How to study learning in European cooperation projects? An introduction of a comparative research design

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Date: February 2015

Project: KNOW2ADAPT - Knowledge transfer for climate change adaptation

Deliverable: No 1 - Inception Report

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1   Introduction

This report elaborates the theoretical and methodological basis of the research project 'Knowledge transfer for climate change adaptation (KNOW2ADAPT)'. This chapter begins with an introduction of the research background, the empirical focus and problem context. Subsequently, the research scope, objective and questions, research approach and methods, and anticipated outcomes are presented. The last section provides a brief outline of the report.

1.1   Background: Climate change adaptation and European cooperation programmes

The recently published World Water Development Report (WWAP, 2012) shows that many regions around the world face pressing water problems. Some of these problems, such as inadequate access to drinking water and sanitation, are only experienced in some countries. Other problems, such as water scarcity and poor water quality, are faced by many more countries. Particularly climate variability currently puts water supply under pressure. In many regions, the effects of climate change are expected to reduce precipitation and thus the availability of water. At the same time, the frequency of heavy rainfall is expected to increase. The projected impacts and effects of climate change differ from region to region. In Europe, the probability of floods is projected to increase in many river basins. Also droughts and water stress are expected to occur more often, particularly in Southern Europe. Even when mitigation efforts prove to be successful, adjustment of natural and human systems to the effects of climate change are therefore needed (EEA, 2010). In adapting to the potential impacts of climate change, European policy makers underline the need to learn from other countries. At the same time, they feel that knowledge that has been successfully applied in another country does not need to be equally relevant in their own country (Hanger, Pfenninger, Dreyfus, & Patt, 2013). Research confirms that biophysical and institutional contexts alongside political, social, economic and cultural contexts must be considered when transferring knowledge about water management from one setting to another (Swainson & de Loe, 2011). Against this background, this research questions under what conditions actors from diverse countries can learn from each other about climate change adaptation.

Climate change poses similar challenges to many European countries. As countries have other levels of experience and respond differently, there is a great potential for mutual learning and knowledge transfer. International collaboration and learning can accelerate policy developments, prevent reinventing the wheel and may help to adapt in a more efficient and effective manner to climate change. The potential benefits of international collaboration and learning are widely recognized, and the development and dissemination of best practices is promoted by a wide range of international and supranational organizations, such as, the World Bank, the OECD and the European Union (De Boer, Vinke-de Kruijf, Ozerol, & Bressers, 2013; Stead, 2012).

In a European context, learning and knowledge transfer across member states is stimulated by a wide range of programmes. Most notable in the last programming period (2007-2013) are the European Territorial Cooperation objective (formerly referred to as the INTERREG community initiative) and the Seventh Framework Programme (FP7) for European research.

Territorial Cooperation is funded through the European Regional Development Fund and part of the EU's Regional Policy (also referred to as Cohesion Policy). Regional Policy aims at improving the well-

being of the regions and to avoid regional disparities. The specific goal of the Territorial Cooperation objective is to encourage partners from different EU Member States to work together and learn from each other through joint programmes, projects and networks. The Territorial Cooperation objective is realized through three different programmes: one for cross-border cooperation, one for transnational cooperation and one for interregional cooperation. The total budget amounts to circa € 7.8 billion. In the different programmes, natural risks, including climate change, is one of the priority themes.

The Framework Programme is the EU's main programme for research, development and innovation. The programme is currently finalizing its 7th programming period (2007-2013), which had a total budget of € 53.2 billion. The largest part of the budget (€ 32 billion) was meant for the cooperative programme, which co-finances collaborative research projects that are implemented by a consortium with partners from different European countries. The programme supports projects in nine thematic areas, including the area of environment with a budget of € 1.9 billion. A number of these projects addressed water management as well as climate change.

1.2   Problem context: Learning and knowledge transfer through European projects

INTERREG and FP7 programmes promote the implementation of transnational and interdisciplinary programmes, projects and networks. The focus of this research is on climate change adaptation-oriented projects – rather than programmes or networks – that are implemented with financial support from the European Commission. Broadly speaking, a project can be defined as a temporary organisation of people dedicated to the achievement of specified objectives and results, which have to be completed by a certain date and for a certain amount of financial resources (Koskinen, Pihlanto, & Vanharanta, 2003). The focus of this research is on subsidized projects, which have highly pre-defined boundaries: what organizations are involved (i.e. the consortium) and what these organizations will achieve (i.e. projected outcomes and impacts) for how much money (i.e. the financial budget) is defined from the outset and can only change to a limited extent and with permission of the subsidy programme.

In the case of European cooperation projects, learning takes place within the constraints of a heterogeneous team of persons, which are brought together because of a common interest. In the case of INTERREG projects, this can be a single joint problem that affects all partners (e.g. pollution of a transboundary river) or a common problem that manifests itself differently in various partner regions (e.g. adaptation to droughts). Some projects are oriented to the implementation of practical tasks (hands-on approach), whereas other projects are oriented to the development of new knowledge for strategies and policies (Böhme, 2005). Compared to INTERREG, environmental research in the FP7 programme is much more focused on the development of new knowledge and the provision of solutions to problems and policies. The cooperation programme realizes this through collaborative research, the creation of networks, coordination of existing research programmes and technology initiatives and platforms.

While international collaborations may be beneficial, previous research shows that it does not necessarily contribute as much to learning and knowledge transfer as hoped for. Comparative research concerning collaborative projects involving Dutch and Romanian actors identified three major obstacles. Firstly, interactions may be unconstructive, for example, because actors with diverse backgrounds have difficulties to completely understand each other and each other's context.

Secondly, there may be limited possibilities to adapt the project or the knowledge being transferred to (changing) conditions and circumstances or new insights. Thirdly, actors may have difficulties to disseminate and implement the project outcomes, for example, because they do not know how to draw a linkage between their informal learning processes and formal policy processes (Vinke-de Kruijf, 2013).

The above-mentioned obstacles are largely confirmed in a study concerning the strengths and weaknesses of the INTERREG programme for Northwest Europe. The analysis shows that productive interactions are constrained by differences in government and legal structures across administrative boundaries and a lack of a 'culture of cooperation' which would facilitate exchanges. Also the impacts of projects are limited as cooperation often continues to be ad-hoc and rarely becomes institutionalized. In addition, partners often lack the institutional capacity to engage in transnational territorial cooperation projects, and projects are generally undertaken only by a limited number of people in a specific division or unit (this is particularly the case for national and regional public administrations) (INTERREG IVB, 2006). A further analysis of the processes and outcomes of various European projects, as will be done in KNOW2ADAPT, is expected to shed new insights into the conditions that support or restrict learning in an international project context.

1.3 An introduction into the evaluation of climate change adaptation-oriented projects

This research project focuses on the evaluation and comparison of European projects on climate change adaptation in the water sector. Evaluation refers to the process of determining the merit, value or worth of an intervention such as a programme, a project or a process. This can be done for the purpose of improving the intervention (formative evaluation) or once an intervention has been completed (summative evaluation) (Scriven, 1991). The focus of this research is on the latter: it aims to determine and compare the merit of completed cooperation projects concerning climate change adaptation in the water sector. Cooperation projects and climate change adaptation interventions can be evaluated from different perspectives. This section introduces possible approaches and explains why we choose to focus on learning processes and outcomes.

Climate change adaptation is a relatively new evaluation domain for which only recently a few initial monitoring and evaluation guidelines were developed. On behalf of a German Ministry, the World Resources Institute developed a comprehensive report introducing concepts and options for the monitoring and evaluation of climate change adaptation. The authors propose a step-wise approach that starts with describing the adaptation context and action. Next an adaptation hypothesis and a theory of change are formulated and indicators and a baseline (i.e. a starting-point from where progress is measured) are selected. Within this context a 'theory of change' refers to the key assumptions that describe the causal relation between an intervention as well as the factors that inhibit or support the achievement of successful outcomes (Spearman & McGray, 2011). In the evaluation literature, such an approach is commonly referred to as theory-based evaluation. What characterizes such an approach is that it relies on theory, rather than a specific method or output, to provide an improved understanding of what works for whom, when and why. A review by Stame (2004) of various theory-based evaluation approaches shows that they may take different forms and can build either upon one theory that is rooted in social science, multiple theories that are rooted in the programme being evaluated or a theory concerning context, mechanism and outputs, which are achieved by actors. She further argues that complex European programmes and projects suffer from an evaluation deficit, which closely relates to the multi-level governance context in which they are

implemented. Among the issues are that lower level evaluations are not linked to higher level goals and that impact assessments fail to explain why and how outcomes occurred. Theory-based evaluation approaches could improve evaluations on the condition that they consider the various ways in which actors conceive how means and instruments help to achieve certain outcomes (Stame, 2004). The implication of this is that a single theory of change is unlikely to provide a sufficient basis for the evaluation of complex projects that are embedded in a multi-level governance context.

As for the indicators that can be used to assess the actual merit of a cooperation project, a distinction can be made between process and outcome indicators. The outcomes of an intervention can be intended or unintended (positive or negative side effects). Furthermore, they can take the form of immediate outcomes (i.e. direct outputs of effects) or ultimate outcomes (i.e. impacts and consequences) (Rossi, Lipsey, & Freeman, 2004; Scriven, 1991). Evaluations preferably include both process and outcome indicators since an outcome evaluation is incomplete without an assessment of the process, and vice versa (Scriven, 1991). Moreover, a study on the evaluation of collaborative processes shows that process and outcome variables are tied together, i.e. successful processes produce good answers through a good process. The study further shows that outcomes may be tangible products as well as intangible outcomes, such as, new relationships and trust and include direct effects as well as second and third order effects that show outside the project boundaries or that show only once a process is completed (Innes & Booher, 1999). In addition, evaluations focusing on collaborative environmental processes show that it may be useful to distinguish between social and environmental outputs and outcomes. Thus, processes may result high-quality agreements, social, intellectual or political capital, implemented programmes or projects and improved environmental parameters (Mandarano, 2008).

Process and outcome variables both provide a different perspective on the success of a collaborative environmental process. Yet, environmental interventions are often primarily evaluated from an outcome perspective, paying little attention to whether the process was, for example, open and participatory (Rauschmayer, Berghöfer, Omann, & Zikos, 2009). But, what does this imply for the evaluation of climate change adaptation-oriented projects? From a process perspective, adaptation can be seen as an ongoing process of understanding and addressing risks and vulnerabilities that fosters learning and improvement. From an outcome perspective, adaptation can be seen as interventions that aim at building specific capacities, reducing a particular vulnerability, or managing specific risks (Spearman & McGray, 2011). To actually assess the outcomes of an adaptation intervention may be challenging though. Due to the involvement of multiple scales, levels and sectors and the occurrence of long-term effects in a dynamic context, causal linkages between the intervention and its effects tend to be hard to establish (Rauschmayer et al., 2009). This applies to environmental processes in general and to climate change adaptation in particular as the impacts of climate change are yet uncertain. Therefore, one may argue that adaptation should not be seen as an outcome, but as an on-going, iterative process. Within this context, criteria are needed that take uncertainty into account. Examples of such indicators are flexibility (i.e. the robustness of an intervention to a variety of possible future scenarios) or opportunities provided for organizational and societal learning (i.e. does the intervention promote cooperation across and between organizations, sectors and disciplines) (Pringle, 2011).

The above brings us to the conclusion that an evaluation of adaptation projects should pay explicit attention to the multi-level context in which they take place. Furthermore, the actual contribution of an intervention to climate change adaptation is difficult to measure from an environmental outcome

perspective. Rather than providing a 'complete' evaluation of climate change adaptation-oriented project, we therefore choose to focus on learning processes and outcomes. To understand the ultimate outcomes of learning, we adopt a knowledge utilization perspective. From such a perspective, learning becomes visible in the degree to which knowledge, insights and skills arising from interactions are actually used to inform natural resources governance policies and practices (Crona & Parker, 2012). In short, this leads to the following evaluation model (Figure 1): social interactions (process) lead to an increase of knowledge, insights and skills (immediate outcomes), which may lead to more adaptive organizations and natural resource governance policies and practices (ultimate outcomes or impacts) (cf. Crona & Parker, 2012). When assessing the wider impact of a project, one should keep in mind that policies may change in response to other factors than learning (Huitema, Cornelisse, & Ottow, 2010; Newig, Günther, & Pahl-Wostl, 2010).
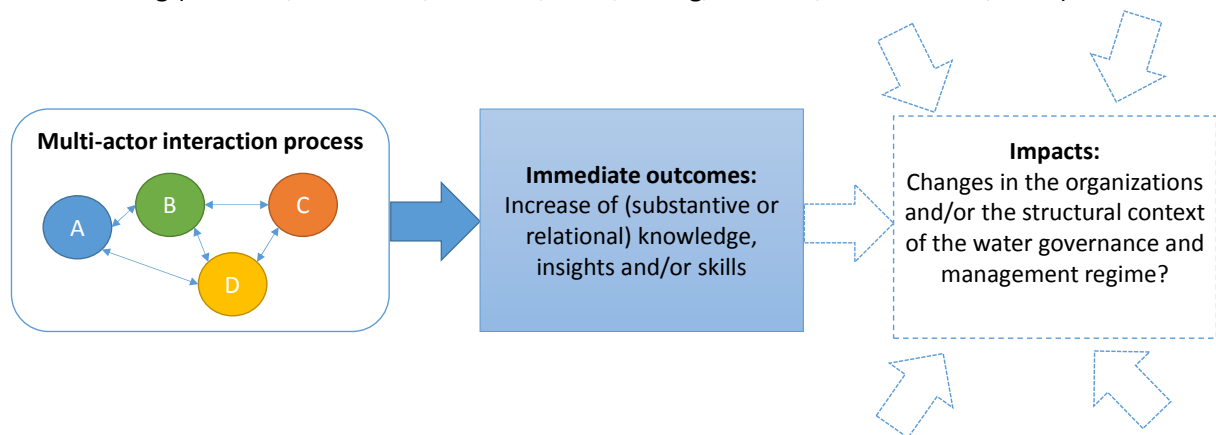
Figure 1 – Conceptualization of projects as a multi-actor interaction process with outcomes and wider impacts

1.4 Objective and questions

Despite that European cooperation projects are abundant, little is known about their impacts and success factors. This raises questions like: Do these projects indeed promote the international transfer of knowledge and learning? Why are some projects more successful than others? Against this background, the objective of this research is:

> *To produce generalizable insights on the outcomes as well as the combination(s) of condition(s) that lead to the outcomes of European cooperation projects with a focus on climate change adaptation in the water sector by systemically comparing the process, outcomes and impacts of these projects from a multi-level learning perspective.*

In this inception report, we establish a basis for the collection and analysis of empirical data. In the next chapters, we address the following research questions:

1. What is climate change adaptation about in a European context and what kind of actions, drivers and barriers to adaptation exist?
2. What are, according to relevant literature, the factors influencing the processes and outcomes of learning, policy change and policy transfer?
3. How to meaningfully compare learning in European projects?

In this research, insights from the literature on social and societal learning, organizational learning, knowledge utilization and natural resource governance are integrated into a conceptual framework of learning. On the basis of this literature, a project is seen as highly successful when project actions

and interactions have learning outcomes at three different levels: (1) the micro-level where individual project partners interact with and learn from each other; (2) the meso-level consisting of organizations (e.g. authorities or associations) with a role in water management and climate change adaptation; and (3) the macro-level forming the structural governance and societal context for water management and climate change adaptation (Pahl-Wostl et al., 2007). Our general expectation is that learning first and foremost occurs at the micro-level where social interactions between project participants can lead to new knowledge and skills as well as changes in understanding. What has been learned at the micro-level can be communicated and disseminated to the meso-level and can therefore result in the uptake of lessons learned by organizations with a role in water management or climate change adaptation. This may eventually lead to incremental or more substantive changes in the governance system, for example, when norms, routines or frameworks are changed in response to the lessons learned. The theoretical basis and building blocks of this framework are elaborated in Chapter 5 of this report.

1.5   Research approach and methods

To achieve the research objective, Qualitative Comparative Analysis (QCA) is used as a research approach and technique (B. Rihoux & Lobe, 2009; Schneider & Wagemann, 2012). The reason for using QCA is that the method allows for "systemic cross-case comparisons, while at the same time giving justice to within-case complexity, particularly in small- and intermediate-N research designs" (Benoît Rihoux & Ragin, 2009, p. xviii). Moreover, the method is based on the assumption that different paths may lead to the same outcome. In other words, the presence or absence of an outcome may be produced by the presence or absence of different combinations of conditions.

In recent years, the number of QCA studies has expanded with applications mostly in political science, sociology and anthropology, and economics and management (Benoît Rihoux, Alamos, Bol, Marx, & Rezsohazy, 2013). We expect that QCA can also be fruitfully applied to understand learning in natural resources management. While QCA applications are yet scarce in the environmental policy and governance literature, the method has been used, for example, to examine the relation between governance regime characteristics and policy learning (Huntjens et al., 2011), project and organization characteristics and project knowledge transfer (Bakker, Cambré, Korlaar, & Raab, 2011), spatial planning project networks and stakeholder satisfaction (Verweij, Klijn, Edelenbos, & Van Buuren, 2013) and water governance regime ideal types and adaptive capacity (Pahl-Wostl & Knieper, 2014).

In this research, QCA will be used to understand the conditions that are necessary or sufficient for climate change adaptation-oriented learning in a project context but with outcomes at multiple levels. On the basis of a literature review, Chapter 5 of this report presents a preliminary model of learning. As we conceptualize learning as a multi-level process, what composes 'a case' is not straightforward. A single project can be seen as one case or as one context consisting of multiple cases (read: project participants or partners). In other words, the multi-level framework allows us to 'play' with what will be a case and, at the moment of writing, no final decisions were made regarding the unit of analysis (i.e. individuals or projects). On the basis of a literature review, this report presents relevant outcomes and conditions (see Chapter 5). Before applying the preliminary model at a larger scale, the model will first be applied to a pilot case.

Selecting cases for QCA must be done purposefully so that cases display common background features and vary on outcomes and conditions (B. Rihoux & Lobe, 2009). In this research, cases will be selected from European cooperation projects that have the following features in common: (1) implemented with support of the recently completed INTERREG IV A, B and C programmes or the cooperative research programme of FP 7 Environment; (2) recently completed (completion date between 2011 and 2014); (3) address water management or governance issues in relation to climate change adaptation. Conditions on which the cases vary include: actors, process, theme, outcomes, organizational and policy context. In total, circa 10-15 projects will be selected so that it will be possible to acquire in-depth knowledge of each project while also having sufficient cases to draw conclusions.

