower-income people |
| 7 | Realising rooftop PV-installations that are not bigger than 100kWp |
| 8 | Guarantee stable investment returns |
| 9 | Develop locally based energy solutions |

*Table 8. Possible Options Identified after the Cream-off Method (for the details of each option, please refer to Appendix B)*

As we aim to provide quality options, a desk research is conducted to support the options, namely, the importance of the topic covered or the feasibility of the option per se. We summarized some key findings related to the 9 options chosen via the cream-off method as follows.

(1) Option 1: Clarifying energy bills and tariff structures

Due to the energent need for sustainable development, more and more companies are switching to electricity, especially from clean sources. This leads to grid congestion in several places in the Netherlands for both off-take and feed-in (TenneT ,n.d.-b), a problem that was also highlighted by our client in the first project description document and our kick-off meeting. As suggested by IEA (Kvarnström et al, 2025), regulators should enable grid operators to adopt innovative solutions, such as new tariff structures to allow a flexible energy distribution.

In the Netherlands, some companies already tried to implement flexible tariffs to tackle the challenges. For example, providing electricity with lower fee at during peak solar generation hours (PV Magazine, 2025). These initiatives, while innovative and can be potential to solve current net issues, can lead to confusions from the consumers' side.

At the same time, changes in the regulation environment can also lead to uncertainties regarding energy bills. For example, the netting scheme for solar energy in the Netherlands will stop since 2027. Owners of solar panels can no longer offset self-generated electricity against their consumption since then (Rijksoverheid, n.d). Although the compensation for returning electricity still remains, the regulation changes will inevitably influence how the energy bill is calculated.

The constant-changing energy production system and the legislation environment highlights the importance to provide clear, transparent information to citizens, especially clean energy users and producers.

(2) Option 2: Clarify subsidies and potential returns

Nowadays, energy cost still remains a burden to many households (Beekdaelen Sociaal, n.d.-a). While subsidies and welafare programs like "Temporary Emergency Energy Fund" is available (Noodfunds Energie, 2025); the fact that the fund is quickly used up reflects a high demand. Providing those information can potentially help ImpulZ attract citizens to join the cooperative.

On the other hand, as energy cooperatives are mostly founded for the public good, “allowing citizens to make decisions that benefit the majority”, especially when they utilize the capital accumulated by members and receive returns (REScoop.EU, 2024). ImpulZ can clarify and highlight the potential returns to people to increase motivation for participation.

(3) Option 3: Explore a new joint ownership project opportunity and become an energy supplier

There are already examples of different-scale projects worldwide that communities share the initial cost and also the benefits. For example, the Compile Project is a successful case of the collaboration between citizens and the government; it tackles the issue of insatiable energy supply and enhances local energy resilience (Compile Project, n.d.-a; n.d.-b).

As a energy cooperative, ImpulZ emphasizes the welfare of the locals. It is thus worthy to consider the possibility of this form of joint ownership to engage with and benefit citizens, especially those with limited financial resources.

(4) Option 4: Expand and personalize energy advising services

Several studies have questioned the effectiveness of the free energy coach services for the energy transition (Schneider et al, 2023). On the other hands there are paid integrated and full-scale advising services using promising and straightforward language (KiesZon. n.d; ING, 2024). These advisors are promising integrated solutions that cover technical solutions, such as grid congestion for houses and businesses. These services also promise to meet the future's needs and financial return, making it more attractive for the customers who are willing to invest into renewable energy.

As ImpulZ already provides energy coach services, we consider expanding and personalizing energy advising services as a potential approach for them to secure their current members and expand broader citizen engagement in the cooperative, which contributes to its long-term sustainability goal.

(5) Option 5: Expand and improve communication channels

Engaging people is a central goal for energy cooperatives, and it also represent the heart of this project. In a guidebook, Energy Cities, & REScoop.eu (2024) highlights the importance to tailor communication channels and provides clear instructions to

shape communication approaches that align with energy cooperatives' core values and services, which can be a powerful approach for ImpulZ to introduce itself to the citizens and connect with targeted groups.

(6) Option 6: Partnerships between energy coaches and social workers who work with lower-income people

Previous research shows that there is a correlation between a higher incidence of major depressive disorder and poverty (Heflin & Iceland, 2009). In Beekdaelen, social services are provided for people who face challenges in financial situation, housing, health and mental issues, relationship problems, and so on (Beekdaelen Sociaal, n.d.-b).

We recognize that the target groups of social workers and ImpulZ may significantly overlap. Collaboration between the two can be a win-win situation for both: on one hand, it can help ImpulZ reach people with limited financial resources through existing databases, on the other, it enhances the quality of social workers' services, especially in relation to energy use in different housing situations.

(7) Option 7: Realising rooftop PV-installations that are not bigger than 100kWp

This option was suggested by EMEC, as small-scale projects can be connected to the grid via a small commercial connection, circumventing current net congestion.

The option has two significant advantages. First, as the systemic challenge of net congestion is recognized by our client as an invisible challenge to scale-up the cooperative, this option can expand ImpulZ's projects and corresponding capital flow, supporting ImpulZ's operation and its long-term mission. Second, small-scale projects require less upfront investment, which lowers the barrier for people with limited financial resources to participate in.

(8) Option 8: Guarantee stable investment returns

Participants in energy cooperatives invest together and share the returns, which makes it important to be transparent about how the returns are calculated and splited. For example, EMEC unveils information about its financial management on its website, including the maximum amount that each member can invest, the definition and distribution of the yield of solar plant. Moreover, it is stated that people are expected to receive a reduction in their energy bill greater than original contribution (EMEC, n.d.).

We think it is important to provide clear information regarding financial returns and guarantee a basic yet reasonable return to members. It can attract more people to participate, especially those with limited financial resources.

(9) Option 9: Develop locally based energy solutions

Developing local energy projects and establishing a local energy supply can not only enhance resilience but also provide economic advantages, for instance, trading energy within the region can potentially lower the price due to lower transportation costs. This makes energy projects more lucrative and makes it easier to recoup the cost of investments (Groendus, n.d.).

# 5. Phase 3: Assessing possible solutions

This phase focuses on assessing possible solutions against multiple context-relevant criteria. A multi-criteria analysis (MCA) was conducted in this stage, with an emphasis on stakeholder participation. Specifically, we consider the “critical actors” we identified in the Actor analysis (See 3.1.4. Actors’ problem formulation, Table 3) for participation in this phase.

After the cream-off method from phase 2, nine options are selected for assessment in phase 3. The criteria for assessing them are supported by the objectives tree (see Figure 5). These criteria were brainstormed with and consented to by our client. In summary, in this stage the 9 options are assessed against 4 criteria:

(1) Feasibility: *'How easily can the option be realised, regarding the technical, material and legislative background?'.*

E.g. investigating if the technology already exists and is compatible with the existing system or how easily the legislative framework allows this project. The best way to consider this overall is in similar projects already implemented in the EU. The higher the feasibility, the better for the project.

