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Summary

The concept of energy citizenship purports an ideal of informed and active citizens, co-creating their environment to bring about a more democratic and sustainable energy system. However, realisation of such an ideal depends on various contextual factors. This Deliverable (D4.3) applies the Qualitative Comparative Analysis (QCA) method to examine 20 case studies of energy citizenship across Europe to identify necessary and sufficient conditions that lead to outcomes related to democratisation of the energy system, own goal achievement, and environmental sustainability. A set of seven conditions is developed to explain these outcomes, including intermediation by non-governmental actors, support by different levels of government in interaction with the decentralisation of the energy governance system as well as characteristics of the organisations such as professionalisation and formalisation and the degree of hybridity.

The intermediary role of non-governmental actors was found to be necessary for all outcomes, indicating its significance in forming and sustaining these initiatives. The analyses showed that achievements did not depend on support from one specific governmental level but that support from multiple levels was important for success. Sub-national governmental support was sufficient in achieving democratisation and comprehensive goal achievement, especially in decentralised government systems, even for non-highly professionalised and formalised organisations. The results suggest that professionalisation and formalisation are crucial for accessing national support programmes, which can be challenging for small organisations. Overall, the results highlight the complex relationships between different levels of governance and their influence on more or less professionalised energy citizenship initiatives.

1. Introduction

Energy citizenship purports an ideal of capable, energy-aware and actively participating citizens who co-shape their environment (Devine-Wright, 2007). In this ideal, it is presumed to contribute to a more democratic and sustainable energy system. However, when translated into concrete empirical cases of energy citizenship, it becomes evident that progress towards this ideal depends on a plethora of contextual factors (Pel et al., 2021). Despite a growing body of empirical research on the enabling or inhibiting factors for energy citizenship initiatives, there remain important research gaps.

So far, there has been little comparative research that systematically investigates multiple case studies of energy citizenship or similar phenomena (Hoppe et al., 2015, see also Igalla et al., 2019). There are studies that focus on macro-factors through country comparisons but do not take into account meso-level features that differ between individual energy citizenship initiatives within the context of a country (e.g., Mignon & Rüdinger, 2016). There has been little research on how such different factors interact. Furthermore, existing studies usually focus on single dimensions when it comes to operationalising ‘success’ of energy citizen initiatives as explanandum of the analyses. However, both the proclaimed value of meaningful co-creation by participating citizens and the expectations of active energy citizenship to contribute to multiple dimensions (more democratic, sustainable, etc.) suggest a more nuanced view.

To address these gaps, this deliverable presents the methodology and results of three linked Qualitative Comparative Analyses (QCA) of 20 cases of energy citizenship across Europe. QCA is a research method used to compare medium-n cases within a specific context and to identify different configurations of factors (conditions) that lead to a particular outcome. The method is well-suited to address the aforementioned research gaps, especially as it is designed to investigate interactive effects of different factors (Ragin, 1987; Schneider & Wagemann, 2007).

The three QCAs focus on the following research question: What are necessary and sufficient conditions for cases of energy citizenship i) to substantially contribute to democratisation of the energy system ii) to achieve their own goals

and iii) to substantially contribute to environmental sustainability?

Section 2 outlines how the QCA methodology was applied. This includes a description of how the QCA method was integrated in the overall research process of the EnergyPROSPECTS project, how the aforementioned research interests were operationalised in QCA-outcomes, how the 20 cases were selected and how the set of seven explanatory conditions were formed. The results of the three QCAs are presented in Section 3, including analyses of necessary and sufficient conditions for both the occurrence and non-occurrence of the outcomes. Chapter 4 provides a conclusion by contrasting the results of the three QCAs.

2. Application of Qualitative Comparative Analysis (QCA) in EnergyPROSPECTS

2.1. Embedding QCA in EnergyPROSPECTS research process

For the application of the QCA method, it was essential to embed the intended analysis into the empirical research process of the overall EnergyPROSPECTS project; on the one hand due to the requirements of QCA for case selection and focus of the analysis, and on the other hand in order to do justice to the understanding of QCA as an integral research approach and not only as a technical analysis tool (Schneider & Wagemann, 2007). This section briefly outlines how steps of the QCA research process were linked to other parts of the EnergyPROSPECTS project, in particular to the mapping of 596 cases of energy citizenship across Europe (see D3.2, Debourdeau et al., 2023), to detailed case studies in WP3 (see D3.3, Pel et al., 2022) and to the PESTEL analyses of the national contexts in WP5 (see D5.2, Hajdinjak et al., 2023).

2.1.1. Embedding QCA methodology in EnergyPROSPECTS WP3: mapping and case studies

The main data collection underlying the QCA was conducted as part of EnergyPROSPECTS' detailed case studies implemented in WP3, Task 3.5. This task included detailed study of 40 cases of various forms of energy citizenship across the nine partner countries of the EnergyPROSPECTS project, serving multiple analytical purposes emerging from tasks in WP3 and WP4. A subset (20) of these 40 cases was selected for the QCA. For this purpose, requirements for

applying QCA were incorporated into the research design and methodology for these case studies developed in EnergyPROSPECTS Deliverable 3.3 (Pel et al., 2022). This particularly concerned the case selection as well as the research foci, i.e., an outline of the topics to be explored in the case studies, which would then inform the outcomes and conditions of the QCA.

The cases for the detailed case studies were selected from a pool of 596 cases of energy citizenship, which were identified and analysed in a previous mapping analysis (see D3.2, Debourdeau et al., 2023). Not only did this provide the information basis for the application of the case study criteria, it also anticipated the case definition and boundaries. As a result, the methodology for the mapping in Deliverable 3.1 (Vadovics et al., 2022a) also predetermined the case definition of the QCA as well as the list of cases available for case selection. The case definition used for the QCA is further elaborated in Section 2.2, the case selection for the QCA cases in Section 2.4.

The detailed case studies in Task 3.5 also entailed the data collection that was used as the basis for the evaluation of the cases in terms of membership values in the QCA outcomes and most (all but one) conditions. Data collection in the case studies relied on document analysis and semi-structured interviews with different kind of actors (e.g., leaderships, members, volunteers, employees) of the energy citizen initiatives in each case (see D3.4, Vadovics et al., 2022b for further information). For each investigated case, case study researchers were asked to complete an extensive survey, for which a set of 32 questions was developed to provide information for the QCA conditions and outcomes (all question relevant to the QCA are shown in the Appendix). At the beginning of the data collection process, case study researchers were provided with an introduction to the QCA methodology (D3.4, Vadovics et al., 2022b).

In the process of data collection, an initial selection and calibration of outcomes and conditions were refined, taking into account preliminary findings of the case studies. For this purpose, a two-hour workshop with case study researchers was implemented after three months of ongoing data collection. At time of completion of the data collection, the case study researchers were then asked to make an evaluation of their cases for the revised calibration of conditions and

outcomes i.e., to determine the set membership scores of their cases in the conditions and outcomes. For this, they were asked to take into consideration their answers to the relevant questions in the researchers' survey described above (see Appendix for a list of survey questions that were used to inform the assignment of membership scores for each condition and outcome).

2.1.2. Embedding in national-level PESTEL analysis

One condition used in the QCA related to the national contexts in which the case operates, namely the condition/context of a 'Decentralised (energy) governance with strong autonomy of local government'. Data underlying this condition were not collected through the detailed case studies but through PESTEL analyses that investigated factors for the development of energy citizenship at national level and that were implemented in all partner countries (see D5.2, Hajdinjak et al., 2023). Considerations on this condition were fed into the selection of factors to be investigated in the PESTEL analyses. Scoring of cases regarding this condition then relied on the qualitative descriptions given in national PESTEL reports (see D5.2), in addition to secondary data (see Section 2.5.7).

2.2. Case definition and boundaries

Generally, the object of study for this QCA is energy citizenship. In the context of the EnergyPROSPECTS project, energy citizenship has been defined as “[...] forms of civic involvement that pertain to the development of a more sustainable and democratic energy system. Beyond its manifest forms, energy citizenship (ENCI) also comprises various latent forms: it is an ideal that can be lived up to and realised to varying degrees, according to different framework conditions and states of empowerment” (Pel et al., 2021, p. 64).

Based on this definition, 596 cases of energy citizenship across Europe were mapped. For this mapping, the previous definition was operationalised so that a case of ENCI has been defined as:

- “1. a constellation of actors (in a context) and how it enables/supports citizens to become active private and/or public energy citizens; acts as a collective energy citizen by contributing to change of the energy system, or
- 2. Include[ing] individual energy citizens and how they realize their

potential in a private, public or organisational setting.” (D3.1, Vadovics et al., 2022a, p. 10f.).

The 596 cases mapped in accordance with this definition contain a spectrum of actor-types (individuals, different types of organisations). As the mapping aimed for diversity of types of energy citizenship, these cases cover all ideal-types of energy citizenship as developed in the Energy PROSPECTS conceptual typology as of Deliverable 2.2. (Debourdeau et al., 2021), including individual agency in household, organisational-embedded and public settings as well as collective agency in citizen-based and hybrid collectives and social movements, and thus represent a highly heterogeneous pool of energy citizenship.

To improve comparability of cases, the present QCAs only focus on a subset of those ideal-types of energy citizenship. Namely, it focuses on cases that exhibit collective agency in citizen-based and hybrid forms:

“The citizen-based and hybrid collectives refer to energy-related practices and configurations that are respectively initiated and led by citizens only (such as grassroots initiatives), whilst the latter encompasses various other-than-citizen actors, notably public authorities and private actors such as renewable energy sources (RES) developers or project managers. Both citizen-based and hybrid collectives are combined here in one single attribute of agency with regard to the current trend to ‘multi-actor situations of ENCI’” (Debourdeau et al., 2021, p. 22f, see also Pel et al., 2021, p. 40).

In the EnergyPROSPECTS conceptual typology of energy citizenship (D3.2., Debourdeau et al., 2023), collective agency in citizen-based and hybrid forms was distinguished in two ideal types of energy citizenship that also takes into consideration the ‘outcome-orientation’ (type 7 and 8).

“Type 7 mostly takes the form of a collective assembled by citizens and/or other-than-citizen actors, notably NGO, public authorities and private actors. These often heterogeneous agencies give shape and enact citizens’ willingness to be part of the energy transition along with or guided by other sorts of actors. So, type 7 refers to the many ways through which citizens are collectively involved in the energy realm, e.g., by getting involved in a local climate-energy plan or by taking part in renewable energy projects in which local citizens are offered to buy some

shares (though remaining a minority shareholder group). This type is mostly on the active side of ENCI.” (p. 57)

“Type 8 relates to a collective agency composed of citizens and/or other-than-citizen actors, notably NGO, public authorities, municipalities or private actors who are engaged in pushing forward the energy transition. This type often takes its origin from a grassroots movement or a visionary organisational initiative, in which citizens are at centre of some innovative and alternative energy transition project, group or community. Many cooperatives and energy communities but also progressive enterprises or municipalities can be seen as part of this type of ENCI, whose purpose is to ‘go ahead’ in the energy transition through direct involvement of active citizens.” (p. 64)

This understanding of collective citizen-based and hybrid types of energy citizenship has similarities with social phenomena that have been usually conceptualised under a different framing than ‘energy citizenship’ but that share certain key features. It can be expected that recourse to such related concepts will prove helpful for the theoretical positioning of the social phenomenon analysed in the QCA, including the development of relevant causal mechanisms and relationships by drawing on existing literature on these related concepts. Hoff and Gausset (2016), for instance, investigate the development of citizen participation in ‘citizen driven climate initiatives’, which they define as “the participation of citizens in any type of collaborative activities with public agencies to either formulate, decide on, and/or implement measures that have to do with climate change mitigation” (p. 30). Note that, as in the description of type 7 above, the hybrid nature of citizens’ initiatives in collaborative arrangements with public authorities (or private actors) is emphasised.

Similarly, Igalla et al. (2020) investigate factors to explain the performance of community-based initiatives, which they define as “[...] a form of self-organization in which citizens mobilize resources to collectively define and carry out projects aimed at providing public goods or services for their community” (p. 2). They base this definition on an earlier review of citizen initiatives (Igalla et al., 2019) where they also stress that “citizen initiatives are often linked to formal institutions, such as local authority, governmental agencies, and NGOs, especially for facilitation and public

funding” (p. 1183). Against this background, it is useful, as suggested by Hoff and Gausset (2016), to understand collective citizen initiatives within a spectrum of public actor involvement, where initiatives are initiated either by government agents or by citizens, but usually operate in a hybrid form. This key feature is integrated in the case definition but will also be dealt with in a dedicated condition (see Section 2.5.1). Building on the aforementioned case definition by Vadovics et al. (2022a), the case definition for the QCA in this deliverable emphasises the following elements:

- The unit of analysis refers to collective actors (the organisation)
- With the focus on *energy* citizenship, the organisation must be engaged in energy-related activities. However, this might include direct energy production and consumption, mobility or even more holistic approaches
- Cases can exhibit different degrees of hybridity, i.e., public and private actor involvement
- While the unit-of-analysis is at the organisational (meso-) level, the domain in which the explanatory conditions of a case are located also contain a macro-level factor relating to the country context of a case (see Section 2.5.7).

2.3. Research interests: QCA-outcomes

QCA is a Y-centred methodology (focusing on ‘causes-of-effects’). This means that the main research interest is to understand why a certain social phenomenon occurred or is manifested in the way it is (as opposed to X-centred methodologies where the main interest is concerned with understanding the isolated effect of individual factors on an outcome, speak ‘effects-of-causes’, see Goertz & Mahoney, 2012; Iannacci et al., 2022). Hence, the main research interest of the QCA method is to explain the presence or absence – the occurrence or non-occurrence - of a certain outcome.

The QCA research interest in EnergyPROSPECTS focuses on achievements of ENCI cases (D3.3, Pel et al., 2022): “Broadly, achievements refer to fulfilment in line with outcome-orientation, goals towards a sustainable and low-carbon energy transition and/or more democratic energy decision-making or what ENCI actors and initiatives feel they have achieved in their pathway towards a (just) energy transition through individual and collective actions. [...] Finally, achievements

imply also the existence of non-achievements in the ENCI cases, for example, when ENCI actors did not manage to reach a certain goal or purpose. What did they aspire but not achieved (= non-success)” (p. 27).

Against this backdrop, three main QCA-outcomes are investigated with the QCA method:

- Firstly, a central promise of energy citizenship is related to the democratisation of the energy system, which is why a first QCA investigates under which configurations of conditions a case achieves making contributions to a democratisation of the energy system. This QCA-outcome has substantially driven the case selection strategy (see Section 2.4.1).
- Secondly, and more generally, a second QCA is implemented to explain why (under which configuration of conditions) cases of collective citizen-based and hybrid types of energy citizenship achieve their own goals and others do not – independent of what the content of these goals is.
- Thirdly, the case studies that form the basis for the present QCA investigated further outcome-orientations and achievements. Building on this data, substantial contributions to environmental sustainability are investigated as a third outcome. For this purpose, the previous outcome on goal achievement was combined with an assessment of the cases in terms of their orientation towards environmental sustainability goals.

2.3.1. Outcome 1: Substantial contribution to democratisation of energy system [DemEngSys]

- Key research question: Why (under which configuration of conditions) do cases of collective citizen-based and hybrid types of energy citizenship achieve making substantial contributions to a democratisation of the energy system?

A key promise of energy citizenship is the democratisation of the energy system. This links the question of achievements of energy citizenship cases to the notion of energy democracy, which Szulecki (2017) defines as: “an ideal political goal, in which the citizens are the recipients, stakeholders (as consumers/producers) and acountholders of the entire energy sector policy. Governance in energy democracy should be characterized by wide participation of informed, aware, and responsible political subjects, in an inclusive and transparent

decision-making process relating to energy choices, with the public good as its goal. To create and safeguard civic empowerment and autonomy, high levels of ownership of energy generation and transmission infrastructure through private, cooperative or communal/public means are necessary” (p. 35). In such an understanding, an ideal of energy democracy usually presumes a current situation in which the energy system has severe democratic deficits characterised by a highly centralised system, dominated by a couple of large, oligopolistic companies (notably the former state-owned companies) and dominated by experts (Debourdeau et al., 2021). In energy democracy research, the energy sector is usually conceived as a domain that eludes direct citizen control. Given the critical role energy plays in modern human societies, increasing citizen control of the energy system is seen as crucial (Michels & Graaf, 2010; Pickering et al., 2020).

As Szulecki (2017) highlights, his definition encompasses three main aspects, namely i) democratic popular sovereignty, ii) participatory governance, and iii) civic ownership. Importantly, with this conceptualisation, energy democracy is a feature of a governance system and not of a single organisation (like the investigated cases). It is therefore too narrow to inquire about the level of energy democracy within the studied cases and instead focus on their contribution to energy democracy in energy production, consumption and the governance systems in which they are embedded. Nevertheless, internal organisational aspects play a role for this contribution. Accordingly, Becker and Naumann (2017) distinguish in their discussion of energy democracy between “political calls to open energy systems to participation”, but also “efforts to institutionalise democratic principles in lasting organisations” (p. 4). This distinction between internal and external organisational levels corresponds to the differentiation of outcomes of citizen initiatives made by Igalla et al. (2019) who differentiate between the external level (“outcomes or results of citizen initiatives that are observable outside the initiative; [...] outcomes concern the contribution of citizen initiatives to the common good” (p. 1185) and the internal level (“outcomes that citizen initiatives realize as organizations [such as] durability, legitimacy outcomes, and organizational outcomes” (p. 1185). The conceptualisation of this outcome therefore takes into account i) what contribution the case activities have made to engage and involve

citizens in the external energy governance system and to increase civil ownership of energy production and generation infrastructures and exert control over their own energy, but also ii) how the organisational internal governance of the cases contributes to a democratisation of the external system through their lived practices.

In the examined cases, these two dimensions of energy democracy were examined separately in two parameters. The two parameters were then combined for the outcome used in the QCA.

