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# Wider learning outcomes of European climate change adaptation projects: A Qualitative Comparative Analysis

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ABSTRACT

Learning in project settings may contribute to a societal transition when learning outcomes become situated in organizations or networks that are external to the project. This paper examines to what extent and under which conditions European cooperation projects contribute to such wider learning outcomes. Learning outcomes are assessed using five progressing stages of knowledge utilization. We use fuzzy-set Qualitative Comparative Analysis to determine how seven potentially relevant conditions influence learning outcomes. From the systematic comparison of 30 cases (i.e. organizations who participated in seven selected projects) we conclude that, on the short-term, there is no relation between high levels of project-internal learning and wider learning outcomes. For wider learning outcomes to occur, a project needs to be aligned with formal policy processes. When "policy agenda alignment" is present, "motivation", "external actor involvement" and "project knowledge and communication" are sufficient for the use of project knowledge by external actors.

## 1. Introduction

With the impacts of climate change becoming increasingly visible, nations around the world are increasing their efforts to adapt to climate change. Climate change adaptation refers to "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (Parry et al., 2007, p. 869). The geographic focus of this paper is on Europe where we have seen a rapid increase in the number of adaptation strategies and plans in recent years (see: climate-adapt.eea.eu). In this paper, we aim to identify the conditions under which international cooperation projects may promote or accelerate a transition towards a so-called "well-adapting society" (Tompkins et al., 2010). In doing so, we focus on the wider learning outcomes of adaptation-oriented European (EU) cooperation projects in the water sector.

EU cooperation projects are subsidized research or demonstration projects that bring together partners from diverse organizations and countries around a common goal. They often aim at testing innovative approaches and generating new knowledge through pilot or demonstration projects (Böhme, 2005). EU cooperation projects are, like e.g. pilot projects, connected to and yet also positioned at a distance from formal policy processes (van Popering-Verkerk and van Buuren, 2017; Vreugdenhil et al., 2010). This implies that they provide a protective space, a niche, where actors can experiment and learn about an innovative approach or method (Smith and Raven, 2012). Learning in niches and the embedding of these learning outcomes can stimulate a transition (van Mierlo, 2012). A transition refers here to a major transformation in the way societal functions, such as water management, transport, energy or housing, are fulfilled (Geels, 2002). Such a transition is a change process that typically spans one or more generations. It involves a set

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of connected, mutually reinforcing changes in different areas, including changes in social values, infrastructure and institutions (Rotmans et al., 2001).

Transition scholars have repeatedly stressed the importance of (social) learning (cf. Bos et al., 2013; Loorbach, 2010; Luederitz et al., 2016; Smith, 2007). Especially in the early phases of a (potential) transition, experimentation and learning (including cross-disciplinary and inter-organizational exchange of knowledge and experiences) may contribute to a transition since they may generate trust in new technologies and collaborations (Rijke et al., 2013). For experimentation and learning to contribute to a transition, second-order learning, which involves the questioning of values and assumptions, is often expected to be necessary (Smith, 2007). Yet, studies that systemically examine the relation between: (a) the setting and learning outcomes of relatively protected projects; and (b) wider learning outcomes that may contribute to a transition, are lacking.

To address this gap, we examine: To what extent and under which conditions do EU cooperation projects on climate change adaptation contribute to wider learning outcomes? We assert that wider learning outcomes occur when new knowledge or insights that were acquired by project participants are disseminated (replicated at or spread to other locations) or scaled up (institutionally or geographically; Vreugdenhil et al., 2009). To answer this question, we start out from literature that perceives social learning as a multiscale process where learning by actors through their interactions may lead to changes in the wider management or governance regime or other societal systems (Pahl-Wostl et al., 2007; Reed et al., 2010). We specifically focus on the conditions under which learning outcomes become situated in so-called “wider social units” (Reed et al., 2010). In doing so, we limit ourselves to knowledge utilization by external actors, i.e. organizations and networks that did not have a formal role in the project under study.

To answer our research question, we use Qualitative Comparative Analysis (QCA) as our research approach and method. QCA is a set-theoretic approach that facilitates the identification of conditions (and combinations thereof) that are necessary or sufficient for an outcome to occur. We reviewed the literature on social, organizational, network and societal learning as well as knowledge utilization, diffusion and transitions and identified seven conditions that are potentially relevant to wider learning outcomes. We used this conceptual model to systemically compare 30 cases. All our cases are partner organizations that participated in an EU co-operation project that was completed between 2011 and 2014 and focused on climate change adaptation in the water sector.

By systemically comparing wider learning outcomes and the conditions under which these outcomes occur, this paper adds in several ways to the field of transition studies. Firstly, it clarifies the relation between learning in relatively protected niche environments of subsidized pilot or research projects and societal learning and transition processes. This is important knowledge for those involved in the design, implementation and evaluation of these processes. Secondly, it shows the relevance and applicability of comparative research designs to a field where methods for systemic comparison, such as QCA, are perceived as promising and yet hardly applied (cf. Köhler et al., 2017, p. 46). Thirdly, by integrating insights from the literature on social learning and knowledge utilization, we add to existing studies on strategic niche management, which tend to focus on niche-regime interactions (cf. Raven et al., 2008; Smith, 2007; Smith and Raven, 2012) rather than the actual uptake of learning outcomes.

The remainder of this paper is structured as follows. Section 2 introduces European cooperation projects and the learning that may occur in these projects and elaborates our conceptual framework. Section 3 presents our research approach and methods. Section 4 presents the case study results. The last section discusses these results and provides our main conclusions. The appendix provides background information on QCA as well as further details about our assessment framework, case selection, the comparative analysis and results.

## 2. Theoretical concepts and conceptual model

### 2.1. Learning in and from European cooperation projects

Experimentation and learning plays an important role in EU cooperation projects (Böhme, 2005; Hachmann, 2008). They are different from routine projects since they involve actors and activities that are different from the normal or regular tasks of project partners (cf. Colomb, 2007). We therefore assert that they can be seen as attempts to “influence, facilitate, stimulate and organize processes that contribute to [a] transition” (Van der Brugge and Rotmans, 2007, p. 252). Previous studies have shown that EU cooperation projects may contribute to achieving structural change, for example, by changing policies as well as the way policy concepts are understood and conceptualized (Colomb, 2007) and by promoting the exchange of knowledge, strategies and policies across regions as well as across governance levels (Hachmann, 2011). Thus, projects may benefit participants and partner organizations (direct beneficiaries) as well as a large number of individuals, organizations, inter-organizational groups, policy networks and communities in the ‘outside world’ (INTERREG IVC, 2013; Valkering et al., 2013).

To understand the conditions influencing wider learning outcomes of EU cooperation projects, we start out from the literature on social learning in natural resources management. Over the past decades, diverse research perspectives on social learning have been developed, with some researchers focusing on individuals as unit of analysis and others using multi-actor networks or social-ecological systems as unit of analysis (Rodela, 2011). In our view, the learning by actors inside as well as outside an interaction process are important when assessing social learning (Webler et al., 1995). In line with the widely cited definition by Reed et al. (2010), we assert that social learning may occur when actors engage in social interactions and processes. Social learning involves a change in understanding in the individuals involved as well as the diffusion and integration of these changes in so-called “wider social units”. This paper aims to explain the latter outcome of social learning, i.e. degree to which project knowledge, according project participants, is disseminated to and used by wider social units. Our focus is on knowledge utilization by wider social units that were external to the project, i.e. organizations or networks that were not participant or partner in the project under study (see Fig. 1).

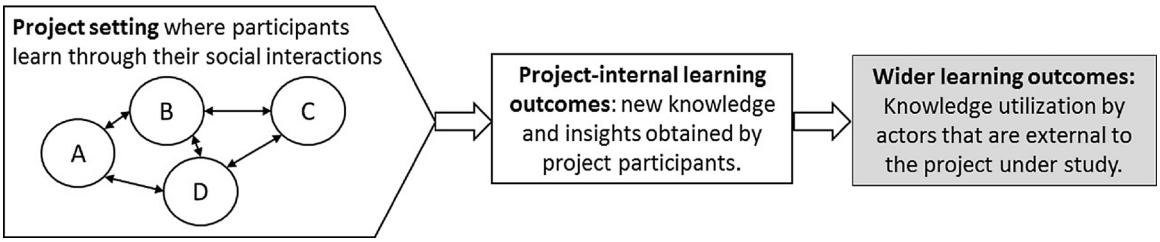


**Fig. 1.** Visualization of two different social learning outcomes of a project setting. This papers' focus is on explaining the degree to which wider learning outcomes occur (the grey-coloured box).

### *2.2. Wider learning outcomes*

For project-internal learning to have an impact, it is crucial that what has been learned is shared with other individuals, organizations or networks and used to change shared policies or practices (Colomb, 2007). These wider learning outcomes can be achieved when project-internal learning outcomes become situated in wider social units, for example, through interaction, communication or diffusion of what has been learned (Reed et al., 2010). These units can be groups, organizations, inter-organizational networks or communities (Diduck, 2010). Learning by these wider social units has been studied under various headings, including inter-organizational learning (Colomb, 2007), network learning (Newig et al., 2010), policy learning (Huitema et al., 2010; Huntjens et al., 2011) or societal learning (Diduck, 2010). Inspired by these literature streams, we assert that wider learning outcomes can be reflected in changes in, for example, organizational culture, policies and practices (Wolman and Page, 2002), institutional and relation structures (Newig et al., 2010) and informal and formal institutions, including social norms and values, policies and laws (Diduck, 2010).

For the assessment of wider learning outcomes, we adopt a knowledge utilization perspective. Knowledge utilization measures focus on one possible impact of learning (cf. Crona and Parker, 2012). In this paper, this is the extent to which lessons learned by project participants are used to improve adaptation policies or practices in their respective regions. In doing so, we neglect other effects that are possibly relevant, such as, the emergence of generic lessons for an emerging niche trajectory (cf. Raven et al., 2008) or the extent to which lessons learned lead to a general shift in viewpoints, restructuring of knowledge or enhanced trust (cf. Baird et al., 2014). Our focus on knowledge utilization has two major advantages. First, it draws attention to a learning effect that is of great interest, i.e. the actual use of new knowledge and insights. Second, a well-established tool exists for the systematic measurement of knowledge utilization (Crona and Parker, 2012).

Our measurement tool is derived from a model of knowledge utilization that was developed by Knott and Wildavsky (1980). The model is based on the assertion that utilization can be conceptualized as a process consisting of multiple, progressing stages. Each stage is a link in the "chain of knowledge utilization" (Knott and Wildavsky, 1980). This model has been translated into measurement tools that assess the degree of knowledge utilization from the perspective of the knowledge source (Landry et al., 2001, 2007) or the knowledge receiver (Crona and Parker, 2012). We adapted these measurement tools to assess knowledge utilization from the perspective of the knowledge provider or source. This implies that we assess the degree to which new knowledge and insights obtained by project participants (project-internal learning) have been disseminated to and, according to project partners, taken up and used by wider social units. For our overall assessment of wider learning outcomes, we distinguish between five progressing stages of knowledge utilization (see Table 1): (1) transmit; (2) present; (3) interact; (4) influence; and (5) implement. For each stage, we developed scoring categories depending on the frequency and width of activities (see Appendix A.2). The stages are partly overlapping, e.g., when knowledge has been presented it has also been transmitted. Only when concrete evidence can be provided of a link between the project and a utilization activity, an activity is counted as contributing to wider learning outcomes.

**Table 1**
Our understanding of five progressing stages of knowledge utilization, including concrete examples.
Adapted from Landry et al. (2007).

| Stage: | Assessment of utilization stage as the degree to which: | Example(s) of activity: |
|---|---|---|
| 1 Transmit | Participants shared project knowledge with external actors. | Dissemination of brochure, policy brief, scientific publication. |
| 2 Present | Participants provided tailor-made project-related presentations for external actors. | Project presentation at a scientific conference or in an inter-organizational working group. |
| 3 Interact | Participants discussed or interacted about project knowledge with external actors. | Project knowledge was discussed in a roundtable meeting or workshop. |
| 4 Influence | Project knowledge influenced the policies or practices of external actors. | Project knowledge informed a (new) approach or method. |
| 5 Implement | External actors used or applied project knowledge to change policies or practices. | Project knowledge led to changes in regional spatial planning policy. |

**Table 2**
Overview of potentially relevant conditions, including references to literature.

| Condition | This condition is highly supportive of wider learning outcomes when: |
|---|---|
| Project-internal learning | Participants acquired new substantive and/or relational understandings, knowledge and skills that are relevant to understanding, planning and implementing climate change adaptation as a result of the cooperation project (Hachmann, 2013; Moser and Ekstrom, 2010; Newig et al., 2010; Pahl-Wostl, 2009; Pahl-Wostl et al., 2007; Scholz et al., 2013; Van der Wal et al., 2014; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010) |
| Ability | Participants and the partner organizations knew who the relevant external actors are and have the position to influence them, i.e. have resources, legitimacy, strength, capacity and strong horizontal and vertical network relations (Cots et al., 2009; Crona and Parker, 2012; Meijerink and Huitema, 2010; Perkmann, 2007; Van Wijk et al., 2008). |
| Motivation | The partner deliberately designed actions to include or enhance wider knowledge transfer, and participants were willing to invest time and resources to engage external actors and to transfer knowledge to them (Kingdon, 1984; Szulanski, 1996) |
| Opportunity | During the project, concrete opportunities arose to transfer knowledge, e.g. within the context of structural cooperation in networks or external events or developments (Meijerink and Huitema, 2010). |
| External actor involvement | Relevant external actors (i.e., potential users, policymakers, decision-makers, informal networks) were actively engaged in the project, amongst other things, to connect formal and informal policy processes and networks (Edelenbos et al., 2008; Meijerink and Huitema, 2010; Pahl-Wostl, 2009; Vinke-de Kruijf, 2013) |
| Policy agenda alignment | The process and its results came at the right time since the theme was high on the policy or political agenda of relevant external actors (INTERREG IVC, 2013; van Mierlo, 2012; Vreugdenhil et al., 2010). |
| Project knowledge and communication | Project knowledge is available, accessible and relevant to external actors in other regions, the strategy to communicate and disseminate this knowledge has been developed at an early stage of the project and was specific and engaging partners, and diffusion activities were pursued throughout the project duration (INTERREG IVC, 2013; Szulanski, 1996; van Mierlo, 2012; Vinke-de Kruijf, 2013; Vreugdenhil et al., 2010). |

### 2.3. Potentially relevant conditions

To identify potentially relevant conditions, we conducted a review of the literature dealing with European cooperation projects, international policy and knowledge transfer, learning processes and transitions in water resources management. We then also reviewed the literature dealing with specific types of learning (i.e., including social, network, societal, organizational, policy and inter-organizational learning) and knowledge utilization. On the basis of this review, we selected seven conditions that may influence wider learning outcomes (see Table 2 and Appendix A.2).