(2) Time to implement: *'How quickly can it be implemented?'*

The shorter the time frame, the better for the project.

(3) Public acceptance: *'How much willingness do people have to support, adopt, or tolerate the option?'*

This can be measured in number of participants, where an increase of number of participants is better.

(4) Cost effectiveness: *'How attractive is the option regarding cost benefits?'*

This can be split into various categories, e.g. cost of the project overall and therefore how much each participant has to contribute monetarily versus how much the benefit for the community is, for example going towards independence from gas imports, less risk of extreme weather events, and the return for ImpulZ and therefore towards future projects. Individual benefits also fall into the cost effectiveness criteria, meaning the amount of energy cost reduced for individuals.

### 5.1. Three approaches to complete the MCA

We tailored three approaches for the MCA: first of all, we held a physical workshop for experts on the topic, including three people from ImpulZ (the problem owner, a member, and the chairman), one representative of Rescoop Limburg and one from EMEC (both from the stakeholder group of "cooperatives"), and Pure Solar (a solar company from the stakeholder group "other"); secondly, we conducted an MCA in digital form (Figure 10) with

other stakeholders such as the Municipality of Beekdaelen and another ImpulZ member; and lastly, we conducted an MCA on the streets with citizens of Beekdaelen and approached people actively.

*Figure 10: Screenshot of a question in our online survey*

The stakeholders mentioned above were reached through the connection of the University network, publicly-available contact like email address, or physical interaction. It should be highlighted that although the National Government, the Province of Limburg, and Grid Operator are also identified as our critical actors, they are not included in this phase, due to unavailability or the bounds of the scope of this project.

Notably, we intentionally adjusted the details of the MCA in the three approaches mentioned above. For the workshop and the digital MCA with experts, participants were required to complete both scoring and weighing; while the last approach, the street MCA with citizens, only contained the scoring. This is done as organizational stakeholders, who are engaged through the first two approaches, hold more professional insights or more influence on the operation of ImpulZ; it is thus crucial to consider how they weigh different criteria, which is a determinant factor to select the final solution(s). During the street survey, we regrettably discovered that our assumption that the scoring of the options was achievable for citizens was incorrect. We talked to about 50 people for one afternoon and they were not able to grasp the task and we therefore had to reduce our input to the other two approaches, the workshop and the online MCA.

While the workshop was mainly designed to gain insights for Phase 3, we also used it to retouch our Phases 1 and 2. We had discussions about the research question, which was for example criticised for being too narrow, as it was argued that people with limited financial resources should not be the first to be engaged in the cooperative's projects, which was further explored in section *3.1.4. Actors' problem formulation*. However, all stakeholders

agreed on the importance for a general acceptance to be created within the community regardless of which path to upscale would be taken. Additionally, they also highlighted how difficult it is to reach the target demographic especially considering the negativity of the media about the energy transition, which further justifies our research question.

The scoring procedure included all participants giving the nine options scores for each criterion on a scale from 1 (least feasible, longest time to implement, least public acceptance and least cost effectiveness) to 10 (most feasible, shortest time to implement, most public acceptance and most cost effectiveness). The weighing procedure consisted of each participant allocating a total of 10 points to the four criteria, where the criteria with the most points is the most important.

*Figure 11: Picture from the physical MCA workshop in Municipality of Beekdaelen*

### 5.2. Calculation process and the final outcome of the MCA

The calculation process included the grouping of same stakeholders, the consequential calculation of average scores per option per criterion, and finally regarding the

average weight given. The grouping of the stakeholders was kept consistent with the groups identified in the stakeholder analysis (see Table 2). The group scores were averaged per option per criterion and then averaged across all groups (Figure 12).

| option | feasibility | time to implement | public acceptance | cost effectiveness | TOTAL |
|---|---|---|---|---|---|
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.38 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 7.00 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.37 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.30 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.38 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.95 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.38 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 5.87 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 5.90 |

*Figure 12. Overview of the scoring per criteria and in total*

The weighing calculation was similar to the scoring calculation, where the stakeholders were grouped again according to their institutions and then the number of points given was averaged among groups and then averaged across all groups. This resulted in a weighing percentage, which was 21.33% for feasibility, 14.00% for time to implement, 36.00% for public acceptance - by far the most important criterion - and 28.67% for cost effectiveness. Concluding from this, the following table will show the final calculation of scoring and weighing together (Figure 13).

| *weighing* | 21.33% | 14.00% | 36.00% | 28.67% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiveness | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.26 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.92 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.62 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.31 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.41 | 6 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.05 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.51 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.28 | 7 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.10 | 8 |

*Figure 13. Overview of scoring and weighing*

Figure 13 shows the overall score on a scale of 1 to 10 for each option. We concluded to choose the best four options for two reasons: Firstly, the difference in scoring was significant between the fourth and fifth rank (0.41) in comparison to the difference

between the first four places (0.39 between rank 1 and 4) and secondly, they go into similar directions and synergies can be used to implement them more effectively. Therefore, we believe the following options are the best solution to increase participation of people with limited financial resources in the energy transition:

(1) Expand and personalize energy advising services
Increase the number and training quality of energy coaches, and tailor their advice to specific household needs, with special attention to vulnerable groups.

(2) Clarify energy bills and tariff structures
Providing transparent explanations of dynamic energy tariffs and illustrating how green energy options can be cost-effective in the long run.

(3) Forge partnerships between energy coaches and social workers
Educating social workers about the energy transition and household needs, as they already have a trusted relationship with people who are often excluded from energy initiatives, such as low-income families, the elderly, etc. Additionally, Social workers could bridge the gap by introducing energy coaches to these individuals.

(4) Simplify subsidy and investment guidance
Many citizens are discouraged by the complexity of subsidies and return-on-investment calculations. Offering simple, personalized overviews and basic financial projections can make sustainable investments feel more accessible and realistic.

These results elaborate on the importance of creating services tailored to potential participants, to get them slowly interested and involved. The biggest incentive for this is the potential for citizens to save money through getting the right knowledge on insulation, tariffs and subsidies, which will specifically attract people with limited financial resources. Therefore our recommendation for the future of ImpulZ is combining these four pathways to attract attention, establish trust in an equitable energy transition and then slowly increase their membership base.

### 5.3. Sensitivity analysis

A sensitivity analysis investigates whether a change in the gathered data will lead to a different outcome. Therefore, it highlights tipping points regarding variance in ranking and examines the dependence on specific criteria. In this MCA, the weights of all criteria were increased as well as decreased by 10% and the outcomes were compared.