Calibration of parameter 1: Substantial contribution to enhancing citizens’ control, voice and power in choices about how energy is produced, distributed and consumed

Table 1 shows how the membership scores of the first parameter were calibrated. For the assessment of their cases, case researchers were asked to consider the following possible indicators:

- The case has contributed to processes of energy policy-making at the level it operates.
- The case has helped to improve citizens’ awareness and education, which are necessary to make informed decisions on public energy issues.
- By increasing the ownership of energy generation and/or transmission infrastructure in the hands of citizens, the case has set the stage for democratic governance thereof.
- It has contributed to ensure that decision-making in energy governance is made in a way that is transparent and accountable to the public.

Table 1: Calibration of Outcome Parameter 1: Substantial contribution to enhancing citizens’ control, voice and power in choices about how energy is produced, distributed and consumed

Calibration of Outcome Parameter 1: Substantial contribution to enhancing citizens’ control, voice and power in choices about how energy is produced, distributed and consumed	
Membership score	Description of membership score
1 (full membership)	The case has substantially enhanced the control, voice and power of citizens in choices how energy is produced, distributed and/or consumed. It has achieved a substantial contribution in at least one of the listed indicators.
0.67	The case has modestly improved citizens’ control, voice and power in deciding how energy is generated, distributed and/or consumed. It has

	achieved a modest contribution in at least one of the listed indicators.
0.33	The case has not (yet) achieved to enhance the citizen’s control, voice and power in choices about how energy is produced, distributed and/or consumed. It may have contributed in one of the listed indicators, but not to a significant degree.
0 (no membership)	The case has not (yet) achieved to enhance the citizen’s control, voice and power in choices about how energy is produced, distributed and/or consumed at all. It has not contributed in any of the listed indicators.

For a high scoring (1 or 0.67), it was not required that the case made contributions in all the listed indicators. Rather, these indicators were meant as avenues within which the investigated contributions may have taken place. Furthermore, it was not material to this assessment whether the case pursues such a contribution as a deliberate goal. It may be that it is a secondary contribution or a contribution with no or little awareness of it. Therefore, this outcome parameter is primarily based on the assessment of the case study researchers.

Calibration of parameter 2: Democratic internal governance

Table 2 shows how the membership scores of the second parameter were calibrated. For the assessment of their cases, case researchers were asked to consider the following possible indicators:

- Members and/or staff are given an equal say in important decisions about the direction of the organisation/project.
- They have the opportunity to co-shape internal rules and policies.
- Participation or membership in the organisation is open to other members of the (local/regional) public without disproportionate barriers.
- Decision-making and working processes within the organisation are made in a transparent way to all members/staff.

Table 2: Calibration of Outcome Parameter 2: Internal Democratic Governance

Calibration of Outcome Parameter 2: Internal Democratic Governance	
Membership score	Description of membership score
1 (full membership)	The case has strong democratic internal governance. For the most part, all the listed indicators are met in this case. Key decisions are reflective of the entire membership base.
0.67	The case features some important elements of democratic internal governance but falls short in others. Overall, the case can still be attributed to have a democratic internal governance.
0.33	In this case, only partial aspects of the listed indicators apply. In most of them, however, it falls short. Overall, the case cannot be attributed to have a democratic internal governance.
0 (no membership)	This case does not have a democratic internal governance. It falls short in all the listed indicators. Decisions only reflect the leadership team.

Construction of the outcome relying on two parameters

The outcome used in the QCA was formed on the basis of these two parameters. The basic assumption for the combination was that both parameters were necessary pillars in order to be able to speak of a ‘Substantial contribution to democratisation of energy system’. Membership in the outcome therefore requires membership in both parameters (0.67 or 1). The combination of the two parameters was done with a $\text{Min}(x,y)$ function (see table 3).

Table 3: Construction of outcome 1 based on two parameters

Construction of outcome 1 [DemEngSys] based on two parameters					
		Parameter 1 ‘Substantial contribution to enhancing citizens’ control, voice and power in choices about how energy is produced, distributed and consumed’			
		0	0.33	0.67	1
Parameter 2 ‘Internal Democratic Governance’	0	0	0	0	0
	0.33	0	0.33	0.33	0.33
	0.67	0	0.33	0.67	0.67
	1	0	0.33	0.67	1

2.3.2. Outcome 2: Comprehensive goal achievement [Gachv]

Key research question: Why (under which configuration of conditions) do

cases of collective citizen-based and hybrid types of energy citizenship comprehensively achieve their goals?

The second QCA-outcome addresses whether a case achieves its own goals. For this outcome, the content of these goals did not directly matter. It is only a question of the extent to which set goals have been achieved. Also, it can be expected that absolute goal achievement will hardly ever occur – in the sense that the purpose of the organisation would cease to exist. The focus of the assessment therefore takes into account operational goals and timeframes.

Table 4: Calibration of Outcome 2: Comprehensive goal achievement [Gachv]

Calibration of Outcome 2: Comprehensive goal achievement [Gachv]	
Membership score	Description of membership score
1 (full membership)	The case has achieved or even exceeded its stated goals, especially regarding its operational goals for a certain period of time as defined by the case actors. Relative to its own goals, the case can be considered very successful.
0.67	The case has mostly achieved its stated goals, especially regarding its operational goals for a certain period of time as defined by the case actors. However, in some aspects, it fell short. Relative to its own goals, the case can still be considered successful overall.
0.33	Although the case has achieved minor individual goals or at least made some progress towards them, the case has not yet managed to achieve its goals or only to an unsatisfactory degree. Relative to its own goals, the case must therefore be considered not successful.
0 (no membership)	So far, the case has not managed to achieve any of its goals. Relative to its own goals, the case must therefore be considered not successful at all.

2.3.3. Outcome 3: Substantial contribution to environmental sustainability [EnvSust]

Key research question: Why (under which configuration of conditions) do cases of collective citizen-based and hybrid types of energy citizenship achieve making substantial contributions to environmental sustainability?

It is often assumed that greater citizen engagement is associated with more sustainable outcomes, although with mixed empirical evidence (see e.g., Pickering et al., 2020; Vadovics & Milton, 2018). The QCA applied was not primarily designed

for this research interest and outcome. Nevertheless, a tentative outcome ‘contribution to environmental sustainability’ was formed based on the case researchers’ assessments of their cases. More specifically, the investigated outcome relies on a combination of i) an assessment by case study researchers how important environmental sustainability goals are to the cases and ii) the level of goal achievement portrayed in the previous outcome 2. In EnergyPROSPECTS, ‘outcome orientations’ – as a measure of citizen initiatives’ goals and ambitions – with regard to environmental sustainability are differentiated between orientation towards shallow and towards deep environmental sustainability (see D2.2, Debourdeau et al., 2021). On this basis, case study researchers assessed their cases in light of a question that inquired about the centrality of environmental sustainability for the case’s ambitions. Apart from a qualitative answer, they assessed each case on the following four-level ordinal scale (D3.4, Vadovics et al., 2022b), which was used for the construction of the outcome:

1. “Environmental sustainability is a core issue, and it is even considered in goal setting, which is followed with a holistic strategy (mix of efficiency, consistency and sufficiency measures). Its assessment through indicators is seen as desirable.
2. Environmental sustainability is part of the process or case, but this concern is addressed in a superficial (non-radical) way (focus on efficiency strategies) and without dedicated assessment. Energy remains the main focus.
3. Environmental sustainability issues are not relevant to this case in the sense that they are not addressed by case goals or related activities.
4. Environmental sustainability issues are mostly seen as self-evident and not explicitly taken into account. In the lowest forms, environmental sustainability tends to be dealt with as a positive or negative externality.”

(D3.4, Vadovics et al., 2022b, p. 19f.; see D2.2, Debourdeau et al., 2021, p. 31 for further background)

For the formation of the outcome, the first and second option were regarded as membership in the set, in the sense that they indicate that a case actually has goals in terms of environmental sustainability (requirement for 1 and 0.67

membership values). The third and fourth options were considered as indications of non-membership in this outcome (requirement as 0.33 and 0 membership values). This assessment then served as the basis for reading the set of Outcome 2 to mean that comprehensive goal achievement occurred in the area of environmental sustainability, given that it was a central goal. Table 5 illustrates how the combination of these two underlying concepts was made.

Table 5: Construction of outcome 3

Construction of outcome 3				
	Comprehensive goal achievement [Gachv]			
How important are goals of the case in terms of environmental sustainability:	0	0.33	0.67	1
Environmental sustainability issues are not relevant to this case	0	0	0	0
Environmental sustainability issues are mostly seen as self-evident and not explicitly taken into account	0	0.33	0.33	0.33
Environmental sustainability is part of the process or case	0	0.33	0.67	0.67
Environmental sustainability is a core issue	0	0.33	0.67	1

The calibration of the outcome ‘contribution to environmental sustainability’ is shown in Table 6.

Table 6: Calibration of outcome 3: Contribution to environmental sustainability [EnvSust]

Calibration of outcome 3: Contribution to environmental sustainability [EnvSust]	
Membership score	Description of membership score
1 (full membership)	Environmental sustainability is a core issue. The case has achieved or even exceeded its stated goals.
0.67	Environmental sustainability is part of the process or case. The case has achieved all or at least most of its stated goals.
0.33	Environmental sustainability issues are mostly seen as self-evident and not explicitly taken into account. The case has at least achieved minor individual goals or made some progress towards them.
0 (no membership)	Environmental sustainability issues are not relevant to this case.

2.4. Case selection

2.4.1. Case selection criteria

Applying QCA requires a case selection that can best be characterised as heterogeneity within a range of homogeneity (Berg-Schlusser & De Meur, 2009).

Homogeneity criteria: Cases need to be comparable. All included cases must have the same unit of analysis and essentially be about the same thing. They must have “sufficient characteristics to be considered ‘constants’ in the analysis” (Ibid., p. 20). Cases need to be selected so that the investigated outcome and all conditions are investigable and so that operationalised outcomes and conditions measure the same thing in all studied cases.

Heterogeneity criteria: The cases within the range of homogeneity must be sufficiently heterogeneous for fsQCA to work as a technique of data analysis. Although a outcome and conditions must theoretically make sense for all cases, there must be cases that are members in an outcome/condition set (cases in which this outcome/condition is present) and there must be cases that are not members in this outcome/condition (cases in which this outcome/condition is absent).

Table 7 lists the case selection criteria that were applied to select cases for the QCA among the 596 mapped cases as part of Task 3.2 (see D3.2, Debourdeau et al., 2023). As already indicated in the case definition, it was especially important for the homogeneity requirement that cases are collective actors, specifically citizen-based and hybrid initiatives. For this, the case selection relied on assessment of this feature in the mapping. For the heterogeneity requirement, another assessment in the mapping was used that focused on ‘citizen power and control’. The rationale was that this would ensure a sufficient degree of heterogeneity in the membership scores of the cases with regard to outcome 1. No corresponding criteria were established for the other outcomes in order not to further complicate the case selection process, faced with an already limited number of feasible cases. Furthermore, certain correlations between the outcomes was expected. Other criteria were included for practical reasons related to the case study process.

Table 7: Case selection criteria

Case selection criteria	
Homogeneity criteria	<ul style="list-style-type: none"> are mapped as citizen-based and hybrid (type 7 OR 8) are currently active cases cases started their operations no later than 2020 cases must have a local/regional/municipal focus in their operations
Heterogeneity criteria	<ul style="list-style-type: none"> cases have either low, medium or high effective citizen power/control (each partner was asked to choose at least one case assessed as having 'high' effective citizen power/control and the other as having 'low' or 'medium' effective citizen power/control).
Further criteria	<ul style="list-style-type: none"> case must be in partner countries there is sufficient information available for the case or there is an established contact

This approach to meet the heterogeneity criterion (i.e., heterogeneity of outcome within each country) has important implications for the analysis. By selecting cases with and without membership in the outcome within each country, the range of possible explanatory conditions is shifted to the organisation-specific level (and away from the national macro-context level). This is because such macro-conditions are particularly suitable for explaining differences between different macro-contexts. On the other hand, if there are both 'positive' and 'negative' cases within each macro-context, the exclusive focus on macro-conditions does not yield meaningful explanatory results. Yet, there is still the potential that an effect of certain case-specific factors depends on macro-context, which would speak for the inclusion of certain macro conditions. These considerations were also the reason why no two-step QCA (Haesebrouck, 2019; Schneider, 2019) was implemented, despite a conducive situation with different cases in different national macro-contexts (interpretable as remote and proximate conditions). Such a two-step QCA

would have required that heterogeneity was designed across the case selection rather than in each individual national context.

2.4.2. Case selection process

Based on the developed selection criteria, a pool of complying cases (a subset of the 596 mapped cases) was developed. Each partner then carried case selection from this pool out decentrally (see Pel et al., 2022 for details). This made it possible to draw on case-specific knowledge gained during the preceding mapping. Each partner was expected to select at least a defined proportion of their total number of case studies (4-6 each, 40 in total) which meet the QCA selection criteria. This was to ensure that at least 20 cases were available for QCA. This approach provided data on a total of 29 cases at the end of the case studies. Of these 29 cases, 20 were used for the present QCA. 9 cases were excluded because they either had missing data or did not meet the case selection criteria.

2.4.3. Selected cases

Table 8 shows the final list of cases that were included in the present QCA analyses. They cover 8 out of 9 EnergyPROSPECTS partner countries: Belgium (1), Bulgaria (1), France (1), Germany (2), Hungary (6), Ireland (3), Netherlands (3) and Spain (3).

Table 8: List of selected cases

List of selected cases			
Name of case in English:	Name in original language:	Country	Description (taken from EnergyPROSPECTS, 2023)
Hydro Electricity Ourthe and Sambre	Hydro électricité d'Ourthe et Sambre (HOSe)	Belgium	HOSe develops and operates several hydroelectric power plants on two rivers in Wallonia. This enterprise was created by ten renewable energy cooperatives and the company Hydro in order to produce electricity for households.
Energy Transition of City of Burgas: Going Smart and Sustainable	Енергийна трансформация на Община Бургас	Bulgaria	Fifteen years ago, the Bulgarian town of Burgas was highly energy inefficient, leading to very high energy costs for local authorities and citizens, as well as poor living conditions and environmental inequality. Today, it is a different story. Burgas is a smart, energy-efficient city that implements the most up-to-date energy approaches and measures, which demonstrates the power of local authorities to drive sustainable change. Since 2007, energy efficiency has become one of the priorities of the Municipality. As a result, nowadays, the entire population of Burgas Municipality (232,000 people) has directly or indirectly benefitted from this decision. All public buildings have been retrofitted, providing better living conditions for inhabitants. Children, young people and teachers have benefitted from the retrofitting of 98% of kindergartens and schools, and local businesses have benefitted from investments in energy efficiency and renewable energy sources. Burgas municipality is now leading the country when it comes to energy-efficient living, with more than 200 residential buildings retrofitted under the National EE Programme, and the number of hybrid and e-vehicles in the city is constantly rising. As a result of these activities, Burgas won the energy category of the 2020 edition of the Transformative Cities award. The Transformative Cities initiative inspires people to take action to transform their cities in areas of water, energy, food and housing.
Trégor Energ'éthiques	Trégor Energ'éthiques	France	Tregor Energ'ethiques is a local NGO based in Tregor, Brittany, which started in 2019 from a solar project on the roof of a sports facility in one of the municipalities and a willingness to expand the initiative to other nearby municipalities. It was initiated by two engaged individuals (Enercoop members) as a local initiative for renewable energy development. Following a public screening of a documentary on local initiatives for climate change mitigation (Après Demain, by Cyril Dion and Laure Noualhat), 15 volunteers gathered to contribute to the launch of a new association dedicated to new local PV project development
Berlin Citizen Energy	BürgerEnergie Berlin	Germany	BEB - BürgerEnergie Berlin eG - is a cooperative that brings together citizens to work together for a sustainable, climate-friendly and citizen-owned energy system in Berlin. It is a free cross-party association of citizens.
SoLocal Energy	SoLocal Energy	Germany	SoLocal Energy is part of a proactive and progressive energy transition. On the basis of corporate values oriented at the common good, the initiative intends to simultaneously get people from all population groups on board. For this purpose, they have founded the non-profit association SoLocal Energy e.V. This serves as an umbrella for their various activities, from balcony power plants to neighbourhood circles to the self-build

			community, supplemented by various workshop and lecture formats.
TreeDependent	TreeDependent	Hungary	The TreeDependent programme is about providing support to reduce carbon emissions, as well as calculating and compensating them through the services offered within the 'TreeDependent – responsible events, responsible travel' programme. However, this is not a typical compensation programme as only native fruit trees are planted in the form of fully voluntary compensation, and they are planted in school or non-profit gardens, thereby connecting activities related to different sustainable development objectives. This is a programme run by GreenDependent in Hungary.
Cargonomia	Cargonomia	Hungary	Cargonomia is the formalisation of a pre-existing collaboration between three socially and environmentally conscious small enterprises operating in or near Budapest. Partners within the project include the Cyclonomia Do it Yourself Bicycle Social Cooperative, Zsamboki Biokert, an organic vegetable farm and sustainable agriculture community education centre which distributes weekly vegetable boxes to food communities in Budapest, and Kantaa, a self-organised bike messenger and delivery company. Cargonomia and its partner's activities aim to display how environmentally friendly and equity-based partnerships can create sustainable and meaningful community empowerment opportunities which offer concrete alternatives to standard profit-driven social and economic systems.
Biomass briquettes programme (for the energy poor)	(Bio)brikett program (az energiaszegény ségben élőknek)	Hungary	The Biomass briquettes programme was established in a disadvantaged region of Hungary where the unemployment rate is higher than the national average and many people live below the poverty line. The target area is Told, a Roma village, the residents of which, as a socially marginalised group in Hungary, have even less access to combustible materials for heating. The project was developed within the framework of the Real Pearl Foundation and Art School with the aim of hand-making biomass briquette, a cheap, environmentally friendly fuel. The project contributes to creating new jobs and strengthening the community, reducing the heating costs of families involved, and saving local forests from being illegally cut down.
Nagypáli, the renewable energy village	Nagypáli megújuló energiás települése	Hungary	The Green Road Village Development Program started in 1997 in Nagypáli, the main goal of which was to develop the village into a European-standard, self-sustaining settlement, preserving the traditions of the villages of the Göcsej region in Western Hungary. The directions of the development were determined from the start: the use of renewable energy sources, development of tourism, building a community, environmental protection and environmental awareness, and the production of local products. In two decades, a sustainable, liveable, and well-functioning settlement has been established with all kinds of renewable energy use: a biosolar heating plant, solar collectors and solar panel farms (with very minimal municipal overhead costs), e-mobility (bikes and cars) powered by solar panels, energy plantations, etc. The latest plans include building a biogas plant and turning an old water tower into a lookout tower with a wind turbine that will also generate electricity. In 2007 they opened the Renewable Energy Innovation Eco Centre, which serves as a promotional centre, where they organise temporary exhibitions, conferences, lectures and workshops, the main topics of which are the use and implementation of biomass, biogas, solar and wind energy, and energy plantations.
Community	MTVSZ	Hungary	The mission of Friends of the Earth Hungary (FoE), comprised of over 100 Hungarian member groups, is the