From the literature on transnational cooperation (Böhme, 2005; Colomb, 2007) and social learning (Pahl-Wostl et al., 2007; Reed et al., 2010) we take that wider learning outcomes result from *project-internal learning*. In a project setting, participants may learn about substantive aspects (the system and problem(s) under concern and potential solutions) as well as relational aspects (relevant actors and social structures). The extent to which participants learn is assessed by looking at the degree to which participants acquired new knowledge, insights and capacities regarding these substantive and/or relational aspects. The highest possible level of learning (see Appendix A.2) is associated with double-loop learning, i.e. reframing and reflecting on goals and system boundaries and questioning established rules and practices. Moderately low learning is associated with single-loop learning, i.e. incremental changes to existing knowledge or insights (Pahl-Wostl, 2009; Pahl-Wostl et al., 2007).

To understand how individuals and organizations may influence wider change processes, we build upon studies that examined the role of policy entrepreneurs in water management transitions (Meijerink and Huitema, 2010). While individuals and organizations cannot manage or control policy change, they can influence transition processes by acting as change agents. What characterizes successful policy entrepreneurs is that they are willing to invest resources in a particular proposal for policy change over a longer period of time and possess good networking skills. They are basically able to anticipate, recognize and make use of opportunities when they arise, for example, by strategic framing of disasters or problems, developing and testing alternatives (e.g. in pilot projects), building coalitions and connecting formal and informal networks (Huitema and Meijerink, 2010; Meijerink and Huitema, 2010). A study on cross-border organizations confirms that policy entrepreneurship depends on an organizations' ability to build coalitions, both vertically and horizontally and further stresses the importance of organizational, technical and communication skills (Cots et al., 2009). We connect these characteristics of policy entrepreneurs to three conditions for knowledge transfer: *motivation, opportunity* and *ability* (Argote et al., 2003). Given the need to build coalitions and connect networks, we further include *external actor involvement* as a potentially relevant condition (cf. Edelenbos et al., 2008; Vinke-de Kruijf, 2013).

From studies on transitions (van Mierlo, 2012), transformative change (Pahl-Wostl et al., 2013) and pilot projects (Vreugdenhil et al., 2010), we take the need for adequate *policy agenda alignment*. For project-based learning outcomes to be relevant, they need to be linked to formal policy processes (Pahl-Wostl et al., 2013). Results of a highly innovative project are less likely to be adopted and implemented on the short term as structural changes may be required first (van Mierlo, 2012). Along similar lines, research shows that when knowledge does not fit with existing institutions, a project is more likely to lead to an impasse (Vreugdenhil et al., 2010).

Lastly, various aspects of *project knowledge and communication* are stressed in studies on pilot projects (Vreugdenhil et al., 2010), knowledge transfer (Van Wijk et al., 2008) and transnational cooperation (INTERREG IVC, 2013). For knowledge to be relevant to project-external actors, it should be communicated in an understandable manner (Van Wijk et al., 2008). One of the issues may be that knowledge is too specific to be relevant to other regions or projects. The impact of a project may also be limited because of a wait-and-see-attitude with regard to diffusion (Vreugdenhil, 2010). Diffusion benefits from having a communication and

dissemination strategy in an early stage of the project. To be effective, the strategy should be specific about what is target audience and how to engage them or obtain their commitment (Vinke-de Kruijf, 2013). When various partner organizations of a project are given a role in diffusion, it is more likely to be effective (INTERREG IVC, 2013).

## 3. Research approach and methods

### 3.1. An introduction of Qualitative Comparative Analysis (QCA)

To answer our research question, we use QCA as approach and method. We selected this method since it helps to systemically compare a larger number of cases (e.g. between 20 and 50) while doing justice to within-case complexity. QCA combines key strengths of case-oriented, qualitative approaches that aim at understanding individual cases and variable-oriented, quantitative approaches that aim to find patterns across cases (Rihoux, 2006). QCA is a set-theoretic method that aims to identify set relations rather than correlational relations. Set-theoretic methods can help to unravel causally complex patterns. Causal complexity entails: (1) equifinality, i.e. different paths may lead to the same outcome, (2) conjunctural causation, i.e. a condition may have an effect on the outcome only in combination with further conditions, and (3) asymmetric causation, i.e. the explanation of an outcome (e.g. presence of learning) does not allow deriving the explanation of its negation (e.g. absence of learning), but both require separate analyses (Schneider and Wagemann, 2012). We use QCA since we believe that causal complexity allows a more realistic description of many social phenomena than correlations do.

With the help of computer software, QCA allows a researcher to identify paths (i.e. conditions or combinations thereof) that are necessary or sufficient for an outcome to occur. A condition (or path) is necessary for the outcome when it is always present when the outcome is present. Thus, a statement of necessity applies to a condition for which all cases score higher on this specific condition than they score on the outcome. A condition (or path) is sufficient when the outcome is always present when a specific condition occurs. For the analysis of sufficiency, every case is assigned to an ideal-typical configuration in a truth table. To assess the relationships of necessity and sufficiency several parameters are used. Consistency parameters describe to what extent the empirical data are actually in line with the definitions of necessity and sufficiency, respectively. In the assessment of sufficiency, consistency is an expression for the degree to which an empirical case deviates from the ideal-typical configuration it is assigned to in the truth table. With respect to necessity, parameters of coverage and relevance describe how far a condition or path can also be found in cases without the outcome and may therefore be regarded as trivial. For sufficiency, coverage parameters describe how much of the outcome can be explained through a condition, path or entire solution term (Schneider and Wagemann, 2012). Appendix A.1 provides more information on these parameters.

QCA allows the researcher to study what conditions and combinations thereof are related to a certain outcome in terms of necessity or sufficiency. The underlying mechanisms, i.e. how conditions and their interplay bring about the outcome, remains subject to the interpretation of the researcher.

### 3.2. Unit of analysis and case study selection

In this study, we assess wider learning outcomes from the perspective of the persons who were actively involved in an EU project and, as a result, may have obtained new knowledge and insights and perhaps also disseminated these. Our unit of analysis (a case) is the partner organization that was represented in the project. In the selection of projects and partners, we tried to achieve a balance between similarity and diversity in terms of project design, learning orientation, funding programme, country, organization type, number of partners and so on (a detailed description of the selection process is provided in REF removed for double-blind review). Cases were selected from seven EU cooperation projects that were completed in the period between 2011 and end-2014. All projects aimed at improved water management in the context of climate change. Four projects were implemented with financial support of INTERREG IVB programmes (Northwest Europe, Southeast Europe and North Sea), two with support of the INTERREG IVC programme for interregional cooperation and one with support of the FP7 cooperation programme for environment. We collected data for two to six partner organizations per project. Our final selection includes 30 cases from 13 different countries and different types of organizations, including knowledge institutes, municipalities, national and regional agencies and authorities (see Table 3).

### 3.3. Data collection and processing

This study is part of larger comparative study (KNOW2ADAPT) into the learning outcomes of EU cooperation projects (cf. Vinke-de Kruijf, 2018; Vinke-de Kruijf and Pahl-Wostl, 2016). For the work that is presented here we collected data about the relevant conditions and wider learning outcomes through document analysis and semi-structured interviews. Data were collected by the first author (for 5 projects) and by a master student (for 2 projects) in 2015 and 2016. The master student used the same framework as the first author. Both researchers had extensive discussions about the framework, case study results and scores and, if needed, adapted their findings to ensure that they assessed the indicators that measure the conditions and outcome in the same way.

The collection of case study data was guided by a case study description template consisting of four parts: (1) general project description; (2) project-specific conditions; (3) partner-specific conditions; and (4) learning outcomes. Detailed information on the framework and questions is provided in a research report (Vinke-de Kruijf, 2015) and a previous publication (Vinke-de Kruijf and Pahl-Wostl, 2016). The document analysis focused on project documents (e.g. meeting, progress and output reports) and other relevant (online) documents. In addition, semi-structured interviews were conducted with 7 project coordinators of the lead partners

**Table 3**
Overview and background information of selected projects and cases.

| Project ID | Funding programme | Project partners (consortium) | Overall aim of the project | Selected cases (no., organization types, countries) |
|---|---|---|---|---|
| 1 | INTERREG IVB South East | 12 national, regional, local, management authorities, knowledge institutes (+5 observers) | Mitigate vulnerability of drinking water resources | 4: national authorities, knowledge institutes (AT, SLO, HU, SRB) |
| 2 | INTERREG IVB North West | 15 national, local, management authorities | Improve the resilience of urban areas to flood risks | 4: national, local semi-public authorities, knowledge institute (NL, BE, UK, DE) |
| 3 | INTERREG IVB North Sea | 15 local, regional, national authorities, knowledge institutes | Support implementation of local urban flood risk management measures | 6: municipalities, knowledge institutes (NL, NO, UK) |
| 4 | FP7 Environment | 25 knowledge institutes | Improved understanding and management of freshwater ecosystems | 4: knowledge institutes (UK, GR, EST) |
| 5 | INTERREG IVC | 11 local, regional, management authorities, knowledge institutes | Improve capacity for developing new lakes and wetlands | 2: municipality, knowledge institute (NL, HU) |
| 6 | INTERREG IVB North West | 6 regional (water) authorities | Prepare regional water systems for potential impacts of climate change | 6: regional authorities (NL, DE, BE, FR, UK) |
| 7 | INTERREG IVC | 14 national, regional, management authorities | Improve water management in times of droughts and water scarcity | 4: regional authorities, NGO (DE, HU, RO, NL) |

and with 25 persons that were actively involved in the project as participant. All respondents were asked to answer the questions on behalf of their organization. This implies that they were asked to report not only on themselves but also on colleagues that played a role in the dissemination of project knowledge. Interviews were conducted in Dutch (native language of the researchers) or in English and typically lasted 1–1.5 h. On the basis of the document analysis and audio-recordings of the interviews, we prepared for each case a qualitative description of how this partner organization "scores" on our indicators. These descriptions were send back to respondents for verification. We received clarifications and additional remarks from the majority of the respondents. We collected partner-specific data for 30 partners, including 6 lead partners.

Our assessments of conditions and outcomes are based on information provided by project participants and documents. Both project-internal and wider learning outcomes were assessed on the basis of self-reported information. This information was verified, as often as possible, with documented information. For example, if a respondent argued that project knowledge did have an influence on a certain policy process, we actively searched for an indication of this influence in relevant policy documents. We did so since we expected that participants would overestimate the influence of their project. In some cases, we could indeed not find any supporting evidence and therefore decided to exclude a reported influence from our assessment. However, we regularly also came across evidence which indicated that participants underestimated the influence of their project. Participants had sometimes already forgotten about certain activities and obviously were only aware of knowledge utilization activities they were actively involved in or informed about. A similar approach was followed for the assessment of project-internal learning outcomes and other potentially relevant conditions (see Appendix A.2). Compared to an in-depth study, our assessment certainly provides a less complete picture of wider learning outcomes. However, we have no indication that our assessment provides consistently higher or lower values. What is more important is that we used the same questions and methods to analyse all cases. The study therefore serves the purpose of a systematic comparison.

In order to systemically compare cases using methods and software for QCA (see below), we developed a scoring method consisting of classification rules that determine for each indicator how the qualitative description is transformed into numerical values. In doing so, we took fuzzy-set QCA (fsQCA) as a starting-point. While in the original crisp-set variant of QCA, conditions are either present (value of 1) or absent (value of 0), in fsQCA conditions can also be partly present or absent. This variant of QCA was developed in response to critiques on crisp-set QCA. It acknowledges that cases generally correspond to different degrees to an ideal-typical condition or outcome (Schneider and Wagemann, 2012). In our scoring method, we distinguish between four values with 0 being the lowest score, 0.3 a moderately low score, 0.7 a moderately high score and 1 the highest score. The resulting data matrix is provided in Table 4.

Most of the conditions are assessed using a single indicator. For the assessment of the conditions "project-internal learning outcomes" and "project knowledge and communication", the overall score is based on multiple indicators. For "project-internal learning outcomes", the score is calculated by taking the aggregated scores of two indicators: substantive and relational learning. As we assumed that both are partly complementary, the overall score on project-internal learning is calculated by adding the maximum score of substantive and relational learning and their arithmetic mean and dividing this by two. For "project knowledge and communication" we took the average score of six indicators: three indicators for the projects' communication strategy (proactive, specific and engaging) and three for knowledge characteristics (available, accessible and relevant). For the assessment of wider learning outcomes, we used five levels of knowledge utilization as indicators: transmit, present, interact, influence, implement. As suggested in the literature, we calculated the overall outcome value by taking the weighted average of the respective scores for each stage (see e.g. Crona and Parker, 2011; Landry et al., 2001). In doing so, the score for the lowest applicable level of knowledge utilization (i.e. transfer) is multiplied by 1, the second-lowest level (i.e. present) by 2 and so on (see Appendix A.2 for more information on the indicators and scores).

### 3.4. Data analysis

We analyzed our data using formulas and software for fsQCA (see Schneider and Wagemann, 2012). Our general expectation was that the presence of potentially relevant conditions (see Table 2) is supportive of learning, whereas the absence of these conditions is restrictive. Prior to the actual comparative analysis, we visually inspected the data matrix (Table 4) to verify whether there was a need to refine or expand our conceptual model, to adjust how data were calibrated or to add or drop cases (Rihoux and Lobe, 2009). From this visual inspection we concluded that there was no need to adjust how data were calibrated (cases are sufficiently diverse) or to add project, country, or organization-specific conditions (cases of the same project, country or organization are sufficiently diverse). An iterative process of going back and forth between preliminary QCA results and data led us to drop six cases (all project 7 cases and case IDs 34 and 35) from the QCA. These cases and their exclusion are explained in a qualitative way in Section 4.1 and Appendix A.3.

For the systemic comparison of the remaining 24 cases, we used the QCA package (version 2.5, released 9 November 2016, see: Dusa, 2007) of a software package called R (Version 3.3.2, released 31 October 2016, see: Thiem and Dusa, 2013). We first investigated what (combinations of) conditions are necessary or sufficient for high learning outcomes to occur. This was followed by an investigation of conditions that are necessary or sufficient for low levels of learning to occur (Schneider and Wagemann, 2012). In this process, cases are assigned an ideal

We applied consistency thresholds as recommended in the literature (see Appendix A.1).