*feasibility +10%*

| weighing | 31.33% | 10.67% | 32.67% | 25.33% | 100% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiveness | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.35 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.93 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.53 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.38 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.49 | 6 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.18 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.55 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.09 | 7 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.07 | 8 |

*feasibility -10%*

| weighing | 11.33% | 17.33% | 39.33% | 32.00% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effecti | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.17 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.90 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.71 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.25 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.32 | 7 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.92 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.46 | 6 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.46 | 5 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.12 | 8 |

*time to implement +10%*

| weighing | 18.00% | 24.00% | 32.67% | 25.33% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiveness | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.31 | 1 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.98 | 3 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.48 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.28 | 2 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.37 | 6 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.93 | 4 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.39 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.11 | 7 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 5.98 | 8 |

*time to implement -10%*

| weighing | 24.67% | 4.00% | 39.33% | 32.00% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effecti | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.22 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.85 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.76 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.35 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.44 | 7 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.17 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.63 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.45 | 6 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.21 | 8 |

*public acceptance +10%*

| weighing | 18.00% | 10.67% | 46.00% | 25.33% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiveness | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.23 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.91 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.71 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.35 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.46 | 7 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.13 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.54 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.50 | 6 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.21 | 8 |

*public acceptance -10%*

| weighing | 24.67% | 17.33% | 26.00% | 32.00% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiv | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.30 | 1 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.93 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.53 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.28 | 2 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.35 | 6 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.97 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.48 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.06 | 7 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 5.98 | 8 |

*cost effectiveness +10%*

| weighing | 18.00% | 10.67% | 32.67% | 38.67% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiveness | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.16 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.85 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.76 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.25 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.30 | 7 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.96 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.55 | 5 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.41 | 6 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.12 | 8 |

*cost effectiveness -10%*

| weighing | 24.67% | 17.33% | 39.33% | 18.67% | 100.00% | |
|---|---|---|---|---|---|---|
| option | feasibility | time to implement | public acceptance | cost effectiv | final score | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.37 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.99 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.48 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.38 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.51 | 5 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.14 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.46 | 6 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.14 | 7 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.07 | 8 |

*Figure 14. Overview of the sensitivity analysis applying 10% range*

Overall, even though the ranks changed minimally, the top four options never changed. Consistently the options 1, 2, 4 and 6 were ranked the best, which proves that even if the stakeholders had differing opinions on the importance of the criteria, the result would have been the same. Therefore, these four options build a solid ground to increase participation in the energy transition in Beekdaelen. The sensitivity analysis was taken one step further to investigate extreme scenarios and consequently test if some options are

extremely dependent on one a single criterion. The group calculated the score of the options with 40% added to each criterion.

*feasibility +40%*

| weighing | 61.33% | 0.67% | 22.67% | 15.33% | 100% | |
|---|---|---|---|---|---|---|
| option | feasibilit | time to impleme | public acceptanc | cost effectivene | final scor | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.63 | 1 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.99 | 4 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.25 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.58 | 2 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.73 | 5 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.57 | 3 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.69 | 6 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 5.53 | 8 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.01 | 7 |

*time to implement +40%*

| weighing | 8.00% | 54.00% | 22.67% | 15.33% | 100% | |
|---|---|---|---|---|---|---|
| option | feasibilit | time to impleme | public acceptanc | cost effectivene | final scor | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.45 | 1 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 7.17 | 3 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.07 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.19 | 2 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.27 | 5 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.58 | 4 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.02 | 6 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 5.60 | 8 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 5.65 | 7 |

*public acceptance +40%*

| weighing | 8.00% | 0.67% | 76.00% | 15.33% | 100% | |
|---|---|---|---|---|---|---|
| option | feasibilit | time to impleme | public acceptanc | cost effectivene | final scor | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 7.13 | 4 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.88 | 5 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 5.99 | 9 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.44 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 6.63 | 6 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 7.36 | 2 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.62 | 7 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 7.17 | 3 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.54 | 8 |

*cost effectiveness +40%*

| weighing | 8.00% | 0.67% | 22.67% | 68.67% | 100% | |
|---|---|---|---|---|---|---|
| option | feasibilit | time to impleme | public acceptanc | cost effectivene | final scor | rank |
| 1 | 8.07 | 7.73 | 7.13 | 6.60 | 6.85 | 2 |
| 2 | 7.13 | 7.47 | 6.93 | 6.47 | 6.63 | 6 |
| 3 | 4.67 | 4.33 | 6.07 | 6.40 | 6.17 | 8 |
| 4 | 7.80 | 7.07 | 7.53 | 6.80 | 7.05 | 1 |
| 5 | 7.00 | 6.13 | 6.80 | 5.60 | 5.99 | 9 |
| 6 | 7.93 | 6.07 | 7.53 | 6.27 | 6.69 | 5 |
| 7 | 6.73 | 5.47 | 6.60 | 6.73 | 6.69 | 4 |
| 8 | 4.47 | 4.60 | 7.53 | 6.87 | 6.81 | 3 |
| 9 | 5.73 | 5.07 | 6.73 | 6.07 | 6.18 | 7 |

*Figure 15. Overview of the sensitivity analysis applying 40% range*

While the top four options stay the same with a 40% increase in the weight of feasibility and time to implement, they change slightly when public acceptance and cost effectiveness are increased. For public acceptance at 76%, option 8 - guaranteeing stable investment returns of renewable energy projects - became the third best option. This aligns with the need for people with limited financial capital to make investments with less risk, therefore increasing the acceptance of partaking in the energy transition. This option however, was discussed in depth at the workshop to be not feasible, as energy cooperatives and specifically ImpulZ as a very small cooperative does not have the financial resources to compensate for stable returns to the citizens if a project is not generating the expected return of investment. When increasing cost effectiveness by 40% another option scores on the leaderboard: Installing PV panels below 100kWp. This option is on rank 5 for the calculation with the usual weights and performs badly due to its long time to implement. Steady and quick investment returns are important for people with limited financial resources as they do not have the money to wait for long term return rates. However, once ImpulZ has expanded its membership base and therefore can offer lower investment rates per member, the longevity of the projects will become less important and this option will then be very attractive for ImpulZ. This extreme sensitivity analysis shows the impact of setting different importance levels to the criteria and therefore highlights how looking at the options from different angles will change some of the outcome. This is relevant, as these options may become more attractive as soon as some of the barriers will decline in the future.

This sensitivity analysis overall shows the robustness of the data gathered and therefore supports our recommendation of expanding and personalizing energy advising services, clarifying energy bills and tariff structures, building partnerships between energy coaches and social workers who work with lower-income people and clarifying subsidies and potential returns. It also shows important insights on options that will become more relevant in the future, which will be further explored in the implementation plan of Phase 4.