Energy Programme of FoE Hungary	Közösségi Energia programja		comprehensive protection of nature, as well as the promotion of sustainable development. The Community Energy Programme of FoE is focused on creating a more favourable legislative environment for community Renewable Energy Sources (RES) projects and building up a cross-national and national community power coalition. Additionally, public campaigns have been organised in five Hungarian regions to facilitate the birth of more community energy initiatives and projects. This programme has given rise to the Community Energy Service Company, which supports the creation of energy co-operatives and the implementation of pilot projects.
Zsuzsanna Hojtsy-Keresztény - EnergyNeighbourhoods energy master, local change maker	Hojtsy-Keresztényi Zsuzsanna - EnergiaKözösségek klíma-koordinátor többször, helyi aktivista	Hungary	Zsuzsanna was a regular participant in GreenDependent's EnergyNeighbourhoods programme as an "energy master". She also has experience with another Hungarian NGO's community-based, household greening programme, called ÖkoKör (EcoTeam). Based on its methodology, a local eco-club was founded; she was one of the main organisers of the first meeting in 2019. Since then, the informal community has grown into a formal NGO. They want to create a community whose members are willing to address the current ecological crisis and are ready to learn about and apply solutions that help create an ecologically sustainable way of life.
Aran Islands Energy Cooperative	Comharchumann Fuinnimh Oileáin Árann Teoranta (CFOAT)	Ireland	The Aran Islands Energy Co-operative is a community-owned energy cooperative on the Aran Islands at the mouth of Galway Bay. Through the cooperative, the residents of the three islands aim to become self-sufficient in clean, locally owned energy and to build the local economy of the islands using the benefits that accrue from this. The main activities are related to energy efficiency and retrofitting of houses, renewable energy generation, electrification of mobility, and participation in research projects.
Energy Communities Tipperary Cooperative	Energy Communities Tipperary Cooperative	Ireland	Energy Community Tipperary Cooperative ECTC is an organisation bringing together 14 communities in the Tipperary region to reduce the amount of money leaving the local economies in the form of energy and fuel bills every year. ECTC facilitates energy efficiency work on older houses and community buildings by leveraging grants from the SEAI under the Better Energy Communities scheme.
Galway Energy Co-operative	Galway Energy Co-operative	Ireland	The Galway Energy Co-operative is an organisation that aims to advocate for providing clean, renewable energy and services for Galway City and the surrounding area. As a member of the SEAI's Sustainable Energy Communities Initiative, the cooperative has been coordinating an Energy Master Plan for the city and offers consultancy services.
Weert Energy	Weert Energie	Netherlands	WeertEnergie is an energy cooperative created to produce locally generated, affordable green energy for people in Weert. WeertEnergie works together with its members, the municipality of Weert and other regional cooperatives to shape the energy goals Weert wants to achieve. For the realisation of their projects, they work with local, specialised companies.
Drechtsteden Energy	Drechtsteden Energie	Netherlands	The Loenen Energy cooperative is located in the village of Loenen in the Netherlands. Loenen Energy's journey started in 2013 when the municipality of Apeldoorn launched a competition for the best sustainable village idea, called: "the Energetic Village". To accelerate the transition to an energy-neutral village, a group of residents from Loenen came up with a plan for the 'Energetic villages' competition and they won the prize

			of 200,000 Euros as part of an EU subsidy from the 'Academy of Champions for Energy'. The Loenen Energy cooperative is located in the village of Loenen in the Netherlands. In 2017, they were one of the first regions in the Netherlands to create a regional energy strategy (RES) in cooperation with thirty organisations. They are working with many other partners, each with their own interests and the same goal. In 2018, a cVPP project was launched under the leadership of TU Eindhoven which made them win the prestigious EU Sustainable Energy Award. In 2018, a cVPP project was launched under the leadership of TU Eindhoven which made them win the prestigious EU Sustainable Energy Award.
Reindonk Energy	Reindonk Energie	Netherlands	The mission of this initiative is to make the municipality of Horst aan de Maas sustainably energy neutral. Together with, for and by inhabitants, companies, authorities, and organisations from Horst aan de Maas, they aim to contribute to the energy transition. Reindonk Energy & Co focuses on local solutions that contribute to resolving the global challenge, through local action. The cooperative is very active and has multiple energy projects".
Couso's project	Proyecto O Couso	Spain	An integrated and open community where everyone operates under the principle of "Leave what you can; take what you need". The self-sufficient ecovillage has many permanent residents and also hosts pilgrims making the Camino de Santiago.
La borda. Housing cooperative in transfer of use	La Borda. Cooperativa d'habitatge en cessió	Spain	A housing cooperative that follows a model of cooperative housing ruled by grant of use, where the property will always be collective, while use is personal. The model eliminates property speculation and profiteering. Members belonging to the cooperative have the ability to decide on juridical, legal and economic aspects and on the housing infrastructure itself. One of its main objectives is to give priority to environmental aspects, which is economically achievable through creating homes with a passive design or low energy consumption, with the local, decentralised and self-managed generation of renewable energy. Less total energy and materials are consumed by sharing major appliances and amenities.
Goiener	Goiener	Spain	GoiEner is a cooperative project for the generation and consumption of renewable energy. They seek to make the energy something that belongs to everyone and for everyone, far from large-scale projects, from models that perpetuate the use of fossil fuels and from practices that do not empower people. Although its objectives include the provision of services and distribution of goods, the purpose is the defence, information, and promotion of consumer rights, and above all, the recovery of energy sovereignty under a discourse that opposes the oligopoly of the large distribution companies, under the protection of Spanish State concessions. GoiEner believes that electricity is now a need that is as basic as that for food and wants consumers to reclaim their energy sovereignty and make them aware of its importance.

2.5. Developing a set of conditions

This section presents the QCA conditions used to explain the outcomes developed above. Given the multiplicity of QCA-outcomes under investigation, conditions were included that can be presumed to have causal-explanatory potential for all or most of these outcomes. For each condition, a short introduction is provided and outlined how the condition was calibrated (in 4-level fuzzy sets). The questions asked to the case researchers that underlie the assessments for each condition are listed in the Appendix. Furthermore, the 'directional expectations' are shown for each condition. They represent assumptions about the effects of the single conditions. They are also used for the 'intermediate solution' of the QCA (Schneider & Wagemann, 2007).

2.5.1. Condition: Citizen-driven organisation (low hybridity) [CitizenDrivOrg]

The relationship to (local and/or regional) government is often discussed as a key aspect in the context of citizen-driven initiatives (Buratti et al., 2022; Creamer et al., 2018; Edelenbos et al., 2016; Igalla et al., 2019, 2020). This concerns, on the one hand, the nature of citizen-driven initiatives as such (see also above, Section 2.2) and, on the other hand, aspects of this relationship that function as factors for the success of these initiatives. This condition takes up the first aspect. The second aspect is taken up in the condition ('Substantial support by subnational (local & regional) government schemes and actors', see Section 2.5.6).

The condition is designed as 'Citizen-driven organisation (low hybridity)'. This intends to capture the extent to which a case has primarily emerged from a situation where citizens were the main actors and that continues to show low hybridity in its development. This can include the organisational involvement of (local/regional) state actors (see Hoff & Gausset, 2016), as well as the involvement of civil society umbrella organisations (e.g., replication of existing models) or private actors. The condition is not intended to determine whether a case has any relationships with or is also supported (or hindered) by such actors at all but about the characteristics of a cases.

It is important here that this condition is not theorised as a direct causal factor but as a mediating factor that becomes relevant in interaction with other factors.

Table 9: Directional expectations for condition: Citizen-driven organisation (low hybridity)

Directional expectations for condition: Citizen-driven organisation (low hybridity)		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	Not used	Not used
Outcome 2: Comprehensive goal achievement	ambivalent	ambivalent
Outcome 3: Substantial contribution to environmental sustainability	ambivalent	ambivalent

Table 10: Calibration of condition: Citizen-driven organisation (low hybridity) [CitizenDrivOrg]

Calibration of condition: Citizen-driven organisation (low hybridity) [CitizenDrivOrg]	
Membership score	Description of membership score
1 (full membership)	The case is strongly citizen-driven. It originated as a grassroots organisation and has since maintained no hybridity in terms of the actors involved in the governance of the case. The organisation in this case is kept separate from other organisations (It may still be that the case cooperates with or is supported by other actors.)
0.67	The case is mostly citizen-driven. Since its emergence, citizens have been the main actors. Yet other actors have also been involved or have become more involved during the development of the case. Choose this score, for example, if a governmental actor is a member in the case amongst others but without having majority/steering control.
0.33	The case is not mainly citizen-driven. Nevertheless, citizens are and have been actively involved in the case since its emergence, for example as co-creators or partners. The case exhibits hybridity in terms of the actors involved.
0 (no membership)	The case is not citizen-driven. Citizens were not (or only negligibly) involved in the initiation of the case. Their participation is limited to predefined (or even passive) roles.

2.5.2. Condition: Professionalised and formalised organisation [ProfFormOrg]

Challenges related to professionalisation are generally an area of great concern for citizen initiatives. This applies even more to citizen initiatives in the energy sector given that activity in this highly regulated, technically complex area requires high administrative capacity and technical expertise (Buratti et al., 2022). Lack of professionalisation can therefore be a key obstacle to the development and goal achievement of such initiatives, as for example Scheuer (2015) observed in the case of citizen power initiatives in Austria (see also Brummer, 2018; Feola & Nunes, 2013). As further elaborated on below in the condition 'Substantial support by national government schemes and actors (including intermediation)', this can also impair access to complex governmental support schemes.

At the same time, it is a key resource for such initiatives to rely on voluntary work (Buratti et al., 2022; van Meerkerk et al., 2018). And the creation of paid positions in the process of professionalisation requires stable income to fund these positions.

Furthermore, it can be a desirable characteristic of such initiatives not to become too professionalised and formalised so that committed persons participate as unpaid citizens and not as paid workers. This puts professionalisation in the context of the democratic contribution.

The condition is conceived as 'Professionalised and formalised organisation' and is intended to take into account the extent to which paid positions have been created in the organisation that give the organisations the capacity to act without having to completely dispense with voluntary work. It also includes the extent to which the work processes within the case organisation are based on formalised procedures, including a division of labour.

Table 11: Directional expectations for condition: Professionalised and formalised organisation

Directional expectations for condition: Professionalised and formalised organisation		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	ambivalent	ambivalent
Outcome 2: Comprehensive goal achievement	present	absent
Outcome 3: Substantial contribution to environmental sustainability	present	absent

Table 12: Calibration of condition: Professionalised and formalised organisation [ProfFormOrg]

Calibration of condition: Professionalised and formalised organisation [ProfFormOrg]	
Membership score	Description of membership score
1 (full membership)	The case is organised in a mostly professionalised manner. At least key positions are occupied by paid or contracted/mandated staff, which requires a viable source of funding. Workflows within the organisation of the case are largely geared towards formalised procedures, including a division of labours. This endows the case with a high level of administrative capacity and specialised knowledge. However, the case may still involve voluntary work for part of its activities.
0.67	Overall, the case is organised in a semi-professionalised manner. Some individuals active in the case are paid or contracted/mandated for some of their activities, but it is not their main occupation (for example, compensation for meetings or certain projects). Some workflows in the organisation of the case are formalised, yet some activities are run on a more ad-hoc basis without a strong division of labours. Still, the case has a considerable level of administrative capacity and specialised knowledge. There is still a considerable amount of voluntary work.
0.33	The case is not organised in a professionalised manner in the sense that it provides paid or contracted/mandates positions. Most of the activities are run on an ad-hoc

	basis, only some processes are formalised (for example, an annual assembly). It may be that the legal form of the case prescribes certain positions within the organisation (for example, a president of the association). Yet this does not result in a strong division of labours. Due to voluntary commitment, a certain degree of administrative capacity and specialised knowledge is still provided within the organisation.
0 (no membership)	The case is not organised in a professionalised manner. It does not provide payment for any position and is organised and run on a strongly informal basis without any division of labours. The case has no considerable administrative capacity and specialised knowledge within the organisation.

2.5.3. Condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries) [InterNonGov]

Intermediations and intermediaries have been proposed as key catalysts that speed up change towards more sustainable socio-technical systems (Kivimaa et al., 2019; Sovacool et al., 2020) and recognised to play a key role for (sustainable) citizen initiatives. By bridging the gap between citizens and existing systems, intermediaries may foster collaboration, knowledge exchange, and collective action, for instance by providing guidance, training, and support access to funding opportunities. Specifically, they can support initiatives by addressing three key challenges: i) lack of resources and capacities due to their bottom-up and often voluntary nature (Park, 2012; Rogers et al., 2012), ii) institutional hurdles and barriers stemming from the fossil fuel-based energy regime (Oteman et al., 2014), iii) difficulties in opening up the regime for their uptake, acceptance or breakthrough (Bird and Barnes, 2014; Seyfang et al., 2014) (see Markantoni et al., 2023). While various definitions and typologies of intermediaries have been developed, they fundamentally share the idea that intermediaries “bridge between actors and their related activities, skills and resources in situations where direct interaction is difficult due to high transaction costs, information asymmetry or communication problems” (Kivimaa et al., 2019, cited by Kanda et al., 2022).

Against this background, intermediaries are defined in EnergyPROSPECTS as “actors or organisations that mediate, work in-between, make connections, and

enable a relationship between different persons or things” (Hodson et al., 2013, cited in Markantoni et al., 2023). Based on this definition, EnergyPROSPECTS differentiated between six kinds of intermediation that may be relevant to energy citizen initiatives:

1. Organizational intermediation: Structuration and organisation of the functioning of the case: entities composing the case, legal status, coordination of the various activities (capacity building, energy production retail), negotiating with administrative authorities.

2. Financial intermediation: Capitalisation and resource mobilisation required for the case to build up and sustain/grow.

3. Scientific-technic intermediation: Technical and scientific expertise activities for concretising the project: ICT conception, planners, architects, PV or wind power specialists, monitoring of the project, facilitating experimentation and pilots, facilitate/support adoption and implementation of innovations.

4. Networking intermediation: All networking activities with actors that present similarities with the case, enabling cooperation between actors, building and managing networks of multiple stakeholders, exchange of knowledge and visions.

5. Information intermediation: Communication activities making the case public: consult demand-side for implementation, mediation activities, put suppliers in contact with end users.

6. Legal/regulatory and lobbying intermediation: Lobbying activities protest against or attempts to modify legislative proposals or draft laws. (Ibid.)

Note that these kinds of intermediation can be provided by various kind of actors. In EnergyPROSPECTS, five kinds of intermediary actors (intermediaries) are included:

1. Commercial intermediaries for knowledge-intensive business services: banks who offer a mortgage or a loan (thus connecting capital providers with those that need capital), business lawyers and consultants who are hired for assisting in deals between two parties.

2. Governmental intermediaries, e.g. government agencies that manage

programmes with loans and funds and technical assistance on, for instance, energy renovation and energy cooperatives, platforms for knowledge exchange.

3. Non-government intermediaries, civil society umbrella organisations (for transition towns), collective actors such as cooperative networks (e.g., REScoop, the European Federation of citizen energy cooperatives), chambers of commerce.

4. Other civil society organisations, not created explicitly to be intermediaries, non-sector or umbrella organisations.

5. Intercessors are individuals who talk to different actors with the aim of learning about possibilities for collective action, cooperation, partnerships, institutional change by learning about the beliefs, material interests, mandates, responsibilities, capabilities and resources of specific actors. (Ibid.)

In this condition, only extensive intermediation by non-governmental actors (including commercial, educational, civil-society intermediaries and intercessors) is covered to avoid conceptual overlap between conditions. Among the five kinds of intermediaries are also governmental intermediaries. In fact, governments, too, can play intermediary roles (for instance knowledge exchange) by providing objective information and tools (Broers et al., 2023; Kivimaa et al., 2014). However, such intermediation by governmental actors was included in the respective conditions describing governmental support (see 2.5.4-2.5.6).

Table 13: Directional expectations for condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries

Directional expectations for condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries)		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	present	absent
Outcome 2: Comprehensive goal achievement	present	absent
Outcome 3: Substantial contribution to sustainability	present	absent

Table 14: Calibration of condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries) [InterNonGov]

Calibration of condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries) [InterNonGov]	
Membership score	Description of membership score
1 (full membership)	The case has benefited from extensive intermediation through non-governmental actors. This intermediation has covered more than two types. The intermediation has been provided by multiple intermediaries.
0.67	The case has benefited from some intermediation through non-governmental actors. This intermediation has covered more than one type. One intermediary actor has been central in providing the intermediation.
0.33	The case has only benefited from minor intermediation through non-governmental actors. This has only covered one type of intermediation that was provided by only one intermediary.
0 (no membership)	The case has not benefited from any significant intermediation so far.