**Table 4**
Data matrix showing how the cases score on the potentially relevant conditions, the outcome indicators and the overall outcome of interest. The first digit of the case ID refers to the project number (see Table 2). Conditions: PL: project-internal learning, AB: ability; MOT: motivation; OPP: opportunity; ACT: external actor involvement; POL: policy agenda alignment; PKC: project knowledge and communication. Outcome indicators: 1: transmit; 2: present; 3: interact; 4: influence; 5: implement (the number refers to the weighting that is applied to assess the outcome); O: outcome (wider learning outcomes). Green colours are used to indicate that a condition or outcome is more present than absent. Red colours indicate that a condition or outcome is more absent than present. The different colour intensities are meant to represent the degree to which a condition or outcomes is absent or present. (For interpretation of the references to colour in this table, the reader is referred to the web version of this article).

| | | | Potentially relevant conditions | | | | | | | Outcome indicators | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Case ID | Organization type | Country | PL | AB | MOT | OPP | ACT | POL | PKC | 1 | 2 | 3 | 4 | 5 | O |
| 11 | National Authority | Austria | 0.60 | 0.70 | 0.70 | 1.00 | 0.70 | 0.70 | 0.37 | 0.70 | 0.70 | 0.70 | 0.70 | 0.00 | **0.47** |
| 12 | Knowledge Institute | Slowakia | 0.60 | 0.70 | 0.70 | 0.70 | 0.70 | 0.30 | 0.37 | 1.00 | 1.00 | 0.70 | 0.00 | 0.00 | **0.34** |
| 13 | National Agency | Hungary | 0.53 | 0.70 | 0.70 | 0.70 | 0.30 | 0.70 | 0.37 | 0.70 | 0.30 | 0.30 | 0.70 | 0.30 | **0.43** |
| 14 | Knowledge Institute | Serbia | 0.23 | 1.00 | 0.30 | 1.00 | 0.30 | 0.70 | 0.37 | 0.70 | 0.70 | 0.00 | 0.00 | 0.00 | **0.14** |
| 21 | National Agency | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.30 | 1.00 | 0.68 | 0.70 | 1.00 | 0.30 | 0.30 | 0.00 | **0.32** |
| 22 | National Agency | Belgium | 0.70 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.68 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | **0.67** |
| 23 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 0.70 | 0.70 | 0.68 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | **0.70** |
| 24 | Semi-public authority | Germany | 0.60 | 0.30 | 0.30 | 1.00 | 0.70 | 1.00 | 0.68 | 1.00 | 1.00 | 0.70 | 0.30 | 0.30 | **0.52** |
| 31 | Municipality | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.80 | 0.70 | 1.00 | 0.70 | 1.00 | 0.70 | **0.82** |
| 32 | Municipality | Norway | 0.70 | 1.00 | 0.70 | 1.00 | 1.00 | 1.00 | 0.80 | 0.70 | 0.70 | 0.70 | 1.00 | 0.00 | **0.55** |
| 33 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.80 | 1.00 | 1.00 | 0.70 | 1.00 | 0.00 | **0.61** |
| 34 | Municipality | UK | 0.60 | 0.70 | 0.00 | 0.70 | 1.00 | 0.70 | 0.80 | 0.30 | 0.00 | 0.30 | 0.30 | 0.00 | **0.16** |
| 35 | Municipality | UK | 0.93 | 0.70 | 0.70 | 0.70 | 1.00 | 0.70 | 0.80 | 0.70 | 0.30 | 0.70 | 0.30 | 0.00 | **0.31** |
| 36 | Knowledge Institute | Netherlands | 0.53 | 1.00 | 0.70 | 0.70 | 1.00 | 1.00 | 0.80 | 1.00 | 1.00 | 0.70 | 1.00 | 0.70 | **0.84** |
| 41 | Knowledge Institute | UK | 0.70 | 0.70 | 1.00 | 1.00 | 0.00 | 0.30 | 0.75 | 1.00 | 1.00 | 0.70 | 0.00 | 0.00 | **0.34** |
| 42 | Knowledge Institute | UK | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 1.00 | 0.75 | 0.70 | 1.00 | 0.70 | 0.70 | 0.30 | **0.61** |
| 43 | Knowledge Institute | Greece | 0.60 | 1.00 | 0.70 | 1.00 | 0.30 | 0.30 | 0.75 | 0.70 | 1.00 | 0.70 | 0.00 | 0.00 | **0.32** |
| 44 | Knowledge Institute | Estonia | 0.53 | 0.70 | 0.30 | 1.00 | 0.70 | 0.70 | 0.75 | 1.00 | 1.00 | 0.70 | 0.70 | 0.00 | **0.53** |
| 51 | Municipality | Netherlands | 0.30 | 0.30 | 0.00 | 0.70 | 0.70 | 0.30 | 0.37 | 0.70 | 0.30 | 0.00 | 0.00 | 0.00 | **0.09** |
| 52 | Knowledge Institute | Hungary | 0.60 | 1.00 | 0.70 | 1.00 | 1.00 | 0.70 | 0.37 | 0.70 | 0.30 | 0.30 | 0.30 | 0.30 | **0.33** |
| 61 | Regional Authority | Netherlands | 0.60 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.43 | 0.70 | 0.00 | 0.70 | 0.70 | 0.00 | **0.37** |
| 62 | Regional Agency | Germany | 0.83 | 0.30 | 0.30 | 0.30 | 0.30 | 0.00 | 0.43 | 0.70 | 0.30 | 0.30 | 0.30 | 0.00 | **0.23** |
| 63 | National Agency | Belgium | 0.70 | 1.00 | 0.30 | 1.00 | 0.70 | 1.00 | 0.43 | 0.70 | 0.70 | 0.70 | 0.30 | 0.00 | **0.36** |
| 64 | Regional Authority | Netherlands | 0.70 | 0.70 | 0.30 | 0.70 | 0.70 | 1.00 | 0.43 | 0.70 | 0.30 | 0.70 | 0.00 | 0.00 | **0.23** |
| 65 | Regional Agency | France | 0.60 | 0.70 | 0.30 | 0.00 | 0.70 | 0.00 | 0.43 | 0.30 | 0.30 | 0.30 | 0.00 | 0.00 | **0.12** |
| 66 | Regional Authority | UK | 0.60 | 0.70 | 1.00 | 1.00 | 0.70 | 1.00 | 0.43 | 1.00 | 0.70 | 0.70 | 0.70 | 0.30 | **0.59** |
| 71 | Regional Authority | Germany | 0.53 | 0.70 | 1.00 | 0.70 | 0.70 | 0.70 | 0.95 | 0.70 | 0.70 | 0.30 | 0.30 | 0.30 | **0.38** |
| 72 | NGO | Hungary | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.95 | 1.00 | 1.00 | 0.70 | 0.30 | 0.00 | **0.42** |
| 73 | Regional Agency | Romania | 0.93 | 0.70 | 1.00 | 1.00 | 0.70 | 0.70 | 0.95 | 1.00 | 0.70 | 0.70 | 0.70 | 0.30 | **0.59** |
| 74 | Regional Authority | Netherlands | 0.70 | 1.00 | 1.00 | 1.00 | 0.70 | 0.70 | 0.95 | 1.00 | 1.00 | 0.70 | 0.70 | 0.00 | **0.53** |

## 4. Case study results and comparative analysis

### *4.1. A qualitative analysis of learning outcomes*

The 30 studied cases have diverse scores on wider learning outcomes: 3 cases score rather high (> 0.7), 9 cases moderately high, 12 cases moderately low and 6 cases low (< 0.3). An example of a case with a high score (0.82) is case 31 (the number refers to the case ID). In this case, new knowledge and insights: (1) were *transmitted* to wide range of regional, national and international actors via knowledge platforms, workshops and conferences; (2) were *presented* at regional workshops and national and international conferences; (3) were discussed at the regional and the national level (*interaction*); (4) *influenced* national and regional policies and best practice documents; and (5) were *implemented* in a national pilot programme. Case 65 is an example of a case with a low score (0.12). Project knowledge was: (1/2) *transmitted* to and *presented* for regional stakeholders; and (3) discussed with local and regional

**Table 5**
Overview of how cases score on various indicators. (0: no activity; 0.3: some activity but only within the context of (regional) project actions; 0.7: activity beyond the project region/context; 1: diverse and/or repeated activity).

| | 0 (low/absent) | 0.3 (limited) | 0.7 (moderate) | 1 (high) |
|---|---|---|---|---|
| Transmit | 0 (0%) | 2 (7%) | 17 (57%) | 11 (37%) |
| Present | 2 (7%) | 7 (23%) | 8 (27%) | 13 (43%) |
| Interact | 2 (7%) | 7 (23%) | 20 (67%) | 1 (3%) |
| Influence | 7 (23%) | 9 (30%) | 9 (30%) | 5 (17%) |
| Implement | 20 (67%) | 7 (23%) | 3 (10%) | 0 (0%) |

stakeholders in dialogue sessions (*interaction*). In this case, all knowledge utilization activities took place within the project. The respondent was not aware of any influence or use beyond the project scope.

When comparing the overall level of activity across cases, case 65 is clearly an exception. Nearly all partners put an effort in transmitting project knowledge to actors inside and outside their project region (see Table 5). To transmit knowledge, about 37% used multiple communication means at different points in time. Most partners also presented and discussed the project results with external actors; about a quarter (23%) only within the context of project actions but the majority of the partners also beyond. The wider influence of projects was diverse. For some cases (e.g. case 43), we did not come across any evidence of an influence. For other cases (e.g. case 31), we found evidence that project knowledge influenced the policies and practices of external actors in several ways. For example, project results were used to inform the development of new drinking water legislation (case 13), the development of a regional development plan (case 11) and had an indirect influence on the regional or national climate change adaptation strategy (e.g. in case 44 the results were used in a review that provided input to the national strategy). In various cases, the project led to cooperation between actors that did not collaborate before (e.g. case 24, 31, 32, 42) and the establishment of new cooperation structures once the project was ended (case 33, 34, 42, 66). Various respondents reported that the project played an important role in raising awareness amongst stakeholders in their regions about climate change (case 62, 73) or about the fact that government cannot always protect inhabitants from flooding (case 63). While the majority of the respondents indicated that this influence did not translate (yet) into implementation, about one third indicated that one or multiple lessons learned in the project led to implementation. For example, the systems for incident and asset recording developed in project 2 were implemented by several local authorities (case 23) and the learning and action alliance approach developed in project 3 were applied in other parts of the world (case 36).

On the basis of a visual inspection of the data matrix and qualitative analysis of the cases, we decided to exclude six cases from the QCA. The reason is that they cannot be explained by our conceptual model and, as a result, complicate the identification of patterns across the remaining cases. The four cases of project 7 score high on all potentially relevant conditions and yet moderate on wider learning outcomes. The most probable reason is that project 7 differs from the other projects: its aim was to exchange and transfer existing knowledge and to identify best practices whereas the other projects aimed to develop strategies or plans and to generate new knowledge through pilot or demonstration projects. Even though partners did not develop new knowledge, project-internal learning outcomes were high as partners learned a lot from each other. To verify whether the transfer versus generation of knowledge indeed influences wider learning outcomes is beyond the scope of this study since this would require adding another condition and more cases. We opt for another solution, which is to drop these cases from the QCA. As a result, it became easier to identify patterns across the remaining cases.

Another case that does not match our expectation is case 35: all conditions are supportive and yet learning outcomes are very limited (score: 0.31). The respondent of this case, a municipality in the UK, explained that the uptake of project knowledge was hampered by a serious lack of capacity and experience at the local level. This restriction directly relates to a recent shift in responsibility for flood risk management from the national to the local and the regional level following elections in 2010 and 2011 (cf. Vink et al., 2015). Case 34 is similar: a municipality in the UK who participated in the same project. This case has a very low score on the outcome (0.16) since wider learning outcomes were hampered by a lack of capacity and experience. Moreover, the respondent was not motivated to transfer knowledge. Both cases indicate that stability of the relevant governance regime might be required to achieve wider learning outcomes (see Appendix A.2).

### *4.2. Conditions producing high wider learning outcomes*

To understand what conditions are necessary or sufficient for wider learning outcomes to occur, we first tested whether the absence or presence of individual conditions or combinations thereof are necessary for wider learning outcomes to occur (see Appendix A.4). Since most cases have a higher score on the individual conditions than on the learning outcome, the statement of necessity is highly consistent ($> 0.9$) with the presence of all individual conditions. To verify whether the statement of necessity indeed applies to all cases, we visually inspected condition-outcome plots for each condition. We found that only for the conditions "opportunity" and "policy agenda alignment" there are no individual cases that contradict the statement of necessity. For the remaining five conditions, we could identify at least one case that clearly contradicts the statement of necessity. For example, while most cases score higher on the condition "project-internal learning outcomes" than on the outcome "wider learning outcomes" there are two cases (31 and 36) that clearly contradict the statement of necessity: while project-internal learning involved more single-loop than double-loop learning (scores were respectively 0.3 and 0.53), wider learning outcomes are high (respectively 0.82 and 0.84).

A further analysis of "opportunity" shows that the necessity of this condition is irrelevant. This has to do with the fact that nearly all partner organizations experienced high opportunity as they were involved in one or more projects at the local, regional, national or European level with a similar focus and/or cooperated on a structural basis with other project-external organizations. We accept the statement of necessity for policy agenda alignment, since we observe clear differences across cases for this condition. In project 6, for example, the policy context was highly unsupportive according to the French and German partners since adaptation to climate change was no on policy and political agendas (yet) whereas the policy context was or became highly supportive in other countries.

Next, we analyzed which conditions are sufficient for wider learning outcomes in the 18 cases where the necessary condition "policy agenda alignment" is moderately high of high. The analysis shows that the parsimonious solution, i.e. the shortest possible solution with the lowest possible number of conditions and logical operators "AND" and "OR" (Schneider and Wagemann, 2012; see the appendix for an explanation of solution types) combines "motivation", "external actor involvement" and "project knowledge and communication" (consistency: 0.91; solution coverage: 0.87). This path towards wider learning outcomes applies to seven cases that belong to three different projects (see Table 6 and Appendix A.6). In all these cases, the overall project had a rather effective dissemination and communication strategy and partner organizations were motivated to transfer knowledge and actively engaged

**Table 6**
Most parsimonious (shortest) solutions for high and low wider learning outcomes (present conditions are written in capital letters, absent conditions are written in lowercase letters), including relevant cases and measures for consistency and coverage. MOT: motivation, ACT: external actor involvement, POL: policy agenda alignment; PKC: project knowledge and communication.

| Score on wider learning outcome: | Sufficient path(s) | Case IDs | Consis-tency | PRI con-sistency | Raw coverage | Unique coverage |
|---|---|---|---|---|---|---|
| High | MOT*ACT*PKC<br>(POL is a necessary condition) | 22, 23, 31, 32, 33, 36, 42 | 0.911 | 0.752 | 0.868 | n.a. |
| Low | act | 13, 14, 21, 41, 43, 62 | 0.925 | 0.809 | 0.577 | 0.079 |
| | pol | 12, 41, 43, 51, 62, 65 | 0.938 | 0.872 | 0.501 | 0.105 |
| | mot *pkc | 14, 51, 62, 63, 64, 65 | 0.991 | 0.975 | 0.516 | 0.068 |
| Low (6 more cases, less stringent thresholds) | act | – | 0.925 | 0.809 | 0.577 | 0.085 |
| | mot | 24, 34 | 0.907 | 0.787 | 0.619 | 0.077 |
| | pkc | 11, 52, 61, 66 | 0.961 | 0.894 | 0.733 | 0.133 |

relevant external actors. High ability is only part of the "longer" conservative and intermediate solutions, which implies that these partner organizations, like many others, were also well-embedded in relevant networks. High "project-internal learning outcomes" is the only condition that is neither necessary nor sufficient for wider learning outcomes to occur.