# 6. Phase 4: Monitoring, evaluation & learning

This sustainability assessment explored how ImpulZ can play a more effective role in promoting a fair and inclusive energy transition in Beekdaelen: *“How can ImpulZ increase participation of citizens with limited financial resources in the energy transition, in Beekdaelen, within 2 years?”*

The analysis revealed that while the cooperative has a strong grassroots foundation and local commitment, several internal and external factors are limiting its impact and growth potential. One significant internal challenge is the absence of a shared vision within ImpulZ itself. Throughout this project, it became clear that the board does not always agree on the core priorities of the cooperative, i.e. how to upscale (see table 3). This divergence is hindering coherent decision-making and limiting the development of a unified strategy.

Externally, ImpulZ is operating in a complex and uncertain context. The national and regional legislative landscapes are constantly changing, e.g. subsidy rules and energy policies, making it difficult for cooperatives to plan ahead and convey clear, consistent information to the citizens. At the same time, the grid congestion in the Netherlands is making it challenging to develop or expand meaningful renewable energy generation projects. Moreover, stakeholders indicated that recent negative media coverage surrounding renewable energy has contributed to rising skepticism among residents. As a result, many people remain unconvinced about the value of sustainable energy and are hesitant to engage. For many, the energy transition is only being evaluated from a financial perspective, rather than from an environmental one.

Despite these barriers, this assessment identified four concrete options through which ImpulZ can expand its reach and effectiveness in the next two years: (1) Expand and personalize energy advising services, (2) clarifying energy bills and tariff structures, (3) forging partnerships between energy coaches and social workers, and (4) simplifying subsidy and investment guidance.

## 6.1. Implementation plan

To translate these recommendations into practice, we propose a phased implementation plan, structured over two time horizons: short-term (2 years) and medium-term (5 years), which can support the long-term goal of reaching climate neutrality in 2050.

In the short term (within 2 years), ImpulZ should begin by aligning its internal vision through structured strategy sessions or workshops with board members and key volunteers. This shared perspective is necessary before scaling more complex efforts. The four proposed options should be implemented as part of an integrated service model. Energy coaching can be expanded by recruiting and training new coaches, potentially in collaboration with local vocational schools or municipal programs. These coaches should offer in-home visits and drop-in sessions at community centers, with bookings accessible via the ImpulZ website. Partnerships with social workers should be formalized through meetings with local welfare or housing organizations. Joint outreach, where social workers introduce energy coaches to vulnerable residents, can help to reach this difficult to reach target group. To clarify energy tariffs, ImpulZ should develop simple educational materials (e.g. infographics, videos) and distribute them online and at local events. A short community survey could help tailor the content. Lastly, subsidy guidance should be simplified through an easy-to-use online tool or printed handout that explains eligibility, steps, and expected returns. This could be offered alongside in-person “subsidy help desks” at community info nights. These short-term interventions, while modest in scope, will build visibility, credibility, and operational readiness.

In the medium term (within five years), ImpulZ should aim to contribute meaningfully to a more equitable and inclusive energy transition in Beekdaelen. This timeline aligns with national climate targets: by 2030, the Netherlands aims to generate 70% of its electricity from renewable sources and ultimately achieve carbon neutrality by 2050 (RVO, n.d.). However, the cooperative’s trajectory over this period will depend heavily on the evolving state of grid infrastructure, particularly the persistent challenge of grid congestion.

In the first scenario, where grid congestion has been resolved or significantly alleviated, ImpulZ should seize the opportunity to develop local renewable energy generation projects, such as PV projects. Multiple options that were taken into account in the MCA would be likely to get higher scores on “feasibility” and “time to implement”, meaning they should be revisited and reevaluated. Like members of ImpulZ and other energy cooperatives said, “projects lead to more members and visibility”. This momentum can then be leveraged to scale operations, attract investment, and expand.

In the second scenario, where grid congestion persists and restricts large-scale generation projects, ImpulZ must adapt its strategy. In this case, it should focus on smaller, permitted interventions. The sensitivity analysis highlights that option 7, related to small scale PV installations, might be promising in this scenario, when the relevance of the criteria

“time to implement” is reduced due to the investments being smaller. Other options such as off-grid solutions, shared battery storage pilots, or energy-saving retrofits for specific households could also be considered. Alternatively, the cooperative may need to critically reassess its long-term role and capacity within the region’s energy ecosystem. This reflection should consider whether its ambitions remain realistic under structural constraints and whether partnerships or new organizational forms are necessary to achieve impact.

Due to the recognized systemic uncertainty and the defined time frame of this project, we are not able to provide long-term strategies in this project. However, we firmly believe that implementing the short and medium-term suggestions above and considering the key aspects we indicated can support ImpulZ to strategize for the long run later on.

### 6.2. Recommendations on monitoring and evaluation

As highlighted throughout this assessment, ImpulZ is currently navigating a complex operational environment shaped by resource limitations, internal divergence in vision, and shifting external conditions. For this reason, the monitoring and evaluation strategy should not only serve a tracking function but also act as a tool for learning and strategic alignment within the organization. Details on criterion and frequency of monitoring efforts are listed in Table 9.

In the short term, monitoring and evaluation efforts should prioritize the systematic collection of data related to participation, outreach, and engagement. As ImpulZ expands its membership and begins to implement targeted energy coaching and educational initiatives, it will be crucial to monitor its interactions. This includes documenting who is being reached and gathering qualitative feedback to assess the perceived value and accessibility of services provided. These efforts are particularly important given the urgency of increasing community involvement and delivering immediate, low-barrier interventions. At this stage, it is also important to evaluate whether ImpulZ’s internal vision has evolved and whether strategic alignment has been achieved across its board and operational teams. This reflection should include perspectives from members, volunteers, and local partners, and could take the form of periodic strategic workshops or collaborative evaluation sessions.

In addition, given that ImpulZ’s future project scope is dependent on the national and regional electricity grid’s capacity, they should regularly monitor the status of grid congestion in Beekdaelen and the surrounding areas. This includes assessing whether grid limitations

are improving, worsening, or remaining unchanged, and how these conditions affect the feasibility of renewable energy generation projects. ImpulZ should develop a concrete evaluative criterion for grid capacity, such as an annual review of available connection capacity or project approval rates by the regional grid operator, which can inform whether to pursue large-scale energy generation, invest in smaller initiatives, or reassess the cooperative's long-term strategic direction.