For each project, data will be collected for different levels of analysis. Data about the structural context will be derived mostly from existing studies. Other data will be collected mostly through the analysis of project documents (e.g. proposal, progress reports, outputs and the website, and on other relevant documents such as policies or plans, scientific articles, reports and the like) and interviews with project participants (semi-structured phone interviews with the lead partner and a selection of other partners, possibly in combination with an (online) questionnaire). As project participants are likely to overestimate the project impacts, information will be cross-checked as much as possible with third parties or documents.

Data collection will be guided by a case study description template (see Annex 1, to be adjusted on the basis of the pilot case study results). First, a general description of the project will be prepared on the basis of project-specific documents and an interview with the lead partner. This description will be verified with other partners. Second, partner-specific information will be collected about learning and change processes. Eventually, the data (mostly qualitative) will be transformed into 'fuzzy' values between 0 and 1 (with 0 indicating a low score on that specific sub-indicator for an outcome or a condition). This than will be used as input for the computer-aided part of QCA.

1.6   Anticipated outcomes and relevance

The main outcome of this research is the production of new knowledge regarding the conditions that contribute to learning at multiple levels within the context of international collaboration on climate change adaptation in the water sector. As climate change poses similar challenges to many countries, the production of this knowledge is very relevant from a policy-making perspective. An important aspect of this research is therefore to translate the generated knowledge into concrete lessons and recommendations on how countries may successfully collaborate in reducing global environmental problems.

The scientific relevance of this research is two-fold. First of all, insights from two rather diverse literature streams will be integrated: about transnational and organizational learning and knowledge transfer as developed in political and organization sciences and about the management and governance of natural resources and social learning as developed in environmental sciences. The integration of both literature streams is rather uncommon (exceptions include De Boer et al., 2013; Swainson & de Loe, 2011; Vinke-de Kruijf, 2013). While the issue of transferability is touched upon in various articles focusing on natural resources management and governance (e.g. Ingram, 2008; Ostrom, 2007; Pahl-Wostl & Kranz, 2010) they generally do not use insights from studies that specifically focus upon transfer processes or on organization sciences. Transfer studies do provide

useful insights in why, who, what, from where and to what degree policy-relevant knowledge is transferred (see e.g. Dolowitz & Marsh, 1996, 2000; Kroesen, de Jong, & Waaub, 2007; Rose, 1993), but the focus of these studies is mostly upon the transfer of public administrative knowledge (e.g. related to welfare policies or new public management). Hence, they emphasize political, socio-economic and institutional differences between countries but do not pay attention to biophysical differences, which may become relevant in the context of water management.

Secondly, this research aims to test the applicability of QCA to knowledge transfer and water governance studies. By doing so, we hope to provide a credible alternative to researchers who examine policy transfer or water governance and prefer in-depth case studies. This is understandable given the complexity and context-specificity of such processes. However, the lack of systemic comparison also resulted in fragmented knowledge that lacks the potential of deriving more general conclusions (Mossberger & Wolman, 2003; Pahl-Wostl & Kranz, 2010). Moreover, previous research shows that knowledge transfer processes cannot be explained by analysing simple causal relations, such as the similarity between countries and the successful transfer of knowledge (De Jong, Mamadouh, & Lalenis, 2002; Kroesen et al., 2007).

1.7 Outline of the report

The report is structured as follows. This chapter provides an introduction of the proposed research. In the next chapters, an overview of theoretical concepts and ideas on climate change adaptation (chapter 2), learning and policy change in the natural resource literature (chapter 3), collaboration and learning in European projects and the organization sciences literature (chapter 4) is provided. Each of these chapters closes with a brief summary of the key findings. In Chapter 5, the presented theoretical concepts and ideas are synthesized into a conceptual framework. The last chapter provides an introduction of relevant programmes, including potential case studies. Annex 1 of the report provides a preliminary case study description template, which is meant to guide the collection of data in the pilot case study.

2 Climate change adaptation

This section provides an introduction of relevant studies and literature focusing on climate change adaptation. First, we summarize relevant insights from policy documents and relevant literature concerning the development and implementation of adaptation. Next, we set out a definition of climate change adaptation.

2.1 From mitigation to adaptation

In previous decades, the primary response to climate change has been mitigation through the reduction of greenhouse gas emissions. Only with the increasing evidence of climate impacts occurring adaptation has recently climbed the political agenda (Biesbroek et al., 2010). This evidence is especially provided by the Intergovernmental Panel on Climate Change (IPCC), which was established by the United Nations Environmental Programme (UNEP) and the World Meteorological Organization (WMO) in 1988. The IPCC aims to provide the world with a clear scientific view on knowledge about climate change and its potential impacts by reviewing and assessing available information. The most recent IPCC report reads that "warming of the climate system is unequivocal. […] The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC, 2013, p. 4). Against the background of this evidence, it is now widely recognized that even when mitigation efforts prove to be successful adaptation measures are needed (European Commission, 2007, 2009, 2013a; Preston, Westaway, & Yuen, 2011).

For various reasons governments have focused on mitigation rather than adaptation. One reason is that mitigation can reduce impacts on all climate-sensitive systems whereas the adaptation potential of many systems may be limited. Another reason is that the long-term impacts of mitigation are relatively well known and can be monitored whereas the effectiveness of adaptation actions are highly uncertain and difficult to measure. Moreover, mitigation can be realized through the 'polluter pays' principle whereas the need for adaptation measures is typically highest in developing countries (which are usually not the causers of climate change) (Füssel, 2007). Currently, the attention for adaptation is growing. Both in public and private sectors, actors have started to incorporate climate change considerations in policies and plans. However, the implementation of adaptation responses remains limited and focuses upon engineering and technological options. On the positive side, there is some evidence that the attention for incremental adjustments, win-win situations, flexibility and learning is growing (IPCC, 2014).

In the international mitigation debate, the European Union has played a leading role. In the early 1990s, several EU countries took the lead in establishing voluntary emission reduction targets. In the beginning of the 2000s, the EU decided to move forward with the ratification of the Kyoto protocol, even though the US had withdrawn (Schreurs & Tiberghien, 2007). In the adaptation debate, the EU has played a less prominent role. Only in recent years, the European Commission has acknowledged the need for adaptation in a green paper (European Commission, 2007), a white paper (European Commission, 2009) and strategy (European Commission, 2013a) for climate adaptation. Before these papers and strategy, national and regional adaptation policies and practical steps were already being developed by communities and individuals (Smit & Wandel, 2006).

2.2 An overview of adaptation strategies, plans and actions

In the past decade, national adaptation strategies were developed by most European countries. Finland was the first country to have a formal strategy (adopted in 2006). This forerunner was followed by France and Spain (2006) and by Denmark, Hungary, the Netherlands, the United Kingdom and Germany (2008) (Swart et al., 2009). The adaptation progress of countries is monitored by the United Nations Framework Convention on Climate Change (UNFCCC) to which countries submit their National Communications on a four-yearly basis (5th due on 1 January 2010 and 6th due on 1 January 2014)[1]. In addition, the Climate Adaptation Platform of the European Environment Agency[2] provides an overview of the adaptation progress of 33 member countries[3] (28 European Union member states and Iceland, Liechtenstein, Norway, Switzerland and Turkey). According to the Climate Adaptation Platform (last access: 26 January 2015) 23 of these countries[4] adopted a national adaptation strategy and 10 countries[5] are still in the process of developing or adopting a strategy (no data for Luxembourg and Croatia). Countries are thus in different stages of preparing, developing and implementing national adaptation strategies. Moreover, existing strategies tend to differ in scope. For example, the focus in the Netherlands is very much on water and spatial planning whereas there is much more attention for health, equity, costs and cultural heritage in France (Swart et al., 2009). A key explanation behind these differences is that adaptation contexts are diverse. Hence, there is no single approach to adaptation assessment, planning and implementation (Füssel, 2007).

'Top-down' adaptation actions (e.g. the development of a national strategy) are relatively easy to identify and compare and therefore often focused upon in comparative studies (Biesbroek et al., 2010; Swart et al., 2009). One of the characteristics of top-down adaptation plans and policies is that they are based upon global assessments and climate models, which are downscaled to the national and/or regional level. Adaptation may also occur in a 'bottom-up' manner, which is the case when adaptation is introduced as add-on to regular development policies on the basis of present day or recent climate variability (Dessai & Hulme, 2004). Bottom-up adaptation is also referred to as 'mainstreaming' and refers to the idea that it becomes normal to consider adaptation alongside other issues when developing new policies or plans. In the European adaptation strategy, the mainstreaming of adaptation measures into European policies and programmes is seen as a key priority (European Commission, 2013a). A project that aims to integrate bottom-up knowledge and top-down processes is the EU-funded project BASE[6] (bottom-up climate adaptation strategies towards a sustainable Europe).

The literature shows that most adaptation actions currently involve mainstreaming: adaptation seldom occurs in response to climate change alone. Rather, adaptation action are side effects of mitigation or of non-climate change activities (Adger et al., 2007; Tompkins et al., 2010). Most of the studies focus on planned adaptations, i.e. interventions that are made based on the awareness that changes have or will occur. These interventions can be reactive (after some impacts have been experienced, e.g. disaster recovery) as well as anticipatory or proactive (before impacts of climate change are actually observed or experienced, e.g. forecasting, early warning, crop diversification).

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[1] See: http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/7742.php
[2] See http://climate-adapt.eea.europa.eu
[3] See http://www.eea.europa.eu/about-us/countries-and-eionet (no data for Croatia)
[4] Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Lithuania, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom
[5] Bulgaria, Czech Republic, Cyprus, Estonia, Greece, Iceland, Italy, Latvia, Liechtenstein and Slovenia,
[6] For more information, see: http://base-adaptation.eu

Adaptation does not need to be purposefully planned but may also occur autonomously or spontaneously (ecological, market or welfare changes without intervention) (Füssel, 2007; Parry, Canziani, Palutikof, van der Linden, & Hanson, 2007). While some economists argue that much adaptation will occur spontaneously, there are good reasons to argue that planned government interventions are needed to ensure efficient adaptation. Public policy should particularly target at protecting those least able to cope, protecting public goods and providing information on climate risks (see also Benzie, 2014; Tompkins et al., 2010). While public authorities play a key role in the adaptation process, they cannot adapt on their own. Adaptation planning requires combined efforts of public and private actors at different governance levels (Biesbroek et al., 2010) and of actors with diverse backgrounds, including scientists, practitioners, decision-makers and stakeholders, analysts (Füssel, 2007).

Planned adaptation actions can address different sectors (e.g. water, agriculture, nature, energy, transport, housing, infrastructure, health, recreation and tourism) (de Bruin et al., 2009), they may take different forms (e.g. technical, institutional, legal, educational or behavioural) (Adger et al., 2007; Füssel, 2007) and may concern different scales (i.e. involving short-term coping measures, substantial adjustments to some aspects of a system or a longer-term system transformation and paradigm shift) (Moser & Ekstrom, 2010). However, a review of observed adaptation shows that actions tend to be dominated by government initiatives and focused upon research into climate change impacts. Moreover, there is little evidence of climate change adaptation at the local level. Most progress is being made in sectors where large-scale infrastructure investments are needed (e.g. flood defence and water supply sectors) (Tompkins et al., 2010). An assessment of adaptation plans in the United Kingdom, the United States and Australia further shows that low-risk capacity building actions are preferred over the delivery of actions to reduce vulnerability. In addition, the plans are largely underdeveloped in the sense that most of them consider only some of the relevant aspects (Preston et al., 2011).

A study focusing on companies' responding to climate change pressures shows that they are likely to adapt to climate change as they adapt to market, regulatory or technological changes. Common modes of adaptation are changes to the commercial strategy, applied technologies, financial management systems and in data gathering and monitoring. How an organisation approaches adaptation is closely related to its core competencies, core business, dynamic capabilities and organisational culture. Depending on the outlook of these factors, organisations may adopt one of the following strategies: wait-and-see, risk assessment and options appraisal, bearing and managing risks, and sharing and shifting risks (Berkhout, Hertin, & Gann, 2006).

2.3   Adaptation interventions and adaptive capacity

To support the analysis of adaptation interventions, various attempts have been made to distinguish between different types of actions. A report on monitoring and evaluation suggests to distinguish between: (1) building of adaptive capacity; (2) implementation of actions to reduce risks or vulnerability; and (3) sustainable development in a changing climate (Spearman & McGray, 2011). An alternative classification is provided by the European Environment Agency, which distinguishes between grey actions (engineering and technological solutions), green actions (eco-system based approaches) and soft actions (managerial, legal and policy approaches) (see also Table 1). Particularly green and soft actions aim at enhancing adaptive capacity (i.e. the ability of a system to adjust to climate change) (EEA, 2013).

Table 1 – Overview of adaptation actions that have been taken across Europe (EEA, 2013)

Action type	Purpose and examples
Grey	Reduce vulnerability using technical or engineering solutions such as strengthening of coastal defences or river dykes and beach nourishment
Green	Use the multiple services of nature (i.e. ecosystem-based approaches) by applying measures such as crop diversification and wetland restoration
Soft	Alter human behaviour and governance styles, for example, through changes in the legal framework, early warning systems, monitoring, insurance schemes and awareness raising campaigns.

While the classification of the EEA is clear, its usability depends on the type of actions that are actually being taken. According to the IPCC, adaptation actions tend to focus on technical (grey) solutions (IPCC, 2014). The authors of a review in the UK, however, conclude that most of the observed adaptation actions fall into the 'soft' category of actions (e.g. research, plans/policies, networks, legislation, awareness raising, training and advocacy). In their own review, they distinguish between: (1) building of adaptive capacity; (2) implementation of adaptation; and (3) development of a supportive legislative and policy framework. However, they conclude that this classification has been limiting and propose two alternative categorizations (Tompkins et al., 2010). The first proposed alternative is to distinguish between: risk management, vulnerability reduction and resilience-enhancement (Eakin, Tompkins, Nelson, & Anderies, 2009). The second proposed alternative is to use the following categories: planning and management strategies, legal and institutional mechanisms, technological approaches, financial incentives and disincentives, education and training, and research and development (Scientific Expert Group on Climate Change, 2007). A classification that may be even less restricting and therefore more appropriate is to see adaptation as a process consisting of multiple decision-making phases rather than actions. Relevant phases include understanding, planning and managing, which can each be divided into three subprocesses (Moser & Ekstrom, 2010). These phases and the associated subprocesses are presented in Table 2.

Table 2 – Phases and subprocesses that may be included in projects focusing on climate change adaptation (Moser & Ekstrom, 2010)

Phase	Subprocesses
Understanding	Detecting a problem – Gathering/using information – (Re)defining the problem
Planning	Developing options – Assessing options – Selecting options
Managing	Implementing options – Monitoring – Evaluating

In various classifications, the concept of 'adaptive capacity' plays a key role. Within the context of climate change, adaptive capacity can be defined as "the ability or potential of a system to respond successfully to climate variability and change" (Adger et al., 2007, p. 727). Within this context, the notion of 'system' may refer to the natural system or the human system (as does the IPCC; cf. Parry et al., 2007) as well as to an ecosystem that is intricately linked to one or more social systems. In the latter social-ecological system perspective, the following structural elements may be considered relevant for climate change adaptation: actors, the object upon which they act (i.e. the system of concern) and the encompassing larger context (governance system, and human and biophysical environment), see Figure 2. Adaptation processes may involve a change in a system of concern (e.g. coastal defence) or a change in actors (e.g. perceptions, use of information) and may only be possible

when the governance context changes as well (Moser & Ekstrom, 2010). An implication of this view on adaptation is that 'building adaptive capacity' is more than just altering technical, financial or environmental systems, it is also about institutions, organisations and individuals having the skills, resources and flexibility to adapt to climate change (Spearman & McGray, 2011).
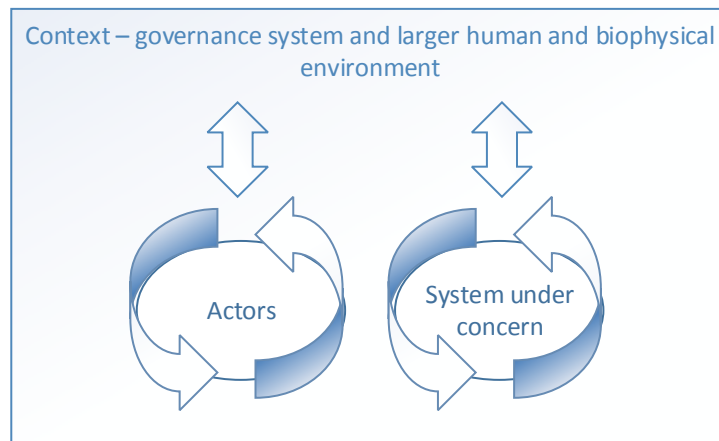

Figure 2 – Structural elements of climate change adaptation processes: interacting actors and the system of concern embedded in a wider context (Moser & Ekstrom, 2010)

In recent publications, various authors explicitly link climate change adaptation and adaptive capacity to learning processes. Pelling et al. (2008) argue that learning and relational attributes of organizations and governance regimes are central to adaptive capacity. This implies that adaptation is not just about reducing risks and institutional modifications, but includes processes through which actors can learn to learn. Similarly, Pahl-Wostl (2009) argues that sustainable resource management cannot be realized unless governance regimes become more adaptive. Within this context, she links the concept of adaptive capacity to governance systems and multi-level learning processes. Adaptive capacity refers here to "the ability of a resource governance system to first alter processes and if required convert structural elements as response to experienced or expected changes in the societal or natural environment" (Pahl-Wostl, 2009, p. 355). Adaptive capacity has also been linked to the characteristics of institutions and, in particular, to the degree to which institutions allow actors to "learn from new insights and experiences in order to flexibly and creatively 'manage' the expected and the unexpected, while maintaining a degree of identity" (Gupta et al., 2010, p. 461).

2.4   Drivers and barriers towards adaptation

National strategies are generally developed in response to a combination of key events or factors, including extreme weather events, international policy developments, scientific research, expected costs or opportunities and influences from other stakeholders (media, NGOs, private sector). In most European countries, the development of a national strategy has been triggered by the projected and experienced impacts of extreme events (particularly droughts in southern Europe and floods in central and northern Europe) in combination with an increase of region-specific information about vulnerabilities and impacts. Factors that facilitated the development of adaptation policies include the presence of resources (knowledge, proactive experts), political will and good cooperation between key actors (Biesbroek et al., 2010). A list of preconditions for effective planned adaptation largely overlaps with these factors: problem awareness, availability of measures, information about these measures, information, resources, cultural acceptability and incentives (Füssel, 2007).