### *4.3. Conditions producing low wider learning outcomes*

For low learning outcomes, the analysis of necessity shows that none of the potentially relevant conditions is necessary (see Appendix A.5). Next, we conducted two analyses of sufficiency: one with more stringent and one with lower consistency thresholds. When more stringent thresholds are applied, the parsimonious solution reads that one of the following paths may be sufficient for low learning outcomes to occur: "lack of external actor involvement", "lack of policy agenda alignment" or a combination of "lack of motivation" and "lack of project knowledge and communication" (consistency: 0.91; solution coverage: 0.81). This solution covers eleven cases. Several cases are covered by multiple paths, which implies that the unique coverage of a single path is low. When we add expectations about how the conditions may influence learning (i.e. the absence of the conditions lead to the absence of the outcome), the software provides us with five possible paths (consistency: 0.97; solution coverage: 0.77). Each path combines the limited "external actor involvement" or "project knowledge and communication" with low scores on another condition ("motivation", "project-internal learning" or "policy agenda alignment"). Two cases that are covered by multiple paths are, for example, a knowledge institute from Serbia (case 14) and a regional water authority from Germany (case 62). These cases differ in terms of project-internal learning outcomes, opportunity to transfer knowledge and policy agenda alignment. What both cases have in common is that knowledge dissemination and communication at the project level was insufficient and that these partner organizations were not motivated to transfer knowledge (they did not consider this relevant) and failed to engage relevant external actors.

When less stringent thresholds are applied, the test of sufficiency provides a solution for more cases, including cases that score slightly above 0.5 on the outcome. The parsimonious solution now reads that: "lack of external actor involvement" or "lack of policy agenda alignment" or a combination of "lack of motivation" and "lack of project knowledge and communication" is sufficient for low wider learning outcomes (consistency: 0.88; solution coverage: 0.92). None of these paths is unique: seven cases are explained by two or more paths; case 14 and 62 are now even covered by all three paths. Compared to the above presented most parsimonious solution, this solution is less consistent with the statement of sufficiency but covers six more cases. For these six additional cases, learning outcomes are moderate (with scores varying between 0.33 and 0.59). These moderate scores may be produced by a "lack of project knowledge and communication" or by a "lack of motivation" (see Table 6 and Appendix A.6).

The analysis shows that low wider learning outcomes can be explained by various combinations of conditions. Very low learning outcomes ($< 0.3$) only occur when "lack of motivation" is combined with "lack of project knowledge and communication" and one or more other conditions are unsupportive (cases 14, 51, 62, 64 and 65). For two cases, "lack of external actor involvement" alone is sufficient for the moderately low learning (outcome scores of 0.43 and 0.32, cases 13 and 21). Limited "motivation" or "project knowledge and communication" is sufficient for moderate learning (outcome scores varying between 0.33 and 0.59).

## 5. Discussion and conclusions

### *5.1. Explaining wider learning outcomes*

One of the key findings of our QCA is that high "policy agenda alignment" is necessary for wider learning outcomes to occur. This condition was measured by looking at whether the project theme was high on the political and policy agendas of the countries and regions involved. In some cases (e.g. cases 22 and 33), alignment was high since flooding events increased the attention for climate change adaptation. In these cases, alignment was thus related the opening up of so-called "windows of opportunity" (Meijerink and Huitema, 2010). In other cases (e.g. cases 31, 32 and 36), alignment was high because of the growing attention for climate change adaptation at multiple governance levels. Policy agenda alignment is also associated with limited wider learning outcomes. For six cases, a lack of alignment is one of the conditions that is sufficient for limited utilization of project knowledge. In some of these cases,

the projects' institutional environment was unsupportive since the project theme had not really entered policy and political agendas yet (e.g. cases 12, 43, 62, 65). While we have seen a rapid increase in the development and implementation of adaptation plans throughout Europe, there are clear differences across countries in terms of progress made (cf. EEA, 2014). In some of the studied cases, a transition towards a "well-adapting society" (Tompkins et al., 2010) was in a very early phase whereas in other countries a transition was taking off or in the acceleration phase (cf. Rijke et al., 2013).

In the literature, the relation between a niche and its environment is often discussed in terms of compatibility. A niche can be "in tune" with the regime, i.e. fit and conform, or can be demanding structural changes, i.e. stretch and transform (Smith, 2007; Smith and Raven, 2012). On the basis of an in-depth study of the compatibility between a system innovation initiative and its institutional context, Beers and Van Mierlo (2017) identify three modes of alignment: (1) paving the way for change applies to situations where an initiative has a considerable influence on its institutional context; (2) easy ride applies when changes to the institutional context are supportive of the structural changes pursued by the initiative; (3) roadblock applies when the institutional context becomes less supportive of the change that is pursued by the initiative. We clearly recognize two of these modes in our study. Knowledge utilization was an "easy ride" for cases with high alignment since changes of the institutional setting were supportive towards the embedding of project knowledge. In cases where alignment was limited, project knowledge often helped "paving the way for change" by making organizations in the policy network aware of climate change adaptation (e.g. cases 62 and 65). In addition, our study also included cases where some awareness of climate change existed and no change was observed (case 12), cases where the environment became less supportive until a crisis created a window of opportunity (case 66) or where the environment was not really a "roadblock" but also not supportive (cases 41 and 52).

Another key finding is that high policy agenda alignment is insufficient for learning to occur; partner-specific and project-specific conditions also play an important role in achieving high wider learning outcomes. High "motivation" and "external actor involvement" are both associated with high learning outcomes and low scores on these conditions with low learning outcomes. Our research thus confirms that policy entrepreneurs, i.e. actors that are willing to invest resources in a particular proposal for policy change over a longer period of time and possess good networking skills (Huitema and Meijerink, 2010), play an important role in the diffusion of new knowledge and ideas. As "external actor involvement" was associated not only with the involvement of knowledge users but also with creating a connection between the informal learning process and formal policy processes, our study confirms that the diffusion of knowledge from informal settings depends on whether these settings are effectively linked to formal policy processes (Pahl-Wostl et al., 2013). Another relevant condition is "project knowledge and communication". High scores on this condition are associated with high learning outcomes and low scores with limited learning. Projects differ greatly in terms of the attention that was paid to communication and dissemination and the effort that was put into making knowledge accessible, available and relevant to other contexts. While all projects had a basic communication and dissemination strategy, the focus of some projects was much more on internal learning processes whereas in other projects there was a lot of attention for knowledge dissemination. This, in turn, had an effect on what and how knowledge was disseminated by participants and, eventually, also on wider learning outcomes.

Several conditions turned out being less important than expected. Opportunity and ability was high for nearly all cases. If they had low scores, other conditions also had low scores. Hence, they have no influence on wider learning outcomes. More importantly, we could not establish a relation between project-internal learning and wider learning outcomes. Inspired by the literature on social learning and transnational cooperation, we expected that high levels of project-internal learning (which we associated with double-loop learning) would be associated with high wider learning outcomes. However, the two cases that score highest on wider learning outcomes (IDs 31 and 36) have rather low scores on project-internal learning. The most probable explanation is that these partner organizations had been working for a longer period of time on similar projects or initiatives. As a result they did not obtain truly new insights. However, they could still use the project to improve their knowledge the uptake of knowledge in this domain. Our study also includes many cases with high scores on project-internal learning and yet low scores on wider learning outcomes. This finding corresponds with transition studies that underline a policy context may not be ready to absorb learning outcomes that involve the acquisition of truly new insights (cf. van Mierlo, 2012) and that diffusion is less likely for radical innovative niches since they demand many structural regime changes (Smith, 2007). It also implies that the relation between project-internal learning outcomes and the embedding of these learning outcomes is much more complex than presented in Fig. 1 and that previous experiences and alignment both play an important role.

### 5.2. Reflections and limitations on the comparative approach

In transition studies, qualitative case studies prevail, limiting the development of generic insights (Luederitz et al., 2016; Pahl-Wostl and Kranz, 2010). The explanatory power of generic insights might be limited if they do not take into account complexity and the influence of context-specific factors. To overcome the challenge of producing knowledge that is too generic or too context-specific, diagnostic approaches that acknowledge within-case complexity and yet allow for the transfer of insights amongst similar classes of problems and contexts are required (Mollinga and Gondhalekar, 2014; Ostrom, 2007; Pahl-Wostl, 2015; Young, 2013). QCA is an example of an approach that helps to systemically compare cases by going back and forth between theory and cases. Such a systemic comparison is only possible when a selected set of cases displays common background features and yet display variation on the selected conditions and outcome of interest (Berg-Schlosser and De Meur, 2009). The final selection of cases and conditions usually is an iterative process. Also in this study, we had to exclude certain conditions and certain cases. These decisions were informed by case-specific knowledge.

First of all, we decided to exclude four cases of a project that aimed to exchange and transfer existing knowledge. Compared to the other projects, this project did not provide an opportunity to really engage external actors in the creation and production of new knowledge, e.g. by involving them in concrete case studies or pilot projects. Whether projects involved processes to co-produce new knowledge was not measured in the cases but might be a relevant condition. Secondly, we excluded two cases for which the

governance system was changing and the uptake of project knowledge was, according to the respondents, seriously hampered by a lack of capacity and experience at the local level. The decentralization of water management and climate change adaptation also affected other partners from the UK. However, they perceived it differently. Other respondents explained that it led to an increase of attention for climate change and water management at the local and the regional level. In one case (case 66, a regional authority), decentralization in combination with severe floods in 2012 and 2014 had a positive impact on wider learning outcomes. These cases underline that alignment is a dynamic process and draw attention to the absorptive capacity of the project context.

### 5.3. Conclusions

Inspired by the literature on social learning and sustainability transitions, we examined to what extent and under which conditions learning in project environments contribute to a transition towards a well-adapting water sector. Our comparative analysis shows that for wider learning outcomes to occur "policy agenda alignment" is a necessary condition and a combination of "motivation", "external actor involvement" and "project knowledge and communication" is sufficient. The absence of one or more of these conditions explain a lack of wider learning outcomes. Our analysis confirms the importance of proactive individuals that are willing to invest resources to actually transfer knowledge and to influence policy processes (Huitema and Meijerink, 2010). The analysis underlines that successful diffusion is more likely when niches are "in tune" (Smith, 2007) and knowledge utilization is "an easy ride" since changes to the institutional context are supportive (Beers and Van Mierlo, 2017). If this is the case, it becomes much easier to engage external actors who can link informal learning processes to formal policy cycles (Pahl-Wostl et al., 2013).

Our study draws attention to the complexity of the relation between project-internal learning and wider learning outcomes. More specifically, double-loop or second-order learning by participants has, at least on the short term, a far less direct influence on wider learning outcomes and, thus, achieving transformative change than is often assumed in the literature (cf. Luederitz et al., 2016). Alignment, which might involve double-loop learning by external actors, and previous experience with similar projects are much more influential and deserve more attention in the literature and in the design and evaluation of learning-oriented projects.

Our comparative analysis could not explain knowledge exchange-oriented cases and cases for which knowledge uptake was seriously hampered by recent changes to the governance structure. We suspect that, in addition to the identified conditions, previous experience and the inclusion of knowledge co-production processes are conditions influencing wider learning outcomes and recommend further research into the role of these conditions. Moreover, future research should focus more on the interface between an EU cooperation project and its transition context, including where and how a project is positioned in a transition, the implications of this position and how to understand and shape learning processes at this interface.

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## Appendix A

### A.1 Background information on QCA

This section summarizes the parameters of fit that are used in the QCA package of R (and in most other software for fuzzy-set QCA) and the solutions that result from QCA. Within this context, it is important to note that QCA is a set-theoretic method. In fuzzy-set QCA (fsQCA), each case is assigned a membership score for the presence and for the absence of each condition and the outcome. Consistency parameters indicate to what extent a condition is a subset or superset of an outcome. Coverage parameters measure how much of the outcome is covered by a sufficient condition or how trivial or relevant a necessary condition is. The information and formulas that are presented in this section are derived from and further explained by Schneider and Wagemann (2012).

- - *Analysis of necessity*

The analysis of necessity in fsQCA investigates whether membership in a condition X is larger or equal to membership in the outcome Y across all cases. To determine the necessity of a certain condition, we use the formulas and thresholds that are provided below. Furthermore, we made XY plots for those conditions that score high on necessity to visually inspect to what extent there are cases that contradict the statement of necessity.