Over the medium term, the focus of evaluation should shift toward assessing their actual impact. The evaluation framework should support reflection on whether the cooperative has made progress toward its overarching goal: contributing to a more just and inclusive energy transition in Beekdaelen. As ImpulZ enters the five-year operational window, attention must be paid to whether interventions are generating the intended outcomes. Key indicators for the low-barrier projects should include the uptake of available subsidies, improvements in household energy efficiency, or observable changes in energy consumption behaviors. Monitoring the external energy infrastructure landscape, e.g. grid development, should continue as a central criterion, given its direct influence on ImpulZ's ability to scale up.

ImpulZ is encouraged to embed learning into its organizational culture. Annual internal reviews, focusing on both progress and obstacles, can help the cooperative remain flexible and responsive. Moreover, making findings public through short reports or community events can increase trust and position ImpulZ as a transparent, accountable actor within the energy transition landscape.

| **Criterion** | **Method of Measurement** | **Frequency of Measuring** |
|---|---|---|
| Members of ImpulZ | - Number of registered members<br>- Demographic breakdown (e.g., age, income, homeowner/renter status) | Quarterly |
| Projects started | - Count of new initiatives launched<br>- Progress reports on each project | Quarterly |
| Energy usage | - Energy consumption data from households<br>- Surveys on behavior change | 6 months after start of project, then Biannually |

| | | |
|---|---|---|
| Uptake of subsidies | - Number of applications submitted<br>- Amount of subsidies received by members | 6 months after start of project, then Biannually |
| Energy cost for households | - Comparison of pre- and post-intervention energy bills<br>- Self-reported savings from members | 6 months after start of project, then Annually |
| Access to renewable energy for people with limited financial resources | - Number of households with limited financial resources that have access<br>- Geographic and demographic data analysis | 6 months after start of project, then Annually |
| Grid congestion level | - Reports from grid operators (Enexis)<br>- Project application outcomes | Biannually |

*Table 9. Criteria to measure monitoring*

# 7. Conclusions and critical reflections

## 7.1. Reflection on assessment methodology

### 7.1.1. Phase 1

In Phase 1, we conducted an interview with ImpulZ to understand the problem from their perspectives. However, the absence of direct citizen input and other actors at this stage limited our understanding of the entire system. In this way, including more interviews with ImpulZ board members could have provided a more comprehensive view of internal challenges and strategic direction. A major issue was that the research question had to be revised at a late stage, which disrupted consistency across phases. Additionally, the system boundaries were not clearly defined in the beginning with the client, which made early scoping and analysis more difficult.

### 7.1.2. Phase 2

In this phase, options were primarily developed through desk research and brainstorming based on insights from Phase 1. The inclusion of EMEC as an external cooperative partner was especially valuable and brought practical insight. However, we received limited input from our client during this phase. No new options were added and existing ones were only briefly discussed. For the cream-off method, a wider range of actors could have been consulted for a more holistic view. The two actors showed big differences in scoring options during the cream-off process, and interviews afterwards could have helped us to better understand why these actors diverged so much.

### 7.1.3. Phase 3

The use of MCA allowed us to transparently assess options based on stakeholder input. During our workshop there was a lot of useful discussion which helped our project a lot. The group made efforts to involve diverse actors, but faced difficulties reaching our target group of citizens on the streets, as some citizens struggled to understand what they were scoring, which may have affected the quality of the data.

### 7.1.4. Phase 4

It would have been beneficial to co-create the monitoring goals more closely with ImpulZ to ensure alignment with their operational capacity and strategic goals. In addition, more flexible mechanisms could be included to adjust the implementation based on future feedback or changing conditions.

### 7.2. Reflection on project work and group collaboration

Overall, this project was a highly intense yet solid learning experience for the team. Reflecting on our group collaboration, we are pleased to acknowledge that we largely adhered to the principles and expectations outlined in the Team Charter that we drafted in the beginning of the project.

First, we maintained consistency in using the selected digital platforms, which allowed us to keep documents well-organized and up to date throughout the project. Second, each team member clearly understood and fulfilled their designated responsibilities, whether it was a fixed role such as external communication or a rotating role like weekly facilitator or meeting scribe. Third, we actively cultivated a positive and respectful team dynamic by valuing each other's input and encouraging open dialogue. We were not afraid to question ideas or express dissenting views when necessary, always with the shared goal of arriving at the best outcomes for both the team and the project. This collaborative approach not only strengthened our final results but also contributed to a meaningful group learning experience.

In addition to strong internal collaboration, we also maintained clear and consistent communication with our coach. By preparing thoroughly for our weekly coaching sessions, we were able to make the most of these opportunities, gaining valuable insights and constructive feedback. These sessions not only helped us refine our direction and deliverables but also challenged us to think critically about our assumptions and approaches. Our coach played an important role in guiding us through complex issues and encouraging us to deepen our analysis.

Looking back, there are also several aspects we would improve if given the opportunity to undertake a similar project again. One key area is time management. While we successfully completed the project within the given timeframe, our schedule was occasionally disrupted due to overlapping deadlines from the university, personal commitments other than the projects, and vacation periods. Additionally, we encountered an unexpected and significant change in the direction of our project, particularly a revision of the main research question. This shift, while necessary, caused some delays and required us to reallocate time and effort. Moving forward, we would be more mindful of external events and build a more flexible timeline that includes buffer periods to accommodate unforeseen

changes. This experience highlighted the importance of agility and proactive planning in project management.

Another area for improvement is communication. While we did a good job of staying in touch via WhatsApp and maintaining an organized document archive on Google Drive, we noticed that key information sometimes got lost in long message threads. Moreover, practical communication habits, such as consistently CC'ing team members in emails, were not always followed, resulting in inefficiencies during team meetings once in a while. In future projects, we would consider switching to more structured, work-oriented platforms like Microsoft Teams or Slack. These tools would allow for clearer topic-based discussions, better tracking of decisions, and centralized documentation of important information, including the reasoning and debates behind them.

Finally, although we made efforts to distribute tasks fairly and according to each member's strengths, achieving perfect balance was challenging. Some roles were more time-consuming or complex than others, and the workload naturally shifted at different stages of the project. If we were to conduct this research again, we would like to have more in-depth discussions about workload distribution and perhaps learn from how other groups managed similar issues. Reflecting on our process, we see opportunities to enhance fairness, efficiency, and mutual support in future collaborations.

### 7.3. Reflection on interaction with the client

Our interaction with the client throughout the project was generally effective and aligned well with our intended communication strategy. We primarily communicated via email, maintaining a professional tone and clear structure in every exchange. The client was responsive, which facilitated a smooth flow of information. Internally, we set a criterion to ensure clarity and professionalism in our outreach, a standard we consistently met and are proud of.