2.5.4. Condition: Substantial support by national government schemes and actors (including intermediation) [NATsupp]

Support provided by national governmental schemes or actors has long been recognised as key factor in facilitating the achievement of the goals of citizen-driven initiatives (Dóci & Gotchev, 2016; Kooij et al., 2018; Markantoni, 2016; Mignon & Rüdinger, 2016; Nolden, 2013). As Leonhardt et al. (2022) stated, “payment-based instruments, which provide money directly (e.g., grants and funding programs) or indirectly (e.g., tax exemptions or feed-in tariffs)” (p. 3) are one of four key categories of government instruments that support community initiatives in energy. However, it can be assumed that not all examined cases have benefited from such instruments. Even in situations where such instruments are formally in place, there are often major administrative hurdles for small, often voluntary organisations to obtain access to support through such instruments. This has been exacerbated by the shift in renewable energy support policies in many countries from easy-to-handle feed-in tariffs to feed-in premiums awarded through tenders, which involve complex procedures and thus can often only be managed by larger organisations with

sufficient expertise and administrative capacity (Amazo et al., 2020; Fell, 2019; Tews, 2018). Therefore, this condition aims to describe whether substantial support has actually been provided in the investigated cases.

Furthermore, an important point about these payment-based instruments is that not only the directly provided monetary support matters but also the extent to which these instruments are able to establish or promote long-term investment security (see Buratti et al., 2022). On the one hand, this concerns the type of support instruments used from which the case could benefit. For example, one-off payments are probably less suitable than long-term guaranteed purchase contracts for generated energy. On the other hand, this also concerns the perceived stability of the support policy. Repeated, abrupt or even retroactive changes are likely to pose barriers to investment security and thus to the achievement of goals. Therefore, the calibration of the condition takes into account the perceived stability of the support.

As the investigated cases focus on a diverse range of activities in the energy-realm (renewable energy, renovation, mobility, etc.), it is not feasible to ask about a specific support instrument in the calibration. Rather, in the assessment of the cases, those support schemes were taken into account that were considered relevant for the respective activities by the case study researchers.

As elaborated in the description of the condition 'Extensive intermediation by non-governmental actors', governmental support need not only consist of financial support but may include diverse forms of intermediation.¹ Therefore, intermediation is included as form of support in this condition if intermediation is provided by the national governmental level.

Finally, it has been argued that too much dependence on such public support can be counterproductive for citizen-driven initiatives and can have negative side effects. As Brandsen (2016) notes, citizen-driven initiatives need a sense of ownership over their initiative and a sense of self-contribution. Strong support, however, can be accompanied by strong controlling-intervening demands (Creamer

¹ Including management and organisation intermediation, financial and funding intermediation, networking and coordination intermediation, information and communication, technic and scientific intermediation and legal/regulatory and institutional (lobbying) intermediation (see Markantoni et al., 2023 for more details).

et al., 2018; Igalla et al., 2020; Molenveld et al., 2021), which risks compromising these sentiments and crowding out activism (Healey, 2015).

This view is matched by Mees et al.’s (2019) ‘Ladder of government participation’, which describes different roles of government in relation to community initiatives. With ascending rungs, government power and authority increase from letting go, facilitating/enabling, stimulating, network steering, and finally to regulating (p. 3). Here, too, it is suggested that governments (there is no explicit mention of local/regional governments) go as low as possible on the rung in order to give community initiatives enough room for development, while still supporting them. Therefore, assumptions about the direction of the causal effect were kept ambivalent when it comes to the outcome ‘Substantial contribution to democratisation of energy system’: It is conceivable that the condition can play a positive or negative role in different cases in interaction with other conditions.

Table 15: Directional expectations for condition: Substantial support by national government schemes and actors (including intermediation) [NATsupp]

Directional expectations for condition: Substantial support by national government schemes and actors (including intermediation) [NATsupp]		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	ambivalent	absent
Outcome 2: Comprehensive goal achievement	present	absent
Outcome 3: Substantial contribution to environmental sustainability	present	absent

Table 16: Calibration of condition: Substantial support by national government schemes and actors (including intermediation) [NATsupp]

Calibration of condition: Substantial support by national government schemes and actors (including intermediation) [NATsupp]	
Membership score	Description of membership score
1 (full membership)	The case has benefited from substantial support by national government schemes and/or actors, including substantial financial support. The support is provided over the longer term and is expected to be stable in the near future. Support may also include various forms of intermediation by national government actors.
0.67	The case has benefited from some support by national government schemes and/or actors. This may have included financial support, but this was limited to either a one-off support or it is not expected to be stable in the near future. Support may also include various forms of intermediation by national government actors.
0.33	The case has only benefited from minor support by national government schemes and/or actors. This did not include any financial support. If any, intermediation provided by national government actors was limited to one type of intermediation.
0 (no membership)	The case has not benefited from any support by national government schemes and/or actors.

2.5.5. Condition: Substantial support by European Union schemes and actors (including intermediation) [EUsupp]

In the course of carrying out the detailed case studies, it became evident how important it was for a number of the analysed cases to receive support through participation in European Union projects. While initially only foreseen as a condition in the sense of ‘support from public, supra-regional actors’, a specific condition was created to address this role of EU support. In particular, initial results showed that participation in EU projects was an important source of funding for some of the investigated cases.

As elaborated in the description of the condition ‘Extensive intermediation by non-governmental actors’, governmental support must not only consist of financial support but may include diverse forms of intermediation. Therefore, intermediation is included as form of support in this condition if intermediation is provided by the EU level, for instance through EU projects.

Table 17: Directional expectations for condition: Substantial support by European Union schemes and actors (including intermediation)

Directional expectations for condition: Substantial support by European Union schemes and actors (including intermediation)		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	present	absent
Outcome 2: Comprehensive goal achievement	present	absent
Outcome 3: Substantial contribution to environmental sustainability	present	absent

Table 18: Calibration of condition: Substantial support by European Union schemes and actors (including intermediation) [Eusupp]

Calibration of condition: Substantial support by European Union schemes and actors (including intermediation) [Eusupp]	
Membership score	Description of membership score
1 (full membership)	The case has benefited from substantial support by EU schemes and actors, including substantial financial support. Support may have also included various forms of intermediation by actors associated with the EU.
0.67	The case has benefited from some support by EU schemes and/or actors. This did not include substantial financial support. Support may have included various forms of intermediation by actors associated with the EU.
0.33	The case has only benefited from minor support by EU schemes and or actors. This did not include any financial support. If any, intermediation provided by actors associated with the EU was limited to one type of intermediation.
0 (no membership)	The case has not benefited from any support by EU schemes or actors.

2.5.6. Condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation) [SUBNATsupp]

The relationship to local/regional governments represents an important factor for citizen initiatives. On the one hand, this relationship shapes the character of the

cases (see Section 2.2); on the other hand, it can influence the success of citizen initiatives. The former aspect was addressed in a separate condition ‘Citizen-driven organisation’ (see 2.5.1). With respect to the latter, citizens’ initiatives often have few resources of their own and are therefore dependent on external support. As local/regional governments are often the first point of contact and operate on a similar scale, their support in various monetary but also non-monetary forms is considered an important success factor (Hoppe et al., 2015; Igalla et al., 2019; Meister et al., 2020; Schmid et al., 2020). This may involve not only direct financial support but also the removal of administrative barriers, networks and door openers, or the provision of investment security through guarantees. Due to proximity and direct personal relationships, such forms of support often work in a more direct and case-specific way than is the norm for support schemes at national and EU level.

As elaborated in the description of the condition ‘Extensive intermediation by non-governmental actors’, governmental support must not only consist of financial support but may include diverse forms of intermediation. Therefore, intermediation is included as form of support in this condition if intermediation is provided by the subnational governmental level.

For this condition as well, the assumptions about the direction of the causal effect are kept ambivalent when it comes to the outcome ‘Substantial contribution to democratisation of energy system’ to take into account the potentially detrimental effects of dependency on public funding (see Section 2.5.4 for elaboration).

Table 19: Directional expectations for condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation)

Directional expectations for condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation)		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	ambivalent	absent
Outcome 2: Comprehensive goal achievement	present	absent

Outcome 3: Substantial contribution to environmental sustainability	present	absent
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Table 20: Calibration of condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation) [SUBNATsupp]

Calibration of condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation) [SUBNATsupp]	
Membership score	Description of membership score
1 (full membership)	The case has benefited from substantial support by subnational (local/regional) governmental actors, including financial support. Intermediation by those actors included more than one type. Possibly, individuals are active in the case and, in a different capacity, in local/regional government at the same time and take on a boundary spanning/intercessor function. Also choose this scoring if the case itself is situated within the local or regional governmental administration and is supported within the administration.
0.67	The case has benefited from moderate support by subnational (local/regional) governmental actors, except for financial support. Intermediation included more than one type. Possibly, individuals are active in the case and, in a different capacity, in local/regional government at the same time and take on a boundary spanning/intercessor function. Also select this scoring if the case itself is situated within the local or regional governmental administration but receives little support within the administration.
0.33	The case has only benefited from minor support by subnational (local/regional) governmental actors. There has been no financial support. Provided intermediation by these actors has been limited to only one type of intermediation and only concerned minor issues.
0 (no membership)	Subnational (local/regional) governmental actors have not provided any support (including intermediation) for the case. There are no individuals that are active in the case and, in a different capacity, in local/regional government at the same time. The case has had no notable interactions with local/regional government.

2.5.7. Condition: Decentralised (energy) governance with strong autonomy of local government [DecEnGov]

This condition differs from all previous ones as it does not directly represent a feature of the investigated detailed cases. Rather, it relates to the context in which the case operates, thus representing a superordinate level of analysis. As explained above (Section 2.4.1), there is a plethora of contextual factors that affect energy citizenship (see D5.2, Hajdinjak et al., 2023). However, most of these factors can mainly contribute to the question of how citizens' initiatives form and develop as an aggregate unit of analysis in a given context (e.g., citizens' initiatives in France as an aggregate unit). However, such factors are only of limited use in explaining how differences between cases within a particular context (e.g., their achievement of objectives) come about. Given the case selection in the present analysis, effects of such contextual conditions can therefore only be understood in interaction with other, case-specific conditions. The present condition is intended to reflect the extent to which the impact of support from different levels of government manifests itself depending on how this governmental system is organised.

For instance, local and regional governments may compensate for gaps in national support policies, depending on their own competence in energy policy. Hence, an interaction between the previous condition 'Substantial support by subnational (local & regional) government schemes and actors' and this condition is to be expected. Accordingly, support from local/regional governments is likely to be particularly important in countries where (energy) governance is decentralised, and local/regional governments have strong autonomy and resources for such support (Schmid et al., 2020).

Table 21: Directional expectations for condition: Decentralised (energy) governance with strong autonomy of local government

Directional expectations for condition: Decentralised (energy) governance with strong autonomy of local government		
Outcome	Directional expectation: Occurrence of outcome	Directional expectation: Non-occurrence of outcome
Outcome 1: Substantial contribution to democratisation of energy system	Present	ambivalent
Outcome 2: Comprehensive goal achievement	Ambivalent	ambivalent
Outcome 3: Substantial contribution to environmental sustainability	Not used	Not used

Data source: National PESTEL analyses and secondary data

In contrast to the previous conditions, scoring of the cases in this condition was based on results of national PESTEL analyses (see D5.2, Hajdinjak et al., 2023). An individual PESTEL analysis was conducted for each country in which detailed cases are located (partner countries of EnergyPROSPECTS). The analysis focused especially on national-level factors shaping the emergence and development of energy citizenship, with additional selected examples on the subnational level. Among these factors, the investigated factor ‘Multi-level energy governance structure of a country (degree of centralisation/federalism in energy policy)’ was used as basis for this condition. Insights into questions of ‘Energy Governance and Ownership’ were summarised in Deliverable 5.2 (Hajdinjak et al., 2023) and also used for this condition.

Furthermore, secondary data were used to corroborate the calibration of this condition, specifically the ‘Local Autonomy Index (LAI)’ (Ladner et al., 2021). Relying on evaluation along seven dimensions², the LAI provides an assessment of

² (1) Legal autonomy: The legal status and protection of local governments, (2) Political discretion: The formal distribution of power and the effective decision-making competences with respect to

the local autonomy of local governments across 57 countries, including all EU member states. Although not specific to energy policy, the LAI provides a good supplementary basis for the assessment of this condition.

Table 22: Calibration of condition: Decentralised (energy) governance with strong autonomy of local government [DecEnGov]

Calibration of condition: Decentralised (energy) governance with strong autonomy of local government [DecEnGov]	
Membership score	Description of membership score
1 (full membership)	The country in which the case is located has a strongly decentralised governance system, especially when it comes to energy policies. Subnational governments have discretion to shape their own energy policies and sufficient resources to implement them. Local Autonomy Index Score: >0.65
0.67	The country in which the case is located has a moderately decentralised governance system, especially when it comes to energy policies. Subnational governments have delegated authorities in energy governance and are resourced to a degree to implement own policies. Local Autonomy Index Score: >0.55
0.33	The country in which the case is located has only a weakly decentralised governance system, especially when it comes to energy policies. Although subnational units may formally be given some authority in energy governance, they are provided with insufficient resources to take on this responsibility. Local Autonomy Index Score: <0.55
0 (no membership)	The country in which the case is located has not a decentralised governance system, including in energy policy. Subnational governments have little to no competencies in energy policy. Their role is restricted to implementation of national policy. Local Autonomy Index Score: <0.46

services delivery, (3) Policy scope: The scope of services for which local governments are responsible, (4) Financial autonomy: the financial resources available locally and the possibility to decide on their sources, (5) Organisational autonomy: the free organisation of local political arenas and administration. (6) Non-interference: the extent of liberty left by higher levels of government in their control, (7) Access: the degree of influence of local governments on political decisions at higher levels of government (Ladner et al., 2021)

3. Results of the Qualitative Comparative Analyses

In this section, the results of the QCA are presented. In Section 3.1, an overview of the scorings of all cases in all outcomes and conditions are shown in a so called ‘Fuzzy set membership scores matrix’. Then, for each of the three investigated outcomes is presented (Sections 0-3.4): First, an analysis of necessary conditions for both the occurrence and non-occurrence of the outcome. Second, the results of the Truth Table Analysis³ of sufficient (combinations of) conditions for the occurrence of the respective outcome and, third, the same analysis for the non-occurrence of the respective outcome. All six ‘Truth tables’ used for the analyses as well as the ‘Complex solutions’ and ‘Parsimonious solutions’ are shown in the Appendix. The presentation of the results focuses on the ‘intermediate solutions’ as they provided the most insightful results.⁴ If a particular solution term of the parsimonious or complex solutions was useful for the interpretation, it is introduced in the text. Table 23 contains an overview of all sets (outcomes and conditions) as well as the abbreviations used in the analyses.

Table 23: Overview of sets (outcomes and conditions) and abbreviations

Overview of sets (outcomes and conditions) and abbreviations	
Set (Outcome/Condition)	Abbreviation
Outcome 1: Substantial contribution to democratisation of energy system	DemEngSys
Outcome 2: Comprehensive goal achievement	Gachv
Outcome 3: Substantial contribution to environmental sustainability	EnvSust
Condition: Citizen-driven organisation (low hybridity)	CitizenDrivOrg
Condition: Professionalised and formalised organisation	ProfFormOrg
Condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries)	IntermNonGov
Condition: Substantial support by national government schemes and actors (including intermediation)	NATsupp
Condition: Substantial support by European Union schemes and actors (including intermediation)	EUsupp

³ A truth table is a chart that shows all possible combinations of truth values (either true or false, 1 or 0) for a given set of conditions and a outcome.

⁴ The total of rows in a truth table, i.e. configuration of conditions for which the outcome is present constitute the complex solution. QCA uses an algorithm to minimise this complex solution to either the parsimonious solution (least complexity) or intermediate solution (taking into account assumption about directionality of conditions for the outcome) (Schneider & Wagemann, 2007)

Condition: Substantial support by subnational (local & regional) government schemes and actors (including intermediation)	SUBNATsupp
Condition: Decentralised (energy) governance with strong autonomy of local government	DecEnGov

The following operators are used in the presentation of the results:

- * denotes a logical 'as well as' (for example, $A*B$ denotes the simultaneous presence of conditions A and B in a solution term)
- ~ denotes a logical 'not' (for example, $\sim A$ denotes the absence of condition A in the solution term)

3.1. Scoring of cases in conditions and outcomes: Fuzzy set membership scores matrix

Table 24: Scoring of cases in conditions and outcomes: Fuzzy set membership scores matrix

Fuzzy set membership scores matrix		Outcomes			Conditions						
Case	Country	Outcome 1: DemEngS ys	Outcome 2: GAchv	Outcome 3: EnvSust	EU supp	NAT supp	SUBNATs upp	IntermNon Gov	CitizenDri vOrg	ProfForm Org	DecEnGov
Hydro Electricity Ourthe and Sambre	BE	0.67	0.67	0.67	0.67	0.67	0.67	1	0.67	0.67	0.67
Energy Transition of City of Burgas	BG	0.67	0.67	0.67	1	0.67	1	0.33	0.33	1	0.33
Trégor Energ'éthiques	FR	0.67	0.33	0.33	0	0.33	0.67	0.67	1	0.33	0.67
Berlin Citizen Energy	DE	0.33	0.33	0.33	0	0	0.33	0.67	1	1	1
SoLocal Energy	DE	1	0.67	0.67	0	0	0.33	1	1	1	1
Cargonomia	HU	1	0.67	0.67	0.33	0	0.67	1	1	0	0
TreeDependent	HU	0.33	0.67	0.67	0	0.33	0	1	0.33	1	0
Biomass briquettes programme	HU	0.33	0.33	0.33	0	0	0.67	1	0.33	0.67	0
Nagypáli, the renewable energy village	HU	0.33	1	1	1	0.67	1	0.67	0.33	1	0
Community Energy Programme of FoE Hungary	HU	0.67	0.67	0.67	1	0.33	0.33	0.67	0.67	0.33	0
Zsuzsanna Hojtsy-Keresztény - EnergyNeighbourhoods	HU	0.67	0.67	0.67	0	0	0.33	0.67	1	0.33	0

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citizenship outcomes

Aran Islands Energy Cooperative	IE	0.67	0.67	0.67	1	1	0.33	1	1	1	0
Energy Communities Tipperary Cooperative	IE	0.33	1	0.33	1	1	0.33	1	1	0.67	0
Galway Energy Co-opertive	IE	0.33	0.33	0.33	1	1	0.33	0.33	1	0	0
Weert Energy	NL	0.67	1	0	1	1	0.67	1	0.67	0.67	0.67
Drechtsteden Energy	NL	0.67	0.67	0.67	0.33	1	1	0.33	0.33	1	0.67
Reindonk Energy	NL	0.33	0.33	0.33	0	1	1	0.67	1	0.67	0.67
Couso's project	ES	0	0	0	0	0	0	0.33	1	0	1
La borda. Housing cooperative	ES	0.67	0.67	0.67	0.33	0.67	0.67	1	1	0.33	1
Goienar	ES	1	0.67	0.67	0.67	0.33	1	1	1	0.33	1
Distribution of membership scores	1	3	3	1	11	8	8	10	12	7	6
	0.67	9	11	12	5	5	6	6	3	5	9
	0.33	7	5	5	4	6	11	4	5	5	4
	0	1	1	2	9	10	4	0	0	3	10



A glance at the fuzzy set membership scores matrix (Table 24) alone reveals some insights without further analysis. First, it is noticeable that many cases have similar manifestations in the three investigated outcomes (1. substantial contribution to democratisation of energy system, 2. comprehensive goal achievement and 3. substantial contribution to environmental sustainability). Since outcome 3 is a subset of outcome 2, this is not surprising for these two outcomes. Rather, this suggests that environmental sustainability is an important goal for a majority of the cases studied. Comprehensive goal achievement is then the relevant varying parameter for both outcomes (cf. Section 2.3.3 on the construction of outcome 3). In comparison, differences between Outcomes 1 and 2 are more frequent, even if the manifestations are still mostly similar.