Parameters for analysis of necessity:

- Consistency of necessity (**Cons. Nec)** measures whether empirical information is in line with the statement of necessity (i.e. whenever the outcome is present, the condition is also present). Cons. Nec $(Y_i \leq X_i) = \Sigma (\min (X_i, Y_i)) / \Sigma (Y_i)$. As recommended in the literature, we apply a high consistency threshold of 0.9 (cf. Knieper and Pahl-Wostl, 2016; Skaaning, 2011).
- Coverage of necessity (**Cov. Nec)** is a measure of the empirical relevance of a solution, i.e. how much smaller the outcome set Y is in relation to the condition set. High values indicate relevance whereas low values indicate trivialness Cov. Nec $(Y_i \leq X_i) = \Sigma (\min (X_i, Y_i)) / \Sigma (X_i)$

- Relevance of necessity (**RoN**) measures to what extent a condition is trivial (e.g., since a condition is omnipresent). RoN = $\Sigma$ (1-$X_i$) / $\Sigma$ (1 – min ($X_i$, $Y_i$))

- - *Analysis of sufficiency*

The analysis of necessity is done prior to the analysis of sufficiency. In our analysis, we excluded cases and conditions that do not confirm with the statement of necessity (i.e. has a < 0.5 score on the necessary condition) from the analysis of sufficiency. For the analysis of sufficiency, cases are assigned to ideal-typical combinations of conditions (so-called configurations) in a truth table. For the construction of the truth table, condition values below 0.5 are changed to 0 and condition values larger than 0.5 are changed to 1. The truth table presents for each configuration the number of cases that is assigned to that combination and the measures of fit (i.e. consistency and coverage values). Only those configurations that pass certain thresholds are included in the calculation of the solution term. The parameters of fit and thresholds that are included in the analysis of sufficiency are:

- Consistency (**incl**) measures the degree to which a condition is a subset of the outcome, i.e. the inclusion rate. Incl ($X_i \leq Y_i$) = $\Sigma(\min(X_i, Y_i)) / \Sigma(X_i)$. Recommended and applied threshold: 0.8 or higher (cf. Knieper and Pahl-Wostl, 2016; Ragin, 2009)
- PRI Consistency (**PRI**) measures the Proportional Reduction in Inconsistency and expresses how much a condition is indeed a subset of the outcome rather than not the outcome. PRI = $[\Sigma(\min(X_i, Y_i)) – \Sigma(\min(X_i, Y_i, \sim Y_i))] / [\Sigma(X_i) – \Sigma(\min(X_i, Y_i, \sim Y_i))]$. For PRI consistency, there is no generally recommended threshold (cf. Knieper and Pahl-Wostl, 2016). We applied a flexible threshold that was determined on the basis of the truth table values.
- Raw coverage (**cov.r)** measures how much of the outcome is covered by a path. Raw coverage ($X_i \leq Y_i$) = $\Sigma(\min(X_i, Y_i)) / \Sigma(Y_i)$
- Unique coverage measures how much of the outcome is covered by a unique path.

*Interpretation of solutions for the analysis of sufficiency*

When constructing the truth table, it often happens that not all theoretically possible configurations are empirically observed. This is especially the case when the analysis includes a high number of conditions in comparison to the number of cases. All rows of the truth table that are not covered by cases are so-called logical remainders. These logical remainders can be dealt with differently, which may lead to different solutions. The conservative or complex solution only includes those configurations that are empirically observed. The most parsimonious solution is based on assumptions about logical remainders so that the resulting solution term includes the fewest conditions and logical operators (logical “AND” and “OR”). The intermediate solution only takes into account logically remaining configurations that match the assumptions of the researcher. It is a (less complex) superset of the conservative solution and a (more complex) subset of the most parsimonious solution.

Solutions are presented in Boolean algebra. An asterisk (*) denotes a logical AND and a plus (+) a logical OR. Capital letters denote that conditions are present. Lowercase letters or “not” refer to the negated condition (i.e. the condition is absent). Most of the solutions include different paths. For every separate path, measures of fit are provided. Each analysis of sufficiency also provides overall measure of fit that apply to the entire solution.

*A.2 Iterative development of assessment framework*

This section provides background information on the iterative development of the assessment framework. It explains what indicators were measured and how they were aggregated and why some of the indicators are excluded from the analysis.

Potentially relevant conditions and indicators

When conducting a QCA one should find a balance between the number of potentially relevant conditions and the number of cases. When the number of conditions is high, very few combinations of conditions (configurations) are empirically observed. This implies that the analysis of sufficiency is based on assumptions rather than on empirical observations. Our assessment framework initially consisted of five conditions, which all consisted of multiple indicators (Vinke-de Kruijf, 2015; Vinke-de Kruijf and Pahl-Wostl, 2016). We critically reviewed our data and indicators/conditions. We decided *not* to aggregate indicators into one condition if these conditions were measuring completely different things. Second, we verified if a condition was missing, redundant or too generic.

Project-internal learning

The condition “project-internal learning” was not part of our initial framework. We added this condition since we expect a relation between learning by participants and wider learning outcomes. Project-internal learning is measured using two indicators, see the table below. The distinction between substantive and relational learning is based on the recognition that social learning processes are of dual nature with dual outcomes. Both the processing of factual information and dealing with social-relations play a key role (Pahl-Wostl et al., 2007). While we cannot say that the one type of learning is more important than the other or that they always need to be combined, they tend to be complementary in adaptation-oriented projects. Therefore, rather than taking the arithmetic mean (ignoring that they are complementary), the minimum score (assuming indicators are strictly complementary, i.e. one-out, all out) or the maximum score (assuming achieving one indicator is sufficient, for example, since indicators are mutually exclusive) (Langhans et al., 2014), we aggregate this outcome using a mixture of the arithmetic mean and maximum aggregation. In doing so, we take into account that a combination of both substantive and relational learning is more valuable than having only substantive or only relational learning.

| Indicator | Interpretation of indicator (when is a condition highly supportive?) |
|---|---|
| Substantive learning | Process documents reflect and participants report that the collaborative process contributed to reframing, which implies that they acquired entirely new (rather than improved or broader) understandings, knowledge and skills a substantial (rather than incremental) increase of their ability to understand, plan for and implement climate change adaptation (CCA) options (Hachmann, 2013; Moser and Ekstrom, 2010; Newig et al., 2010; Pahl-Wostl, 2009; Pahl-Wostl et al., 2007; Scholz et al., 2013; Van der Wal et al., 2014; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010) |
| Relational learning | Process documents reflect and many participants report that the collaborative process contributed to reframing, which implies that they acquired entirely new (rather than improved or broader) understandings and knowledge concerning interacting actors and networks in the CCA process (who are they, what are their interests, what resources do they have) and a substantial (rather than incremental) increase of the ability to deal with interacting actors and networks in the CCA process, which is reflected in increase of trust, new relations or coalitions and new knowledge/understanding about how to raise (public) awareness and understanding, communicate and collaborate with relevant actors (trust and relations) and to reach an agreement on options (assessment, selection, implementation) (Hachmann, 2013; Moser and Ekstrom, 2010; Newig et al., 2010; Pahl-Wostl, 2009; Pahl-Wostl et al., 2007; Scholz et al., 2013; Van der Wal et al., 2014; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010). |

As the above table shows high levels of learning are associated with reframing. This type of learning is referred to in the literature as double-loop learning and involves the calling into question of guiding assumptions as well as reflections on how goals are defined, problems are framed and goals can be achieved (Argyris, 1976; Pahl-Wostl, 2009). Low levels of learning are associated with single-loop learning, which implies that actors learn to improve performance without calling into question any of the guiding assumptions, such as, the design, activities or goals of an organization or management regime (Argyris, 1976; Pahl-Wostl, 2009). While Pahl-Wostl (2009) associates single-loop learning with incremental changes in established practices and actions, we link it here to incremental changes in an actors' understanding and knowledge base. Such an incremental change has occurred when an actor reports that his or her knowledge base or understanding was improved or broadened but no truly new insights were obtained.

The above leads us to distinguish between the following four levels of learning:

- No learning (score: 0)
- Moderately low learning (score: 0.3) is associated with single-loop learning, which involves incremental changes. This applies when a participant obtained an improved or broadened understanding or knowledge base
- Moderately high learning (score: 0.7) is associated with some double-loop learning, which involves calling into question guiding assumptions. This applies when a participant obtained partly improved or broadened understanding or knowledge base and partly new knowledge, insights and perspectives.
- High learning (score: 1) is associated with double-loop learning. This applies when the knowledge that was obtained in the project really was an eye-opener and provided a participant with truly new knowledge and perspectives.

*Partner-specific conditions*

We initially aggregated motivation, ability and opportunity into one condition "participant characteristics". In practice, cases had diverse scores on these indicators, which is understandable since each indicator measures a different characteristic. Hence, we included each of these indicators as a separate condition in the study presented in the main article.

Our framework further included four indicators that helped to measure the degree to which partners acted as policy entrepreneurs and were strategic about who to include, the type of activities, framing a project in a certain way and connecting the project to a wider change process (condition: "participant scoping strategy"). From these four indicators, we only include "external actor involvement". The other three indicators, "activities", "framing" and "change process", are not included in the analysis. The indicators and an explanation why they are excluded is provided in the table below.

| Indicator | Interpretation of indicator (when is a condition highly supportive?) | Reason for excluding |
|---|---|---|
| Activities | Process activities were innovative (i.e. involved the development or testing of new or alternative solutions) and oriented towards diffusion (i.e. when successful, they could be applied at other locations or at a larger scale) (Meijerink and Huitema, 2010; Vreugdenhil et al., 2010). | The degree to which project activities were strategically chosen to develop or test alternative solutions is unlikely to be relevant since some projects focused on the transfer and exchange of existing knowledge and yet had a moderately high score on network and societal learning. |
| Framing | Process actions and knowledge were framed to match the needs of various users (i.e. adjusted to fit user- | Associated with high and low learning outcomes when conducting the first analysis of sufficiency. The |

| | | |
|---|---|---|
| | specific situations and circumstances) (Meijerink and Huitema, 2010). | problem is that the two cases with the highest wider learning outcomes (case IDs 31 and 36) combine supportive conditions with a lack of framing. However, a lack of framing is unlikely to contribute to high learning outcomes. |
| Change process | The process was seen as part of a longer and more encompassing change process (i.e. going beyond the process duration and the partner organization(s)) (Meijerink and Huitema, 2010; Vinke-de Kruijf, 2013). | Some partners saw the case study project as part of a more encompassing process of becoming more engaged in EU projects (which links to more administrative organizational objectives) whereas others linked it to content-wise developments. The latter is of most relevance to network and societal learning but also measured by the indicator "policy agenda". |

*Project-specific conditions*

Project-specific characteristics were initially measured using two conditions, which were both measured using three indicators. The condition "communication strategy" measured the presence of a proactive, specific and engaging communication and dissemination strategy. The condition "knowledge characteristics" measured the availability, accessibility and relevance of project knowledge. We aggregated all indicators into the condition "project knowledge and communication" since the projects have a similar score on all indicators. A probable explanation is that when project partners pay ample attention to communication and dissemination, there also put an effort in making knowledge accessible and available and pulling out generic lessons. This condition basically measures the extent to which the project as a whole was supportive of wider learning outcomes. The table below provides an overview of the conditions and indicators that are included in this aggregated condition.

| Condition | Indicator | Interpretation of indicator (when is a condition highly supportive?) |
|---|---|---|
| Communication strategy | Proactive | A communication and dissemination strategy was developed at an early stage of the project and activities have been pursued throughout the process duration (Vinke-de Kruijf, 2013; Vreugdenhil et al., 2010). |
| | Specific | The communication strategy identifies potential users and includes a plan describing how to transfer knowledge to these users and, if applicable, how to obtain their commitment (Vinke-de Kruijf, 2013). |
| | Engaging | The various partners were given a role in implementing the strategy and the engagement of external actors was stimulated (INTERREG IVC, 2013). |
| Knowledge characteristics | Availability | The process produced concrete evidence (i.e. knowledge was proven useful in pilot or demonstration projects) and this knowledge was made available to external actors (Szulanski, 1996). |
| | Accessibility | Knowledge resulting from the process was communicated in an understandable manner so that it could be easily interpreted by others (Argote et al., 2003; Szulanski, 1996; Van Wijk et al., 2008). |
| | Relevance | Knowledge resulting from the process was relevant to other regions (i.e. not bound to the partner region, problem was on the policy agenda and has not been solved by other approaches) (Hachmann, 2013; INTERREG IVC, 2013; van Mierlo, 2012; Vreugdenhil et al., 2010). |

*Context-specific conditions*

In the framework, we initially included two indicators to measure the supportiveness of the wider context towards wider learning outcomes. We only included "policy agenda alignment" as condition since the other indicator (governance system) was too generic and therefore difficult to assess in relation to the project. Information about the indicator and the reason for excluding the indicator is provided below.

| Indicator | Interpretation of indicator (when does it reflect a high learning outcome or a highly supportive condition?) | Reason for excluding |
|---|---|---|
| Governance system | Relevant governance structures were supportive (rather than restrictive) of the process theme and knowledge (e.g. presence of integrated cooperation structures, advanced information | Indicator is too ambiguous. Very difficult to define "relevant governance structure". |

| | |
|---|---|
| | management) (Bressers et al., 2013; Bressers and Kuks, 2004; Huntjens et al., 2011) |

*Outcome indicators and measurement*

The outcome "wider learning outcomes" is assessed using indicators that are derived from knowledge utilization measures (Crona and Parker, 2012; Knott and Wildavsky, 1980; Landry et al., 2001, 2007). Following these measures, we distinguish between five levels of knowledge utilization (see table below). In the literature, "adoption" is often added as stage between "interaction" and "influence". The reason for excluding "adoption" (i.e. external actors considering or making an effort to adopt knowledge resulting from the process) is that observations for this stage cannot be meaningfully separated from "interaction" (discussions about knowledge) and "influence" (contribution or influence of knowledge). The underlying reason is that participants generally lack detailed knowledge about the extent to which external actors just consider or actually will adopt certain project results.

The overall score on wider learning outcomes is determined by taking the weighted average of the respective level scores (see e.g. Crona and Parker, 2011; Landry et al., 2001). In doing so, the score for the lowest applicable level of knowledge utilization (i.e. transfer) is multiplied by 1, the second-lowest level (i.e. present) by 2 and so on. The indicators are given a score of 0 when there has been no activity. A score of 0.3 is given when there has been activity only within the context of (regional) project actions. A score of 0.7 score if given when there has been activity beyond the project region or project context. A score of 1 is given when there is multiplicity of activities and actors involved.

| Indicator | Interpretation of indicator (when does it reflect a high learning outcome?) |
|---|---|
| Transmit (weight 1) | Various communication means were used at several points in time to share project results as widely as possible. |
| Present (weight 2) | Presentations were provided in diverse contexts to promote the project and its results. |
| Interact (weight 3) | Widespread and frequent interactions inside and outside partner region. |
| Influence (weight 4) | Project results have influenced the policies and practices of external actors at multiple levels in several ways. |
| Implement (weight 5) | Multiple project results have been implemented by various external actors. |

Usually, data in knowledge utilization studies are collected using questionnaires with respondents indicating to what extent a certain level of knowledge transfer applies (with values ranging from never to always) (Crona and Parker, 2012; Landry et al., 2001, 2007). We collected data using qualitative methods (i.e. document analysis, semi-structured interviews). As a result, we had to make decisions not only regarding the transformation of data but also regarding the applicable utilization stages. To do justice to utilization being a "chain of events", we decided to include the utilization of certain knowledge at all relevant stages (potentially multiple).

We assess knowledge utilization from the perspective of the source (cf. Landry et al., 2001, 2007). A key assumption underlying this approach is that respondents are aware of the uptake and influence of knowledge by others. In other words, we only include learning that involved some kind of interaction with the partner organization and exclude learning that may have resulted, for example, from website downloads. While this approach towards the assessment of knowledge utilization is common practice, ideally one should also include the perspective of the receiver (cf. Crona and Parker, 2012). To include the perspective of the source is beyond the scope of the presented study also since the collection of qualitative data was already rather resource intensive. It is also unlikely that actual levels of learning are much higher since higher levels of learning almost by definition require some form of interaction.