In line with our project plan, we engaged the client regularly, providing updates at the conclusion of each phase and seeking input. For instance, we reached out to validate the problem definition, discuss potential options, and organize the stakeholder workshop in Phase 3. In several cases, we even exceeded our initial expectations by being proactive in requesting feedback and clarifying uncertainties. We also recognized that our client is not a

native English speaker, which could occasionally lead to misinterpretation. To mitigate this, we shared a Dutch-speaking team member's contact to facilitate more precise communication and made conscious efforts to align our internal understanding with the client's input.

Despite these strengths, we also encountered certain limitations. We observed that the client did not always have a clear internal consensus on key aspects of the project, particularly the temporal and spatial boundaries or their long-term strategic vision. As a result, some important decisions were made primarily based on our internal knowledge, albeit with the client's agreement. Furthermore, our communication was mostly limited to a single representative of ImpulZ. While we engaged a member of ImpulZ in Phases 1, and the member and the chairman of ImpulZ in Phase 3, a broader inclusion of perspectives from within ImpulZ was limited. This constraint may have led to certain insights or judgments being less comprehensive than desired.

Overall, our interaction with the client was strong in terms of responsiveness, professionalism, and adaptability. However, a more diverse and consistent engagement with multiple stakeholders within the client organization could have further enriched our project outcomes.

### 7.4. Reflection on the results: achieved versus intended outcomes

The intended outcomes of our project was not only to provide clear solutions to the problem statement but also to provide ImpulZ with a robust, actionable framework to support sustainable growth and stakeholder engagement. While many of our objectives were met or even exceeded, several deviations emerged due to unforeseen constraints, especially around timing and shifts in the client's focus. Below is a phase-by-phase comparison of intended versus achieved outcomes.

**Phase 1**

The original intention for Phase 1 was to produce a comprehensive system diagram, actor and network analysis, means-ends diagram, objective tree, and causal map. These were expected to lay a solid analytical foundation for the subsequent phases and provide ImpulZ with clarity on its operational and relational environment.

In practice, we successfully achieved most of these objectives. We developed a clear

problem statement that aligned with the client's revised goals and included well-defined spatial and temporal boundaries. Our actor analysis and system diagram were particularly thorough, incorporating insights from extensive desk research and preliminary client interaction. These outputs provide ImpulZ with valuable strategic tools for understanding its role in the energy transition and the interests of various stakeholders.

However, the late-stage change in the client's project focus required us to revise our problem statement and project scope under time pressure. As a result, although we adapted quickly, some elements may not have reached their full potential. Moreover, while our proposed spatial and temporal boundaries were accepted by the client, feedback from Phase 3 suggests internal differences within ImpulZ regarding these boundaries, indicating that our framing may not fully align with the perspectives of all stakeholders.

**Phase 2**

This phase aimed to build on Phase 1 by consulting stakeholders to identify possible solutions and corresponding assessment criteria. Our methodology was executed as planned, and we were able to draw meaningful insights that surpassed our initial expectations in depth and relevance.

Nonetheless, the scope of stakeholder engagement was limited to two main actors due to time constraints. While this partially fulfilled our intended outcome, it represents a significant limitation in terms of capturing a broader range of perspectives, which could have enriched our solution development.

**Phase 3**

The intended outcome for Phase 3 was to finalize solution options, establish criteria for evaluation, and foster mutual understanding through a participatory workshop with the client and key stakeholders. The workshop was also expected to contribute to stakeholder capacity-building and guide the formulation of short-, medium-, and long-term strategies for ImpulZ.

We successfully implemented a well-structured participatory approach, gathering valuable insights and fostering dynamic communication. The workshop not only helped validate our findings but also played an important role in building knowledge around energy transition within the stakeholder group.

However, similar to Phase 2, we encountered challenges in stakeholder outreach.

Despite efforts to involve all relevant actors identified earlier, limitations in availability, interest, and knowledge—particularly among local citizens—restricted the diversity of perspectives represented in the workshop. We recognize this as a key limitation of the project.

**Phase 4**

Our original aim for Phase 4 was to reflect on the SA's outcomes, evaluate its strengths and weaknesses, and deliver final recommendations to the client. In this phase, we exceeded our expectations. We demonstrated sensitivity to stakeholder perspectives and synthesized insights from all phases into a clear, actionable report. The recommendations are designed to be practical, adaptable, and aligned with ImpulZ's sustainability goals, providing a timeline and implications for near-, medium-, and long-term strategies. Additionally, we emphasized the importance of learning throughout the SA process. By capturing reflections, feedback, and process notes, we not only contributed to ImpulZ's organizational learning but also modeled a culture of continuous improvement.

**Overall reflection**

While we encountered some limitations, particularly in stakeholder coverage and the late shift in the problem statement and the project scope, we are more than satisfied with the final outcomes. The outputs we delivered align strongly with the original project objectives and demonstrate the group's commitment to quality and adaptability. Our effort to iteratively improve our work, even under tight constraints, is reflected in the coherence and utility of our final deliverables. This SA provides a solid foundation for ImpulZ to build a resilient, stakeholder-informed, and sustainable business strategy.

### 7.5. Learning from the project and the outcome

While the team learned a lot throughout the whole process, including the methodology, applying methodology to the real-life case, the topic of energy transition and citizen engagement, and the context of ImpulZ, we all agree that we learn the most from the third phase, where we engage in-depth with most stakeholders (i.e, energy cooperatives, network cooperatives, energy providers, the municipality, and different members from ImpulZ).

On one hand, from the conversation with stakeholders, we not only have a more thorough understanding of the topic from different angles but also have a higher certainty about the direction of the project, especially regarding the problem and relevant actors we identified. Firstly, stakeholders stress the importance of inclusivity in the energy transition, particularly because the legislative environment often neglects social groups with limited financial resources.  It is shocking as we understand the systemic challenges they refer to. while the national government aims to provide incentives for energy transition (eg, subsidies on purchasing electric cars, subsidies on insulation in self-owned houses, subsidies in investing in solar panels), it is often hard to reach people with financial resources with these benefits due to they lack the capital to invest or the autonomy to make changes in their rental houses. As we gain knowledge in the complexity of the issue, we recognize that the identified central topic cannot be reached solely by ImpulZ, and it is thus important to collaborate and initiate deeper conversations among stakeholders in the future.

Secondly, most stakeholders recognize the difficulties in reaching out to or engaging people in energy transition. It is interesting, and sometimes surprising, when we decompose the root cause of the phemonenon. For example, EMEC mentioned that the changing legislative environment leads to uncertainty in investing in and using renewable energy, causing distrust between renewable energy companies/ energy cooperatives and people; Pure Solar pointed out the risks of the negative or incorrect information about energy transition on the media, leading to confusion in the public. Those two factors, arising from stakeholders' empirical experiences, were new to us in Phase 3.