Secondly, it becomes evident that several sets have strongly skewed membership scores. Especially for the conditions ‘Citizen-driven organisation [CitizenDrivOrg]’ and (even more pronounced) for ‘Extensive intermediation by non-governmental actors [IntermNonGov]’, most cases (15/20 and 16/20 respectively) have scores suggesting membership in the condition (either with 0.67 or 1 score), while only a few (5/20 and 4/20 respectively) cases have non-membership scores (0.33 or 0). In the case of the condition ‘Extensive intermediation by non-governmental actors [IntermNonGov]’, this may indicate a key role of intermediation. The fact that this condition appears to be trivial among the selected cases in this QCA suggest that such intermediation is vital for citizens’ initiatives to emerge in the first place. Therefore, it would be present in (almost) all the examined cases, which represent a sample of emerged initiatives. A deeper investigation of this thesis, however, would require cases in which no initiative or formal organisation emerged. This is not covered in this QCA case selection (for further analysis on intermediation, see also D4.1, Markantoni et al., 2023). When it comes to the skewed membership scores in the condition ‘Citizen-driven organisation [CitizenDrivOrg]’, it stands out that all non-membership cases (except for Drechtsteden Energy) are located in Hungary and Bulgaria (which notably only included one case). This might indicate the importance of such hybrid cases for these two countries.

Thirdly, while these may be interesting first insights into the examined cases, overly skewed conditions pose a problem for quantitative analysis in QCA, which

requires a certain heterogeneity among the cases in terms of the membership scores (Schneider & Wagemann, 2012). Both conditions were nevertheless included in the present analysis. However, potential effects of a skewed condition need to be taken into account in the interpretation of the results.

In the Appendix, a correlation matrix is provided which shows correlation values (Spearman rank correlation) between all conditions and outcomes used.

3.2. Analysis of outcome 1 ‘Substantial contribution to democratisation of energy system’

Key research question: Why (under which configuration of conditions) do cases of collective citizen-based and hybrid types of energy citizenship achieve making substantial contributions to a democratisation of the energy system?

3.2.1. Analysis of necessary conditions for occurrence and non-occurrence of outcome 1 ‘Substantial contribution to democratisation of energy system’

Table 25: Analysis of necessary conditions (Outcome 1) ‘Substantial contribution to democratisation of energy system’

Analysis of necessary conditions (Outcome 1) ‘Substantial contribution to democratisation of energy system’

Conditions tested	Occurrence of outcome 1 (DemEngSys)		Non-occurrence of outcome 1 (~DemEngSys)	
	Consistency	Coverage	Consistency	Coverage
EUsupp	0.53	0.64	0.50	0.46
~EUsupp	0.56	0.59	0.62	0.50
NATsupp	0.59	0.67	0.65	0.57
~NATsupp	0.62	0.70	0.61	0.53
SUBNATsupp	0.79	0.79	0.69	0.53
~SUBNATsupp	0.53	0.69	0.73	0.73
IntermNonGov	0.94	0.69	0.88	0.50
~IntermNonGov	0.32	0.78	0.46	0.85
ProfFormOrg	0.70	0.67	0.81	0.58
~ProfFormOrg	0.56	0.79	0.54	0.58
DecEnGov	0.56	0.73	0.50	0.50
~DecEnGov	0.62	0.62	0.73	0.56

To be considered a necessary condition, the consistency value should be above 0.9 (Schneider & Wagemann, 2007, p. 213). Only one condition, ‘Extensive intermediation by non-governmental actors [IntermNonGov]’, meets this threshold. As indicated above, this may hint at the key importance of such kind of intermediation for the investigated cases. However, the fact that the same condition

also almost meets the requirement for being a necessary condition for the non-occurrence of the outcome is because the condition is present in (almost) all cases. Looking at the two inconsistent cases in this regard (Energy Transition of City of Burgas and Drechtsteden Energy) reveals certain peculiarities of these cases when it comes to intermediation. In the former case, intermediation is still important but mostly provided by governmental actors. In the latter, the case itself functions as non-governmental intermediary.

Furthermore, the result of this analysis is interesting as it suggests that none of the other investigated conditions are fundamentally required for cases to substantially contribute to a democratisation of energy system. Neither the support of a certain level of government nor a pronounced professionalisation and formalisation (or absence thereof) is an absolute prerequisite for cases to achieve this outcome.

3.2.2. Analysis of sufficient (combinations of) conditions for occurrence of the outcome 1 ‘Substantial contribution to democratisation of energy system’ (DemEngSys)

For investigating the occurrence of this outcome, the following model was used in the Truth Table analysis:

$DemEngSys = f(EU\text{supp}, NAT\text{supp}, SUBNAT\text{supp}, InternNonGov, ProfFormOrg, DecEnGov)$

The condition ‘Citizen-driven organisation (low hybridity)’ was not included in this analysis to avoid tautologies as it conceptually overlaps with the investigated outcome, especially with the second parameter used to construct it (‘Democratic internal governance’).

Table 26: Intermediate solution: Occurrence of outcome 1 'Substantial contribution to democratisation of energy system' (DemEngSys)

Intermediate solution: Occurrence of outcome 1 'Substantial contribution to democratisation of energy system' (DemEngSys)

Assumptions on directional expectations: EUsupp (present), IntermNonGov (present), DecEnGov (present)

consistency cutoff: 0.829

	raw coverage ⁵	unique coverage ⁶	consistency ⁷
~NATsupp*IntermNonGov*~ProfFormOrg ⁸	0.41	0.06	0.93
~NATsupp*~SUBNATsupp*IntermNonGov	0.38	0.12	0.81
EUsupp*NATsupp*SUBNATsupp*ProfFormOrg	0.38	0.03	0.93
NATsupp*SUBNATsupp*ProfFormOrg*DecEnGov	0.32	0.03	0.92
EUsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg	0.20	0.00	0.87
SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov	0.26	0.03	1.00
EUsupp*NATsupp*IntermNonGov*ProfFormOrg	0.38	0.00	0.81

solution coverage⁹: 0.913

solution consistency¹⁰: 0.814

~NATsupp*IntermNonGov*~ProfFormOrg: Cargonomia, TrégorEnerg'éthiques, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, Goiener

~NATsupp*~SUBNATsupp*IntermNonGov: BürgerEnergieBerlin, SoLocalEnergy, TreeDependent, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster

EUsupp*NATsupp*SUBNATsupp*ProfFormOrg: HydroElectricityOurtheandSambre, EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage, WeertEnergy

NATsupp*SUBNATsupp*ProfFormOrg*DecEnGov: HydroElectricityOurtheandSambre, WeertEnergy, DrechtstedenEnergy, ReindonkEnergy

EUsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg: AranIslandsEnergyCooperative,

5 how much weight belongs to each path

6 how strongly the individual paths overlap and how much explanatory power a path has, minus the other paths

7 Extent to which cases that share a particular combination of causal conditions also have the outcome

8 Every row represents another solution term, these are alternative ways how the outcome can be sufficiently explained

9 how big the explanatory power of all combinations together is

10 'Quality' of the entire solution

EnergyCommunitiesTipperaryCooperative

SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov: TrégorEnerg'éthiques, Laborda.Housingcooperativeintransferofuse, Goienér

EUsupp*NATsupp*IntermNonGov*ProfFormOrg: AranIslandsEnergyCooperative, HydroElectricityOurtheandSambre, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative, WeertEnergy

The overall consistency of the intermediate solution is not perfect, but with 0.81 still at an acceptable level. Still, consistency levels of the individual solution terms need to be taken into account when interpreting the results. The overall coverage of the solution (0.91) is good.

The solution term ‘~NATsupp*IntermNonGov*~ProfFormOrg’ has the highest raw coverage and suggests that extensive intermediation by non-governmental actors is sufficient for cases that do not have a strongly professionalised and formalised organisation but only if they were not substantially supported by national government schemes and actors. The combination of the first two conditions points towards the potential of intermediation by non-governmental actors to enable also less professionalised cases to make contributions to the democratisation of energy system, even more so as the combination ‘IntermNonGov*~ProfFormOrg’ appears as sufficient solution term in the parsimonious solution as well (see Appendix). While interpreting solution terms with the skewed condition ‘IntermNonGov’ warrants caution, this relationship still emerges as a plausible mechanism that merits further investigation.

Interpreting the combination with ‘~NATsupp’ in this term, however, is less straightforward. This could be an indication of the theorised detrimental effects of too much involvement of governmental actors on citizens’ initiatives, especially when it comes to aspects of democratisation (as suggested by Brandsen, 2016; Creamer et al., 2018; Healey, 2015; Igalla et al., 2019 or Molenveld et al., 2021, see Section 2.5.4). Such an interpretation is supported by the second solution term, which suggests the absence of ‘substantial support by subnational government schemes and actors’ as part of a sufficient combination of conditions. In both these solutions terms, it is noticeable that most of the cases to which the configurations apply are localised in Hungary. The suggested role of governmental actors in this term should therefore be interpreted specifically for the Hungarian context.

Yet another interpretation of the first solution term (and the role of ‘~NATsupp’) may be that the simultaneous absence of ‘substantial supported by national government schemes and actors’ and of a ‘professionalised and formalised organisation’ does not represent a combinatory effect but rather a dependency between these two conditions. It may indicate that citizens’ initiatives require a certain degree of professionalisation to access national funding schemes. Such an interpretation is supported by the third, fourth, fifth and seventh solution term, in all of which governmental support from different levels is combined with the presence of a professionalised and formalised organisation in the cases. This seems to apply especially to support from national and EU levels. On the other hand, the sixth solution term (SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov) indicates that substantial support by subnational government schemes and actors can be accessed by less professionalised and formalised organisations and contribute to a democratisation of the energy system; but this only in the context of a decentralised governmental system, in which such local and regional governments enjoy considerable autonomy.

Finally, an important insight about the effects of governmental support for energy citizenship initiatives is that in several solution terms, support from different governmental levels is combined. In particular, the results suggest that support from national governmental schemes or actors needs to be supplemented by support from either the subnational or EU level to become sufficient for cases to substantially contribute to the democratisation of energy system. Such an interactive effect from the interaction of different levels of government might be understood as what Schreurs and Tiberghien (2007) called ‘multi-level reinforcement’ (see also Ohlhorst, 2015).

3.2.3. Analysis of sufficient (combinations of) conditions for non-occurrence of the outcome 1 ‘Substantial contribution to democratisation of energy system’ (~DemEngSys)

This analysis identifies sufficient (combinations of) conditions to explain why cases have not achieved to substantially contribute to the democratisation of the energy system. When selecting the conditions, the focus was on finding conditions that can explain occurrence rather than non-occurrence (rather contributing than

hindering factors). Nevertheless, it can be an insightful supplement to the previous analysis of occurrence to also look at non-occurrence, especially as QCA does work with an assumption of ‘asymmetric causality’ (Schneider & Wagemann, 2007).

For investigating the non-occurrence of this outcome, the following model was used in the Truth table analysis:

$$\sim\text{DemEngSys} = f(\text{EU}\text{supp}, \text{NAT}\text{supp}, \text{SUBNAT}\text{supp}, \text{IntermNonGov}, \text{ProfFormOrg}, \text{DecEnGov})$$

Table 27: Intermediate solution: Non-occurrence of outcome 1 ‘Substantial contribution to democratisation of energy system’ ($\sim\text{DemEngSys}$)

Intermediate solution: Non-occurrence of outcome 1 ‘Substantial contribution to democratisation of energy system’ ($\sim\text{DemEngSys}$)

Assumptions on directional expectations: $\sim\text{EU}\text{supp}$ (absent), $\sim\text{NAT}\text{supp}$ (absent), $\sim\text{SUBNAT}\text{supp}$ (absent), $\sim\text{IntermNonGov}$ (absent), $\sim\text{DecEnGov}$ (absent)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency
$\text{ProfFormOrg}^*\sim\text{DecEnGov}$	0.65	0.31	0.77
$\sim\text{SUBNAT}\text{supp}^*\sim\text{IntermNonGov}^*\sim\text{DecEnGov}$	0.19	0.08	1.00
$\sim\text{EU}\text{supp}^*\text{NAT}\text{supp}^*\text{IntermNonGov}^*\text{ProfFormOrg}$	0.27	0.00	0.88
$\sim\text{EU}\text{supp}^*\text{SUBNAT}\text{supp}^*\text{IntermNonGov}^*\text{ProfFormOrg}$	0.38	0.04	0.83
$\sim\text{EU}\text{supp}^*\sim\text{NAT}\text{supp}^*\sim\text{SUBNAT}\text{supp}^*\sim\text{IntermNonGov}^*\sim\text{ProfFormOrg}$	0.15	0.08	1.00

solution coverage: 0.923

solution consistency: 0.774

$\text{ProfFormOrg}^*\sim\text{DecEnGov}$: TreeDependent, Nagypáli,therenewableenergyvillage, AranIslandsEnergyCooperative, Biomassbriquettesprogramme(fortheenergypoor), EnergyCommunitiesTipperaryCooperative, EnergyTransitionofCityofBurgas

$\sim\text{SUBNAT}\text{supp}^*\sim\text{IntermNonGov}^*\sim\text{DecEnGov}$: GalwayEnergyCo-opertive

$\sim\text{EU}\text{supp}^*\text{NAT}\text{supp}^*\text{IntermNonGov}^*\text{ProfFormOrg}$: ReindonkEnergy

$\sim\text{EU}\text{supp}^*\text{SUBNAT}\text{supp}^*\text{IntermNonGov}^*\text{ProfFormOrg}$: Biomassbriquettesprogramme(fortheenergypoor), ReindonkEnergy

$\sim\text{EU}\text{supp}^*\sim\text{NAT}\text{supp}^*\sim\text{SUBNAT}\text{supp}^*\sim\text{IntermNonGov}^*\sim\text{ProfFormOrg}$: Couso´project

Compared to the analysis of the occurrence of the result, the consistency value of this solution is less than 0.8 and thus of limited validity (especially with regard to the first solution term). The second and third terms are fully consistent,

but both relate exclusively to the same two cases, Galway Energy Cooperative and Couso’s project, which have similar configurations. The results suggest that non-occurrence of outcomes in both cases can be explained by a combination of lack of substantial intermediation by non-governmental actors with either lack of professionalisation and formalisation or lack of support by sub-national actors. This underlines the key role of such intermediation as a prerequisite for the operation of citizens’ initiatives, even more since in the case of Couso’s project the organisation has since been dissolved.¹¹

The fourth and fifth solutions terms suggest an interesting insight to the role of support by EU schemes and actors. The absence of such support appears as an element in both terms to explain non-occurrence of the outcome while other forms of governmental support are present. However, these terms rely only on the cases ReindonkEnergy and Biomassbriquette programme.

3.3. Analysis of outcome 2 ‘Comprehensive goal achievement’

Key research question: Why (under which configuration of conditions) do cases of collective citizen-based and hybrid types of energy citizenship comprehensively achieve their goals?

3.3.1. Analysis of necessary conditions for occurrence and non-occurrence of outcome 2 ‘Comprehensive goal achievement’

Table 28: Analysis of necessary conditions for outcome 2 ‘Comprehensive goal achievement’

Analysis of necessary conditions for outcome 2 ‘Comprehensive goal achievement’

Conditions tested	Occurrence of outcome 2 (Gachv)		Non-occurrence of outcome 2 (~Gachv)	
	Consistency	Coverage	Consistency	Coverage
EU supp	0.64	0.82	0.41	0.35
~EU supp	0.50	0.56	0.79	0.59
NAT supp	0.67	0.80	0.54	0.43
~NAT supp	0.53	0.63	0.75	0.60
SUBNAT supp	0.75	0.79	0.75	0.53
~SUBNAT supp	0.55	0.77	0.71	0.65
IntermNonGov	0.92	0.72	0.87	0.45

¹¹ For more information, see:

<https://www.lavozdegalicia.es/noticia/lugo/samos/2023/04/11/comunidad-alternativa-samos-llega-finvenden-casa-autosuficiente-medio-millon-euros/00031681207697534499422.htm> (only in Spanish)

~IntermNonGov	0.30	0.78	0.46	0.78
CitizenDrivOrg	0.83	0.64	0.96	0.49
~CitizenDrivOrg	0.33	0.92	0.29	0.53
ProfFormOrg	0.75	0.75	0.71	0.47
~ProfFormOrg	0.47	0.71	0.62	0.62
DecEnGov	0.44	0.62	0.63	0.57
~DecEnGov	0.69	0.74	0.58	0.41

As in the analysis for outcome 1 (substantial contribution to democratisation of energy system), intermediation by non-governmental actors appears to be as a necessary condition for cases for this outcome. Again, this underlines the key importance of such intermediation for energy citizen initiatives while posing a challenge to the QCA due to the skewed membership scores of the condition. In fact, also here, condition ‘IntermNonGov’ almost reaches the threshold for being a necessary condition for non-occurrence of this outcome.