Generally speaking adaptation is a response to some kind of stressor, signal or stimulus. In the case of climate change, this stressor can be external (e.g. flooding or drought), internal (e.g. change in policy goals), direct (e.g. damage experienced to infrastructure) or indirect (e.g. changes in socio-economic conditions) (Pelling, High, Dearing, & Smith, 2008). A review of observed climate adaptation in the United Kingdom shows that experienced or perceived impacts of climate change are the most important driver of general climate actions (public and private sector, anticipatory and reactive, purposeful and accidental). In addition, key drivers of climate change actions are legislation (climate and non-climate related, national and international), biodiversity conservation, risk management and cost savings (Tompkins et al., 2010). A study regarding adaptation by companies (water and housing sectors) shows that firms have difficulties interpreting signals of climate change. Even when they are aware of climate change, they hardly experience any direct signals. In case potential signals (e.g. decrease in water supply or flooding) are experienced, they are interpreted as being specific rather than being a direct consequence of climate change. Signals of climate change are therefore not only difficult to interpret but also often not experienced directly (Berkhout et al., 2006).

An assessment of adaptation practices shows that while measures that take future climate change into account are growing, they remain limited. Even when there is a high capacity to adapt (i.e. resources, capacity and knowledge are available), this does not necessarily translate into actions (Adger et al., 2007). Among the common barriers are uncertainty over information, the need for collective decision-making and a lack of clarity over who is responsible for action (Tompkins et al., 2010). A framework to diagnose possible adaptation barriers identifies barriers related to actors, governance systems and the larger context. These barriers may occur in different phases of the adaptation process, including the understanding phase (e.g. lack of awareness or information), planning phase (no leadership, control, agreement on assessment data or methods) and managing phase (lack of resources, monitoring option or willingness to learn). Issues that tend to arise in multiple phases are: leadership, resources, communication and information, values and beliefs. The origin of these barriers can be diverse: they can be remote or proximate from a spatial or jurisdictional perspective as well as contemporary or legacy from a temporal perspective (Moser & Ekstrom, 2010).

2.5   Defining climate change adaptation

Over the past years, various definitions of climate change adaptation have emerged. Among the most cited ones is the definition of the IPCC:

> *Adaptation is any anticipatory, autonomous or planned "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).*

A key word in the IPCC definition is 'adjustment', which according to the UNFCCC website[7] refers to "changes in processes, practice and structures". As for the aim of adaptation, most organizations emphasize that adaptation is about two different things: (1) moderating, preventing or reducing disruption, risk, harm or damage; and (2) exploiting opportunities, taking advantage or realizing benefits (Levina & Tirpak, 2006). In the European Adaptation Strategy, this dual goal is made more

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[7] Retrieved: http://unfccc.int/focus/adaptation/items/6999.php (11 August 2014)

explicit by translating them into economic costs and benefits of adapting versus not adapting (European Commission, 2013a).

While many studies refer to the IPCC definition, it has also been critiqued for focusing only on actions that are motivated by climate drivers. This does not need to be the case: while adaptation must consider climate change, actions may also result (partly) from non-climatic drivers (Moser & Ekstrom, 2010; Tompkins et al., 2010). The UKCIP website[8], for example, reads that "adaptation is a process of on-going adjustments in response to climate and non-climate drivers". In their working definition of adaptation, Tompkins *et al.* (2010) see adaptation as "any adjustment by any actor or institution to any real or perceived climate change […] whether or not motivated by climate change" (ibid, p. 630). Another critique on the IPCC definition is that it is based on the implicit assumption that adaptation actions are effective, which is yet unknown. Therefore, Moser and Ekstrom (2010) suggest the following definition:

> *"Adaptation involves changes in social-ecological systems in response to actual and expected impacts of climate change in the context of interacting non-climatic changes. Adaptation strategies and actions can range from short-term coping to longer-term, deeper transformations, aim to meet more than climate change goals alone, and may or may not succeed in moderating harm or exploiting beneficial opportunities" (ibid, p. 22026).*

In this research, we investigate adaptation within the context of transnational projects. In these projects, adaptation is likely to be driven by climate change in combination with other issues. Actions can be diverse and may vary from the development of a strategic plan to the implementation of concrete technical or social measures. As to who adapts, these are the actors involved in the project in interaction or cooperation with other actors. Considering this, we adopted the following working definition of adaptation.

What?   Any change in the social-ecological system (i.e. in the actors, governance system, human or biophysical environment) in response to experienced or expected climate change (in the context of climatic and non-climatic changes) with the aim of moderating potential harm or exploiting beneficial opportunities

Who?   Any actor or institution, including public authorities, private sector, non-governmental actors at the supranational, national, regional, local governance levels.

How?   Changes in the governance system (e.g. the development of policies or plans, the adjustment of legislation, policies or practices), changes in the socio-economic and biophysical environment (e.g. implementation of technical or eco-system based measures, awareness raising and the implementation of soft measures (e.g. training, research, education) to raise awareness, reduce uncertainties and provide information.

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[8] Retrieved: http://www.ukcip.org.uk/about-adaptation/ (11 August 2014)

2.6 Summary of key findings

The presented literature on climate change and climate change adaptation highlights that:

- There is a growing awareness of the need to adapt to the experienced and expected impacts of climate change, i.e. to change the social-ecological system in such a way that the ability of the system to cope with or adapt to climate change is expected to increase.
- The European Commission recently adopted an adaptation strategy, and national adaptation strategies have been developed by most European countries. Adaptation is increasingly considered in the development of new policies and plans and yet adaptive responses remain limited.
- Adaptation actions are taken at different levels and tend to involve a wide range of actors from diverse sectors. They are seldom taken in response to climate change alone. They generally aim at building adaptive capacity, reducing vulnerability or risks or sustainable development in a changing climate.
- Some of the common barriers to adaptation (e.g. a lack of resources like knowledge and finances) can be reduced through transnational projects, but their success is likely to be dependent on other factors such as political will, availability of information or awareness.
- Adaptation is a learning process as the impacts of climate change are uncertain. Process and outcome indicators may nevertheless help to monitor and evaluate adaptation interventions.

3   Learning and policy change in natural resources management

In most countries, the uncertainties associated with climate change require structural changes in existing water governance and management regimes. Traditional "command-and-control" approaches are no longer suitable and need to be replaced with more integrated and adaptive approaches, which involves change processes that may be achieved through multi-level learning processes (Pahl-Wostl, 2007, 2009). Also in the implementation of adaptation projects and programmes, learning plays a crucial role. As the impacts of climate change and the effects of adaptation are yet largely unknown, adaptation is a learning process rather than an outcome (Pringle, 2011). This chapter aims to provide an overview of the relevant literature on learning and policy change within the context of water and climate change. After introducing learning and the multiple levels of learning, we provide an overview of the process and outcomes of learning and how various actors, processes and other factors may influence them.

3.1   An introduction of learning and social learning

Within the context of natural resources management, learning processes have been studied widely under different headings and in different contexts. In the literature on social-ecological systems and environmental education, learning has been defined as an individual process that involves changes in thoughts, feelings and actions, which depends on the learner (i.e. an active participant), the object of learning (i.e. aspects of the social and ecological system as well as their interactions) and the socio-economic, cultural and biophysical situation and setting (Krasny, Lundholm, & Plummer, 2010; Rickinson, Lundholm, & Hopwood, 2009). The natural resources literature draws on different learning theories, including theories focusing on individual learning processes (e.g. experiential learning and transformative learning) and theories focusing on group learning processes (e.g. social learning) (Armitage, Marschke, & Plummer, 2008). Moreover, different conceptions of learning are used to describe learning at different levels of social organization (e.g. action group learning, network learning, policy learning and societal learning) (cf. Diduck, 2010). From the different theories, social learning theory is probably most widely applied in the natural resource literature and, at the same time, most difficult to precisely define and conceptualize as the term continues to incorporate a great diversity of meaning (Blackmore, 2007; Diduck, 2010; Muro & Jeffrey, 2008; Swartling, Lundholm, Plummer, & Armitage, 2011).

Among the commonly referred to conceptions of social learning is the one by Reed et al (2010) who argue that social learning has occurred when social interactions lead to individual changes in understanding as well as changes that go beyond the individual level (e.g. become situated in an organization, a community of practice or a policy network). For the latter to occur, what has learned needs to be diffused by those who learned to the wider social units or communities of practices to which they belong. Within this context, a 'community of practice' refers to a social context that is formed by people who share a common concern and interact on a regular basis (Cundill, 2010). Two key aspects of this definition, which are emphasized in other publications as well, are that communication and interaction of different actors are required for social learning to happen (cf. Muro & Jeffrey, 2008) and that it is individuals who learn (rather than organizations and networks) under influence of their social context (Fazey, Fazey, & Fazey, 2005). Alternatively, social learning is also seen as a reflective process that may occur at different levels (e.g. personal, interpersonal, community and social) (Keen, Brown, & Dyball, 2005). That the term "social learning" is actually used

to understand learning at different levels of analysis is clearly shown in a recent literature review of studies concerning social learning in natural resources management. The review basically shows that existing studies can be grouped around three different research approaches: individual-centric, network-centric and systems-centric. Central in the individual-centric research approach are individual changes in values, understandings, relations and trust. Network-centric research takes the network as unit of analysis and focuses on changing practices and improved relations. The system-centric perspective is often central in research focusing on climate change adaptation, which focuses more on (structural) changes of institutions and management practices (Rodela, 2011). Thus, different studies on social learning are based on rather diverse ideas of 'who' learns.

While the concept of 'social learning' is often said to include more than just individual or small group learning (Reed et al., 2010), various studies focus on the learning that occurs through the direct interactions between a relatively small number of actors, for example, within the context of a participatory process (Cundill, 2010; Maarleveld & Dabgbégnon, 1999; Rist, Chiddambaranathan, Escobar, & Wiesmann, 2006; Scholz, Dewulf, & Pahl-Wostl, 2013; Schusler, Decker, & Pfeffer, 2003). At the same time, these collective or group processes are often directly linked to the improved governance and management of natural resources. More specifically, social learning is often seen as a process that contributes to the development of a common understanding, mutual agreement and collective or concerted action (Blackmore, 2007; Ison, Röling, & Watson, 2007; Muro & Jeffrey, 2008). This conception of social learning is less applicable to this research since actors involved in European cooperation projects do not necessarily face a common resource problem. In other words, they are only mutual dependent on each other and each other's resources for the implementation of their collaborative project (Vinke-de Kruijf, Bressers, & Augustijn, 2014).

Also when it comes to the 'how' of social learning, the natural resources literature is inconsistent. While some authors emphasize communication and social interaction as the one and only mechanism for social learning (Muro & Jeffrey, 2008; Reed et al., 2010), others emphasize that content management and technical qualities are as important as social interactions and the development of relational qualities (Pahl-Wostl et al., 2007; Pahl-Wostl & Hare, 2004) or that social learning is a form of experiential learning (Keen et al., 2005). The latter perspective on social learning is more commonly found in the literature focusing on social-ecological systems and adaptive co-management, which puts more emphasis on the interconnectedness of the social and ecological system. In this perspective, social interactions, reflection, learning-by-doing as well as simulations, modelling and policy experiments are mechanisms that support learning (Armitage et al., 2008; Brown, Keen, & Dyball, 2005; Cook, Casagrande, Hope, Groffman, & Collins, 2004; Maarleveld & Dabgbégnon, 1999; Pahl-Wostl & Hare, 2004).

The above shows that the social learning literature is diverse. And, while not all aspects and conceptions of social learning are relevant to this research, many studies do provide valuable starting-points for this research. The literature, for example, shows that social learning occurs in a group setting, in response to social interactions or other activities such as monitoring and modelling (Pahl-Wostl & Hare, 2004). Furthermore, the literature highlights that social learning may have impacts that well extend beyond an interaction context. The latter means that the learning that happens *inside* an interaction process as well as the learning that happens *outside* of the process are important to social learning (Webler, Kastenholz, & Renn, 1995).

While studies on social learning are highly relevant to this research, we will avoid using the concept for two reasons. Firstly, the concept is generally associated only with social interactions and social contexts whereas we believe that learning may result from other processes as well. Secondly, the term is associated with change processes at rather diverse levels of analysis. Instead of using the term 'social learning', we rather use the term learning in combination with the context in which the learning occurs (cf. Diduck, 2010). Hence, learning in a project context is referred to as group or project learning and expected to have impacts that go well beyond an interaction process and its participants contributing to changes at the level of organizations (organizational learning) and governance and management policies and practices (policy or societal learning). The various conceptions of learning that underlie our multi-level learning framework are further elaborated in this section (2.2) and in the next section (2.3).

3.2   Learning as a multi-level process

In particular the literature on adaptive co-management emphasizes that collaboration and learning takes place in a governance context consisting of multiple levels of social organization, including individuals, formal and informal organizations, agencies and institutions, that are linked both horizontally and vertically (Armitage et al., 2008; Diduck, 2010; Folke, Hahn, Olsson, & Norberg, 2005). This conception of learning as a multi-level process has been elaborated by Diduck (2010) who, rather than adopting a single definition of learning, distinguishes among five conceptions of learning that corresponds to different levels of organization: individual learning, action group learning, organizational learning, network learning and societal learning. The learning at each of these different levels is elaborated using different learning theories (Diduck, 2010).

In addition to this framework, other frameworks have been developed to support the analysis of (social) learning and capacity development at multiple levels. Among these frameworks is the one that was developed in a European research project concerning collaborative planning (HarmoniCOP) to develop an understanding the role of social learning in water resources management. The focus of the framework is on multiparty collaborations, which are embedded in a specific context, leading to specific outcomes. A feedback loop between outcomes and context indicates that the specific outcomes of these interactions may influence the structural (societal and environmental) context in which they are embedded. In the framework, learning is conceptualized as a process involving three levels: (1) micro-level (where actors interact); (2) meso-level (organizations in the governance regime, who may partly engage in the actor interactions); and (3) macro-level (structural context) (Pahl-Wostl et al., 2007). Within the context of the framework, social learning refers to the increase of knowledge and capacity that occurs through the actor-interactions. When the outcomes of social learning also lead to changes in the structural, societal context (i.e. there is a feedback relation between the process and the governance regime as a whole) this is referred to as 'societal learning' (Pahl-Wostl, 2009; Pahl-Wostl, Holtz, Kastens, & Knieper, 2010).

Similar multi-level frameworks can be found in other literature streams. Policy implementation theory shows that the course and outcomes of policy processes are shaped by actor interactions, which influence and are influenced by the specific interaction context, the governance context and the wider economic, political, technological, economic and problem contexts (H. T. A. Bressers, 2009). A study on the assessment of policy capacity for climate change adaptation distinguishes between three levels: (1) the individual actor level (micro level, focus on tasks and attitudes); (2) the department or organization level (meso level, focus on mandate and resources); and (3) the policy

network (macro level, focus on density and centralization); (Craft, Howlett, Crawford, & McNutt, 2013). Along similar lines, a study on capacity development for integrated water resources management distinguishes between three interdependent levels: (1) the individual level (changes in knowledge, skills and attitude) (2) the organizational level (changes in the mission, strategy or responsibilities of an organization); and (3) the enabling environment (changes in policies or regulations affecting individuals or organizations) (Leidel, Niemann, & Hagemann, 2012).

Inspired by the presented frameworks, we assert that learning processes can be analysed at the micro-level, the meso-level and the macro-level (see also Table 3). The micro-level corresponds to the learning by participants within an interaction process, who have rather intense interactions and working experiences. The other two levels (meso and macro) refer to learning that occurs outside of the process, which may be facilitated by written communication (e.g. press coverage) as well as by direct interactions with participants (in formal as well as in informal settings) (Webler et al., 1995).

Table 3 – The multiple levels of learning (Craft et al., 2013; Leidel et al., 2012; Pahl-Wostl et al., 2010)

Level	Relevant aspects and role
Micro	Individual actors where interactions, learning and capacity development takes place
Meso	Organizations or policy network which directly affect interactions (e.g. providing resources or mandate) and may partly engage in actor interactions
Macro	Wider environment or policy network providing the general and structural context for interaction processes and the organizations involved

3.3 Outcomes of (social) learning processes

In the natural resource literature, learning is defined and hence assessed in many different ways. An aspect that, however, turns out as being important in many publications is that learning may involve incremental as well as substantial changes. As Armitage et al. (2008) conclude: "[t]here are different types of learning and certain types of learning may lead to more significant learning experiences than others…" (p. 89). To analytically distinguish between different 'depths' of learning, scholars generally build upon the distinction between single-loop and double-loop learning that was originally introduced in organization sciences. Single-loop learning applies to situations where fundamental aspects remain unquestioned (incremental change). Double-loop learning is some type of higher-order learning that involves changes in underlying values and principles (Argyris, 1976).

The notion of single-loop and double-loop learning was initially used to understand the learning by individuals in an organizational context and later used also to understand changes at the network and policy level. Moreover, the multi-level learning concept has been extended with the notion of triple-loop learning. For example, in policy sciences, a distinction is made between first-order learning (incremental change related to how policy instruments are used), second-order learning (changes in instruments and their settings) and third-order learning (changes in the overarching goals that guide a policy, possibly changing policy paradigms) (Hall, 1993). In the natural resource literature, single-loop learning refers to changes in actions, double-loop learning to changes in underlying assumptions and values and triple-loop to structural changes in governing values, norms and protocols and regime transitions (Armitage et al., 2008; Keen et al., 2005; Pahl-Wostl, 2009).

The idea of multiple loops (also: orders) of learning has been elaborated specifically for climate change adaptation-oriented policy learning. Within this context, single-loop learning refers to refinement of actions to improve performance (e.g. adoption of a new climate change model). Double-loop learning calls guiding assumptions into question and involves reframing of the problem and reflection on goals (e.g. adjustment of policies). Triple-loop learning involves a transformation of the structural context (e.g. changes in policy networks and power structures) (Huntjens et al., 2011; Pahl-Wostl, 2009). Moreover, in a study on learning in networks, the idea of single-loop and double-loop learning has been connected to learning at the individual level and at the collective level. Within this context, single-loop learning at the individual level occurs when individuals learn new facts or correct their practices. Double-loop learning involves changes in (individual) assumptions and values. Learning at the collective level generally involves change in the network structure or in collective rules, which can be incremental (single-loop) or fundamental (double-loop) (Newig et al., 2010).