On the other hand, while Pure Solar, ImpulZ, and EMEC agree that people are mostly profit-driven when it comes to participating in the energy transition, we realized some nuances that are worth paying attention to when developing the options. Specifically, while some of our options aim to engage people with limited resources by providing financial incentives (eg. gurantee of investments), EMEC reminded us that, based on their observations, the topic of investment per se rarely emerges in households with limited financial resources because many of them struggle to survive day-to-day life. As a substitution, options can be more developed with the concept of "communities" instead of individual investors; for example, developing tiered investment schemes based on people's financial situation and re-distributing revenues in the communities.

Last but not least, while we propose "public acceptance" as a criteria to assess options in Phase 3, without putting specific emphasis on it, it is highlighted by Rescoop that

public acceptance, together with trust, are the prerequisites for initiating any project. It is a valuable insight for us, which we aim to highlight to our client.

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# Appendices

**Appendix A.**

| Stakeholder group | Position | Response | Participation MCA |
|---|---|---|---|
| Impulz | Chairman | Jeu | In person |
| | Board member | Frans | In person |
| | General member | Annemarie | Online |
| | Energy coaches | No response | No |
| Municipality | Sustainability table | Diantha | Online |
| | General board | No response | No |
| Energy cooperatives | Emec | Theo | In person |
| Cooperative energy supplier | Energie van ons | No response | No |
| Energy cooperative Network | Samen om | No response | No |
| | REScoop | Rob | In person |
| Energy business | PureSolar | Ron | In person |
| | VoltaSolar | No response | No |
| NGO | Woonwijzerwinkel | No response | No |
| Housing | WonenLimburg | No response | No |
| Infrastructure | Enexis | No response | No |
| | Van de bron | No response | No |
| Inhabitants | Citizens | 2 | No |
| Total | - | 9 | 7 |

Appendix A. Overview of respondents

## Appendix B

## List of Potential Solutions (before the cream-off method) identified in Phase 2

**Category 1: Decrease mystification**

1. Clarifying energy bills and tariff structures
   Educate citizens on dynamic tariffs and demonstrate how green energy options are more cost-effective in the long term.
2. Clarify subsidies and potential returns
   Provide simple, personalized guidance on available subsidies and support people in estimating their potential financial savings or returns from sustainable investments.
3. Awareness-driven campaigns
   Use climate-conscious branding to shift perceptions, generate awareness, and incentivize community support for the energy transition.

**Category 2: Decrease energy prices**

4. Explore a new joint ownership project opportunity and become an energy supplier
5. Establish solidarity tariffs
   i.e. wealthier members subsidize energy costs for low-income households
   Implement pricing models where higher-income members help subsidize energy costs for lower-income households, ensuring fair access and fostering community solidarity.
6. Partnerships with social housing corporations
   ImpulZ could partner up with social housing corporations to realize big projects for energy production, optimize energy efficiency, provide green, cheap energy, install renewable generators, and insulate buildings. Social housing could become more sustainable with less of the financial burden to the renters, as bulk purchase is more economically efficient.
7. Cooperate with solar companies to provide stable, affordable PV repair service
   This cooperation would ensure a quick and reliable repair service, and transparent pricing, while encouraging more hesitant or skeptical householders to adopt PVs, and preventing abandoned or underperforming systems due to maintenance issues.
8. Advocating for pro-cooperative and pro-energy transition legislation
   Cooperate with other energy cooperatives and networks to advocate for legal frameworks that recognize and support citizen-led energy initiatives. Focus areas could include: Grid accessibility for local green energy; Easier permitting for green projects; Extending Nearly Zero-Energy Building (NZEB) requirements; and Mandating renewable energy share or financial safety nets.

**Category 3: Spread information on household energy efficiency**

9. Offer educational courses and workshops to citizens
   Organize community courses that explain the basics of energy use, the benefits of renewable energy, and the role of citizens in the energy transition.

10. Expand and personalize energy advising services
    Increase the number and training quality of energy coaches, and tailor their advice to specific household needs, with special attention to vulnerable groups.
11. Collaborative marketing with partners
    Partner with municipalities, energy cooperatives, NGOs, housing associations, or other aligned organizations to co-create marketing campaigns. These collaborations reduce costs and increase visibility.
12. Expand and improve communication channels
    Expand ImpulZ's online presence would increase engagement through active social media use, a monthly newsletter, and different platforms that facilitate collaboration, e.g. Slack. Additionally, using physical channels and activities could help tangibly to communicate with citizens or partners, using for example the local newspaper, brochures, leaflets, posters, and individual letters.
13. Direct outreach to marginalized groups
    Visit homes and make phone calls to reach different segments of the population, e.g., older people, and inform them about energy saving and available subsidies.
14. Partnerships between energy coaches and social workers who work with lower-income people
    Social workers already have a trusted relationship with people who are often excluded from energy initiatives, such as low-income families, the elderly, etc. This collaboration could boost social workers' knowledge about energy transition and its benefits. Or, social workers could bridge the gap by introducing energy coaches to these individuals.

**Category 4: Create low-entry barrier projects**

15. Shared ownership opportunities
    Enable members to collectively invest in, co-own renewable energy infrastructure, such as PV installations, and benefit from distributed energy and revenue based on ownership shares.
16. Adopt low-entry projects for clean energy use
    There is an option at several companies to rent instead of buy PV panels. This lowers the barrier to becoming more sustainable and could save a lot of money.
17. Energy as service
    Provide users to pay a monthly fee for access to renewable energy without purchasing or maintaining the system, and ImpulZ or a third-party entity owns, operates, and maintains the infrastructure (e.g., solar PVs on public buildings like schools or libraries), while users benefit from lower energy bills and predictable pricing.
18. Pay-As-You-Go energy models
    Provides energy to low-income households through affordable and gradual payments (daily, weekly, or monthly), to lower the barriers of the large upfront investment. Payments can often be paused or adjusted based on income fluctuations, particularly helpful for people with seasonal work or stable income. PAYG models can be adapted for tenants and shared housing, which is very relevant as homeownership is

often a requirement for installing PVs. Additionally, since the equipment remains owned by the provider, users don't bear the cost or responsibility for maintenance.

19. Leasing models
    Allows low-income people to access renewable energy systems or energy-efficient appliances immediately without upfront investment. Often, includes a flat monthly rate and takes the responsibility to maintain and repair from the user, as the provider retains the ownership. Plus, providers must replace outdated equipment after several years. As well as PAYG models, leasing models can also be adapted for tenants and shared housing, which is very relevant as homeownership is often a requirement for installing PVs. Additionally, some leasing models offer a "lease-to-own" path, i.e., users pay monthly for a few years, and the equipment becomes theirs.
20. Realising rooftop PV-installations that are not bigger than 100kWp
    Smaller projects avoid grid congestion, while generating local green energy .
21. Guarantee stable investment returns
    Ensure a stable and predictable return on investment to reduce financial risk and increase confidence among members, especially the new ones.