In contrast to the analysis of the previous outcome 1, here the condition whether the case is a citizen-driven organisation (‘CitizenDrivOrg’) was included. Results for this condition too exhibit some traits that are likely due to the slightly skewed nature of this condition (high consistency values for both necessity of occurrence and non-occurrence of the outcome), albeit less pronounced than for the ‘IntermNonGov’ condition. Still, the results suggest that the ‘CitizenDrivOrg’ condition is necessary for the non-occurrence of the outcome. In other words, among the investigated cases, it was only citizen-driven organisations that did not comprehensively achieve their goals. On the one hand, this could be an indication of an actual impact of this case feature on the functioning of energy citizenship cases. On the other hand, it could also be an indication of a difference in the reporting of achievements, with hybrid organisation cases (e.g., with government involvement) having a stronger need to legitimise their activities and thus a need to report better achievement of goals.

3.3.2. Analysis of sufficient (combinations of) conditions for occurrence of the outcome 2 ‘Comprehensive goal achievement’

For investigating the occurrence of this outcome, the following model was used in the Truth table analysis:

$$GAchv = f(EU\text{supp}, NAT\text{supp}, SUBNAT\text{supp}, IntermNonGov, CitizenDrivOrg,$$

ProfFormOrg, DecEnGov)

Table 29: Intermediate solution: Occurrence of outcome 2 ‘Comprehensive goal achievement’ (Gachv)

Intermediate solution: Occurrence of outcome 2 ‘Comprehensive goal achievement’ (Gachv)

Assumptions on directional expectations: EU supp (present), NAT supp (present), SUBNAT supp (present), IntermNonGov (present), ProfFormOrg (present)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency
IntermNonGov*CitizenDrivOrg*~DecEnGov	0.58	0.08	0.91
SUBNATsupp*IntermNonGov*CitizenDrivOrg	0.64	0.06	0.88
IntermNonGov*CitizenDrivOrg*ProfFormOrg	0.61	0.03	0.85
~SUBNATsupp*IntermNonGov*ProfFormOrg*~DecEnGov	0.33	0.03	0.92
EU supp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg	0.22	0.06	1
NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg*DecEnGov	0.14	0.03	1

solution coverage: 0.95

solution consistency: 0.81

IntermNonGov*CitizenDrivOrg*~DecEnGov: Cargonomia, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster

SUBNATsupp*IntermNonGov*CitizenDrivOrg: Goiener, HydroElectricityOurtheandSambre, TrégorEnerg’étiques, Cargonomia, WeertEnergy, ReindonkEnergy, Laborda.Housingcooperativeintransferofuse

IntermNonGov*CitizenDrivOrg*ProfFormOrg: SoLocalEnergy, AranIslandsEnergyCooperative, HydroElectricityOurtheandSambre, BürgerEnergieBerlin, EnergyCommunitiesTipperaryCooperative, WeertEnergy, ReindonkEnergy

~SUBNATsupp*IntermNonGov*ProfFormOrg*~DecEnGov: TreeDependent, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative

EU supp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg:

EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage

NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg*DecEnGov: DrechtstedenEnergy

With a value of 0.81, the consistency of the solution is satisfactory but not perfect. With coverage of 0.95, most cases are covered by the solution. The first term suggests that intermediation by non-governmental actors can be sufficient for cases to comprehensively achieve their goals, if they are citizen driven initiatives and if the case is located in a non-decentralised governance system. While the first part further highlights the importance of such intermediation, the combination with

~DecEnGov is not straightforward (in the parsimonious solution, this term appears without the ~DecEngGov condition). The solution is interesting in that it suggests that comprehensive goal achievement by citizens' initiatives is feasible even without substantial government support, that is, if they are supported by extensive intermediation by non-governmental actors.

However, multiple solution terms appear in which governmental support is part of the sufficient expression. As with Outcome 1, 'NATsupp' appears in combination with the 'ProfFormOrg' condition (in the parsimonious solution even as an isolated term (NATsupp*ProfFormOrg, see Appendix). Therefore, also with respect to the outcome of comprehensive goal achievement, it seems to be important for the cases to have a certain degree of professionalisation and formalisation to be able to access governmental support from the national level.

On the other hand, support from sub-national government levels also appears in solution terms without presence of the professionalisation and formalisation condition. The term (SUBNATsupp*IntermNonGov*CitizenDrivOrg) suggests a bottom-up situation sufficient for comprehensive goal achievement, in which citizen-driven organisations are supported by local or regional government as well as by non-governmental intermediaries. With a raw coverage of 0.64, this term provides an explanation for the highest number of cases in this solution and emphasises the importance of subnational governmental support and mediation for citizen initiatives. This seems to apply especially when there is a lack of support from higher levels of government. However, in one solution term (~SUBNATsupp*IntermNonGov*ProfFormOrg*~DecEnGov), the absence of such subnational government support appears as part of the sufficient configuration. Generally, this could indicate a negative effect of support and involvement of subnational governments on citizens' activities, as found by Hatzl et al. (2014). When considering the cases underlying this term, however, it is striking that this configuration describes mainly cases from the Irish context where the role of subnational support should be understood in the context of a centralised governance system (as also indicated by the condition ~DecEnGov in the term). While no evidence of a possible detrimental effect of subnational support emerged from the in-case insights of these case studies, it seemed that local or regional

levels of government are indeed less relevant actors for the operation of the cases due to their lack of own capacity and autonomy in such contexts.

An alternative picture is painted by the term (EU^{supp}*NAT^{supp}*SUBNAT^{supp}*~CitizenDrivOrg*ProfFormOrg). This term describes a situation in which energy citizenship occurs in hybrid organisations (usually with strong involvement of subnational governments). It is thus not surprising that these cases also have a high degree of professionalisation. However, it is interesting to note that such cases seem to require support from the national and EU level in order to fully achieve their goals. This particularly emphasises the important role of EU support for energy citizenship in the context of such local government driven cases.

3.3.3. Analysis of sufficient (combinations of) conditions for non-occurrence of the outcome 2 ‘Comprehensive goal achievement’

For investigating the non-occurrence of this outcome, the following model was used in the Truth Table analysis:

$\sim G_{Achv} = f(EU_{supp}, NAT_{supp}, SUBNAT_{supp}, IntermNonGov, CitizenDrivOrg, ProfFormOrg, DecEnGov)$

Table 30: Intermediate solution: Non-occurrence of outcome 2 ‘Comprehensive goal achievement’ (~Gachv)

Intermediate solution: Non-occurrence of outcome 2 ‘Comprehensive goal achievement’ (~Gachv)

Assumptions on directional expectations: ~EUsupp (absent), ~NATsupp (absent), ~SUBNATsupp (absent), ~IntermNonGov (absent), ~ProfFormOrg (absent)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
~EUsupp*CitizenDrivOrg*DecEnGov	0.58	0.25	0.78
~EUsupp*~NATsupp*CitizenDrivOrg*~ProfFormOrg	0.46	0.04	0.84
~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov	0.21	0.13	1.00
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*~DecEnGov	0.13	0.04	1.00

solution coverage: 0.876

solution consistency: 0.776

~EUsupp*CitizenDrivOrg*DecEnGov: BürgerEnergieBerlin, SoLocalEnergy, Couso’sproject, TrégorEnerg’éthiques, ReindonkEnergy, Laborda.Housingcooperativeintransferofuse

~EUsupp*~NATsupp*CitizenDrivOrg*~ProfFormOrg: Couso’sproject, TrégorEnerg’éthiques, Cargonomia, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster

~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov: GalwayEnergyCo-opertive

~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*~DecEnGov: Biomassbriquettesprogramme(fortheenergypoor)

Although the consistency value is suboptimal, this analysis of why some cases did not comprehensively achieve their goals reveals certain interesting insights. Firstly, it is striking that lack of substantial support by EU schemes or actors appears in all but one solution term. This indicates a strong reliance of many energy citizenship initiatives on such support, especially for citizen driven organisations (with ‘CitizenDrivOrg’ being another part of two of these terms). Yet, lack of support from EU and national level also appears to be a factor in hybrid cases with local government involvement, as the term ~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*~DecEnGov indicates. This suggests that such hybrid cases are strongly dependent on support

from superior governmental levels, especially when they operate in centralised governmental systems (~DecEnGov as part of the term).

3.4. Analysis of outcome 3 ‘Substantial contribution to environmental sustainability’

Key research question: Why (under which configuration of conditions) do cases of collective citizen-based and hybrid types of energy citizenship achieve making substantial contributions to environmental sustainability?

As explained in Section 2.3.3, the QCA was not directly designed for this outcome. Accordingly, the consistency values of these analyses are often unsatisfactory. The following results should therefore be regarded as highly exploratory.

3.4.1. Analysis of necessary conditions for occurrence and non-occurrence of the outcome 3 ‘Substantial contribution to environmental sustainability’

Table 31: Analysis of necessary conditions (Outcome 3) ‘Substantial contribution to environmental sustainability’

Analysis of necessary conditions (Outcome 3) ‘Substantial contribution to environmental sustainability’

Conditions tested	Occurrence of outcome 3 (EnvSust)		Non-occurrence of outcome 3 (~EnvSust)	
	Consistency	Coverage	Consistency	Coverage
EUsupp	0.59	0.68	0.50	0.50
~EUsupp	0.56	0.56	0.68	0.59
NATsupp	0.62	0.67	0.61	0.56
~NATsupp	0.59	0.63	0.64	0.60
SUBNATsupp	0.78	0.73	0.75	0.62
~SUBNATsupp	0.59	0.73	0.68	0.73
IntermNonGov	0.91	0.63	0.89	0.54
~IntermNonGov	0.34	0.78	0.39	0.78
CitizenDrivOrg	0.84	0.57	0.93	0.55
~CitizenDrivOrg	0.34	0.85	0.28	0.61
ProfFormOrg	0.78	0.69	0.71	0.55
~ProfFormOrg	0.50	0.67	0.61	0.71
DecEnGov	0.44	0.54	0.61	0.65
~DecEnGov	0.72	0.68	0.57	0.47

The results of this analysis are very similar to the analysis of necessary conditions for outcome 2 (‘Comprehensive goal achievement’), likely also due to the fact that the analysed outcome 3 is a subset of outcome 2 (see construction of

outcome 3 in Section 2.3.3). Again, substantial intermediation by non-governmental actors appears as necessary condition for the occurrence of the investigated outcome while also being close to being a necessary condition for the non-occurrence. Also, again the ‘CitizenDrivOrg’ condition appears as necessary condition for the non-occurrence of the outcome, suggesting that all the investigated cases that have not achieved to substantially contribute to environmental sustainability were citizen-driven organisations (which does not imply that other citizen-driven organisations have achieved this).

3.4.2. Analysis of sufficient (combinations of) conditions for occurrence of the outcome 3 ‘Substantial contribution to environmental sustainability’

To investigate the occurrence of this outcome, the following model was used in the Truth Table analysis. The condition ‘DecEnGov’ was excluded after an iterative process to improve quality of the results.

$$\text{EnvSust} = f(\text{EUsupp}, \text{NATsupp}, \text{SUBNATsupp}, \text{IntermNonGov}, \text{CitizenDrivOrg}, \text{ProfFormOrg})$$

Table 32: Intermediate solution: Occurrence of outcome 3 ‘Substantial contribution to environmental sustainability’ (EnvSust)

Intermediate solution: Occurrence of outcome 3 ‘Substantial contribution to environmental sustainability’ (EnvSust)

Assumptions on directional expectations: EUsupp (present), NATsupp (present), SUBNATsupp (present), IntermNonGov (present), ProfFormOrg (present)
consistency cutoff: 0.832

	raw coverage	unique coverage	Consistency
IntermNonGov*CitizenDrivOrg	0.84	0.31	0.69
~SUBNATsupp*IntermNonGov*ProfFormOrg	0.47	0.03	0.83
NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg	0.25	0.10	0.89

solution coverage: 0.969

solution consistency: 0.705

IntermNonGov*CitizenDrivOrg: SoLocalEnergy, Cargonomia, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative, Laborda.Housingcooperativeintransferofuse, Goiener, HydroElectricityOurtheandSambre, TrégorEnerg’éthiques, BürgerEnergieBerlin, CommunityEnergyProgrammeoffoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, WeertEnergy, ReindonkEnergy

\sim SUBNATsupp*IntermNonGov*ProfFormOrg: TreeDependent, BürgerEnergieBerlin, SoLocalEnergy, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative

NATsupp*SUBNATsupp* \sim CitizenDrivOrg*ProfFormOrg:
EnergyTransitionofCityofBurgas:GoingSmartandSustainable,
Nagypáli,therenewableenergyvillage, DrechtstedenEnergy

With a value of 0.71, the consistency of this solution is unsatisfactory. Still, the solution term 'NATsupp*SUBNATsupp* \sim CitizenDrivOrg*ProfFormOrg' points to the interplay of governmental support from different levels for the occurrence of this outcome when it comes to cases with hybrid organisations. This reinforces the findings of the analysis for outcome 2, which also indicated the importance of such mutual reinforcement of support.

The second term in the solution suggests that contributions to environmental sustainability can also be achieved in cases that are citizen-driven and where there is no comprehensive governmental support. Apart from comprehensive intermediation by non-state actors, the term suggests that professionalisation and formalisation of the organisation plays an important role to explain the occurrence of this outcome.

3.4.3. Analysis of sufficient (combinations of) conditions for non-occurrence of the outcome 'Substantial contribution to environmental sustainability'

For investigating the non-occurrence of this outcome, the following model was used in the Truth Table analysis:

\sim EnvSust = f(EU supp, NATsupp, SUBNATsupp, IntermNonGov, CitizenDrivOrg, ProfFormOrg)

Table 33: Intermediate solution: Non-occurrence of outcome 3 ‘Substantial contribution to environmental sustainability’ (~EnvSust)

Intermediate solution: Non-occurrence of outcome 3 ‘Substantial contribution to environmental sustainability’ (~EnvSust)

Assumptions on directional expectations: ~EUsupp (absent), ~NATsupp (absent), ~SUBNATsupp (absent), ~IntermNonGov (absent), ~ProfFormOrg (absent)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
	-----	-----	-----
SUBNATsupp*CitizenDrivOrg	0.71	0.25	0.74
~EUsupp*~NATsupp*SUBNATsupp	0.39	0.04	0.91
~IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.29	0.04	1.00
~EUsupp*CitizenDrivOrg*~ProfFormOrg	0.43	0.00	0.80
~EUsupp*~NATsupp*CitizenDrivOrg	0.53	0.07	0.71

solution coverage: 0.965

solution consistency: 0.691

SUBNATsupp*CitizenDrivOrg: ReindonkEnergy, Goiener, HydroElectricityOurtheandSambre, TrégorEnerg’éthiques, Cargonomia, WeertEnergy, Laborda.Housingcooperativeintransferofuse

~EUsupp*~NATsupp*SUBNATsupp: Biomassbriquettesprogramme(fortheenergypoor), TrégorEnerg’éthiques, Cargonomia

~IntermNonGov*CitizenDrivOrg*~ProfFormOrg: GalwayEnergyCo-opertive, Couso’sproject

~EUsupp*CitizenDrivOrg*~ProfFormOrg: Couso’sproject, TrégorEnerg’éthiques, Cargonomia, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, Laborda.Housingcooperativeintransferofuse

~EUsupp*~NATsupp*CitizenDrivOrg: BürgerEnergieBerlin, SoLocalEnergy, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, Couso’sproject, TrégorEnerg’éthiques, Cargonomia

As in the analysis of the occurrence of the outcome, the consistency value of the overall solution is unsatisfactory. Nevertheless, two solution terms can be read as indicating that missing professionalisation and formalisation of the organisations play an important role in explaining the non-occurrence of substantial contributions to environmental sustainability in the studied cases. This seems to be particularly significant in cases that involve citizen-driven organisations (and where there is no support from EU schemes or intermediation by non-state actors).

Furthermore, as with the previous outcome 2, the lack of EU support appears in several terms. This may indicate the dependence of citizens’ initiatives on such support, including when it comes to contributions in the area of sustainability.

4. Conclusions

This deliverable applied three QCAs to answer the following research question: What are necessary and sufficient conditions for cases of energy citizenship i) to substantially contribute to democratisation of energy system ii) to achieve their own goals and iii) to substantially contribute to environmental sustainability? When comparing the results of the three QCAs, several points stand out.

On the one hand, the configurations to explain the different outcomes have several commonalities. Firstly, across all three analyses, intermediation through non-governmental actor stands out as necessary condition for the investigated outcome. While this highlights the importance of such intermediation, the condition also appeared in all three analyses as necessary for the non-occurrence of the respective outcome. This suggests that intermediation by non-governmental actors might be less a factor for success of energy citizenship initiatives than a factor for the formation and persistence of such initiatives in the first place. Without such intermediation, energy citizen initiatives might not even form and develop to a level at which they would be included as an observable 'collective case of energy citizenship' in the EnergyPROSPECTS project (and would thus not be included in the pool of potential cases in the case selection).

Secondly, it was a striking result across the three analyses that, except for the aforementioned condition, no other condition reached the level of a necessary condition. Achievements in any of the three outcomes does not seem to fundamentally rely on support from one governmental level and seems possible for both professionalised and formalised as well as less professionalised and formalised organisations. This is a promising result, as it implies that energy citizen initiatives can be successful even if they lack support or even have adversarial relationships with a certain governmental level, insofar as they receive support from another level.