*A.3 Final selection of cases and data matrix for QCA*

On the basis of several preliminary analyses and a further inspection of the data, we took the decision to exclude six cases from the QCA. These decisions are explained in this section.

Firstly we exclude all cases of project 7. This interregional project aimed at compiling, exchanging and disseminating existing knowledge and did not include activities to generate new knowledge. Even though all conditions are supportive, the cases do not score very high on wider learning outcomes. This implies that these cases cannot be explained using our conceptual model. The cases of this project in fact suggest that concrete knowledge generation activities are needed for high learning outcomes to occur. Relevant to note is that we initially included a condition that measures to what extent project activities were chosen to test or develop new or alternative solutions. This condition, however, did not measure this specific aspect since many projects included concrete activities but did not strategically chose these activities.

Second we exclude the cases for which respondents reported that wider learning outcomes were seriously hampered by a lack of capacity and expertise due to recent changes in the division of roles and responsibilities. This decision was taken since we realized that case 35 could not be explained by the combination of conditions that are included in the analysis. Even though all conditions are

supportive, the case has a low score on wider learning outcomes. As the respondents of case 34 and 35 both reported that wider learning outcomes were hindered by the same factors, we decided to threat the cases in the same way (even though that motivation was also low for case 34).

| | | | | Potentially relevant conditions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case ID | Case No. | Organization type | Country | PL | AB | MOT | OPP | ACT | POL | PKC | O |
| 11 | 1 | National Authority | Austria | 0.60 | 0.70 | 0.70 | 1.00 | 0.70 | 0.70 | 0.37 | **0.47** |
| 12 | 2 | Knowledge Institute | Slowakia | 0.60 | 0.70 | 0.70 | 0.70 | 0.70 | 0.30 | 0.37 | **0.34** |
| 13 | 3 | National Agency | Hungary | 0.53 | 0.70 | 0.70 | 0.70 | 0.30 | 0.70 | 0.37 | **0.43** |
| 14 | 4 | Knowledge Institute | Serbia | 0.23 | 1.00 | 0.30 | 1.00 | 0.30 | 0.70 | 0.37 | **0.14** |
| 21 | 5 | National Agency | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.30 | 1.00 | 0.68 | **0.32** |
| 22 | 6 | National Agency | Belgium | 0.70 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.68 | **0.67** |
| 23 | 7 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 0.70 | 0.70 | 0.68 | **0.70** |
| 24 | 8 | Semi-public authority | Germany | 0.60 | 0.30 | 0.30 | 1.00 | 0.70 | 1.00 | 0.68 | **0.52** |
| 31 | 9 | Municipality | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.80 | **0.82** |
| 32 | 10 | Municipality | Norway | 0.70 | 1.00 | 0.70 | 1.00 | 1.00 | 1.00 | 0.80 | **0.55** |
| 33 | 11 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.80 | **0.61** |
| 36 | 12 | Knowledge Institute | Netherlands | 0.53 | 1.00 | 0.70 | 0.70 | 1.00 | 1.00 | 0.80 | **0.84** |
| 41 | 13 | Knowledge Institute | UK | 0.70 | 0.70 | 1.00 | 1.00 | 0.00 | 0.30 | 0.75 | **0.34** |
| 42 | 14 | Knowledge Institute | UK | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 1.00 | 0.75 | **0.61** |
| 43 | 15 | Knowledge Institute | Greece | 0.60 | 1.00 | 0.70 | 1.00 | 0.30 | 0.30 | 0.75 | **0.32** |
| 44 | 16 | Knowledge Institute | Estonia | 0.53 | 0.70 | 0.30 | 1.00 | 0.70 | 0.70 | 0.75 | **0.53** |
| 51 | 17 | Municipality | Netherlands | 0.30 | 0.30 | 0.00 | 0.70 | 0.70 | 0.30 | 0.37 | **0.09** |
| 52 | 18 | Knowledge Institute | Hungary | 0.60 | 1.00 | 0.70 | 1.00 | 1.00 | 0.70 | 0.37 | **0.33** |
| 61 | 19 | Regional Authority | Netherlands | 0.60 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.43 | **0.37** |
| 62 | 20 | Regional Agency | Germany | 0.83 | 0.30 | 0.30 | 0.30 | 0.30 | 0.00 | 0.43 | **0.23** |
| 63 | 21 | National Agency | Belgium | 0.70 | 1.00 | 0.30 | 1.00 | 0.70 | 1.00 | 0.43 | **0.36** |
| 64 | 22 | Regional Authority | Netherlands | 0.70 | 0.70 | 0.30 | 0.70 | 0.70 | 1.00 | 0.43 | **0.23** |
| 65 | 23 | Regional Agency | France | 0.60 | 0.70 | 0.30 | 0.00 | 0.70 | 0.00 | 0.43 | **0.12** |
| 66 | 24 | Regional Authority | UK | 0.60 | 0.70 | 1.00 | 1.00 | 0.70 | 1.00 | 0.43 | **0.59** |

*A.4 QCA for high learning outcomes (> 0.5)*

Test of necessity for high learning outcomes

All conditions of this study pass the consistency threshold (Cons. Nec) of 0.9. For the negated conditions (condition is absent), no condition passes the threshold.

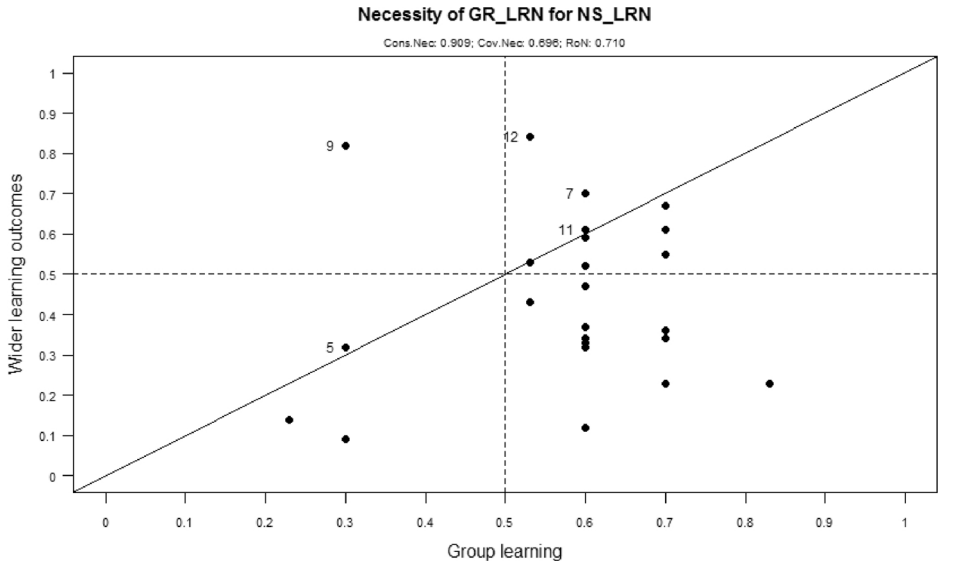
| | Cons.Nec | Cov.Nec | RoN | | Cons.Nec | Cons.Nec | RoN |
|---|---|---|---|---|---|---|---|
| PL | 0.909 | 0.696 | 0.710 | not PL | 0.760 | 0.780 | 0.859 |
| AB | 0.979 | 0.537 | 0.351 | not AB | 0.312 | 0.685 | 0.927 |
| MOT | 0.918 | 0.653 | 0.642 | not MOT | 0.524 | 0.600 | 0.801 |
| OPP | 0.975 | 0.501 | 0.255 | not OPP | 0.178 | 0.534 | 0.926 |
| ACT | 0.940 | 0.635 | 0.596 | not ACT | 0.496 | 0.621 | 0.831 |
| POL | 0.957 | 0.600 | 0.517 | not POL | 0.349 | 0.511 | 0.827 |
| PKC | 0.962 | 0.738 | 0.741 | not PKC | 0.642 | 0.658 | 0.796 |

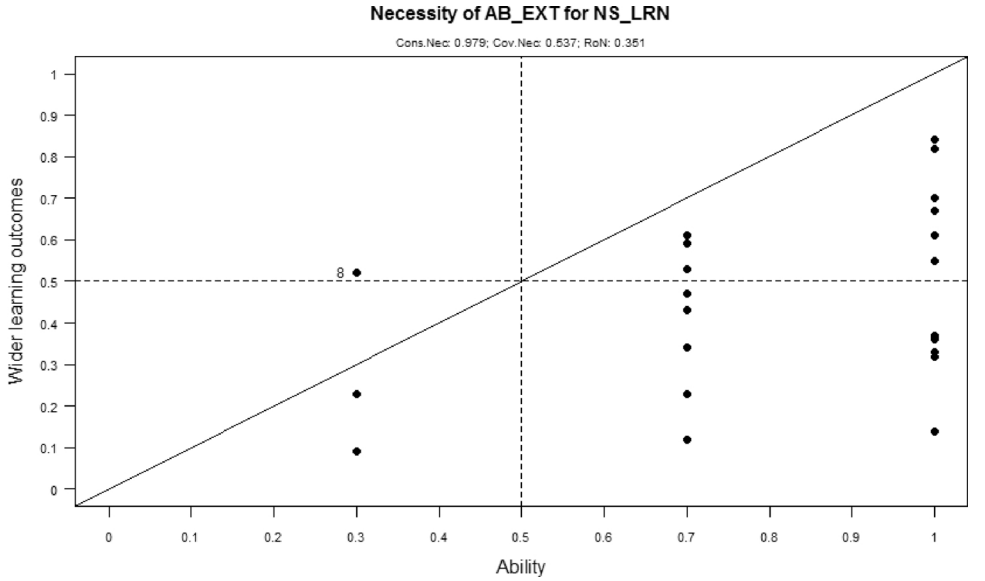
While all conditions pass the consistency thresholds, the relatively low values for coverage and relevance of necessity indicate that they are not necessarily relevant as necessary conditions. To verify whether the statement of necessity applies (i.e. cases are having higher scores on the condition than the outcome), we plot the condition against the outcome for each condition. On the basis of a visual inspection of the plots (see below), we conclude:

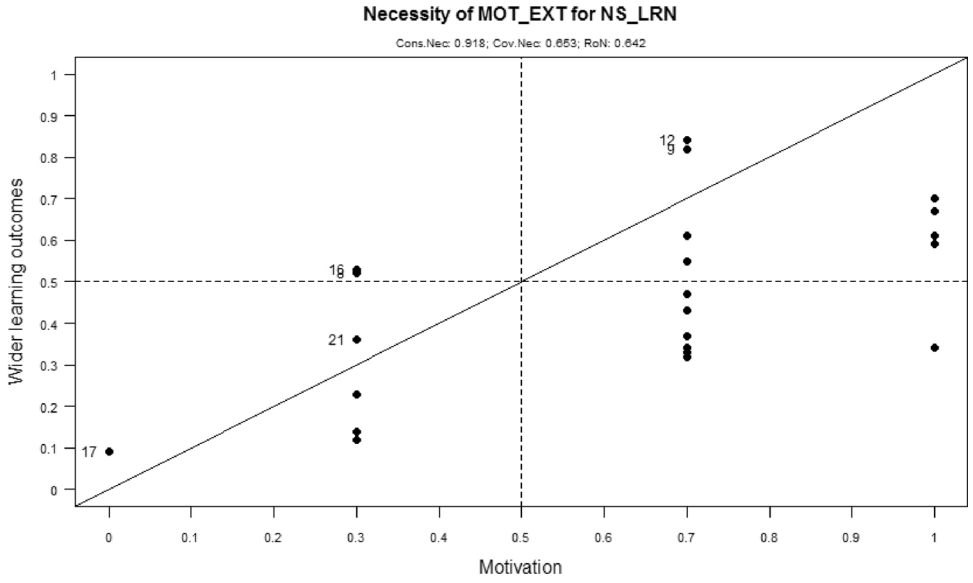
- Project-internal learning: case 9 (ID 31) and case 12 (ID 36) are both clear exceptions. The statement of necessity is rejected.
- Ability: case 8 (ID 24) is a clear exception. Ability is low and yet learning outcomes are moderately high. We also reject this statement of necessity.
- Motivation: cases seem to follow the general pattern that motivation is higher when the outcome is higher. However, especially for case 8 (ID 24) and 16 (ID 44) motivation was rather low and yet there are quite some indications of wider learning outcomes. We also reject this statement of necessity.
- Opportunity: There are two cases for which the outcome has a higher score than the condition. One is case 23 (ID 65) where there was hardly any opportunity to transfer knowledge and wider learning outcomes were indeed extremely low. The other case is case 12 where opportunity was rather high and so were learning outcomes. Yet, the relevance of necessity for this condition is low since only two cases (IDs 62 and 65) have a low score on opportunity and both also have a low score on policy agenda alignment. As the latter condition is necessary for wider learning outcomes, we accept that opportunity is irrelevant.

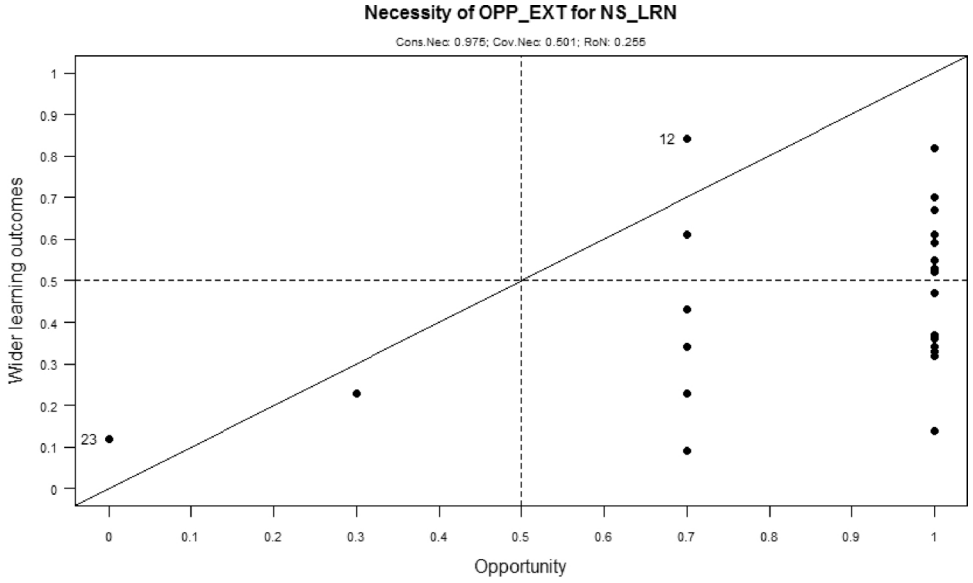
- External actor involvement: case 13 (ID 41) contradicts the statement of necessity. In the overall project, external actors were actively engaged. While this lead partner (university) put an effort in sharing and presenting knowledge (e.g. at the national and the European level), the partner did not actively engage external actors in the process. Case 3 (ID 13, national authority from Hungary) is another exception. In this specific case, the partner wanted to engage external actors more but this was not possible due to a lack of funding. Language was also a problem. They eventually organized a roundtable meeting in their own country, Hungary, which was rather effective and led to concrete impacts. To actively engage external actors during the project is thus not strictly necessary for wider learning outcomes to occur.
- Policy agenda alignment: the main exceptions are here case 20 (ID 62) and case 23 (ID 65). In both cases, the policy agenda was not supportive. There were some but limited interactions in both cases. For case ID 62 there has been some influence on external actors. As this influence is very limited, we accept the statement of necessity.
- Project knowledge and communication: from all potentially relevant conditions, this condition has the highest scores on coverage and relevance of necessity. However, also here there is one case that clearly is an exception: case 24 (ID 66). While most of the partners in this project indeed have a rather low score on network and societal learning, this does not apply to this case. We reject the statement of necessity.