While the above focuses on the 'depth' of learning, one can also distinguish between the aspects actors may learn about. Researchers who take 'individuals' as unit of analysis tend to focus on the following aspects: the moral, cognitive, relational dimensions and trust (Rodela, 2011). Within this context, a distinction can be made between cognitive, normative and relational learning. Cognitive learning refers to the acquisition and restructuring of (substantive) knowledge. Normative learning is about the adjustment of values, norms and paradigms. Relational learning is related to an improved understanding of others, the building of relations, enhanced trust and cooperation. (Baird, Plummer, Haug, & Huitema, 2014; Haug, Huitema, & Wenzler, 2011; Huitema et al., 2010). These forms of learning are sometimes loosely connected to learning loops with cognitive learning referring to single-loop learning and double-loop learning to normative learning (Huitema et al., 2010). A study in which this typology of learning is applied to climate change adaptation-oriented processes shows that while cognitive and relational learning are likely to occur, normative learning is less common. A probable explanation is that values and norms are social institutions that change only slowly. Moreover, it tends to occur under different conditions than cognitive and relational learning (Baird et al., 2014). Hence, we share the opinion that the effects of learning can be analysed by focusing on just two dimensions: substantive and relational. Within this context, the substantive dimension of learning relates to knowledge or perspective about the environmental problem, potential solutions and the process of problem solving. The relational dimension of learning relates to preferences, social structures, trust, working relations and communication (Pahl-Wostl et al., 2007; Scholz et al., 2013; Van der Wal et al., 2014; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010).

An alternative distinction is proposed in the literature on transformative learning, which distinguishes between two domains of learning: instrumental and communicative. Instrumental learning is rather task-oriented and associated with improving performance, i.e. what are effective means to achieve certain ends. Outcomes of instrumental learning are, for example, an increase of knowledge, a new technical solution or problem-solving. Communicative learning is about understanding the values and interests of others. Outcomes of communicative learning are, for example, a better understanding of the values and goals of oneself or others (Diduck, Sinclair, Hostetler, & Fitzpatrick, 2012)

Research focusing on networks or social-ecological systems rather measure the outcomes of social learning in terms of, respectively, changes in how things are done and improved relations or structural changes of institutions or management practices (Rodela, 2011). In particular the latter type of learning is closely related to triple-loop learning and difficult to measure in a project context. Changes in management practices and resource use patterns do matter when analysing learning processes as they may have an impact on learning processes and outcomes.

In many publications, the outcomes of learning are linked to the achievement of desirable outcomes such as the improved management of human and environmental interrelations (Keen et al., 2005) or linked to a convergence of stakeholder perspectives creating a basis for collective or concerted action (De Kraker, Kroeze, & Kirschner, 2011; Van der Wal et al., 2014). Such a definition of learning can be restrictive since this implies that the analyst only focuses on a particular type or direction of learning outcomes (Diduck, 2010). In our opinion, learning extends beyond cognitive changes and may also become visible in relational outcomes, such as improved relations, increased trust and the establishment of networks (Mostert et al., 2007; Pahl-Wostl et al., 2007). Moreover, we believe that learning does not need to be convergent or constructive; it may turn out being divergent or unconstructive as well (Scholz et al., 2013; van Mierlo, 2012; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010). Convergent or constructive learning involves the emergence of shared understandings (Scholz et al., 2013), an alignment of visions and actions (van Mierlo, 2012) or convergences in actor networks and ways of thinking (Vreugdenhil, 2010). On the contrast, interactions may also produce or confirm negative perceptions of other actors, deepen differences in views or worsen relationships (Muro & Jeffrey, 2008; Schusler et al., 2003). When this is the case, learning processes are unconstructive drifting actors further apart and complicating further collaboration (Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010). Learning that does not involve alignment, but actor-bound changes that sometimes deviate from and at times contradict one another, is also referred to as 'divergent' learning. Divergent learning does not need to be unconstructive but implies that actors are not able to create a coherent vision that would be required for coordinated follow-up actions (van Mierlo, 2012).

Table 4 – Overview of potential outcomes of learning (see the text for further explanation)

Area	Substance – an improved understanding of the environment, issues and potential solutions, causalities, opportunities and bottlenecks	Relations – an increase of mutual trust, improved relations or ability to cooperate, better understanding of other actor's positions
Change	Knowledge – Increase of knowledge and insights or a change in understanding	Know-how – An increase of skills and qualities to use and apply knowledge
Depth	Single-loop – Incremental change leading to refinement of actions	Double-loop – change in underlying values or principles leading to an adjustment of policies or instruments
Width	Individual – change in individual understandings	Beyond individual (collective) – shared ideas, rules, policies, mutual trust, relations
Direction	Converging – alignment of visions, networks, actions, basis for further collaboration	Diverging – deepening of differences, worsening of relations, withdrawing from further collaboration

Throughout this section, we introduced a wide range of potential learning outcomes. Table 4 provides a summary of these insights. Lastly, while we agree that an analysis of learning outcomes should not be too restrictive, we also believe that it may be useful to restrict somehow the objects that actors learn about. For example, within the context of this research it makes sense to focus on learning for climate change adaptation. This means that we are particularly interested in learning processes that have an impact on the degree to which individuals, organizations and governance systems have the ability to adjust to the impacts of climate change.

3.4   Embedding and policy impact of learning processes

According to the definition of social learning that was introduced by Reed et al. (2010), learning can only be called 'social learning' when changes at the individual level become situated in a wider policy or organizational context. This aspect of social learning is also referred to as 'societal learning' and involves that (social) learning processes lead to changes in the structural (governance) context (Pahl-Wostl, 2009; Pahl-Wostl et al., 2010). Societal learning occurs when the substantive or relational outcomes of a social learning process are built upon in a wider community (e.g. used in the development of new policies) or have a broad impact (e.g. increased trust between actors) (Scholz et al., 2013) or when collective learning processes lead to changes in the common rules or institutions of a social network (Newig et al., 2010). Societal learning is sometimes also defined more widely as "the process by which communities, stakeholder groups or societies learn how to innovate and adapt in response to changing social and environmental conditions" (Woodhill, 2007, p.4). We use the term in a more restrictive manner and define it as the changes that are made to the structural governance context in response to a (social) learning process. Using this definition, societal learning is very similar to policy learning, which refers to deliberate attempts to adjust certain policies or strategies (Huntjens et al., 2011).

The relation between learning and wider policy impact is, however, a complicated one. First of all, when actors engage in a collaborative process, they may draw negative lessons implying that the process teaches actors what not to do (Rose, 1993). For example, an innovation may not work or turn out to be too risky or too expensive (Vreugdenhil, Slinger, Thissen, & Rault, 2010). Also the understandings and actions of participants may become more divergent (Scholz et al., 2013; van Mierlo, 2012). Secondly, policy learning may not be intended for or expressed in policy change, and effects may become visible in other factors such as the acquisition of factual knowledge or enhanced trust. Thirdly, it may be difficult to attribute learning to policy change as policy change may result from many other factors than learning (Huitema et al., 2010). Oftentimes, policy change results from the application of decision tools or bargaining processes, which leave the preferences of actors and network structures unchanged (Newig et al., 2010).

A factor that particularly affects the relation between learning and desired policy change is the connection between learning processes and formal policy processes. As learning in established and formalized policy networks is often restricted to single-loop learning, informal learning processes (outside of the official channels or government bureaucracies) are required to support structural changes that are associated with double-loop or triple-loop learning. When informal or shadow networks are too closely linked to formal policy processes, they are likely to be less autonomous, and innovative. At the same time, a close link to formal policy processes (i.e. in the form of a formal mandate) may be desirable to increase the impact of learning processes on formal policy and management processes (Pahl-Wostl, 2009). Along similar lines, a study on pilot projects in water

management shows that projects that are less dependent on formal policy actors are likely to be more innovative. However, an innovation that does not fit existing institutions is also more likely to result in an impasse about who is responsible and should take the lead in follow-up actions. Even when such problems are solved, the innovation is likely to be dropped or adapted to fit with relevant institutions, as institutions are hard to change (Vreugdenhil, 2010).

In relation to the above, a comparative study shows that – in the Netherlands – interactive policy processes are more likely to affect policy making when they have a close link to formal institutions. This linkage is measured using the concept of institutional embedding. High institutional embedding involves that civil servants are actively involved, relevant executives (e.g. a state secretary or a minister) play an active role and are committed and politicians identify an active role for themselves (Edelenbos, Klok, & Tatenhove, 2008). A study concerning the effectiveness of Dutch-funded water projects in Romania confirms the importance of involving civil servants and actors at decision-making positions. It shows that learning processes are much more likely to impact formal policy processes when actors at decision-making positions, who can champion the project, are involved and committed (Vinke-de Kruijf, 2013). A study on water transitions adds that "shadow networks are especially important in the phase of idea development and, in several cases, also in showing the applicability of their ideas in principle through pilot projects. The actual uptake of their ideas requires interaction with the formal policy network and gives politicians, former politicians, and high-ranked bureaucrats a key role with their ability to translate the innovations into new policy" (Meijerink & Huitema, 2010, p. 5). Thus, the actual impact of international cooperation projects is likely to crucially depend on the extent to which formal policy actors are engaged in the process.

3.5 The role of policy entrepreneurs and pilot projects

In recent years, various studies have investigated how specific actors and pilot projects may contribute to transitions in water management. A recent study concerning water transitions shows that individuals and groups of individuals can certainly influence such change processes. To understand the role and strategies of these persons, the study uses the concept of "policy entrepreneurs" (Meijerink & Huitema, 2010). This concept has its roots in the policy science literature, where it was introduced to point towards the role and strategies of entrepreneurial individuals in policy processes. Within this context, policy entrepreneurs can be understood as people who are willing to invest their resources in promoting certain policy ideas, for example, because they want to contribute to the solving of certain problems or to expand the position or budget of their organization (Kingdon, 1984). Common strategies of such policy entrepreneurs include networking, identifying problems and coalition building. In addition, the drawing of lessons from other countries can play an important role, for example, to acquire new ideas or to get support for their own ideas (Mintrom, 1997).

As introduced before, the concept of policy entrepreneurs was recently applied to understand the role of individuals or groups in national water management regime transitions (Huitema & Meijerink, 2010; Meijerink & Huitema, 2010). This study shows that while individuals and organizations cannot manage or control policy change, they certainly can affect transition processes by acting as change agents. What characterizes these 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. The study shows that particularly groups consisting of various actors (representatives of government agencies at various governance levels, NGOs, research groups) are able to successfully challenge the

status quo. As for the employed strategies, the study shows that successful entrepreneurs are generally able to: (1) balance between advocating ideas and brokerage (negotiation); (2) anticipate, manipulate and exploit windows of opportunity; (3) connect formal and informal networks through exploitation, manipulation and creation of venues; and (4) focus on acceptance and institutionalization of ideas (rather than learning) (Meijerink & Huitema, 2010).

Recently, the concept of policy entrepreneurs was also used to understand the position and influence of cross-border organizations (i.e. formal material entities such as Euregios that foster the collaboration across territorial borders)(Cots, Tàbara, McEvoy, Werners, & Roca, 2009; Perkmann, 2007). Compared to most public sector organizations, cross-border organizations have rather specific tasks, enjoy a flexible structure but lack a stable resource base. Hence, they can be successful only when developing a strong organizational base, which can be achieved through active policy entrepreneurship and the exploitation of windows of opportunity. For cross-border organizations, the concept of policy entrepreneurship was therefore operationalized in terms of: (1) organizational strength (i.e. size, autonomy, tasks and competences); (2) the ability to generate a stable and diversified income stream; and (3) the extent to which they are recognized as legitimate and competent organization by other organizations. The study shows that the most successful cross-border organization was successful in all respects and made itself indispensable as network broker and project animator (Perkmann, 2007).

Perkmann's study was built upon in a study concerning the role of cross-border organizations in climate change adaptation. The authors argue that policy entrepreneurship depends on the organizational, technical and communication skills of the cross-border organization and its ability to build coalitions, both vertically and horizontally. To assess the role of cross-border organizations, they use the following indicators: (1) organizational capacity; (2) establishment and maintaining of horizontal networking; (3) the creation of vertical networking; (4) adoption of a strategic approach; and (5) the integration of climate change and adaptive water management objective into development goals (Cots et al., 2009). These indicators may provide useful starting points for understanding how individuals, groups of individuals or organizations involved in climate change adaptation projects may influence water management transitions.

Researchers have also studied the role of pilot projects in realizing change. Pilot projects are regularly used by water managers to test innovative approaches. Pilot projects involve the application of new practices, concepts or technologies in a confined setting to learn about how the innovation interacts with the context. The resulting lessons learned can be used to either improve the innovation or to adjust management practices and policies (Vreugdenhil et al., 2010). Pilot projects can take different forms and may be initiated for research, management or political-entrepreneurial purposes. A common use of pilot projects is exploration (research). In addition, pilots are regularly used for communication or problem mitigation purposes (management) and for advocacy purposes (political-entrepreneurial) (Vreugdenhil et al., 2010; Vreugdenhil, Taljaard, & Slinger, 2012). Pilot projects can contribute to transitions in water management by providing the knowledge or evidence needed for changing existing policies or practices. This is particularly the case when the pilot is replicated or spread to other locations (dissemination) or when the pilot is scaled up (institutionally or geographically). Dissemination and upscaling may concern various aspects of a pilot project, including the underlying ideas or assumptions, artefacts or institutional arrangements (Vreugdenhil, Frantzeskaki, Taljaard, Ker Rault, & Slinger, 2009). The literature on socio-technological transitions actually shows that a radical new technology often became successful only after being applied in

small isolated markets, so-called niches. Pilot projects where people learn about the applicability of new technologies can be part of these niches (van Mierlo, 2012). Within the context of transitions towards adaptive management, these niches can be regarded as rather protected environments where innovative approaches can be developed or applied to new areas (e.g. within the context of research projects or subsidized pilot studies) (Pahl-Wostl, 2007).

Pilot projects are widely considered to provide means of dealing with the complexities, dynamics and uncertainties that are associated with social-ecological systems. Whether these positive attributes and high expectations are justified depends, among others, on how one defines and measures the effects of pilot projects. In her comparative study on pilot projects in water management, Vreugdenhil (2010) distinguishes between: (1) effects on the social-ecological system (i.e. changes in the biophysical and actor network contexts); (2) knowledge development (i.e. knowledge creation and learning related to the substance or the process, generic or context-dependent and hard versus soft); and (3) diffusion into policy and management (the spreading or up-scaling of the pilot project and its results in a broad or narrow sense, using internal or external channels). She concludes that pilot projects provide the potential to establish cooperation between unconventional actor coalitions and to develop unique context-dependent hard and soft knowledge. She further argues that the learning processes that take place can be constructive and destructive implying that pilot projects can lead actors to intensify or to avoid further collaboration.

In practice, the actual diffusion of pilot project results may be limited for various reasons. Firstly, the design, conditions or results of a pilot project may not be representative, implying that the pilot cannot easily be up-scaled or repeated at another location. Secondly, knowledge that has been developed may not be adequately transferred to future users implying that learning has been limited. Thirdly, the results may not become institutionalized, for example, since the solution is not included in a list of formally approved options. Fourthly, timing of the innovation may be inadequate, for example, due to a change in the policy climate. Lastly, diffusion may not have priority or is expected to occur by itself. This wait-and-see attitude was observed in many pilot projects (Vreugdenhil et al., 2010)

A study in the energy sector focuses more on the internal effects of pilot projects and distinguishes between: (1) convergent learning (i.e. alignment of perspectives and actions forming a basis for further developments of the technology); (2) organizational adjustment (i.e. adapt internal organization so that it advances the applicability of the new technology); and (3) repeated use (e.g. direct application in follow-up initiatives). Conditions that support the achievement of such effects include: heterogeneous network formation (i.e. involvement of actors with different functions and roles), an open and creative negotiation process (in order to come to an agreement or some form of negotiated action) and network management (this is the case when project managers successfully form a heterogeneous network and facilitate an open and creative negotiation process). Case study research shows that in particular the latter two conditions are relevant for achieving convergent learning. Divergent learning is more likely to occur when a project is rather ambitious, i.e. challenges many regime rules. In such projects, a greater number of process conditions is needed to reach success in terms of convergent learning (van Mierlo, 2012).

3.6 The influence of process factors

Over the past years, numerous studies have come up with a wide range of factors that potentially influence the impacts of learning processes in natural resources management. Concerning the interactive process that brings about learning, the literature emphasizes the importance of a collective process as well as the context in which they take place. It should be noted that in most studies, social learning is examined within the context of some kind of participatory process (Mostert et al., 2007; Schusler et al., 2003; Tippett, Searle, Pahl-Wostl, & Rees, 2005; Webler et al., 1995). In such contexts, social learning usually occurs through the interactions between authorities and stakeholders – usually from the same region – who deal with a common problem. This context slightly differs from European projects, where actors are from different countries and may either face common or similar problems. Therefore, some of the factors that are mentioned in the literature are less relevant to this research.

As for the process factors that support social learning among participants, an important factor is the creation of a learning environment that promotes reflection and reflexivity. Social learning can be seen as a process of iterative reflection that involves multiple learning cycles consisting of diagnosis, design, doing and developing. Hence, reflective processes (i.e. the continuous review of models, theories and practices in a certain context) at the personal, the interpersonal and the social level form an important basis for social learning (Keen et al., 2005; Schon, 1983). Framing and reframing processes are no stand-alone processes; they are strongly influenced by the production and reproduction of mutual trust and commitment. Social learning can thus be seen as a dynamic interaction process that involves the production and reproduction of mutual trust, commitment, and shared framing and reframing (Sol, Beers, & Wals, 2013). In other words, social learning involves both a relational and a cognitive component (see also subsection 3.3 on the outcomes of social learning).