**Category 5: Create knowledge network with banks/ energy & utility companies**

22. Develop locally based energy solutions
    It is already possible to find energy suppliers with green energy (European or from the Netherlands) in the municipality of Beekdaelen. Increasing the share of locally generated green electricity available in Beekdaelen through new energy projects, such as community solar or biogas, would reduce dependency on national or European suppliers.
23. Partnerships with energy suppliers
    Partner with cooperative or ethical energy suppliers to distribute locally generated green electricity, maintaining local ownership and transparency.
24. Community or household batteries to make the energy supply more adaptive and resilient to shocks
25. Geothermal heating systems to reduce gas dependency
26. Solar PV expansion across public and private rooftops
27. Restoration of watermills for micro-hydropower

**Other: Diversify ways to attract people to join ImpulZ and maintain ImpulZ's operations before a strong and stable member basis is built**

28. Enhance transparency to increase trust
    Build trust by opening and sharing information about money flow, project progress, and community impact through clear and regular updates.
29. Organize and participate in events
    Join local and regional events (e.g., stands) to show ImpulZ's work, participate in network events to establish relationships and partnerships, and attend and host events about energy transition and related topics.

30. Cooperate with local companies
    By partnering with local construction firms, electricians, or insulation providers, ImpulZ could negotiate better service rates through contracts and long-term partnerships, create local jobs by ensuring that energy transition projects are being developed in the region, support SMEs and entrepreneurs in Limburg, fostering a circular and sustainable local economy.
31. Seasonal strategic marketing approaches
    Launching marketing initiatives during periods of extra income, such as holiday payment or tax return periods, to incentivize sustainable energy investments.
32. Create a safety net for project risks
    Design funding buffers or insurance schemes to ensure that contributors receive a baseline return even if projects underperform, protecting lower-risk investors.
33. Apply for EU and National funding programs
    There are several potential EU funds that ImpulZ could take advantage of to finance local energy projects and innovation, such as the EU's Cohesion & Structural Funds, or the Limburgs Energie Fonds, such as realisatiefonds voor energiecooperatie.
34. Investment schemes with other financial institutions
    Collaborate with ethical financial institutions, credit unions, or green banks to create shared investment schemes that increase project scale and financial resilience, and to expand ImpulZ's revenue channel.
35. Apply for fund via de Bank for Municipalities (BNG), with a minimum loan of a million euro (> € 1.000.000,-)
36. Flexible membership models
    Develop multiple membership options with varied contributions (e.g., financial investment, volunteer work, or technical skills), responsibilities, and benefits. Offer options based on commitment level, membership duration, affordability, and sustainability goals, allowing broader and more inclusive engagement.

## Appendix C

## Results from the Cream-off Method

| Option | | Feasibility | | Effectiveness | | Total Score |
|---|---|---|---|---|---|---|
| | | ImpulZ | EMEC | ImpulZ | EMEC | |
| 1 | Clarifying energy bills and tariff structures | 8 | 10 | 3 | 10 | 31 |
| 2 | Clarify subsidies and potential returns | 8 | 9 | 5 | 10 | 32 |
| 3 | Awareness-driven campaigns | 7 | 6 | 4 | 5 | 22 |
| 4 | Explore a new joint ownership project opportunity and become an energy supplier | 8 | 6 | 9 | 8 | 31 |
| 5 | Establish solidarity tariffs | 6 | 2 | 8 | 3 | 19 |
| 6 | Partnerships with social housing corporations | 3 | 4 | 9 | 4 | 20 |
| 7 | Cooperate with solar companies to provide stable, affordable PV repair service | 5 | 4 | 3 | 3 | 15 |
| 8 | Advocating for pro-cooperative and pro-energy transition legislation | 8 | 4 | 8 | 5 | 25 |
| 9 | Offer educational courses and workshops to citizens | 8 | 6 | 4 | 7 | 25 |
| 10 | Expand and personalize energy advising services | 9 | 7 | 6 | 9 | 31 |
| 11 | Collaborative marketing with partners | 5 | 6 | 5 | 4 | 20 |
| 12 | Expand and improve communication channels | 8 | 8 | 4 | 9 | 29 |
| 13 | Direct outreach to marginalized groups | 6 | 6 | 4 | 4 | 20 |
| 14 | Partnerships between energy coaches and social workers who work with lower-income people | 8 | 7 | 9 | 5 | 29 |
| 15 | Shared ownership opportunities | 9 | 4 | 7 | 6 | 26 |
| 16 | Adopt low-entry projects for clean energy use | 9 | 5 | 5 | 6 | 25 |
| 17 | Energy as service | 7 | 1 | 8 | 2 | 18 |
| 18 | Pay-As-You-Go energy models | 5 | 2 | 9 | 2 | 18 |
| 19 | Leasing models | 9 | 1 | 8 | 1 | 19 |
| 20 | Realising rooftop PV-installations that are not bigger than 100kWp | 8 | 8 | 4 | 10 | 30 |
| 21 | Guarantee stable investment returns | 9 | 8 | 6 | 10 | 33 |
| 22 | Develop locally based energy solutions | 8 | 5 | 8 | 8 | 29 |
| 23 | Partnerships with energy suppliers | 4 | 9 | 7 | 7 | 27 |
| 24 | Community or household batteries to make the energy supply more adaptive and resilient to shocks | 7 | 4 | 5 | 5 | 21 |
| 25 | Geothermal heating systems to reduce gas dependency | 4 | 3 | 5 | 5 | 17 |
| 26 | Solar PV expansion across public and private rooftops | 8 | 3 | 4 | 6 | 21 |
| 27 | Restoration of watermills for micro-hydropower | 4 | 6 | 4 | 7 | 21 |
| 28 | Enhance transparency to increase trust | 7 | 8 | 3 | 8 | 26 |
| 29 | Organize and participate in events | 8 | 6 | 4 | 8 | 26 |
| 30 | Cooperate with local companies | 5 | 5 | 6 | 5 | 21 |
| 31 | Seasonal strategic marketing approaches | 7 | 4 | 6 | 2 | 19 |
| 32 | Create a safety net for project risks | 8 | 5 | 6 | 5 | 24 |
| 33 | Apply for EU and National funding programs | 8 | 3 | 3 | 2 | 16 |
| 34 | Investment schemes with other financial institutions | 8 | 2 | 3 | 2 | 15 |
| 35 | Apply for fund via de Bank for Municipalities (BNG), with a minimum loan of a million euro (> € 1.000.000,-) | 8 | 5 | 3 | 8 | 24 |
| 36 | Flexible membership models | 8 | 5 | 7 | 5 | 25 |