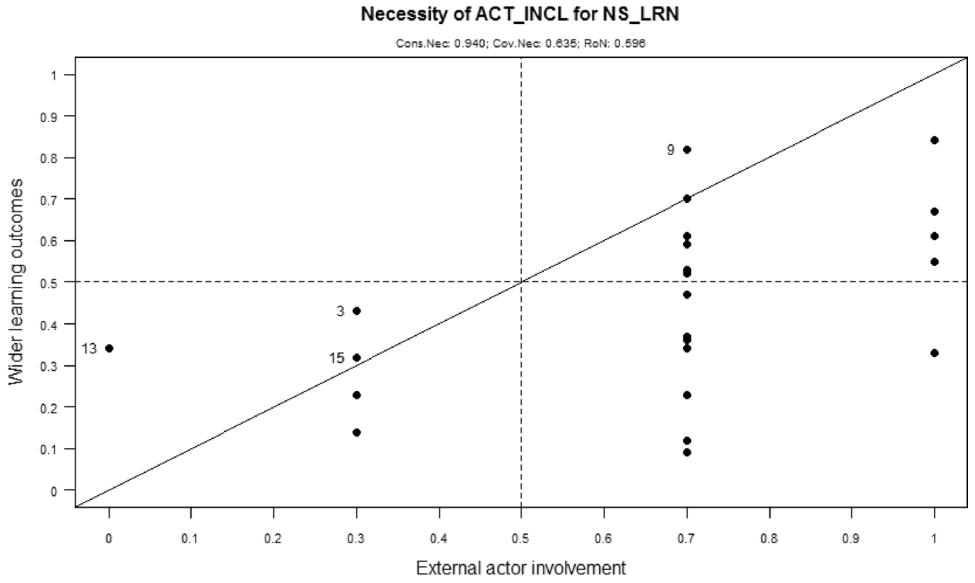
As a next step, we also examined supersets but did not identify relevant combinations of conditions. We conclude that policy agenda is the only condition that is strictly necessary for wider learning outcomes to occur.

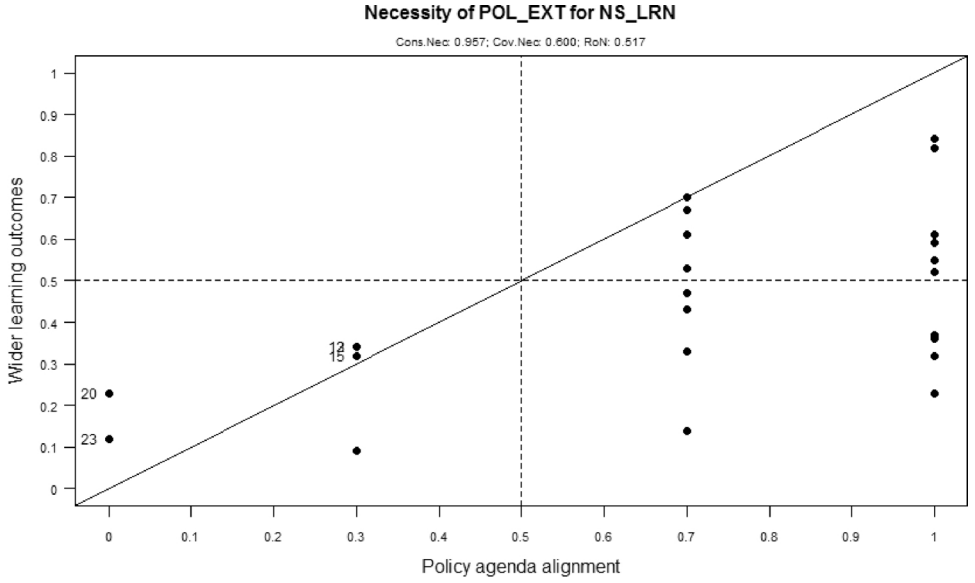


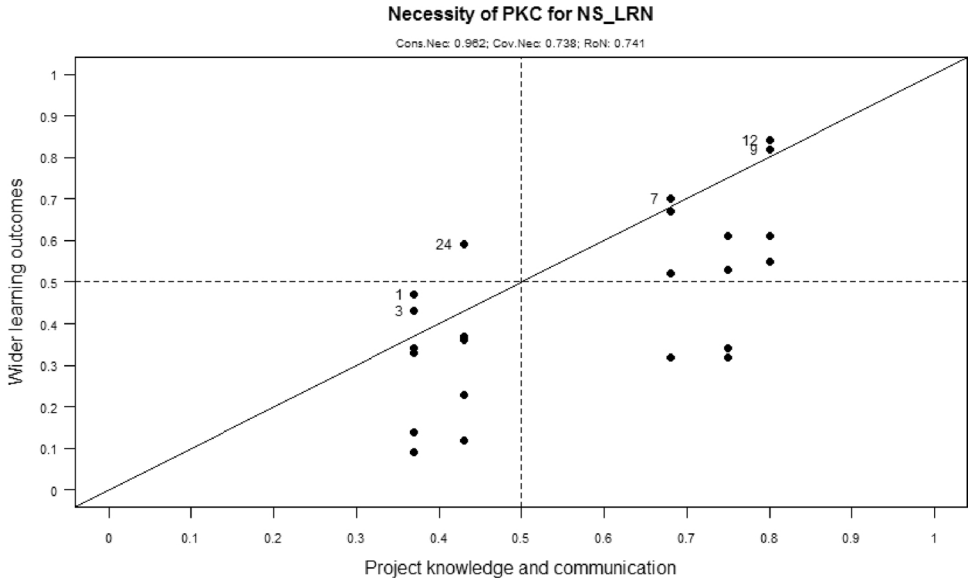




Necessity of MOT_EXT for NS_LRN
Cons.Nec: 0.918; Cov.Nec: 0.653; RoN: 0.642
Wider learning outcomes
Motivation
12
16
21
17


Necessity of OPP_EXT for NS_LRN
Cons.Nec: 0.975; Cov.Nec: 0.501; RoN: 0.255
Wider learning outcomes
Opportunity
12
23


Necessity of ACT_INCL for NS_LRN
Cons.Nec: 0.940; Cov.Nec: 0.635; RoN: 0.596
Wider learning outcomes
External actor involvement
9
3
13
15


Necessity of POL_EXT for NS_LRN
Cons.Nec: 0.957; Cov.Nec: 0.600; RoN: 0.517
Wider learning outcomes
Policy agenda alignment
12
15
20
23




*Test of sufficiency for high learning outcomes*

Since we accept that "policy agenda alignment" is necessary for high learning outcomes to occur and "opportunity" is not relevant, we continue our analysis of sufficiency only with five conditions and only with those cases that have a > 0.5 score on these conditions (6 cases are excluded from the analysis). Thus, both "policy agenda alignment" and "opportunity" as potentially relevant conditions since all cases have a high or moderately high score on these conditions. The resulting data matrix for which we conducted the analysis of sufficiency is provided below. The cells for which Case ID and Case No. are marked green are the cases that we can explain on the basis of the analysis of sufficiency.

| | | | | Potentially relevant conditions | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Case ID** | **Case No.** | **Organization type** | **Country** | **PL** | **AB** | **MOT** | **ACT** | **PKC** | **O** |
| 11 | 1 | National Authority | Austria | 0.60 | 0.70 | 0.70 | 0.70 | 0.37 | **0.47** |
| 13 | 2 | National Agency | Hungary | 0.53 | 0.70 | 0.70 | 0.30 | 0.37 | **0.43** |
| 14 | 3 | National Institute | Serbia | 0.23 | 1.00 | 0.30 | 0.30 | 0.37 | **0.14** |
| 21 | 4 | National Agency | Netherlands | 0.30 | 1.00 | 0.70 | 0.30 | 0.68 | **0.32** |
| 22 | 5 | National Agency | Belgium | 0.70 | 1.00 | 1.00 | 1.00 | 0.68 | **0.67** |
| 23 | 6 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 0.70 | 0.68 | **0.70** |
| 24 | 7 | Semi-public authority | Germany | 0.60 | 0.30 | 0.30 | 0.70 | 0.68 | **0.52** |
| 31 | 8 | Municipality | Netherlands | 0.30 | 1.00 | 0.70 | 0.70 | 0.80 | **0.82** |
| 32 | 9 | Municipality | Norway | 0.70 | 1.00 | 0.70 | 1.00 | 0.80 | **0.55** |
| 33 | 10 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 0.80 | **0.61** |
| 36 | 11 | Knowledge Institute | Netherlands | 0.53 | 1.00 | 0.70 | 1.00 | 0.80 | **0.84** |
| 42 | 12 | Knowledge Institute | UK | 0.70 | 0.70 | 0.70 | 0.70 | 0.75 | **0.61** |
| 44 | 13 | Knowledge Institute | Estonia | 0.53 | 0.70 | 0.30 | 0.70 | 0.75 | **0.53** |
| 52 | 14 | Knowledge Institute | Hungary | 0.60 | 1.00 | 0.70 | 1.00 | 0.37 | **0.33** |
| 61 | 15 | Regional Authority | Netherlands | 0.60 | 1.00 | 0.70 | 0.70 | 0.43 | **0.37** |
| 63 | 16 | National Agency | Belgium | 0.70 | 1.00 | 0.30 | 0.70 | 0.43 | **0.36** |
| 64 | 17 | Regional Authority | Netherlands | 0.70 | 0.70 | 0.30 | 0.70 | 0.43 | **0.23** |
| 66 | 18 | Regional Authority | UK | 0.60 | 0.70 | 1.00 | 0.70 | 0.43 | **0.59** |

An edited version of the truth table (non-relevant configurations are deleted) is provided below. We apply a inclusion threshold of 0.94 and a PRI consistency threshold of 0.75 (see the thick line in the truth table below).

| PL | AB | MOT | ACT | PKC | OUT | n | incl | PRI | cases |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 6 | 0.93 | 0.77 | 5,6,9,10,11,12 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0.95 | 0.76 | 8 |
| 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0.92 | 0.47 | 13 |
| 1 | 1 | 1 | 1 | 0 | 0 | 4 | 0.87 | 0.24 | 1,14,15,18 |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0.93 | 0.21 | 7 |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0.86 | 0.17 | 4 |
| 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0.85 | 0.09 | 16,17 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0.93 | 0.07 | 2 |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0.84 | 0.03 | 3 |

The software provides three solutions: a conservative, intermediate and most parsimonious solution. To calculate the intermediate solution we asserted that all conditions are supportive of learning outcomes. The solutions are almost identical and all provide one path towards wider learning outcomes. Ability is not included in the most parsimonious solution and not as relevant as the other conditions since 17 out of the 18 included cases have a high score on ability.

```
Conservative solution

M1: AB*MOT*ACT*PKC => NS_LRN

                              incl.   PRI   cov.r  cov.u  cases
-------------------------------------------------------------------------
1  AB*MOT*ACT*PKC             0.911  0.752  0.868    -    8; 5,6,9,10,11,12
-------------------------------------------------------------------------
   M1                         0.911  0.752  0.868

Intermediate solution (directional expectations all supportive, 1)

M1: AB*MOT*ACT*PKC => NS_LRN

                              incl.   PRI   cov.r  cov.u  cases
-------------------------------------------------------------------------
1  AB*MOT*ACT*PKC             0.911  0.752  0.868    -    8; 5,6,9,10,11,12
-------------------------------------------------------------------------
   M1                         0.911  0.752  0.868

Most parsimonious solution

M1: MOT*ACT*PKC => NS_LRN

                         incl.   PRI   cov.r  cov.u  cases
---------------------------------------------------------------------
1  MOT*ACT*PKC           0.911  0.752  0.868    -    8; 5,6,9,10,11,12
---------------------------------------------------------------------
   M1                    0.911  0.752  0.868
```

*A.5 QCA for low learning outcomes (< 0.5)*

The analysis of necessity and sufficiency are both conducted using the data matrix presented in Section 3 of the appendix.

*Test of necessity for low learning outcomes*

From the potentially relevant conditions, no condition passes the consistency threshold (Cons. Nec) of 0.9. For the negated conditions (condition is absent), also no condition passes the threshold.

| | Cons.Nec | Cov.Nec | RoN | | Cons.Nec | Cov.Nec | RoN |
|---|---|---|---|---|---|---|---|
| PL | 0.833 | 0.816 | 0.802 | not PL | 0.690 | 0.906 | 0.935 |
| AB | 0.888 | 0.623 | 0.399 | not AB | 0.340 | 0.954 | 0.989 |
| MOT | 0.727 | 0.661 | 0.647 | not MOT | 0.619 | 0.907 | 0.945 |
| OPP | 0.879 | 0.578 | 0.288 | not OPP | 0.241 | 0.926 | 0.987 |
| ACT | 0.764 | 0.660 | 0.613 | not ACT | 0.577 | 0.925 | 0.961 |
| POL | 0.739 | 0.592 | 0.512 | not POL | 0.501 | 0.938 | 0.974 |
| PKC | 0.739 | 0.725 | 0.732 | not PKC | 0.733 | 0.961 | 0.972 |

*1. Test of sufficiency for low learning outcomes (high thresholds)*

We first create a truth table with high thresholds for inclusion (0.97) and PRI consistency (0.8). The edited version of the truth table is provided below (all rows with logical remainders are deleted). The cut-off is indicated by the think line in the truth table. We conduct a second analysis with lower thresholds. This second test of sufficiency and the relevant truth table is provided further below.

| PL | AB | MOT | OPP | ACT | POL | PKC | OUT | n | incl | PRI | cases |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 17 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 20 |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 23 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 2 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1.00 | 0.97 | 4 |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0.99 | 0.95 | 13,15 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 0.99 | 0.93 | 21,22 |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1.00 | 0.93 | 3 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0.98 | 0.83 | 5 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0.96 | 0.70 | 8 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 4 | 0.95 | 0.69 | 1,18,19,24 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0.94 | 0.64 | 16 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0.87 | 0.24 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 6 | 0.77 | 0.12 | 6,7,10,11,12,14 |

The analysis of sufficiency for high thresholds provides three solutions, a conservative, intermediate and most parsimonious solution. To calculate the intermediate solution we asserted that all conditions are unsupportive of learning outcomes. The conservative solution consists of 9 complex paths, which each cover only one or two cases. The intermediate solution consists of five paths, which each consist of a combination of conditions. These paths can be summarized as:

1 A lack of project knowledge and communication in combination with a lack of external actor involvement, motivation or policy agenda alignment is sufficient for low learning outcomes to occur.
2 A lack of external actor involvement in combination with policy agenda alignment or project-internal learning is sufficient for low learning outcomes to occur. A lack of project-internal learning only contributed to the absence of wider learning outcomes in two cases (including one that is also explained by another pathway).