Previous research shows that, in the case of international projects, a dynamic learning process is more likely to be successful when a process provides participants with the opportunity to reflect on 'hands-on-experiences' in interaction with others (Vinke-de Kruijf, Hulscher, & Bressers, 2013). Activities that are supportive of reflective processes are site visits, informal contacts, face-to-face small group work and repeated meetings in a relatively short period of time (Vinke-de Kruijf, 2013; Webler et al., 1995). In addition, in the case of international projects, translation and visual communication tools may be required to ensure the development of a mutual understanding in communication among actors (Vinke-de Kruijf, 2013). Also boundary objects (i.e. an object like an interactive map or model that can be understood by different social worlds, but may have different meanings to these different social worlds) can be supportive. They can help to align interests and enhance learning processes, on the condition that the process is actively facilitated by persons who can broker between diverse interests (Crona & Parker, 2012). As for the design of participatory processes, previous studies highlight the importance of an open problem formulation and an egalitarian atmosphere, which provides participants with the opportunity to learn from each other and from experts and to really contribute their own substantive knowledge (Hommes, Vinke-de Kruijf, Otter, & Bouma, 2009; Webler et al., 1995). Furthermore, as mentioned before, participatory processes and international projects are more likely to have an impact when there is political support for the process and a direct link to the formal decision-making machinery (Vinke-de Kruijf, 2013; Vinke-de Kruijf, Hommes, & Bouma, 2010; Webler et al., 1995).

Recent studies on social learning in water resources management come up with factors that are similar to the presented ones, yet they put more emphasis on facilitation and inclusion. For example, Schusler et al. (2003) identify eight factors that enable social learning in deliberative processes, which can be summarized as: the inclusion of participants with diverse interests and multiple sources of knowledge, an open process (including space for constructive conflict), extended engagement (longer meetings with periods for informal interactions) and involvement of professional and neutral facilitators. On the basis of a European research project, Tippett et al. (2005) identify three key factors that support social learning: the provision of sufficient time, early involvement of stakeholders and adequate process management. In their comparison of social learning in ten river basins, Mostert et al (2007) come up with a list of 71 factors that influence social learning, which they group into eight themes: stakeholder involvement, politics and institutions, opportunities for interaction, motivation and skills of leaders and facilitators, openness and transparency, representativeness, framing and reframing, and adequate resources. On the basis of this and other studies, Tàbara & Pahl-Wostl (2007) come to the conclusion that the following five key factors support social learning: motivation and skills of leaders and facilitators, clarity about the role and purpose of stakeholder involvement, the connection to regulatory institutions, capacity for interactions among social networks, and how the issue at stake is defined and framed.

From the above, we conclude that – when leaving out context-related factors – two process factors stand out that are supportive of social learning: (1) extended engagement by a heterogeneous and committed group of participants that trust each other; (2) an open and well facilitated process. In addition, translation and boundary objects (including visualization techniques) may support social interactions as they help to create a mutual understanding in communication between participants (Crona & Parker, 2012; Vinke-de Kruijf, 2013). As for the facilitator, various studies emphasize the importance of an independent and neutral facilitator (Mostert et al., 2007; Schusler et al., 2003). In addition, personal qualities of the facilitator (which may also be the project manager in case of an international project) such as the ability to develop and maintain social relations, to build trust and to 'translate' among actors with diverse backgrounds and knowledge levels – are likely to be supportive of collaboration and learning processes (Mostert et al., 2007; Vinke-de Kruijf, Hulscher, et al., 2013).

3.7   The influence of context

Next to process factors, contextual factors may as well influence social learning. In analysing the influence of these contextual factors, a distinction can be made between the specific context, the governance regime context and the wider context (H. T. A. Bressers, 2009). Examples of factors in the direct specific context are existing relations and networks among participants, the outcomes of previous processes, previous experiences in similar processes as well as the sense of urgency and presence of windows of opportunity (e.g. related to the occurrence of a flood) (Mostert et al., 2007). Positive experiences and interactions are likely to increase mutual trust and enhance further collaboration, whereas negative experiences have the opposite effect (Vinke-de Kruijf et al., 2014).

General characteristics of the network may influence learning processes in several ways. Generally speaking, rather small, dense and cohesive networks consisting of actors who share similar attributes, have strong ties and different types of relations are associated with high levels of trust and therefore supportive of information transmission, deliberation and single-loop learning. However, when interactions are limited to actors inside cohesive networks, this may lead to

'cognitive blocking' preventing radical change and double-loop learning. The strongest environment for learning is therefore likely to be provided by 'modular networks' consisting of cohesive subgroups with weak relations in the broader network. Furthermore, highly centralized networks (i.e. where a central actor is relatively powerful or important) support the transmission of information as well as single- and double-loop learning but may hinder deliberation due to power imbalances (Newig et al., 2010). Research using Social Network Analysis to understand the role of bridging organizations (working on the interface between research and policy/practice) confirms the importance of cohesive networks. The study shows that policy makers with a greater number of connections to researchers in bridging organizations are more likely to use information from that organization because of greater exposure and access. Also policy makers who discuss bridging organization research with other policy makers are more likely to use information. Moreover, these policy makers are more likely to view provided information as salient, credible and legitimate. Social interactions and networks thus play an important role in the utilization of knowledge (Crona & Parker, 2012).

As for the influence of the governance regime context, institutional structures and cultures are rather important. Factors that may hinder interaction processes include a lack of experience to interact and communicate between different sectors and levels of scale, a technocratic culture where experts are not used talking to different actors or a fear to share information or to lose control (Mostert et al., 2007; Tippett et al., 2005). In addition, the scope and objectives of a project may not fit or even oppose operational practices or underlying values of a governance regime or involves the implementation of activities or measures that are controversial or diverge from the status quo. For example, an international water projects that was implemented using an integrated, bottom-up approach is unlikely to be successful in a centralized governance context (Vinke-de Kruijf, Teodosiu, Bressers, & Augustijn, 2013).

The governance regime context may influence not just project or social learning but also learning at the level of governance systems. Of particular relevance to adaptation-oriented learning are studies focusing on the adaptive capacity of water management regimes. Within this context, a study concerning transboundary river basin management regimes hypothesizes that adaptive capacity is influenced by: cooperation (across sectors, administrative levels and boundaries) and stakeholder involvement in the actor network, an appropriate and adaptable legal framework, flexible policies, which have a long time horizon and consider diverse options, open and inclusive information management, and an appropriate financing system (Raadgever, E. Mostert, N. Kranz, E. Interwies, & Timmerman, 2008). These dimensions were further developed and elaborated in a study concerning the relation between adaptive and integrated management regimes and climate change adaptation. This resulted in a list of nine dimensions: (1) agency; (2) awareness raising and education; (3) type of governance; (4) cooperation structures; (5) policy development and implementation; (6) information management and sharing; (7) finances and cost recovery; (8) risk management; (9) and effectiveness of (international) regulation. The study highlights that regimes are more responsive to floods than droughts and tentatively concludes that more adaptive and integrated regimes show higher levels of learning (i.e. not just improving performance but also changing underlying assumptions and frameworks) (Huntjens, Pahl-Wostl, & Grin, 2010). The relation between regime characteristics and "deep" policy learning was examined further showing that high scores on information management and cooperation structures are necessary conditions for double-loop and triple-loop learning. This aspect of a water management regime can be understood as the socio-cognitive dimension (i.e. the integrated social and cognitive properties of a governance system and its supporting processes). The

study therefore concludes that regimes in which the socio-cognitive dimension is absent or lacking have a reduced capacity to adapt to climate change (Huntjens et al., 2011).

The importance of context and how this may influence river basin governance – and thus indirectly influences learning – is also examined in a study that aimed to better understand the extent to which institutional capacities of a water governance regime fit relevant social-ecological conditions. In this study, six measures were identified as being of particular relevance: allocation, integration, conservation, basinization, participation and adaptation (see Table 5) (Lebel, Nikitina, Pahl-Wostl, & Knieper, 2013). While the presented studies do not directly touch upon the influence of context on the processes and outcomes of learning in international processes, they give some hints regarding the potential influence of context. At the same time, the influence of context as such should not be overestimated as factors in the governance and wider context tend to exert an influence only in as far as they influence the actors involved and their interactions (H. T. A. Bressers, 2009; Vinke-de Kruijf, Teodosiu, et al., 2013).

Table 5 – Measures of fit for water governance regimes

Measure	Institutional capacities	<–>	Social-ecological conditions
Allocation	To manage water shortages		Level of water scarcity
Integration	To integrate/coordinate water uses		Complexity of uses
Conservation	To manage water pollution and aquatic ecosystems		Threats to water quality and ecosystem integrity
Basinization	To manage at basin level		Level of difficulty in controlling flows at basin level
Participation	To engage stakeholders		Diversity of interests
Adaptation	To manage risks and change		Variability and uncertainty in water flows

3.8   Summary of key findings

Key insights from the presented literature on learning and policy change in natural resources management can be summarized as follows:

- Climate adaptation require structural changes in governance regimes, which may be achieved through processes of social and societal learning.
- The learning processes that are associated with the improved management and governance of natural resources occur though – and yet are not limited to – social interactions between individual actors, which have an impact beyond the individual level.
- The analysis of social learning may focus on various units of analysis, including individual actors, networks and social-ecological systems. These different levels are sometimes also referred to as the micro-level (actor-interactions), the meso-level (organizations or policy network) and the macro-level (structural context).
- Social learning may have substantive as well as relational outcomes. These outcomes may involve an individual or collective increase of insights and knowledge as well as skills or qualities. Learning may be incremental (singe-loop) or involve changes in underlying values or principles (double-loop). Interactions may bring interacting actors closer together as well as drift them further apart.

- Societal learning occurs when actor interactions lead to structural changes in the governance regime. Societal learning is influenced by the degree to which a process is connected to formal policy processes. The ambitiousness and innovativeness of a project influences the potential impact of a project.
- Projects can influence policy making via policy entrepreneurs who may employ different strategies, who are willing to invest resources to promote certain policy ideas.
- Pilot projects are particularly useful for establishing unconventional actor coalitions and developing unique context-specific knowledge. Their results may be used to improve the innovation or management policies and practices. A pilot can be replicated or spread to other locations as well as scaled up.
- Process factors that are supportive of social learning include extended engagement (i.e. regular interactions and active involvement) of a heterogeneous group of participants as well as an open and well facilitated process. In addition, translation and boundary objects may be necessary to overcome differences between participants.
- Context factors do influence social learning processes. Of particular importance are previous experiences and network relations. Generally speaking, cohesive networks are supportive of learning, but may lead to 'cognitive blocking' and therefore prevent double-loop learning. The literature further emphasizes the role of institutional structures and cultures, which may be more or less supportive towards the interaction process as well as the project content. Also the degree to which a governance regime is adaptive and integrated influences policy learning.

4 Learning and policy transfer in project and organization contexts

In recent years, various scholars have specifically studied policy transfer and learning in European INTERREG projects (cf. Böhme, 2005; Colomb, 2007; De Jong & Edelenbos, 2007; Dühr & Nadin, 2007; Hachmann, 2008, 2013; Stead, de Jong, & Reinholde, 2008; Valkering, Beumer, de Kraker, & Ruelle, 2013). This section starts with an overview of the key findings of these studies. Next, we provide some insights from studies and evaluations that focus on collaboration and outcomes of research projects (FP7 and other). We then present some of the key insights from two other relevant literature streams: policy transfer and learning and project-based and organizational learning.

4.1 Learning in European INTERREG projects

Important aspects of INTERREG projects are the development and testing of innovative approaches and new solutions as well as the transfer of this knowledge to other actors and regions. Next to collaboration and implementation processes, they therefore involve processes of lesson-drawing, policy transfer and learning (Hachmann, 2013). While such collaborative projects are meant to enhance policy transfer and learning, these may not necessarily be their outcome nor the primary motivation of actors involved (Colomb, 2007; Vinke-de Kruijf et al., 2014). In practice, learning processes often occur almost invisibly in parallel to cooperation processes (Hachmann, 2008). While policy transfer is an important aspect of these learning processes, policy transfer studies may be of limited value as they tend to focus on relatively short-term, unilateral transfers between national actors. Compared to such transfers, transnational (and interregional) transfers involve actors with rather diverse professional and institutional backgrounds, who tend to work at different levels (Colomb, 2007; Hachmann, 2013). In other words, transfers in European cooperation projects tend to occur in a much more 'networked' and dynamic setting (De Jong & Edelenbos, 2007; Hachmann, 2013).

In European projects, transfer and learning may occur in the inter-organizational project partnership (or in sub-groups thereof) as well as within and between organizations involved (Hachmann, 2008). As for the learning that occurs *in* projects, a distinction can be made between: (1) the exchange and transfer of existing or established knowledge (learning *from* each other); and (2) the joint development or production of new knowledge (learning *with* each other) (Hachmann, 2013; Valkering et al., 2013). In many transnational projects, the focus is on the exchange of 'best practices' and limited to the transfer of existing knowledge. Programmes do, however, expect from partners to work jointly on the development of new solutions and policy options (Hachmann, 2013). While individuals are the primary agents of learning, learning may also occur at the partnership level. Thus, learning processes can have individual outcomes (learning by individuals) as well as collective outcomes (learning as a group) (de Kraker, Cörvers, Valkering, Hermans, & Rikers, 2013; De Laat & Simons, 2002; Hachmann, 2013; Vinke-de Kruijf et al., 2014).

A study concerning interregional projects shows that learning in cooperation projects may occur at different levels. Firstly, the participants who are directly and intensely involved can learn, individually or as a group, through their social interactions. Secondly, individuals or groups inside one of the partner organizations or the entire organization can learn from the project, either by being directly involved or via dissemination activities. Thirdly, actors of the local and regional policy subsystems in the partner areas can learn from the project. Fourthly, local or regional actors in other European

regions, national actors in the partner countries or European actors may learn from the project (INTERREG IVC, 2013). Thus, in addition to the individuals and organizations involved (direct beneficiaries), transnational projects may benefit a large number of actors in the 'outside world', (such as academics, practitioners, experts, citizens, policy makers) in other countries, regions or cities (Valkering et al., 2013).

The use of lessons learned by the involved or other regions and organizations (i.e. learning *from* projects) is generally referred to as organizational learning. Organizational learning may lead to changes in the culture, policies or practices of an organization, which can only be achieved when actors who participate on behalf of their organization transfer lessons learned to relevant members of their organization (Colomb, 2007; Wolman & Page, 2002). Thus, organizational learning involves 'organizational knowledge transfer', i.e. processes by which organizational actors "exchange, receive and are influenced by the experience and knowledge of others" (Van Wijk, Jansen, & Lyles, 2008, p. 832). Theoretically speaking, organizational knowledge transfer can take the form of both intra- and inter-organizational learning. Intra-organizational learning implies that knowledge is being transferred within the same organization (transfer from the project participants to their home organization). Inter-organizational learning refers to the learning that may occur across or between organizations, for example, in policy networks (Colomb, 2007). Inter-organizational learning may occur inside a project (through the interactions between participants) as well as outside the project (e.g. when knowledge is being transferred to the wider policy network). Table 6 provides an overview of the different forms of learning that can be found in transnational projects.

Table 6 – Forms of learning in transnational projects (Böhme, 2005; Colomb, 2007; Hachmann, 2008; Valkering et al., 2013)

Setting	Who learns with what effect
Project (participants)	Individuals involved transfer or exchange established knowledge and may also develop or produce new knowledge (individual and/or collective learning)
Organizations (project partners)	Lessons learned by individuals are transferred to their organizations, which may lead to changing culture, policies or practices.
Other (outside project)	Lessons learned are transferred to individuals and organizations (in the partner regions or beyond) who have no direct relation to the project, but may benefit, use or implement knowledge that has been exchanged or developed in the project.

Learning in INTERREG projects by definition occurs in a cross-cultural working environment. The significance of the cross-cultural dimension is obviously highest in EU-wide cooperation programmes and lowest in cross-border programmes (INTERREG IVC, 2013). The learning processes are challenged by various obstacles to cooperation. First, partners with diverse interests may have problems in defining a common objective that is equally relevant to all of them. One may expect that the higher the degree of diversity in terms of country, organization type, sector and profession, the more complex and difficult the necessary discussions. Second, linguistic and cultural differences (including working methods and styles) may lead to communication issues or situations where only certain partners actively contribute (Hachmann, 2008).

A survey among 206 partners in interregional projects shows that communication problems (language skills) are being perceived as the main factor hampering individual and collective learning (30% of the respondents mentioned this as hampering learning inside the project). Other factors

include a lack of continuity in participation and low participation. In addition, an inadequate organization of the learning process and an inadequate partnership were mentioned as factors that particularly hinder collective learning. The study further shows that different activities (i.e. networking activities like study visits and interregional seminars, thematic or comparative studies and joint implementation) support learning processes. The quality of the process has an influence as well: activities need to be connected in a logical way and expert involvement (from the project organizations, external or a combination) is of added value. To promote learning from projects, partners should become active themselves. They can either pro-actively involve others (highly beneficial), make use of personal contacts, participate in events or activities organized by others or develop policy documents or promotion materials. Positive effects (i.e. increase of awareness, uptake or use of lessons learned) were mostly observed when other actors were involved throughout the project. Lastly, previous cooperation in European projects positively influences learning within and from the project (INTERREG IVC, 2013).

To further understand the outcomes of transnational learning, studies on Europeanization processes provide some useful starting points. Europeanization studies look at how the European Union (EU) may influence member states in different ways, including: top-down (influence of EU policy on domestic arrangements or actor beliefs); bottom-up (uploading of domestic ideas to the EU level); horizontal (state-to-state transfer processes independent of or facilitated by the EU); and circular (uploading to and importing from the EU by member states) (Dühr, Stead, & Zonneveld, 2007; Lenschow, 2006). Transnational programmes are meant to support concrete actions and the exchange of ideas among national and subnational actors and therefore have strong bottom-up aspects. At the same time, projects are guided by and need to fit into EU policies. Hence, transnational projects and programmes are characterized by complex, interactive relationships between various governance levels. First of all, projects and programmes can be supportive of the implementation of European policies. Second, they may promote horizontal mechanisms of Europeanization (i.e. policy transfer) as local and regional actors exchange and transfer knowledge and learn from each other. Thirdly, they may assist local and regional actors in 'uploading' their ideas to higher governance levels (most notably the EU level) (Hachmann, 2011). The actual effects of transnational projects on Europeanization remains questionable though. A special issue concerning Europeanization in the spatial planning domain shows that transnational projects are likely to involve circular and horizontal Europeanization processes, but that there is little evidence of actual learning effects. The editors suggest that the relatively recent nature of the studied projects could explain this. Moreover, effects are likely to be subtle and complex, making it difficult to attribute effects to a specific project (Dühr et al., 2007).