This leads, thirdly, to a further commonality between the three analyses. While support from no single governmental level was necessary, the combination of support from several government levels appeared in the solution terms for all three outcomes. Especially support from the national level only appeared sufficient

for any of the three outcomes in combination with support from other governmental levels in the solution terms. Rather than putting the focus on one level, this points to the importance of coherence and mutual reinforcement between levels of a multi-level governance system. The results suggest that this is not only important for the diffusion of climate friendly technologies, as proposed by Schreurs and Tiberghien's concept of 'multi-level reinforcement' (2007), but also for achievements of citizen energy initiatives.

An exception to this appeared in the solutions for both outcomes 'Substantial contribution to democratisation of energy system' and 'Comprehensive goal achievement'. For these outcomes, the analyses indicate that especially in decentralised government systems, support from local or regional governmental actors can be sufficient, even if there is no other governmental support from other levels. This suggests a special role for such sub-national governmental actors for energy citizen initiatives, provided that subnational governments have sufficient autonomy and resources. Interestingly, such sufficient solutions also covered citizen initiatives that were not highly professionalised and formalised - a condition that was otherwise required in many sufficient solution terms.

This role of professionalisation and formalisation was, fourthly, particularly evident in combination with national governmental support. This combination appeared as part of several solution terms in the analyses of all three outcomes. This could be read as evidence that energy citizens' initiatives require a certain degree of professionalisation and formalisation in order to be able to access national support programmes. Such an interpretation is supported by other studies, which have found that access to national funding (e.g., for renewable energy) is a major hurdle for small civil society organisations due to the increasing complexity and administrative requirements.

On the other hand, this role of support from national schemes and actors also brings us to a significant difference between the results of the three QCAs. For the outcome 'Substantial contribution to democratisation of energy system', it was striking the absence of national support appeared in some sufficient solution terms (and the presence of the condition in some solution terms explaining the non-occurrence of the outcome). This result does not appear in the analyses of the other

two outcomes. It remains to be ascertained for the respective cases whether this is an artefact of the analysis or whether the involvement of national support-actors in these cases was in fact a hindrance to their efforts to contribute to democratisation (as found elsewhere, see Nadaï et al., 2015), resp. whether it was important not to be dependent on national support for this purpose.

Another difference between the results of the three outcomes is that support by European Union schemes and actors appeared to be of particular importance for the first outcome 'Substantial contribution to democratisation of energy system'. While such support also appears in solution terms for other outcomes, it is in the sufficient solution terms for this outcome where EU support appears independent from other forms of governmental support. The specific role of EU support for this outcome can be because such support often materialises as participation of the citizen initiatives in EU projects. This may provide citizens' initiatives with resources for the use of which they have more discretion (including ambitions for democratisation) than in the case of national support schemes, which tend to be more earmarked.

Finally, the results for the outcome 'Significant contribution to the democratisation of the energy system' differ in another way from the other outcomes. It is only in the solution for this outcome that non-professional and formalised organisations appear as part of sufficient configurations. This could be the result of a tautology in that one of the parameters used to construct this outcome ('Internal Democratic Governance') actually refers to aspects of professionalisation and formalisation. However, the two sets are hardly correlated (see Appendix). It might be worthwhile to examine the cases that are professionalised and formalised but still achieved to substantially contribute to the democratisation of the energy system.

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Appendix

Questions in case study reports

Questions in case study reports	
Outcome/Condition	Questions
Outcome 1: Substantial contribution to democratisation of energy system	<ul style="list-style-type: none"> • Do/did the actors envision and pursue a more democratic energy future? • Does the case contribute/make achievements to the democratisation of the energy system? If yes, how? <ul style="list-style-type: none"> o ... by enabling or expanding individual/collective ownership of energy infrastructure o ... by initiating and/or participating in public decision-making processes o ... by making its voice heard in the public debate o ... by providing a forum for deliberation on energy o ... by improving accountability in energy sector and governance • How does the internal governance/decision-making within the case relate to its contribution to the democratisation of the energy system? • In which ways do citizens (or different groups of citizens) participate in different types of internal decision-making in this case? • How are those decisions taken? Is this process open and deliberative and how do actors in the case deal with issues for which they cannot reach consensus on (e.g. use voting or defer decision-making)? • Are decisions that are based on citizen votes compulsory and perceived as being meaningful/effective?
Outcome 2: Comprehensive goal achievement	<ul style="list-style-type: none"> • What do the relevant actors (i.e., the actors involved in the case) think they have achieved through the ENCI case under investigation? • Is the case considered to be successful (in terms of the indicated kinds of achievements) or not successful (according to actors closely involved with the ENCI case, and/or according to outside observers)? • What are the three greatest/main achievements of the ENCI case/the individual actor in the case under study? And why? • Which of the hoped-for achievements have the ENCI actors/case not managed to make? And why?
Condition: Substantial support by European Union schemes and actors (including intermediation)	<ul style="list-style-type: none"> • How is (was) the ENCI case supported or hindered by policy frameworks and market regulations? • What type of intermediation is (or has been) needed so that the case can achieve its goals, and what sorts of intermediary actors/organisations are (have been) part of (or conveying) this intermediation?
Condition: Substantial support by national government schemes and actors (including intermediation)	<ul style="list-style-type: none"> • How is (was) the ENCI case supported or hindered by policy frameworks and market regulations? • What type of intermediation is (or has been) needed so that the case can achieve its goals, and what sorts of intermediary actors/organisations are (have been) part of (or conveying) this intermediation?
Condition: Substantial support	<ul style="list-style-type: none"> • How does (did) engagement in ENCI in the case relate to

<p>by subnational (local & regional) government schemes and actors (including intermediation)</p>	<p>local/regional government? Please pay particular attention to i) the organisational and personal ties, ii) whether and how the actors in this case are part of, cooperate with and/or are supported or hindered by local and regional governments, and iii) whether and how the case provides an essential energy-related services to them. Please describe in 10-15 lines how ENCI activities and actors in the case relate to local and regional governments. As a first step, address whether and how the case involves organisational linkages with local and regional governments. As a second step, in cc. 15 lines:</p> <ul style="list-style-type: none"> o If the case is mainly located within governmental institutions, describe how the case is organised and governed within administrative departments. o If the case is mainly outside government institutions, describe what personal relationships or overlaps exist between the case and local/regional governments, how the case is supported or hindered by local/regional governments, whether and how there has been cooperation, mutual disregard or conflict between case actors and local/regional governments, and whether and how the case provides an essential energy-related services to them. <ul style="list-style-type: none"> • Do (did) the actors engaging in ENCI in the case (feel that they) have the autonomy and capacity required to implement their goals/ambitions? • What type of intermediation is (or has been) needed so that the case can achieve its goals, and what sorts of intermediary actors/organisations are (have been) part of (or conveying) this intermediation?
<p>Condition: Extensive intermediation by non-governmental actors (including commercial, educational and civil-society intermediaries)</p>	<ul style="list-style-type: none"> • What type of intermediation is (or has been) needed so that the case can achieve its goals, and what sorts of intermediary actors/organisations are (have been) part of (or conveying) this intermediation?
<p>Condition: Citizen-driven organisation (low hybridity)</p>	<ul style="list-style-type: none"> • How does (did) engagement in ENCI in the case relate to local/regional government? Please pay particular attention to i) the organisational and personal ties, ii) whether and how the actors in this case are part of, cooperate with and/or are supported or hindered by local and regional governments, and iii) whether and how the case provides an essential energy-related services to them. Please describe in 10-15 lines how ENCI activities and actors in the case relate to local and regional governments. As a first step, address whether and how the case involves organisational linkages with local and regional governments.
<p>Condition: Professionalised and formalised organisation</p>	<ul style="list-style-type: none"> • Do (did) the actors engaging in ENCI in the case (feel that they) have the skills and knowledge to implement their goals/ambitions? • Does (did) the case require some professionalisation for its activity and does/did it impact its democratic functioning?

Results of combination of two parameters for formation of outcome 1
‘Substantial contribution to democratisation of energy system’

Case	Parameter 1 [Citznvoice]	Parameter 2 [DemIntG]	Outcome [DemEngSys]
Hydro Electricity Ourthe and Sambre	0.67	1	0.67
Energy Transition of City of Burgas	0.67	0.67	0.67
Trégor Energ'éthiques	0.67	1	0.67
Berlin Citizen Energy	0.33	1	0.33
SoLocal Energy	1	1	1
Cargonoma	1	1	1
TreeDependent	0.67	0.33	0.33
Biomass briquettes programme	0.67	0.33	0.33
Nagypáli, the renewable energy village	0.67	0.33	0.33
Community Energy Programme of FoE Hungary	1	0.67	0.67
Zsuzsanna Hojtsy-Keresztény - EnergyNeighbourhoods energy master, local change maker	0.67	1	0.67
Aran Islands Energy Cooperative	0.67	1	0.67
Energy Communities Tipperary Cooperative	0.33	1	0.33
Galway Energy Co-opertive	0.33	0.67	0.33
Weert Energy	0.67	1	0.67
Drechtsteden Energy	1	0.67	0.67
Reindonk Energy	0.33	1	0.33
Couso's project	0	0	0
La borda. Housing cooperative	0.67	1	0.67
Goener	1	1	1

Correlation matrix (Spearman rank correlation)

	DemEngSys	GAchiev	EnvSust	EUsupp	NATsupp	SUBNATsupp	IntermNonGov	CitizenDrivOrg	ProfFormOrg	DecEnGov
DemEngSys	1.00									
GAchiev	0.36	1.00								
EnvSust	0.48	0.50	1.00							
EUsupp	0.14	0.60	0.22	1.00						
NATsupp	-0.11	0.35	-0.05	0.64	1.00					
SUBNATsupp	0.31	0.20	0.26	0.21	0.33	1.00				
IntermNonGov	0.36	0.42	0.14	0.01	-0.08	-0.08	1.00			
CitizenDrivOrg	0.14	-0.31	-0.30	-0.22	-0.13	-0.31	0.10	1.00		
ProfFormOrg	-0.06	0.33	0.32	0.04	0.21	0.15	0.09	-0.50	1.00	
DecEnGov	0.18	-0.27	-0.22	-0.36	-0.16	0.16	-0.03	0.31	0.00	1.00



Truth tables for analyses of sufficient conditions

Truth table for occurrence of outcome 1 Substantial contribution to democratisation of energy system (DemEngSys)

EUsupp	NATsupp	SUBNATsup	IntermNonG	ProfFormOr	DecEnGov	number	DemEngSys	raw consist.	PRI consist.	SYM consist.
1	1	1	1	1	1	2	1	1.00	1.00	1.00
0	0	0	1	0	0	1	1	1.00	1.00	1.00
1	0	0	1	0	0	1	1	1.00	1.00	1.00
0	0	1	1	0	0	1	1	1.00	1.00	1.00
1	1	1	0	1	0	1	1	1.00	1.00	1.00
0	0	1	1	0	1	1	1	1.00	1.00	1.00
1	0	1	1	0	1	1	1	1.00	1.00	1.00
0	1	1	1	0	1	1	1	1.00	1.00	1.00
0	1	1	0	1	1	1	1	1.00	1.00	1.00
1	1	1	1	1	0	1	1	0.89	0.00	0.00
0	0	0	1	1	1	2	1	0.85	0.66	0.66
1	1	0	1	1	0	2	1	0.85	0.50	0.50
0	1	1	1	1	1	1	1	0.85	0.49	0.49
0	0	0	1	1	0	1	1	0.83	0.00	0.00
0	0	1	1	1	0	1	0	0.80	0.00	0.00
1	1	0	0	0	0	1	0	0.66	0.00	0.00
0	0	0	0	0	1	1	0	0.33	0.00	0.00

Consistency cutoff: 0.8



Truth table for non-occurrence of outcome 1 Substantial contribution to democratisation of energy system (~DemEngSys)

EU supp	NAT supp	SUBNAT supp	Interm Non Gov	Prof Form Org	Dec En Gov	number	~DemEngSys	raw consist.	PRI consist.	SYM consist
1	1	0	0	0	0	1	1	1.00	1.00	1.00
0	0	0	1	1	0	1	1	1.00	1.00	1.00
0	0	1	1	1	0	1	1	1.00	1.00	1.00
1	1	1	1	1	0	1	1	1.00	1.00	1.00
0	0	0	0	0	1	1	1	1.00	1.00	1.00
0	1	1	1	1	1	1	1	0.86	0.51	0.51
1	1	0	1	1	0	2	1	0.85	0.50	0.50
1	1	1	0	1	0	1	1	0.80	0.00	0.00
0	1	1	0	1	1	1	0	0.74	0.00	0.00
0	0	0	1	1	1	2	0	0.71	0.34	0.34
0	0	0	1	0	0	1	0	0.66	0.00	0.00
0	0	1	1	0	0	1	0	0.66	0.00	0.00
0	1	1	1	0	1	1	0	0.66	0.00	0.00
1	1	1	1	1	1	2	0	0.62	0.00	0.00
0	0	1	1	0	1	1	0	0.60	0.00	0.00
1	0	0	1	0	0	1	0	0.50	0.00	0.00
1	0	1	1	0	1	1	0	0.50	0.00	0.00

Consistency cutoff: 0.78



Truth table for occurrence of outcome 2: Comprehensive goal achievement (Gachv)											
EU supp	NAT supp	SUBNAT supp	Interm Non Gov	Citizen Driv Org	Prof Form Org	Dec En Gov	number	G Achv	raw consist.	PRI consist.	SYM consist
1	1	0	1	1	1	0	2	1	1.00	1.00	1.00
1	1	1	1	1	1	1	2	1	1.00	1.00	1.00
0	0	0	1	1	0	0	1	1	1.00	1.00	1.00
1	0	0	1	1	0	0	1	1	1.00	1.00	1.00
0	0	1	1	1	0	0	1	1	1.00	1.00	1.00
1	1	1	0	0	1	0	1	1	1.00	1.00	1.00
0	0	0	1	0	1	0	1	1	1.00	1.00	1.00
1	1	1	1	0	1	0	1	1	1.00	1.00	1.00
1	0	1	1	1	0	1	1	1	1.00	1.00	1.00
0	1	1	1	1	0	1	1	1	1.00	1.00	1.00
0	1	1	0	0	1	1	1	1	1.00	1.00	1.00
0	0	0	1	1	1	1	2	1	0.85	0.50	0.50
0	1	1	1	1	1	1	1	1	0.85	0.00	0.00
0	0	1	1	1	0	1	1	1	0.80	0.00	0.00
1	1	0	0	1	0	0	1	0	0.66	0.00	0.00
0	0	1	1	0	1	0	1	0	0.66	0.00	0.00
0	0	0	0	1	0	1	1	0	0.33	0.00	0.00

Consistency cutoff: 0.79



Truth table for non-occurrence of outcome 2: Comprehensive goal achievement (~Gachv)

EU supp	NAT supp	SUBNAT supp	Interm Non Gov	Citizen Driv Org	Prof Form Org	Dec En Gov	number	~Gachv	raw consist.	PRI consist.	SYM consist.
1	1	0	0	1	0	0	1	1	1.00	1.00	1.00
0	0	1	1	0	1	0	1	1	1.00	1.00	1.00
0	0	0	0	1	0	1	1	1	1.00	1.00	1.00
0	0	1	1	1	0	1	1	1	1.00	1.00	1.00
0	1	1	1	1	1	1	1	1	1.00	1.00	1.00
0	0	0	1	1	1	1	2	1	0.85	0.50	0.50
0	0	0	1	1	0	0	1	1	0.83	0.00	0.00
0	0	1	1	1	0	0	1	1	0.83	0.00	0.00
0	1	1	1	1	0	1	1	1	0.83	0.00	0.00
1	0	0	1	1	0	0	1	0	0.74	0.00	0.00
0	0	0	1	0	1	0	1	0	0.74	0.00	0.00
1	0	1	1	1	0	1	1	0	0.74	0.00	0.00
1	1	1	1	1	1	1	2	0	0.62	0.00	0.00
1	1	1	0	0	1	0	1	0	0.60	0.00	0.00
1	1	1	1	0	1	0	1	0	0.57	0.00	0.00
0	1	1	0	0	1	1	1	0	0.49	0.00	0.00
1	1	0	1	1	1	0	2	0	0.42	0.00	0.00

Consistency cutoff: 0.8



Truth table for occurrence of outcome 3: Substantial contribution to environmental sustainability (EnvSust)

EU supp	NAT supp	SUBNAT supp	Interm NonGov	Citizen Driv Org	Prof Form Org	number	EnvSust	raw consist.	PRI consist.	SYM consist
1	0	0	1	1	0	1	1	1.00	1.00	1.00
1	0	1	1	1	0	1	1	1.00	1.00	1.00
0	1	1	1	1	0	1	1	1.00	1.00	1.00
0	1	1	0	0	1	1	1	1.00	1.00	1.00
1	1	1	0	0	1	1	1	1.00	1.00	1.00
0	0	0	1	0	1	1	1	1.00	1.00	1.00
0	0	0	1	1	1	2	1	0.90	0.50	0.50
0	0	1	1	1	0	2	1	0.89	0.50	0.50
1	1	0	1	1	1	2	1	0.88	0.67	0.67
0	0	0	1	1	0	1	1	0.88	0.51	0.51
1	1	1	1	0	1	1	1	0.86	0.67	0.67
0	1	1	1	1	1	1	1	0.85	0.00	0.00
1	1	1	1	1	1	2	1	0.83	0.50	0.50
1	1	0	0	1	0	1	0	0.66	0.00	0.00
0	0	1	1	0	1	1	0	0.66	0.00	0.00
0	0	0	0	1	0	1	0	0.50	0.00	0.00