The most parsimonious solution consists of three paths that may produce low wider learning outcomes: (1) a lack of external actor engagement; (2) a lack of policy agenda alignment; or (3) a combination of a lack of motivation and a lack of project knowledge and communication.

```
Conservative solution
Number of multiple-covered cases: 0
                                  incl   PRI    cov.r  cov.u  cases
-------------------------------------------------------------------------------------
1  pl*ab_ext*mot*OPP*ACT*pol*pkc  1.000  1.000  0.145  0.024  17
2  pl*AB*mot*OPP*act*POL*pkc      0.995  0.975  0.316  0.024  4
3  pl*AB*MOT*OPP*act*POL*PKC      0.977  0.831  0.381  0.032  5
4  PL*ab_ext*mot*opp*act*pol*pkc  1.000  1.000  0.131  0.020  20
5  PL*AB*mot*opp*ACT*pol*pkc      1.000  1.000  0.131  0.020  23
6  PL*AB*mot*OPP*ACT*POL*pkc      0.988  0.934  0.376  0.067  21,22
7  PL*AB*MOT*OPP*act*pol*PKC      0.988  0.950  0.244  0.049  13,15
8  PL*AB*MOT*OPP*act*POL*pkc      0.996  0.929  0.344  0.012  3
9  PL*AB*MOT*OPP*ACT*pol*pkc      1.000  1.000  0.247  0.059  2
-------------------------------------------------------------------------------------
   M1                             0.980  0.949  0.746

Intermediate solution (directional expectations all unsupportive, 0)
Number of multiple-covered cases: 4
                incl   PRI    cov.r  cov.u  cases
-----------------------------------------------------------------
1  act*pkc      0.987  0.947  0.465  0.007  4; 20; 3
2  act*pol      0.987  0.966  0.330  0.057  20; 13,15
3  pl*act       0.979  0.915  0.483  0.036  4; 5
4  mot*pkc      0.991  0.975  0.516  0.068  17; 4; 20; 23; 21,22
5  pol*pkc      1.000  1.000  0.382  0.062  17; 20; 23; 2
-----------------------------------------------------------------
   M1           0.972  0.931  0.774

Most parsimonious solution
Number of multiple-covered cases: 6
           incl   PRI    cov.r  cov.u  cases
-----------------------------------------------------------
1  act     0.925  0.809  0.577  0.079  4; 5; 20; 13,15; 3
2  pol     0.938  0.872  0.501  0.105  17; 20; 23; 13,15; 2
3  mot*pkc 0.991  0.975  0.516  0.068  17; 4; 20; 23; 21,22
-----------------------------------------------------------
   M1      0.912  0.810  0.817
```

*Test of sufficiency for low learning outcomes when lower thresholds are applied*

A second analysis of sufficiency is conducted. This time we apply lower thresholds for inclusion (0.9) and PRI consistency (0.6), which results in the truth table below. The thick line in the truth table indicates the applied thresholds. In this analysis, we include three additional rows, which are all three so-called contradictory rows. These contradictory rows exist since these configurations (i.e. combinations of conditions) do not clearly lead to the absence or presence of the outcome. From the six additional cases that are included in this analysis, three cases (cases in the truth table; IDs 24, 44, 66) have an outcome score that is slightly above 0.5. The other three cases (cases; IDs 11, 52, 61) have an outcome score that is below 0.5. In the truth table they are all assigned a "1" on the outcome, which implies that they are included as cases for which learning is more absent than present in the logical minimization process.

| PL | AB | MOT | OPP | ACT | POL | PKC | OUT | n | incl | PRI | cases |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 17 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 20 |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 23 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1.00 | 1.00 | 2 |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1.00 | 0.97 | 4 |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 2 | 0.99 | 0.95 | 13,15 |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 0.99 | 0.93 | 21,22 |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1.00 | 0.93 | 3 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0.98 | 0.83 | 5 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0.96 | 0.70 | **8** |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 4 | 0.95 | 0.69 | **1,18,19,24** |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0.94 | 0.64 | **16** |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0.87 | 0.24 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 6 | 0.77 | 0.12 | 6,7,10,11,12,14 |

This analysis provides a conservative solution that consists of two possible solutions and includes the presence of supportive conditions. The intermediate and the most parsimonious solution now both includes two paths that read that a lack of motivation or a lack of project knowledge and communication alone can explain low wider learning outcomes.

Conservative solution
Number of multiple-covered cases: 5

| | | incl | PRI | cov.r | cov.u | (M1) | (M2) | cases |
|---|---|---|---|---|---|---|---|---|
| 1 | PL*AB*MOT*OPP*ACT*pkc | 0.957 | 0.767 | 0.509 | 0.022 | 0.022 | 0.022 | 2; 1,18,19,24 |
| 2 | PL*AB*MOT*OPP*POL*pkc | 0.956 | 0.718 | 0.500 | 0.012 | 0.012 | 0.012 | 3; 1,18,19,24 |
| 3 | PL*mot*OPP*ACT*POL*PKC | 0.924 | 0.564 | 0.399 | 0.013 | 0.013 | 0.033 | 8; 16 |
| 4 | pl*ab_ext*mot*OPP*ACT*pol*pkc | 1.000 | 1.000 | 0.145 | 0.024 | 0.024 | 0.024 | 17 |
| 5 | pl*AB*mot*OPP*act*POL*pkc | 0.995 | 0.975 | 0.316 | 0.024 | 0.024 | 0.024 | 4 |
| 6 | pl*AB*MOT*OPP*act*POL*PKC | 0.977 | 0.831 | 0.381 | 0.028 | 0.028 | 0.028 | 5 |
| 7 | PL*ab_ext*mot*opp*act*pol*pkc | 1.000 | 1.000 | 0.131 | 0.020 | 0.020 | 0.020 | 20 |
| 8 | PL*AB*mot*opp*ACT*pol*pkc | 1.000 | 1.000 | 0.131 | 0.020 | 0.020 | 0.020 | 23 |
| 9 | PL*AB*MOT*OPP*act*pol*PKC | 0.988 | 0.950 | 0.244 | 0.049 | 0.049 | 0.049 | 13,15 |
| 10 | PL*AB*mot*OPP*ACT*POL | 0.937 | 0.734 | 0.422 | 0.015 | 0.036 | | 21,22; 16 |
| 11 | PL*AB*OPP*ACT*POL*pkc | 0.958 | 0.817 | 0.526 | 0.000 | | 0.021 | 21,22; 1,18,19,24 |

Intermediate solution (directional expectations all unsupportive, 0)
Number of multiple-covered cases: 6

| | | incl | PRI | cov.r | cov.u | cases |
|---|---|---|---|---|---|---|
| 1 | mot | 0.907 | 0.787 | 0.619 | 0.077 | 17; 4; 20; **8**; 23; 21,22; **16** |
| 2 | pkc | 0.961 | 0.894 | 0.733 | 0.140 | 17; 4; 20; 23; 21,22; 3; 2; **1,18,19,24** |
| 3 | act*pol | 0.987 | 0.966 | 0.330 | 0.048 | 20; 13,15 |
| 4 | pl*act | 0.979 | 0.915 | 0.483 | 0.027 | 4; 5 |
| | M1 | 0.907 | 0.803 | 0.922 | | |

Most parsimonious solution
Number of multiple-covered cases: 7

| | | incl | PRI | cov.r | cov.u | cases |
|---|---|---|---|---|---|---|
| 1 | act | 0.925 | 0.809 | 0.577 | 0.085 | 4; 5; 20; 13,15; 3 |
| 2 | mot | 0.907 | 0.787 | 0.619 | 0.077 | 17; 4; 20; **8**; 23; 21,22; **16** |
| 3 | pkc | 0.961 | 0.894 | 0.733 | 0.133 | 17; 4; 20; 23; 21,22; 3; 2; **1,18,19,24** |
| | M1 | 0.883 | 0.759 | 0.922 | | |

*A.6 Synthesis: explained cases*

The data matrix of all cases is provided below. We added colours to the Case ID and Case No. as well as to the relevant conditions to indicate by which paths a specific case is explained (most parsimonious and intermediate solution only).

- Grey rows: cases were excluded from the QCA.
- Green: solution for high learning outcome. Darker green cells contain a necessary condition, middle green cells contain conditions that are part of the most parsimonious solution, light green calls contain conditions that are part of the intermediate solution.
- Orange: solution for low learning outcome (high thresholds applied). Darker orange cells contain conditions that are part of the most parsimonious solution and lighter orange cells contain conditions that are part of the intermediate solution.
- Yellow: solution for medium learning outcome (0.3-0.6) when lower consistency thresholds are applied. Yellow cells contain conditions that help to explain moderate levels of learning.

| | | | | Potentially relevant conditions | | | | | | | Outcome |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case ID | Case No. | Organization type | Country | PL | AB | MOT | OPP | ACT | POL | PKC | O |
| 11 | 1 | National Authority | Austria | 0.60 | 0.70 | 0.70 | 1.00 | 0.70 | 0.70 | 0.37 | **0.47** |
| 12 | 2 | Knowledge Institute | Slowakia | 0.60 | 0.70 | 0.70 | 0.70 | 0.70 | 0.30 | 0.37 | **0.34** |
| 13 | 3 | National Agency | Hungary | 0.53 | 0.70 | 0.70 | 0.70 | 0.30 | 0.70 | 0.37 | **0.43** |
| 14 | 4 | National Institute | Serbia | 0.23 | 1.00 | 0.30 | 1.00 | 0.30 | 0.70 | 0.37 | **0.14** |
| 21 | 5 | National Agency | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.30 | 1.00 | 0.68 | **0.32** |
| 22 | 6 | National Agency | Belgium | 0.70 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.68 | **0.67** |
| 23 | 7 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 0.70 | 0.70 | 0.68 | **0.70** |
| 24 | 8 | Semi-public auth. | Germany | 0.60 | 0.30 | 0.30 | 1.00 | 0.70 | 1.00 | 0.68 | **0.52** |
| 31 | 9 | Municipality | Netherlands | 0.30 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.80 | **0.82** |
| 32 | 10 | Municipality | Norway | 0.70 | 1.00 | 0.70 | 1.00 | 1.00 | 1.00 | 0.80 | **0.55** |
| 33 | 11 | Knowledge Institute | UK | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.80 | **0.61** |
| 34 | | Municipality | UK | 0.60 | 0.70 | 0.00 | 0.70 | 1.00 | 0.70 | 0.80 | **0.16** |
| 35 | | Municipality | UK | 0.93 | 0.70 | 0.70 | 0.70 | 1.00 | 0.70 | 0.80 | **0.31** |
| 36 | 12 | Knowledge Institute | Netherlands | 0.53 | 1.00 | 0.70 | 0.70 | 1.00 | 1.00 | 0.80 | **0.84** |
| 41 | 13 | Knowledge Institute | UK | 0.70 | 0.70 | 1.00 | 1.00 | 0.00 | 0.30 | 0.75 | **0.34** |
| 42 | 14 | Knowledge Institute | UK | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 1.00 | 0.75 | **0.61** |
| 43 | 15 | Knowledge Institute | Greece | 0.60 | 1.00 | 0.70 | 1.00 | 0.30 | 0.30 | 0.75 | **0.32** |
| 44 | 16 | Knowledge Institute | Estonia | 0.53 | 0.70 | 0.30 | 1.00 | 0.70 | 0.70 | 0.75 | **0.53** |
| 51 | 17 | Municipality | Netherlands | 0.30 | 0.30 | 0.00 | 0.70 | 0.70 | 0.30 | 0.37 | **0.09** |
| 52 | 18 | Knowledge Institute | Hungary | 0.60 | 1.00 | 0.70 | 1.00 | 1.00 | 0.70 | 0.37 | **0.33** |
| 61 | 19 | Regional Authority | Netherlands | 0.60 | 1.00 | 0.70 | 1.00 | 0.70 | 1.00 | 0.43 | **0.37** |
| 62 | 20 | Regional Agency | Germany | 0.83 | 0.30 | 0.30 | 0.30 | 0.30 | 0.00 | 0.43 | **0.23** |
| 63 | 21 | National Agency | Belgium | 0.70 | 1.00 | 0.30 | 1.00 | 0.70 | 1.00 | 0.43 | **0.36** |
| 64 | 22 | Regional Authority | Netherlands | 0.70 | 0.70 | 0.30 | 0.70 | 0.70 | 1.00 | 0.43 | **0.23** |
| 65 | 23 | Regional Agency | France | 0.60 | 0.70 | 0.30 | 0.00 | 0.70 | 0.00 | 0.43 | **0.12** |
| 66 | 24 | Regional Authority | UK | 0.60 | 0.70 | 1.00 | 1.00 | 0.70 | 1.00 | 0.43 | **0.59** |
| 71 | 27 | Regional Authority | Germany | 0.53 | 0.70 | 1.00 | 0.70 | 0.70 | 0.70 | 0.95 | **0.38** |
| 72 | 28 | NGO | Hungary | 0.60 | 1.00 | 1.00 | 1.00 | 1.00 | 0.70 | 0.95 | **0.42** |
| 73 | 29 | Regional Agency | Romania | 0.93 | 0.70 | 1.00 | 1.00 | 0.70 | 0.70 | 0.95 | **0.59** |
| 74 | 30 | Regional Authority | Netherlands | 0.70 | 1.00 | 1.00 | 1.00 | 0.70 | 0.70 | 0.95 | **0.53** |

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