As for the outcomes and effects of transnational projects, scholars argue that actors can learn about concepts and instruments (increase of knowledge) as well as learn how to do things (know-how or expertise) (Hachmann, 2013). This learning may be single-loop as well as double-loop. Single-loop learning may occur when partners exchange knowledge about techniques and procedures, which may lead to small-scale adaptations and improvements within existing institutional and organizational frames. Double-loop learning rather occurs from the exchange of perceptions, norms and values or innovative practices and involves strategic and structural changes to existing systems (Argyris, 1976; Hachmann, 2013; Valkering et al., 2013).

A study concerning a sustainable urban neighbourhood project shows that potential outcomes of transnational projects include an increase of awareness, the development of new knowledge, the

identification of innovative practices and techniques as well as reflections on the transfer of ideas. The researchers conclude that the action-oriented nature of the project and the use of a wide range of activities and tools particularly enhanced these learning processes (Valkering et al., 2013). Another study shows that transnational projects have the potential to result in changing routines and concepts, the adjustment of existing concepts and increased collaboration with others. However, a systemic comparison of four projects shows that transnational projects are not oriented towards the transfer of knowledge implying that chances are missed. The same applies to the development of new transnational knowledge: partners are often unable to extract generalizable results from their regional pilots (Hachmann, 2013).

An evaluation study of interregional projects shows that nearly all partners see a strong or moderate increase in knowledge and skills related to the project theme. However, how much partners learn is related to the intensity of involvement and level of knowledge. Also the degree to which the project involved a structured process of identifying, analysing and developing good practices influenced the learning outcomes. Learning from the project (by the home organizations and by other actors in the partners regions and beyond) appears to be variable among and within projects. Factors inside the partner organization (e.g. lack of time or resources) as well as other factors (e.g. the role or status of the partner) influence organizational learning. The impacts of a project (e.g. policy improvements and structural policy change) are generally higher in the lead partner region than in partner regions. Projects were generally successful in raising awareness among other actors in their regions and some also managed to receive pro-active support for the further dissemination and uptake of the project results. Moreover, many projects generated results that are of EU-wide relevance or of a wider European value. In some cases, the project results were successfully disseminated to or even taken up by actors at the European level (INTERREG IVC, 2013).

4.2   Learning in European research projects

As shown in the previous subsection, various researchers have specifically studied the learning processes in and the impacts of INTERREG projects. Up to our knowledge, this is not the case for FP research projects. Therefore, to better understand the process and outcomes of FP7 Environment projects, this subsection primarily builds upon various FP6 and FP7 monitoring and evaluation reports. In addition, some general insights from the literature on collaboration in research projects are presented.

A common feature of INTERREG and FP7 programmes is that they bring together people from diverse organizations and countries in a collaborative project. However, compared to INTERREG projects, FP7 projects have another scope (i.e. research rather than knowledge transfer and testing of approaches) and are dominated by other organizations (i.e. mostly higher education and research organizations).

The general objective of the FP7 Environment programme is "the sustainable management of the environment and its resources through the advancement of knowledge […]" (European Parliament and Council, 2006, p. 20). Against the background of this objective, the primary purposes of projects are: development of methods, methodologies and tools, generation of knowledge, provision of policy support, exchange of best practices and experience, and data gathering. The demonstration or development of new technologies is seen far less as a primary purpose. These purposes are reflected in the project results. FP6 and FP7 environment resulted mostly in new or more complete datasets, new decision support tools or recommendations, new methodologies, new applications of existing

methods and new models or the generation of models. In addition, FP Environment projects result in a considerable number of publications (1-5 during the project and 1-5 after project completion in FP6) and play a significant role in the establishment of new durable networks (Amanatidou, Schmidt, Kemp, Nilsson, & Ricci, 2011). The latest FP7 yearly monitoring report confirms and strengthens these findings. In this report, three types of project results are reported on: patent applications, publications (i.e. reports and peer reviewed articles) and the use of so-called foregrounds (i.e. the intangible and tangible results such as knowledge and information that are generated in a project). The report shows that – among the FP7 themes – FP7 Environment has a very low number of reported intellectual property rights and patent applications but has one of the highest publication rates (on average 13 per project of which circa 50% in high impact peer reviewed journals). As regards the use of foregrounds (which is of most interest to our research), a distinction is made between five types of uses: general advancement of knowledge, commercial exploitation, development of standards, uptake in EU policies and (social) innovation. The monitoring report shows, among others, that most important uses of environmental projects are the general advancement of knowledge and the exploitation of results through EU policies (European Commission, 2013b).

As the outcomes and impacts of FP7 projects tend to become visible only on the longer-term, the FP7 interim evaluation – which was prepared and published in 2010 – provides limited information on project outcomes and impacts. As for scientific outcomes and impacts, the evaluation shows that FP7 is indeed likely to attract the best researchers and to support the best proposals. In terms of research and innovation, there are indications that FP7 has a positive influence, among others, by promoting a more open approach to innovation and collaboration across actors from diverse countries and sectors. As regards outreach, communication and dissemination, there are indications that communication is improving. For example, research is presented in project conferences, stakeholders are involved as potential users and policy briefs are sometimes produced. The evaluation further highlights that the cooperation programme is a unique source of funding for collaborative research across national borders. Without this programme, the cross-border component of research would be diminished (Annerberg et al., 2010).

Additional insights into the impacts of research projects were obtained in an ex-ante evaluation of the environment theme in FP6 and the first part of FP7. In this evaluation, a distinction is being made between impacts from the perspectives of research, policy/social and business. Relevant impacts from a research perspective are scientific leadership, collaborative publications, improved scientific and technological capabilities and an increase of collaboration and coordination. From this perspective, FP Environment is likely to have a positive impact as becomes visible from the high involvement of top universities, research organisations and scientists, and the high number of high quality publications. From a policy/social perspective, relevant policy impacts are the use of project results for the development of international, European and national policies and impacts on the environment. Policy support is an important aspect of many projects. About 30-40% of the FP6 and FP7 Environment projects provided inputs for international agreements or conventions. Furthermore, they are often cited in European policy documents. Moreover, projects were reported to have a positive impact on the environment in general, on awareness raising as well as on education and training. The evaluation report reads that an analysis of the 2010 State of the Environment Report by the European Environmental Agency concurs with these findings showing that the most relevant impacts of EU funded research on climate change and water are improved awareness of knowledge and research gaps, improved knowledge base and advancement of

monitoring. From a business perspective, relevant impacts of research project include economic growth, changes in research behaviour, consolidation of networks, enhancement of competition, and job creation. From this perspective, project impacts are moderate, which is to be expected as innovation and economic benefits receive little attention in FP Environment. For businesses, the main impacts are probably related to changes in the way research is carried out and the consolidation of networks. In addition, the indirect impacts of improved knowledge of areas like biodiversity and natural hazards can be huge but are difficult to measure (Amanatidou et al., 2011).

The findings of the ex-ante evaluation largely concur with the scientific, policy, economic and social impacts that were identified in the ex-post assessment of FP6 sub-priority "Global change and Ecosystems" (Technopolis, 2009). Moreover, the executive summary of the latter report highlights specific impacts related to climate change, natural hazards and water management research. These impacts are summarized in Table 7.

Table 7 - Highlighted impacts of FP6 climate change, natural hazards and water management research (Technopolis, 2009)

Research topic	Highlighted impacts
Climate change	Improved knowledge; contribution to IPCC review; identification of best practices.
Natural hazards	Improved models; contribution to regional, national and European policies, standards and guidelines; knowledge transfer to main users (i.e. public sector organizations and policy makers).
Water Management	New methods and knowledge; contribution to formulation and implementation of Water Framework Directive

In addition to the presented evaluations, various country-specific studies provide additional and more detailed insights into how participants perceive FP6 and FP7. An evaluation of the Danish participation in FP6/7 shows that scientific and education outputs (e.g. publications, research grants, newly trained personnel) and new or improved tools, methods and techniques were seen as most important outputs by Danish participants. Danish participants reported further that project results were exploited mostly by Danish and other European researchers in follow-up projects. In addition, half of the respondents indicated that results were used by Danish and other European companies and by European policy makers. As regards the impacts of the projects on their organisations or research group, the main positive impacts were: improved relationships and networks, increased knowledge or understanding, and increased scientific capabilities (Technopolis, 2010).

An evaluation of the impact of FP6 and FP7 on the United Kingdom shows that the FPs had, according to a survey among UK participants, a big impact on the nature and extent of international networks and relationships (60%), a high impact on their knowledge base (55%) and led to an increase of scientific capabilities (40%). Examples of other positive impacts on the organization are an increased scientific reputation as well as an improved ability to attract and retain world class researchers and to successfully work with organizations outside the UK. The FPs also served as a training ground for project management and administration. For individuals, FP contributed to career progression and changes in attitude, outlook and connectedness. For businesses, FP participation had commercial benefits and provided access to new or improved tools or methodologies. The policy impacts of the FPs were mostly related to stronger relations with and an increased awareness of counterparts outside the UK, which contributes to improved opportunities for knowledge transfer, an increase in

the volume of funded research and, from time to time, a higher capacity to address policy issues. In addition to insights into the impacts, the evaluation also sheds light on process-related aspects, including participation motives and project size. The primary motives of participants appear to be access to funds (universities and research organizations) and access to European networks (public bodies, businesses and others). Other important motives include: to develop knowledge and capabilities, and to address specific scientific or technological questions. As regards project size, the relatively large scale of integrated projects is seen as important to really move forward a research agenda. However, many research questions do not require very large integrated projects and are not efficiently answered by a partnership involving 20 or more organisations. Large projects and consortia are difficult to manage and may run the risk of dissembling (Simmonds, Stroyan, Brown, & Horvath, 2010).

The evaluation of Norwegian participation in FP6 and the first part of FP7 provides insights not only into the project results and impacts, but also into how partnerships typically look like. It shows that FP6 consortia consist of a considerable number of partners. This is especially the case for integrated collaborative projects (in total, 155 projects were reported on): 19% of these projects had 10-19 partners, 45% had 20-39 partners and 35% had 40 partners or more. Like in other countries, research and higher education institutes were the dominant participants. About 18% of the researchers involved were PhD students. According to the participants most projects were successfully implemented (77%); only a small percentage was characterised as unsuccessful (4%). Projects were perceived to be particularly successful in building networks, achievement of project objectives and research performance. In addition, more than half of the projects provided a basis for new research projects. Projects were less successful or participants were uncertain about results that were related to economic results and innovation. Similar to the UK, access to research networks, expertise, scientific excellence and funding were among the most important motives for participation both in FP6 and FP7. Further, the evaluation shows that about one-third of the FP6 environment projects are an extension of a previous project (18.6% is an extension of a previous EU project). As regards the nature of FP projects, participants perceive that – compared to other projects – EU projects are more multidisciplinary and long-term, slightly more scientifically or technologically risky, of higher scientific quality, strategically more important and slightly less oriented towards basic research. In the project implementation phase, important strengths are project objectives, leadership abilities of the coordinator and the skills or expertise of partners in general. Weaknesses are mostly related to EU reporting requirements, respecting of deadlines and results delivery as well as the number of partners in the consortium. Participants communicate on a regular basis by e-mail (55% at least once a week and 87% at least once a month). In addition, 96% of them have at least once a year face-to-face meetings with other participants (Godø et al., 2009).

In summary, FP-Environment evaluations confirm that collaborative research projects, like INTERREG projects, contribute to learning. Learning is reported on at the level of participating individuals and organizations as well as beyond (e.g. influence on policy development). It concerns relational aspects (e.g. improved relations and networks) as well as substantive aspects (e.g. improved understanding, increase or scientific capabilities or the development of new tools or methodologies).

4.3   Insights from policy and knowledge transfer studies

Studies concerning learning in a European project setting often refer to policy transfer literature. The concept of 'policy transfer' is oftentimes used in studied concerning the transfer of knowledge in the

public domain (Benson & Jordan, 2012; De Jong & Edelenbos, 2007; Dolowitz & Marsh, 1996; Evans, 2004; Mossberger & Wolman, 2003; Radaelli, 2000; Savi & Randma-Liiv, 2013; Stead, 2012; Wolman & Page, 2002), sometimes in combination with the related concepts of lesson-drawing (James & Lodge, 2003; Rose, 1993; Stone, 1999), policy learning (Bennett & Howlett, 1992; Colomb, 2007) institutional transplantation (De Jong, Lalenis, & Mamadouh, 2002) or policy translation (Fadeeva, 2005; Mukhtarov, 2014; Stone, 2012). Policy transfer is generally defined as "the process by which knowledge of policies, administrative arrangements, institutions and ideas in one political system (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political system" (Dolowitz & Marsh, 2000, p. 5). This rather generic definition encompasses various forms of transfer, including the transfer of policy-relevant knowledge across space or time (Dolowitz & Marsh, 2000; Rose, 1993) as well as across sectors or governance levels (Evans, 2004). These transfers may be driven by a need to solve a public problem, a desire for international acceptance or authoritarian imposition (Dolowitz & Marsh, 2000; Vinke-de Kruijf & Ozerol, 2013). They may occur as part of a domestic planning process, an international project or another context. They may involve repeated interactions between diverse actors (e.g. governmental, non-governmental and private actors) or no interaction at all (e.g. when public officials look for new ideas on the Internet) (Dolowitz, Keeley, & Medearis, 2012; Vinke-de Kruijf & Ozerol, 2013).

Knowledge being transferred (so-called objects) can be diverse and may be embedded in or related to institutions, programmes, ideas, concepts, methods, technologies, management practices and so on (Dolowitz & Marsh, 1996; Vinke-de Kruijf & Ozerol, 2013). As for the way in which they are transferred, a distinction is generally made between: (1) copying (adapting knowledge without modification); (2) emulation (accepting knowledge as best standard); (3) hybridization (combining elements found in several settings) and (4) inspiration (knowledge facilitates change and fresh thinking) (Dolowitz & Marsh, 1996; Evans, 2009; Rose, 1993). While the copy-pasting of legislation or technology may be feasible in theory, this is unlikely to be the case in a European setting due to differences in terms of language, culture, history, public administration, economic development, political system and so on (De Jong, 2004; Stead et al., 2008). In practice, policy transfer is thus rather about learning and adapting knowledge to national, regional and local factors and needs (De Jong, 2004; Kroesen et al., 2007; Stead, 2012).

In the literature, the extent to which objects of knowledge are actually transferable has received limited attention. A study by the OECD (2001) suggests that the transferability of knowledge is influenced by the context-specificity and visibility of that knowledge (i.e. the degree to which knowledge can be specified and understood). Hence, concrete methods, technologies, know-how or operating rules (medium scores on context-specificity and visibility) are easier to transfer than ideas, principles or philosophies, which have low visibility, and programmes, institutions or organization modes, which are too context-specific (Stead, 2012). Comparative research concerning the transfer of legal frameworks shows that in such cases, transferring general lessons, ideas or ideologies to which a local interpretation is added is more effective than copying a concrete model, legal framework or set of procedures (De Jong, Mamadouh, et al., 2002).

The issue of transferability is also touched upon in a study concerning the assessment of policy transfer. The authors argue that policymakers who would like to transfer a policy should consider the following questions: (1) to what extent are the addressed problems and goals similar to your own; (2) to what extent was the policy successful and unsuccessful; and (3) to what extent differs the policy

environment from your own and to what extent do these differences matter (Mossberger & Wolman, 2003). It should be noted that comparative research shows that 'institutional fit' (i.e. congruence between knowledge being transferred and the receiving institutional context) is likely to be more relevant than the degree to which transferring and receiving countries resemble each other (e.g. politically, economically and socio-culturally) (De Jong, Mamadouh, et al., 2002)

While learning is touched upon in policy transfer studies, most of the studies do not clearly define and elaborate what learning actually involves and how it may change policies or practices. One of the exceptions is a review by Bennett and Howlett (1992). First, they show that various scholars hold different ideas about the relation between policy learning and policy change. Next, they argue that while learning is generally seen as an increase of knowledge about policies, scholars have diverse views on who learns about what and to what effect. They conclude that policy learning may refer to three rather different processes: (1) state officials (governments) learning about policy processes leading to organizational changes; (2) policy networks drawing lessons about policy instruments leading to programmatic changes; and (3) policy communities learning about ideas leading to paradigm shifts. Referring to the work of Rose (cf. Rose, 1993), they argue that policy transfer is primarily about the second type of learning, i.e. professionals learning about instruments and programmes.

The presented view on policy transfer has been opposed in more recent studies, which argue that policy transfer may involve diverse learning processes. Building on insights about policy transfer and information theory, Wolman and Page (2002) argue that "policy transfer can encompass transfer of policy goals, concepts, or ideas as well as program structure, design, and techniques" (ibid, p. 480). They further argue that policy transfer is about learning and that learning can be seen as a process of transferring information. This process involves information producers, senders, facilitators and recipients who communicate, process, assess and utilize information. De Jong and Edelenbos (2007) build upon this study in their analysis of policy learning in transnational expert networks. From their analysis of social interaction (as part of the network) and conceptual replication (referring to the adoption of knowledge "back home"), they conclude that experts acting in transnational networks can play an important role in the spread of policy models, ideas and institutions.

Policy transfer as a learning process is further focused upon in studies by Evans and Davies (1999) and Evans (2009). They see policy transfer as an intentional learning process that results in policy action. They further emphasize that policy transfer takes place in a multi-organizational setting (a policy transfer network) that is influenced by structural factors at the global, transnational, international and national levels that constrain and/or facilitate policy transfer (e.g. globalization, Europeanization, privatization). They argue that policy transfers take place in ad hoc, action-oriented networks consisting of a limited number of participants who share the same interest (i.e. engineering policy change) (Evans, 2009; Evans & Davies, 1999). Successful transfer involves policy change, which may take the form of first order change (marginal adjustments), second order change (changes in institutions) or third order change (changes in underlying concepts or values) (Evans, 2009; Hall, 1993).

Various studies show that transfers do not need to be successful. For example, an exploratory phase may also teach actors what not to do (negative lessons) or bring actors to the conclusion that there are – at least at that moment – too many obstacles (Rose, 1993). Examples of constraining factors

are cognitive obstacles (e.g. prevailing organizational culture prevents the transfer), environmental obstacles (e.g. constraints related to structural factors, the policy network or technical implementation) or public opinion (e.g. elite or media) (Evans, 2009). As for transfers across countries, comparative research shows that they tend to fail if actors of the receiving country are not in favour of or hardly involved in the process and have no opportunity to adjust the knowledge to their own context. Hence, the success of a transfer crucially depends on whether actors are 'pulling in': do actors in the receiving country have a strong desire to change things and are they convinced that the transfer is useful? (Kroesen et al., 2007). This finding was confirmed in a study focusing on the transfer of knowledge between the Netherlands and Romania (Vinke-de Kruijf, 2013).