Consistency cutoff: 0.8



Complex and Parsimonious solutions

Outcome 1 Substantial contribution to democratisation of energy system

Complex solution: Occurrence of outcome 1 Substantial contribution to democratisation of energy system (DemEngSys)

consistency cutoff: 0.829146

	Raw coverage	Unique coverage	consistency
	-----	-----	-----
~NATsupp*~SUBNATsupp*IntermNonGov*~ProfFormOrg*~DecEnGov	0.23	0.06	1.00
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg	0.26	0.12	0.81
~NATsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov	0.18	0.03	1.00
EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*~DecEnGov	0.26	0.03	0.90
EUsupp*NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov	0.26	0.03	0.75
~EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*DecEnGov	0.20	0.03	0.87
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg	0.26	0.03	1.00
~EUsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov	0.21	0.03	1.00
EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg	0.35	0.06	0.92

solution coverage: 0.883598

solution consistency: 0.831535

~NATsupp*~SUBNATsupp*IntermNonGov*~ProfFormOrg*~DecEnGov: CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster

~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg: BürgerEnergieBerlin, SoLocalEnergy, TreeDependent

~NATsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov: TrégorEnerg'éthiques, Goiener

EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*~DecEnGov: Nagypáli,therenewableenergyvillage, EnergyTransitionofCityofBurgas

EUsupp*NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov: AranIslandsEnergyCooperative, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative





~EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*DecEnGov: ReindonkEnergy, DrechtstedenEnergy
 ~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg: TrégorEnerg'éthiques, Cargonomia
 ~EUsupp*SUBNATsupp*IntermNonGov*~ProfFormOrg*DecEnGov: TrégorEnerg'éthiques, Laborda.Housingcooperativeintransferofuse
 EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg: HydroElectricityOurtheandSambre, Nagypáli,therenewableenergyvillage, WeertEnergy

Parsimonious solution: Occurrence of outcome 1 Substantial contribution to democratisation of energy system (DemEngSys)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
IntermNonGov*~ProfFormOrg	0.56	0.15	0.95
~SUBNATsupp*IntermNonGov	0.53	0.09	0.78
NATsupp*ProfFormOrg	0.53	0.21	0.78

solution coverage: 0.942

solution consistency: 0.78

IntermNonGov*~ProfFormOrg: Cargonomia, TrégorEnerg'éthiques, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, Laborda.Housingcooperativeintransferofuse, Goiener
 ~SUBNATsupp*IntermNonGov: TreeDependent, BürgerEnergieBerlin, SoLocalEnergy, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative
 NATsupp*ProfFormOrg: AranIslandsEnergyCooperative, DrechtstedenEnergy, HydroElectricityOurtheandSambre, EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative, WeertEnergy, ReindonkEnergy



Complex solution: Non-occurrence of outcome 1 Substantial contribution to democratisation of energy system (~DemEngSys)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency
	-----	-----	-----
~EUsupp*~NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov	0.27	0.19	1.00
EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*~DecEnGov	0.34	0.00	0.90
EUsupp*NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov	0.38	0.04	0.83
~EUsupp*~NATsupp*~SUBNATsupp*~IntermNonGov*~ProfFormOrg*DecEnGov	0.12	0.08	1.00
EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*~ProfFormOrg*~DecEnGov	0.12	0.08	1.00
~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg*DecEnGov	0.23	0.12	0.86

solution coverage: 0.885

solution consistency: 0.851

~EUsupp*~NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov: Biomassbriquettesprogramme(fortheenergypoor), TreeDependent

EUsupp*NATsupp*SUBNATsupp*ProfFormOrg*~DecEnGov: Nagypáli,therenewableenergyvillage, EnergyTransitionofCityofBurgas

EUsupp*NATsupp*IntermNonGov*ProfFormOrg*~DecEnGov: AranIslandsEnergyCooperative, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative

~EUsupp*~NATsupp*~SUBNATsupp*~IntermNonGov*~ProfFormOrg*DecEnGov: Couso'sproject

EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*~ProfFormOrg*~DecEnGov: GalwayEnergyCo-opertive

~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg*DecEnGov: ReindonkEnergy

Parsimonious solution: Non-occurrence of outcome 1 Substantial contribution to democratisation of energy system (~DemEngSys)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency
ProfFormOrg*~DecEnGov	0.65	0.31	0.77
~IntermNonGov*~ProfFormOrg	0.31	0.00	1.00
~SUBNATsupp*~IntermNonGov	0.31	0.00	1.00
~EUsupp*NATsupp*IntermNonGov*ProfFormOrg	0.27	0.00	0.88
~EUsupp*SUBNATsupp*IntermNonGov*ProfFormOrg	0.38	0.00	0.83

solution coverage: 0.923

solution consistency: 0.774

- ProfFormOrg*~DecEnGov: TreeDependent, Nagypáli,therenewableenergyvillage, AranIslandsEnergyCooperative, Biomassbriquettesprogramme(fortheenergypoor), EnergyCommunitiesTipperaryCooperative, EnergyTransitionofCityofBurgas
- ~IntermNonGov*~ProfFormOrg: GalwayEnergyCo-opertive, Couso’sproject
- ~SUBNATsupp*~IntermNonGov: GalwayEnergyCo-opertive, Couso’sproject
- ~EUsupp*NATsupp*IntermNonGov*ProfFormOrg: ReindonkEnergy
- ~EUsupp*SUBNATsupp*IntermNonGov*ProfFormOrg: Biomassbriquettesprogramme(fortheenergypoor), ReindonkEnergy



Outcome 2 Comprehensive goal achievement

Complex solution: Occurrence of outcome 2 Comprehensive goal achievement (Gachv)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency

~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov	0.221298	0.056572	1
EUsupp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg*~DecEnGov	0.221298	0.084027	1
~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov	0.138103	0.028286	0.83
NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov	0.276206	0.056572	0.907104
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg*~DecEnGov	0.110649	0.05574	1
~EUsupp*NATsupp*SUBNATsupp*~IntermNonGov*~CitizenDrivOrg*ProfFormOrg*DecEnGov	0.05574	0.028286	1
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov	0.165557	0.083195	0.854077
EUsupp*NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*~DecEnGov	0.193844	0.111481	1
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.220466	0.028286	0.886288
~EUsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov	0.165557	0	0.854077
~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*DecEnGov	0.193012	0	0.87218

solution coverage: 0.89

solution consistency: 0.913

~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov:
 CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster
 EUsupp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg*~DecEnGov:
 EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage
 ~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov:
 TrégorEnerg'éthiques, Goiener
 NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov:
 HydroElectricityOurtheadSambre, WeertEnergy, ReindonkEnergy



D4.3 Qualitative Comparative Analysis to investigate conditions for energy



citizenship outcomes

~EU supp*~NAT supp*~SUBNAT supp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg*~DecEnGov:
TreeDependent
~EU supp*NAT supp*SUBNAT supp*~IntermNonGov*~CitizenDrivOrg*ProfFormOrg*DecEnGov:
DrechtstedenEnergy
~EU supp*~NAT supp*~SUBNAT supp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov:
BürgerEnergieBerlin, SoLocalEnergy
EU supp*NAT supp*~SUBNAT supp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*~DecEnGov:
AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative
~EU supp*~NAT supp*SUBNAT supp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg:
TrégorEnerg'éthiques, Cargonoma
~EU supp*SUBNAT supp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov:
TrégorEnerg'éthiques, Laborda.Housingcooperativeintransferofuse
~EU supp*NAT supp*SUBNAT supp*IntermNonGov*CitizenDrivOrg*DecEnGov:
ReindonkEnergy, Laborda.Housingcooperativeintransferofuse



Parsimonious solution: Occurrence of outcome 2 Comprehensive goal achievement (Gachv)

consistency cutoff: 0.795

	raw coverage	unique coverage	consistency
-----	-----	-----	
~SUBNATsupp*IntermNonGov	0.55	0.03	0.87
IntermNonGov*CitizenDrivOrg	0.83	0.11	0.77
NATsupp*ProfFormOrg	0.55	0.08	0.87

solution coverage: 0.95

solution consistency: 0.76

~SUBNATsupp*IntermNonG: ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative ov: TreeDependent, BürgerEnergieBerlin, SoLocalEnergy, CommunityEnergyProgrammeofFoEHungary, IntermNonGov*CitizenDrivOrg: SoLocalEnergy, Cargonomia, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative, Laborda.Housingcooperativeintransferofuse, Goiener, HydroElectricityOurtheandSambre, TrégorEnergy'éthiques, BürgerEnergieBerlin, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, WeertEnergy, ReindonkEnergy NATsupp*ProfFormOrg: AranIslandsEnergyCooperative, DrechtstedenEnergy, HydroElectricityOurtheandSambre, EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative, WeertEnergy, ReindonkEnergy



Complex solution: Non-occurrence of outcome 2 Comprehensive goal achievement (~Gachv)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
	-----	-----	-----
~EUsupp*~NATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov	0.21	0.00	0.71
~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*DecEnGov	0.29	0.13	0.87
~EUsupp*~NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov	0.13	0.08	1.00
EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov	0.13	0.13	1.00
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg*~DecEnGov	0.13	0.04	1.00
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov	0.25	0.13	0.85
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.33	0.04	0.89

solution coverage: 0.835

solution consistency: 0.83

~EUsupp*~NATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov: Cargonomia, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster

~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*DecEnGov: ReindonkEnergy, Laborda.Housingcooperativeintransferofuse

~EUsupp*~NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*DecEnGov: Couso'sproject

EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg*~DecEnGov: GalwayEnergyCo-opertive

~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg*~DecEnGov: Biomassbriquettesprogramme(fortheenergypoor)

~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg*DecEnGov: BürgerEnergieBerlin, SoLocalEnergy

~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg: TrégorEnergy'éthiques, Cargonomia

Parsimonious solution: Non-occurrence of outcome 2 Comprehensive goal achievement (~Gachv)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
	-----	-----	-----
~EUsupp*CitizenDrivOrg	0.75	0.13	0.67
~EUsupp*SUBNATsupp*IntermNonGov	0.58	0.04	0.87
~IntermNonGov*~ProfFormOrg	0.33	0.00	1.00
~SUBNATsupp*~IntermNonGov	0.33	0.00	1.00
NATsupp*~ProfFormOrg	0.33	0.00	0.67
~IntermNonGov*CitizenDrivOrg	0.46	0.04	0.92

solution coverage: 0.959

solution consistency: 0.639

~EUsupp*CitizenDrivOrg: TrégorEnerg'étiques, BürgerEnergieBerlin, SoLocalEnergy, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, ReindonkEnergy, Couso'sproject, Cargonoma, Laborda.Housingcooperativeintransferofuse

~EUsupp*SUBNATsupp*IntermNonGov: TrégorEnerg'étiques, Biomassbriquettesprogramme(fortheenergypoor), ReindonkEnergy, Cargonoma, Laborda.Housingcooperativeintransferofuse

~IntermNonGov*~ProfFormOrg: GalwayEnergyCo-opertive, Couso'sproject

~SUBNATsupp*~IntermNonGov: GalwayEnergyCo-opertive, Couso'sproject

NATsupp*~ProfFormOrg: GalwayEnergyCo-opertive, Laborda.Housingcooperativeintransferofuse

~IntermNonGov*CitizenDrivOrg: GalwayEnergyCo-opertive, Couso'sproject

Outcome 3 Substantial contribution to environmental sustainability

Complex solution: Occurrence of outcome 3 Substantial contribution to environmental sustainability (EnvSust)

consistency cutoff: 0.832

	raw coverage -----	unique coverage -----	consistency -----
~NATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.37	0.16	0.80
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg	0.31	0.16	0.91
NATsupp*SUBNATsupp*~IntermNonGov*~CitizenDrivOrg*ProfFormOrg	0.19	0.03	1.00
~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg	0.22	0.06	0.87
EUsupp*NATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg	0.37	0.06	0.80
EUsupp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg	0.22	0.00	0.88
EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg	0.34	0.00	0.84

solution coverage: 0.938

solution consistency: 0.789

~NATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg: Cargonomia, TrégorEnerg'éthiques, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, Goiener

~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*ProfFormOrg: BürgerEnergieBerlin, SoLocalEnergy, TreeDependent

NATsupp*SUBNATsupp*~IntermNonGov*~CitizenDrivOrg*ProfFormOrg: EnergyTransitionofCityofBurgas:GoingSmartandSustainable, DrechtstedenEnergy

~EUsupp*NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg: ReindonkEnergy, Laborda.Housingcooperativeintransferofuse

EUsupp*NATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg: AranIslandsEnergyCooperative, HydroElectricityOurtheandSambre, EnergyCommunitiesTipperaryCooperative, WeertEnergy

EUsupp*NATsupp*SUBNATsupp*~CitizenDrivOrg*ProfFormOrg: EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage

EUsupp*NATsupp*SUBNATsupp*IntermNonGov*ProfFormOrg: HydroElectricityOurtheandSambre, Nagypáli,therenewableenergyvillage, WeertEnergy



Parsimonious solution: Occurrence of outcome 3 Substantial contribution to environmental sustainability (EnvSust)

consistency cutoff: 0.832

	raw coverage	unique coverage	consistency
	-----	-----	-----
~SUBNATsupp*IntermNonGov	0.59	0.03	0.83
IntermNonGov*CitizenDrivOrg	0.84	0.06	0.69
NATsupp*SUBNATsupp	0.53	0.00	0.77
NATsupp*ProfFormOrg	0.56	0.00	0.78

solution coverage: 0.969

solution consistency: 0.675

~SUBNATsupp*IntermNonGov: TreeDependent, BürgerEnergieBerlin, SoLocalEnergy, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative

IntermNonGov*CitizenDrivOrg: SoLocalEnergy, Cargonomia, AranIslandsEnergyCooperative, EnergyCommunitiesTipperaryCooperative, Laborda.Housingcooperativeintransferofuse, Goiener, HydroElectricityOurtheandSambre, TrégorEnerg'éthiques, BürgerEnergieBerlin, CommunityEnergyProgrammeofFoEHungary, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, WeertEnergy, ReindonkEnergy

NATsupp*SUBNATsupp: DrechststedenEnergy, ReindonkEnergy, HydroElectricityOurtheandSambre, EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage, WeertEnergy, Laborda.Housingcooperativeintransferofuse

NATsupp*ProfFormOrg: AranIslandsEnergyCooperative, DrechststedenEnergy, HydroElectricityOurtheandSambre, EnergyTransitionofCityofBurgas:GoingSmartandSustainable, Nagypáli,therenewableenergyvillage, EnergyCommunitiesTipperaryCooperative, WeertEnergy, ReindonkEnergy

Complex solution: Occurrence of outcome 3 Substantial contribution to environmental sustainability (~EnvSust)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
~EUsupp*~NATsupp*~SUBNATsupp*CitizenDrivOrg*~ProfFormOrg	0.32	0.07	0.90
~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg	0.39	0.14	0.84
~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.32	0.00	0.81
NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg	0.46	0.25	0.87
EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.11	0.07	1.00
~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg	0.11	0.04	1.00
~EUsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg	0.32	0.00	0.81

solution coverage: 0.965

solution consistency: 0.791

- ~EUsupp*~NATsupp*~SUBNATsupp*CitizenDrivOrg*~ProfFormOrg: Couso´sproject, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster
- ~EUsupp*~NATsupp*~SUBNATsupp*IntermNonGov*CitizenDrivOrg: BürgerEnergieBerlin, SoLocalEnergy, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster
- ~NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg: Cargonomia, TrégorEnerg´ethiques, Goiener
- NATsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*ProfFormOrg: HydroElectricityOurtheandSambre, WeertEnergy, ReindonkEnergy
- EUsupp*NATsupp*~SUBNATsupp*~IntermNonGov*CitizenDrivOrg*~ProfFormOrg: GalwayEnergyCo-opertive
- ~EUsupp*~NATsupp*SUBNATsupp*IntermNonGov*~CitizenDrivOrg*ProfFormOrg: Biomassbriquettesprogramme(fortheenergypoor)
- ~EUsupp*SUBNATsupp*IntermNonGov*CitizenDrivOrg*~ProfFormOrg: TrégorEnerg´ethiques, Cargonomia, Laborda.Housingcooperativeintransferofuse



Parsimonious solution: Non-occurrence of outcome 3 Substantial contribution to environmental sustainability (~EnvSust)

consistency cutoff: 0.829

	raw coverage	unique coverage	consistency
	-----	-----	-----
~EUsupp*CitizenDrivOrg	0.64	0.11	0.67
SUBNATsupp*CitizenDrivOrg	0.71	0.07	0.74
~IntermNonGov*~ProfFormOrg	0.29	0.00	1.00
~SUBNATsupp*~IntermNonGov	0.29	0.00	1.00
NATsupp*~ProfFormOrg	0.36	0.00	0.83
~NATsupp*SUBNATsupp	0.46	0.04	0.81
~IntermNonGov*CitizenDrivOrg	0.39	0.00	0.92

solution coverage: 0.965

solution consistency: 0.657

~EUsupp*CitizenDrivOrg: TrégorEnerg'éthiques, BürgerEnergieBerlin, SoLocalEnergy, ZsuzsannaHojtsy-Keresztény-EnergyNeighbourhoodsenergymaster, ReindonkEnergy, Couso'sproject, Cargonomia, Laborda.Housingcooperativeintransferofuse

SUBNATsupp*CitizenDrivOrg: ReindonkEnergy, Goiener, HydroElectricityOurtheandSambre, TrégorEnerg'éthiques, Cargonomia, WeertEnergy, Laborda.Housingcooperativeintransferofuse

~IntermNonGov*~ProfFormOrg: GalwayEnergyCo-opertive, Couso'sproject

~SUBNATsupp*~IntermNonGov: GalwayEnergyCo-opertive, Couso'sproject

NATsupp*~ProfFormOrg: GalwayEnergyCo-opertive, Laborda.Housingcooperativeintransferofuse

~NATsupp*SUBNATsupp: Cargonomia, Biomassbriquettesprogramme(fortheenergypoor), TrégorEnerg'éthiques, Goiener

~IntermNonGov*CitizenDrivOrg: GalwayEnergyCo-opertive, Couso'sproject