4.4 Project-based and organizational learning and knowledge transfer

The transfer of knowledge has been studied widely in organization sciences. Within this context, the concept of 'knowledge transfer' generally refers to the learning that occurs across employees of the same or another organization. The latter occurs, for example, within the context of an international acquisition or a development setting (Bresman, Birkinshaw, & Nobel, 1999; Easterby-Smith, Lyles, & Tsang, 2008; Van Wijk et al., 2008). In the literature, the related concept of 'technology transfer' is used as well – especially in studies concerning the transfer of technical knowledge (e.g. in the automotive industry or in the water sector) (Pigram, 2001; Safarian & Bertin, 2013). However, the term knowledge transfer is usually more appropriate as the knowledge associated with a certain technology is being transferred rather than the technological equipment itself (Bresman et al, 1999; Trott et al, 1995).

Of particular relevance to research focusing on transnational projects are studies concerning project-based and organizational learning and knowledge transfer. Within this context, learning can be defined as the process of linking, expanding and improving data (raw facts), information (data with a meaning), knowledge (understanding of information) and wisdom (know what and how to use knowledge in a given situation) (Bierly, Kessler, & Christensen, 2000). Such learning may occur in a project context. Project-based learning involves the creation and acquisition of knowledge in a project context as well as the codification and transfer of this knowledge to the participating organization. Due to their temporary and interdisciplinary nature, projects are very suitable for creating and acquiring knowledge. However, knowledge may be difficult to preserve once a project ends since knowledge is embedded in the experience of the project partners and stays with them. As the 'sedimentation' of knowledge tends to be problematic, organizational knowledge transfer could be seen as a pre-requisite of effective project-based learning (Bakker et al., 2011; Hachmann, 2013).

Organizational knowledge transfer refers to the transfer of knowledge within and between organization actors, teams and units. A meta-review of the concept shows that the concept has been studied widely. Particular attention has been paid to the characteristics of the knowledge being transferred, the organization involved and the network context (Van Wijk et al., 2008). As for the knowledge being transferred, the review confirms that so-called 'causal complexity', i.e. the degree to which knowledge can be communicated, interpreted and absorbed hampers the acquisition and – although to a lesser extent – the exchange of knowledge. As for organization characteristics, the influence of 'absorptive capacity' stands out (see below for a further explanation of this concept). Organization size may also have a positive influence on knowledge transfer, whereas the impact of decentralization and organizational age is unclear or marginal. Also network characteristics help to explain knowledge transfer. Structural factors such as more relations and a centralized network

position increase inter-organizational knowledge transfer. Strong and trustworthy relations and cognitive capital (e.g. shared visions) also enhance knowledge transfer as they create closeness (ibid). A comparative study on project learning confirms the importance of both absorptive capacity and network relations. The study shows that high absorptive capacity is necessary but insufficient for successful knowledge transfer and needs to be combined either with cognitive proximity (i.e. shared understandings) or with some form of on-going collaboration (Bakker et al., 2011). In another review article, knowledge management is discussed along similar lines emphasizing contextual properties (of units, relationships and knowledge) and how this affects knowledge management outcomes (creation, retention and transfer). The review argues that ability, motivation and opportunity of individuals help to explain why certain contextual properties affect knowledge management outcomes. Furthermore, the review emphasizes 'social relations' as well as informal networks as important themes for further research (Argote, McEvily, & Reagans, 2003).

In past decades, absorptive capacity has probably been one of the most prominent research themes in organizational knowledge transfer. This concept was introduced by Cohen and Levinthal (1990) in relation to an organization's capacity to innovate. Within this context, they see 'absorptive capacity' as an organization's ability to recognize new, external knowledge and to integrate and use that knowledge. They highlight the importance of individuals who work at the interface between the organization and its external environment (so-called gatekeepers and boundary-spanners). A wide range of – mostly quantitative – studies confirm the causal relation between absorptive capacity and organizational knowledge transfer (within and across organizations). Particularly the importance of prior related knowledge and experience is confirmed (Cohen & Levinthal, 1990; Van Wijk et al., 2008). One of the few qualitative process-oriented studies on absorptive capacity highlights the role of power. The study shows that social systems (systemic power) influence what external information is accessible and who has the legitimacy to make use of that information. In addition, the ability of self-interested actors to create support (episodic power) influences the adoption and utilization of knowledge (Easterby-Smith, Graça, Antonacopoulou, & Ferdinand, 2008).

Closely related to the concept of 'absorptive capacity' is the concept of 'receptivity'. This concept has been used to study technology transfer (Trott, Cordey-Hayes, & Seaton, 1995), water policy mechanisms (Jeffrey & Seaton, 2004) and the impact of knowledge and innovation programmes (N. Bressers, 2011). Particularly the latter study is of interest as it focuses on impacts, i.e. the perceived changes that occur as a result of the actions of a certain programme. These changes may be with targeted and non-targeted stakeholders and may occur in planned and unplanned ways. Receptivity can be a feature of the sender and receiver of knowledge as well as their interactions can defined in terms of the awareness, association (fit with context), alignment (interactions), acquisition (ability to incorporate) and application of innovative knowledge (N. Bressers, 2011).

A study concerning knowledge sharing in project-based organizations shows that organizational learning can be achieved via different mechanisms. Knowledge may be shared on an individual basis and can be embedded in organizational routines. In addition, knowledge can be shared via informal and ad hoc contacts as well as via formal databases. Hence, a distinction can be made between four different mechanisms of knowledge transfer: (1) individuals sharing knowledge in an informal and ad hoc manner; (2) individuals sharing of project documents and other artefacts in an informal and ad hoc manner; (3) shared knowledge bases, embedded in organizational routines and structures, allow people in the organization to easily access and share relevant knowledge with other persons in their organization; and (4) person-to-person knowledge sharing is facilitated by organizational routines

and structures that promote the sharing of knowledge across individuals. Depending on the organization, some mechanisms may be more appropriate than others. Individual knowledge sharing requires that persons can actually interact directly and have adequate knowledge of 'who knows what'. The sharing of codified knowledge critically depends on how well information is kept and stored; institutional structures and routines influence the probability of employees accessing central databases and sharing knowledge and experience with colleagues (Boh, 2007). As so-called 'tacit knowledge' (i.e. practical know-how that is difficult to codify in databases) plays an important role in a project work context, aspects such as face-to-face interaction, language, mutual trust and proximity are likely to be rather important for the sharing of project knowledge (Koskinen et al., 2003).

Another theme that has been investigated in relation to project-based learning is the role of knowledge boundaries, which may prevent the transfer of knowledge across specialized units (e.g. disciplines or organizations). In analysing these boundaries, Carlile (2002; 2004) distinguishes between three different knowledge boundaries:

1. A syntactic or information-processing boundary related to differences between sender and receiver. Knowledge can be transferred across this boundary when a common language is created and functions as common knowledge between sender and receiver.
2. A semantic or interpretative boundary arises when differences and dependencies become unclear and meanings are ambiguous. Knowledge can be translated across this boundary when individuals engage in similar activities and develop shared meanings as well as when knowledge brokers or translators enable the flow of knowledge.
3. A pragmatic or political boundary arises when actors have diverse interests, which need to be negotiated or resolved. This boundary recognizes that knowledge is 'invested' in practice. Hence, the adoption of new knowledge involves costs related to the transformation of current knowledge. Teams and shared artefacts and methods may provide the capacity to negotiate and transform knowledge. In particular, boundary objects as well as so-called 'trade-off' methodologies have proved to be effective in overcoming this boundary.

Carlile (2002) then concludes that knowledge is: (1) *localized* around problems faced by a given practice; (2) *embedded* in the experiences, know-how, technologies and methods that are used by individuals in a given practice; and (3) *invested* in the methods, ways of doing and successful applications. The localized, embedded and invested nature of knowledge has significant benefits within a certain practice, but may become problematic when working across practices. The concept of knowledge boundaries is used by Valkering et al. (2013) in their analysis of a cross-border project. They highlight four boundaries that emerge in such projects: territorial (related to differences in language, culture and institutional context), role-based (related to differences in interests, means and roles), sectoral (related to professional specializations) and project (related to involvement in the project) (Valkering et al., 2013).

The literature on organizational and project-based learning shows that the knowledge being transferred, the organization involved, social relations and the boundaries or proximity between sender and receiver influence such learning processes. An aspect that has received less attention is the relative importance of environmental factors as well as the 'fit' or congruence between knowledge, units, relationships and the environment (Argote et al., 2003). A study concerning learning in pilot projects, for example, shows that the 'ambitiousness' of a project, i.e. the extent to which project actions challenge rules and interests in the existing regime, matters. For a more

ambitious project to be successful, a greater number of process conditions seems to be required, including an open and creative negotiation process that stimulates learning and network management. This is less important in a more routine project (van Mierlo, 2012).

4.5   Summary of key findings

The presented literature on transnational learning, policy and knowledge transfer and project-based and organizational learning can be summarized as follows:

- International collaboration and learning are important aspects of both European INTERREG and research projects, yet they tend to differ in terms of participants and scope. Government actors play an important role in INTERREG projects, which tend to be focused more towards the actual implementation of knowledge. Research projects mostly involve research and education institutions and are focused on the development of new (scientific) knowledge.
- European cooperation projects involve actors with diverse organizational and socio-cultural backgrounds. Through their interactions, participants may learn from each other (i.e. exchange and transfer of knowledge) and with each other (i.e. development or production of new knowledge).
- A key challenge in transnational projects is to actually transfer lessons learned to the home organizations of participants as well as to actors and organizations who are not directly involved in the project. The latter may involve the transfer of knowledge to other actors in the partner regions, horizontal transfer to other local and regional actors as well as vertical transfer (uploading) to the national and European level.
- Learning within cooperation projects is influenced by participant-specific factors (e.g. language skills and continued participation) as well as project-specific aspects (e.g. the organization of the exchange process, expert involvement and the constellation of the team).
- Transnational projects provide actors with the opportunity to acquire new knowledge and expertise (know-how or skills). This may lead to small-scale adjustments (single-loop learning) as well as structural changes (double-loop learning). However, participants often fail to fully employ provided learning opportunities, implying that chances for knowledge transfer and knowledge production are missed. The degree to which other actors learn from the project (e.g. increase of awareness, change of policies or practices) is largely influenced by the efforts made by the project partners.
- Collaborative research projects mostly contribute to the advancement of knowledge (e.g. new or improved data, knowledge, methodologies and tools) and quite often influence policy processes. Projects are generally successful in terms of building networks, achieving project objectives and research. At the level of project partners, they particularly contribute to the increase of (scientific) knowledge, understanding and capabilities and an improvement of (international) networks and relations.
- The transfer of policy-relevant knowledge may concern different objects. Some knowledge may be too concrete or too abstract to be transferred. Knowledge transfer is in any case unlikely to be the mere copy-pasting of a technology or legislation, but rather about learning and adapting knowledge to context-specific factors and needs.
- Differences across the policy or institutional environment in which knowledge needs to be embedded is more likely to influence the transferability of knowledge than general contextual differences.

- Policy transfer studies mostly focus on policy networks (professionals with a common interest) learning – intentionally – about instruments and programmes. Learning does not need to result in the actual transfer of knowledge, an exploratory phase may also teach actors what not to do.
- The successful transfer of knowledge particularly depends on whether receiving actors have a strong desire to change things and are convinced about the usefulness of the transfer.
- Inter-organizational projects provide organizations with the opportunity to create and acquire knowledge. To actually embed that knowledge in the organization, which involves the codification and transfer of knowledge, tends to be challenging. Organizational knowledge transfer is therefore an important aspect of project-based learning.
- The ability of an organization to recognize new, external knowledge and to integrate and use that knowledge (i.e. absorptive capacity) influences project learning. This is particularly the case when combined with a certain degree of cognitive and relational 'closeness' (i.e. shared understandings and on-going collaboration). Furthermore, the degree to which knowledge can be communicated may influence its transferability.
- Differences between the sender and receiver of knowledge (i.e. knowledge boundaries) may hinder the transfer of knowledge. In transnational projects, these boundaries can be related to the country, role, sector or involvement of an actor. What may help to overcome these boundaries are a common language and shared meanings, knowledge brokers, boundary objects and trade-offs.

5 Synthesis: Multi-level perspective on learning outcomes

As explained in the introductory chapter of this report, this research focuses on European cooperation projects on climate adaptation in the water sector. These projects bring together a group of diverse, interacting actors, who committed themselves to jointly achieve a specified set of objectives and results in a certain context, by a certain date and for a certain amount of financial resources. Common goals of such European projects are the testing or implementation of innovative adaptation measures as well as the development of new knowledge about potential solutions or as input for strategies or policies. In addition, the exchange and transfer of (established) knowledge usually is an important aspect of such cooperation projects. To develop a better understanding of the learning outcome(s) of these projects as well as the conditions that lead to these outcome(s), this chapter synthesizes the insights from diverse literature streams (see previous chapters) into a conceptual framework. The first section of this chapter introduces a multi-level framework for the assessment of learning. In the subsequent sections, the variables of this framework – conditions and outcomes – are elaborated for three levels of analysis (micro, meso and macro). The chapter ends with concluding remarks regarding the presented framework.

5.1 Towards a multi-level learning framework

The ultimate objectives of adaptation-oriented projects are to change the social-ecological system in such a way that the potential harm of actual or expected climate change is moderated and beneficial opportunities are exploited (Moser & Ekstrom, 2010; Parry et al., 2007). This involves processes related to understanding, planning and managing climate change adaptation (Moser & Ekstrom, 2010). How learning may contribute to such processes is the focus of this research. Within this context, learning is seen as a process with effects that may occur inside the project context (below referred to as outcomes) as well as outside the project context (below referred to as impacts). This conception of learning (including the references to key literature sources) is presented in Table 8 (see also Figure 1 in Chapter 1).

Table 8 – Conception of adaptation-oriented learning (process and effects) in a project context

Process	A group of diverse actors share and reflect upon each other's ideas, knowledge, experiences and environments under influence of the social-ecological system context. This may involve social interactions and/or experimental approaches (e.g. modelling, adaptive management, experiments). (Armitage et al., 2008; Keen et al., 2005; Pahl-Wostl & Hare, 2004)
Outcomes	An increase of substantive and relational knowledge and capacities and changes in understanding at the individual and/or the collective level that are relevant from the perspective of climate change adaptation (Armitage et al., 2008; De Laat & Simons, 2002; Gerlak & Heikkila, 2011; Pahl-Wostl & Hare, 2004; Vinke-de Kruijf et al., 2014).
Impacts	Use of project results by organizational actors, networks or communities with potential impacts on the structural governance and societal context (e.g. more adaptive river management, increased societal awareness) (Huntjens et al., 2011; Pahl-Wostl & Hare, 2004; Wolman & Page, 2002)

The presented conception of learning is inspired by the multi-level framework of social learning that was developed by Pahl-Wostl et al. (2007) in the European project Harmonicop. In this framework, multiparty collaboration and learning processes at the micro-level are linked to the meso-level of organizations in the water management regime and the macro-level of the societal and governance context. We use this multi-level learning framework to distinguish between learning at three different levels (see Figure 3). The *micro-level* corresponds to the project context where project participants interact directly and intensely with each other and may learn about the substantive and relational aspects of climate change adaptation (project or group learning). The *meso-level* is formed by organizations (e.g. authorities, associations or companies) with a role in climate change adaptation or water management, who may partly engage in the project and may adopt and use lessons learned (organizational learning). The *macro-level* refers to the structural context for climate change adaptation and water management where lessons learned may be taken up and used by networks or communities thereby changing the structural context (network and societal learning or collective policy learning, which goes beyond learning inside single organizations).
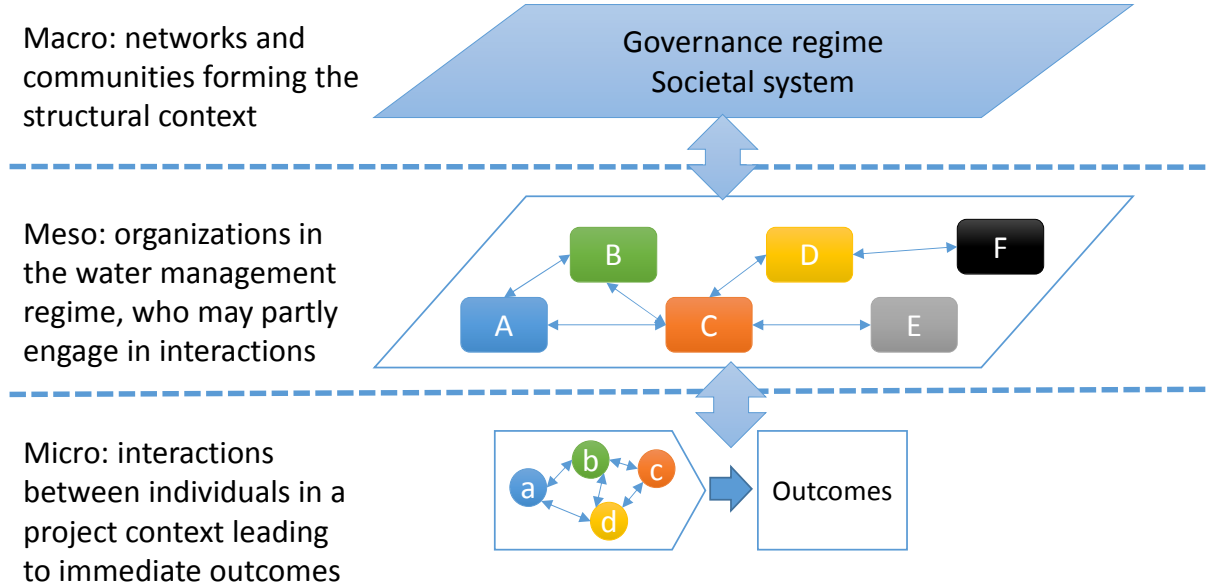

Figure 3 – Learning as a multi-level process with immediate outcomes at the micro-level (individual project participants) and potential impacts at (and influences from) the meso-level (organizations) and the macro-level (structural context). Adapted from Pahl-Wostl et al. (2007)

In this research, the presented framework is used to identify under what conditions project actions and interactions contribute to learning. We basically assert that highly successful projects show learning at all three levels, this is, what participants learn in a project context (micro-level) is taken up and used by relevant organizations (meso-level) and influences the structural context for resources governance and management (macro-level). As 'learning' involves different agents and therefore has a different meaning at these different levels, we adopt distinct conceptions of learning for each level (cf. Bennett & Howlett, 1992; Diduck, 2010). This also implies that we specify the hypothetical outcomes as well as the conditions that are expected to influence these outcomes separately for each level. Against this background this chapter introduces three models of learning (each of them consisting of an outcome and a set of conditions) rather than one cumulative model of learning (see Table 9).

To understand and explain the diverse forms of learning that may occur as a result of a project, we build upon insights from diverse literature streams. To define the outcome and conditions of learning at the micro-level (project learning) studies on social learning and transnational learning provide some useful starting-points (see Chapters 3 and 4). On the basis of these literature streams, we assert that the outcome of project learning can take the form of an incremental or a substantial increase of substantive and relational knowledge, insights and skills. However, in defining the conditions that influence this outcome, we can only partly build upon the literature on social learning in natural resources management as most studies in this domain focus on actors who live or work in the same area and/or share a common resource. Generally, this does not apply to participants of a European project. Also on the basis of the literature on transnational learning, we expect that – compared to local or regional projects – European projects involve actors with rather diverse backgrounds and interests who therefore may have difficulties to understand each other and to identify a common ground or problem. At the same time, these actors are less likely to have deep conflicts or negative experiences from previous collaborations. On the basis of various studies, we basically hypothesize that project learning (micro-level) is influenced by characteristics of individual project participants (i.e. motivation, opportunity and ability), the organizations and persons in the consortium (e.g. balanced diversity, complementary knowledge and previous collaboration) and the interaction process (e.g. atmosphere, activities, facilitation). Other factors in the wider and structural context (e.g. the supportiveness of the partner organization or the governance system) are not included since we expect that they only have an influence in as far as they influence the actors or the interaction process (H. T. A. Bressers, 2009).

Table 9 – Multi-level framework of the learning processes and outcomes of international cooperation projects

Level and unit of analysis	Learning outcomes	Relevant conditions
Micro - Project participants and consortium	Increase of knowledge, insights and skills (substantive and relational)	- Participants - Consortium - Interaction process
Meso - Organizations in the water management regime	Utilization of project results, including lessons learned, by organizations	- Partners - Users - Strategy - Theme
Macro - Water governance and management system (structural context)	Utilization of projects results, including lessons learned, by networks and communities	- Partners - Context - Scope

To assess the wider impacts of a project (i.e. organizational, network and societal learning) is quite a challenge. Among the key issues is that the actual effects of a project may be diverse and become visible only after a longer period of time and that changes may be the result of many other processes and influences. We therefore can only estimate the ultimate outcomes (impacts) of a project. To do so, we adopt a measurement tool that has been developed in the literature on knowledge utilization and transfer. Using this tool, we distinguish between various levels of knowledge transfer with the mere sending and receiving of project results being the lowest level and the actual implementation of project results being the highest level. To understand the conditions that influence such outcomes, we build upon studies concerning project based, organizational and policy learning, policy entrepreneurs and pilot projects (see Chapters 3 and 4). On the basis of these literature streams, we assert that organizational learning is influenced by properties of the partners, users, strategy and

theme whereas network and societal learning is influenced by partners, context and scope. The condition 'partners' refers here to factors such as social relations, the motivation, position and knowledge of participants and their organizations. In addition to the partners, also characteristics of the users (e.g. an organization's absorptive capacity for the meso-level) or the context (e.g. network structure at the macro-level) are expected to influence learning. The condition 'strategy' refers to whether a project has an adequate – i.e. proactive, specific and engaging – strategy to communicate and spread the project results to organizations. The condition 'theme' points towards the attractiveness and relevance of the project theme to different organizational actors. At the macro-level, the conditions of strategy and theme are integrated into the condition 'scope', which assesses whether certain entrepreneurial strategies have been employed by partners in the project. The outcomes and conditions (see Table 9) are elaborated in the subsequent sections.

5.2 Micro-level: project learning outcomes and conditions

At the micro-level of the project, learning is referred to as 'project or group learning'. Project learning is similar to 'social learning' or 'collaborative learning' in the sense that it occurs in a collaborative setting where a group of people are working together to learn together (Dillenbourg, 1999; Pahl-Wostl et al., 2007). The agent of learning is the project participant, i.e. an individual person who acts in the role of representing an organization (see Newig et al., 2010 for a discussion on "who" the actors are). Learning has occurred when a project has led to an increase or enhancement of knowledge or capacities of participants, which may become visible in changing behaviour or actions. Learning in European cooperation projects can take many forms. For example, a financial manager can learn about European regulations for subsidy management or a participant can acquire intercultural communication skills. This research does not include all these learning processes but focuses on learning that contributes to climate change adaptation. This implies that we only consider changes that are relevant to the different phases of climate change adaptation, i.e. understanding, planning and managing (Moser & Ekstrom, 2010). In analysing learning for climate change adaptation, we distinguish between substantive and relational learning (with one being just as valuable as the other) and between single-loop and double-loop learning (with the former being less valuable than the latter).

As regards the conditions that influence project learning outcomes, we hypothesize the following:

1. Project participants: The higher the motivation, opportunity and ability of project participants, the greater the degree of substantive and relational learning.
2. Consortium: The greater the extent to which partners have complementary knowledge and the more balanced a consortium is (neither too homogeneous nor too diverse, neither too new to each other nor too close), the greater the degree of substantive and relational learning.
3. Interaction process: The greater the quality and quantity of interaction moments and activities and the better they are facilitated, the greater the degree of substantive and relational learning.

The outcome and conditions of project learning are elaborated below.

Outcome: substantive and relational learning concerning climate change adaptation
Within the context of this research, project learning outcomes are defined as: *an increase in the understanding, knowledge and skills concerning substantive and relational aspects of climate change adaptation.* Within this context, substantive learning refers to an improved understanding and knowledge about the system under concern, problems and solutions as well as an increased capacity to deal with the system. Relational learning refers to improved understanding and knowledge about social structures and mind-sets of others as well as the increased capacity to communicate, collaborate and work with others (Pahl-Wostl et al., 2007; Scholz et al., 2013; Van der Wal et al., 2014; Vinke-de Kruijf et al., 2014; Vreugdenhil, 2010). Both substantive and relational learning may enhance processes related to understanding, planning and managing climate change adaptation.

In assessing learning outcomes, we distinguish between no learning, single-loop learning and double-loop learning. Single-loop learning applies to situations where fundamental aspects remain unquestioned whereas the double-loop learning refers to some kind of higher-order learning that involves changes in underlying values and principles (Argyris, 1976). Single-loop or simple learning processes allow for the adaptation and improvement of individual measures within existing frames and systems whereas double-loop or systemic learning processes allow for the questioning of existing frames and systems and therefore makes structural change possible (Hachmann, 2013). The distinction is particularly relevant in a climate changing context where organizations and governance regimes need to move away from single-loop learning to become more adaptive. Next to double-loop learning, such change processes are likely to require regime transformations (i.e. triple-loop learning) (Pahl-Wostl, 2009). However, in this research, the latter form of learning is associated with learning at the macro-level and measured separately. At the micro-level of a project, single-loop learning is associated with the learning of new facts, correction of practices, refinement of actions and punctual changes in network structures. Double-loop learning is associated with more structural changes in values, assumptions, policies and networks (Newig et al., 2010; Pahl-Wostl, 2009).

Building upon the presented literature, we assert that high levels of project learning are achieved when project documents reflect and many participants report that truly new understandings, knowledge and skills has been acquired regarding climate change adaptation (CCA). Substantive learning is linked to defining and detecting the problem and potential responses, assessing, selecting and implementing response options as well as monitoring and evaluation of CCA responses. Relational learning is linked to interacting actors and networks (i.e. who are they, what are their interests and resources) and how to deal with them (i.e. how to raise awareness, communicate, collaborate, reach an agreement). These indicators of 'deep' learning are presented in Table 10.

As explained in the introduction of this section, the focus is on learning by individual participants. However, this does not imply that learning is necessarily limited to the individual level. As the literature on social learning shows, learning may involve changes at the collective level such as the development of new shared ideas, a collective plan, social networks or relations (De Laat & Simons, 2002; Gerlak & Heikkila, 2011; Newig et al., 2010). This form of collective learning is often associated with an improved ability to manage a natural resource and included here in the definition of relational learning. The notion of collective learning is also found in the transnational learning literature, where it refers to learning by the partnership as a whole (Hachmann, 2008). Within this context, collective learning has occurred when participants have not only learned from each other (i.e. to exchange and transfer existing knowledge) but also with each other (i.e. to collaboratively

develop new knowledge or solutions) (Hachmann, 2013). While this distinction is an indication of the quality of the learning process, to really distinguish between learning with and from each other requires a deep insight into the process that cannot be acquired when examining historical cases. For example, project documents or chapters in handbooks can be presented as 'collective outcomes' but may in fact only reflect the learning by some individuals. Important to keep in mind though is that individual accounts of learning cannot be extrapolated to groups and vice versa.

Table 10 – Indications of 'deep' substantive and relational learning for climate change adaptation

Substantive learning	Project documents reflect and many participants report that the collaborative process contributed to the development of truly new understandings and knowledge concerning and a substantial increase of the ability to: - Detect, understand and frame (information about) CCA problems and potential responses - Develop, assess and select (information about) CCA response options - Implement CCA options, monitor CCA outcomes and the environment and evaluate the effectiveness of implemented options
Relational learning	Project documents reflect and many participants report that the collaborative process contributed to the development of truly new 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 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 concrete recommendations as to how to: - Raise (public) awareness and understanding - Communicate and collaborate with relevant actors (trust and relations) - Reach an agreement on options (assessment, selection, implementation)

Condition: participants

While studies on social learning rarely stress the importance of individual characteristics, they are mentioned as an influential factor in other relevant literature streams. A review of research on knowledge management in organizations shows that the exchange, transfer and creation of knowledge is influenced by ability, motivation and opportunity. Ability is shaped by factors such as training, previous experience and common language. Motivation depends on rewards, incentives as well as strong relations. Opportunity is provided when the distance between persons is reduced, for example, when persons can observe others performing a task or informal connections exist (Argote et al., 2003). Along similar lines, policy implementation theory asserts that actor-interaction processes and outcomes are basically shaped by actor motivations, cognitions and resources (H. T. A. Bressers, 2009; Owens, 2008).

Also in studies focusing on international and transnational projects individual factors are commonly highlighted. As regards motivations, research shows that project participants are not necessarily motivated and capable of learning in an international setting (Vinke-de Kruijf et al., 2014). Within this context, Colomb (2007) argues that the diverse motivations of participants should be investigated as access to EU funds or influence over EU policy rather than 'learning' might be a motivation to participate. Moreover, motivations are not stable and may change over the course of an interaction process since they are influenced not only by personal goals but also by more dynamic factors, such as, whether actors believe that they can contribute to and learn from a project or whether they feel

supported by their home organizations (Vinke-de Kruijf, Teodosiu, et al., 2013). The latter aspect, organizational support, seems self-evident but does not need to be. International projects are often only a minor part of the day-to-day work of the participants (Hachmann, 2008) and do not necessarily have priority and support inside the home organizations of participants. They are often conceived as an addition to ordinary work and may even be seen as a nice travelling opportunity for senior staff or trainees (Böhme, 2005).

As regards ability, research on transnational learning shows that participants of cooperation projects are not necessarily able to work in a cross-cultural environment as they do not necessarily have a cosmopolitan background and/or international project experience. As a result, input in discussions may not come from the most knowledgeable persons, but from the persons who are most familiar with the project language (Hachmann, 2008). Along similar lines another study that "within the cross-cultural working environment of interregional projects a number of important factors will strongly condition the cognitive capacity of an involved person (e.g. foreign language proficiency, adequate communication skills, receptiveness and openness to new knowledge etc.) and thus influence upon his/her possibility to experience learning" (INTERREG IVC, 2013, p. 16). The latter study further highlights that the qualifications of directly involved persons play a role: learning tends to be differentiated as participants start with diverse knowledge levels, contribute in different ways and are involved at different levels of intensity. Therefore, individual pre-conditions (e.g. communication problems and a lack of continued involvement) may hinder cross-cultural learning (INTERREG IVC, 2013).

Also opportunity has an influence on learning. For example, a study on learning effects shows that persons who participate only in a few meetings learn less than those who are more involved (Baird et al., 2014). Continued and extended engagement is also mentioned as an important factor in other literature sources (cf. Schusler et al., 2003; Vinke-de Kruijf, 2013; Webler et al., 1995).

On the basis of the presented studies, we hypothesize that individual learning in cooperation projects is influenced by motivation (with organizational support, belief in relevance of participation, eagerness to learn as sources of motivation), opportunity (the intensity of involvement) and ability (language and other skills to work in an international environment).

Condition: consortium
Next to individual characteristics, also the composition of a consortium may influence learning processes and outcomes. Actors from different sectors, organization types, professions and countries have diverse interests as well as working styles and methods, implying that they may experience difficulties to understand each other and to effectively work together (Hachmann, 2008). They need to overcome knowledge boundaries, which are related to their different ways of processing, interpreting and valuing knowledge (Paul R. Carlile, 2002; Paul R Carlile, 2004). In case of European projects, these boundaries are related to territorial, sectoral, role-based and project-related differences (Valkering et al., 2013). Transnational learning studies show that while the involvement of organizations with complementary roles (e.g. a public authority and a knowledge institute) is likely to have a positive effect, too much diversity does not. Also, collaboration and learning is challenging when partners have too diverse regional development contexts, administrative structures and levels of knowledge and expertise (INTERREG IVC, 2013). Along similar lines, a study on pilot projects reads that the involvement of actors with diverse functions and roles is likely to have a positive influence on learning (van Mierlo, 2012) and a study on social learning stresses the need to include participants

with diverse interests who have different but complementary knowledge (Schusler et al., 2003). For example, some participants may possess substantive knowledge (related to the problem and potential solutions), others procedural knowledge (related to the organization and management of the process) or political knowledge (related to the policy network). Each of those knowledge types is relevant when dealing with environmental projects (Leeuwis & Van den Ban, 2004; Vinke-de Kruijf, Hulscher, et al., 2013; Wesselink, De Vriend, Barneveld, Krol, & Bijker, 2009). Within this context, previous research shows that a pitfall of European projects is that they involve mostly generalists rather than policy makers and experts (in-house and/or external). Involvement of the latter can be of added value as it may allow for more in-depth discussions on the project theme and more focussed or higher quality discussions (INTERREG IVC, 2013).

When partners have cooperated before (which is often at least partly the case in European cooperation projects), this appears to have a positive effect on project learning (INTERREG IVC, 2013). Research on international cooperation projects confirms the positive influence of previous cooperation experiences – assuming that these experiences were positive – and relates them to the development of relationships and trust as well as the possession of knowledge regarding other contexts (Vinke-de Kruijf et al., 2014; Vinke-de Kruijf, Hulscher, et al., 2013). Similarly, the network management literature shows that cohesive networks (associated with strong relations and high levels of trust) are supportive of social learning. However, too cohesive networks may also lead to cognitive blocking preventing radical change and double-loop learning (Newig et al., 2010). Within this context, projects are unlikely to benefit from the involvement of many partners of the same country (unbalanced cooperation) (Hachmann, 2008).

From the above, we hypothesize that participants are more likely to learn when the consortium is neither too homogeneous nor too diverse and consists of partners with neither too strong nor completely new relations.

Condition: interaction process
To what degree participants are able to learn depends not only on who is involved but also on the process and content of their interactions. Social learning studies highlight the importance of openness, transparency and an egalitarian atmosphere so that all participants are provided with the opportunity to learn and to contribute knowledge (Hommes et al., 2009; Mostert et al., 2007; Schusler et al., 2003; Webler et al., 1995). In addition to atmosphere, the number of interaction moments matters. For actors to really start to learn from and with each other a project should provide ample opportunities for participants to interact, to know each other and each other's objectives and to develop a common language. Therefore, the more a process is oriented towards knowledge transfer and learning – rather than just the implementation of regional work packages or pilots – the better (Hachmann, 2008). One way of promoting learning is by making evaluation activities, which basically stimulate reflexivity and structure collective learning experiences, an integral part of the process (Colomb, 2007). Such activities are particularly useful when they provide participants with the opportunity to reflect in interaction with others. Reflective processes are more likely to occur when participants have informal contacts, face-to-face dialogues and work in small groups (Keen et al., 2005; Vinke-de Kruijf, Hulscher, et al., 2013; Webler et al., 1995).

Transnational cooperation can take different forms and depending on the 'intensity of cooperation' may provide a more or less conducive environment to learning. For example, a transnational project that is oriented towards the exchange of experiences or just an umbrella for a series of national or

regional subprojects is less conducive to learning than a project in which partners jointly develop or implement a solution or strategy (Böhme, Josserand, Haraldsson, Bachtler, & Polverari, 2003; Colomb, 2007). To support learning, rather straight-forward interregional networking activities (e.g. study visits or interregional seminars) can be combined with activities that provide more substance to the exchanges, like studies (e.g. thematic or comparative studies, evaluations or surveys) and joint implementation (e.g. development of policy guidelines or a pilot project). The better integrated and organized activities are – i.e. as a series of logically connected, thematic and diverse activities – the more supportive they are of learning (INTERREG IVC, 2013). Within this context, the literature shows that the experimentation with innovative approaches and measures can enhance double-loop learning (Pahl-Wostl, 2009). Hence, intense learning is more likely to occur in projects that challenge the status quo and involve innovation. Innovation refers here to the introduction of strategies, actions and ideas that are truly new to the context (Innes & Booher, 1999) and may take the form of new technologies, management approaches or governance styles (Vreugdenhil, 2010).

Facilitation is highly important to steer learning processes and to keep discussions going (Hachmann, 2008). The neutrality of the facilitator is highlighted as an important factor in the literature on social learning in participatory processes (Mostert et al., 2007; Schusler et al., 2003; Tàbara & Pahl-Wostl, 2007). In European cooperation projects, this aspect is unlikely to be as important yet the involvement of a professional facilitator is also in this context likely to support learning. For example, professional facilitators (in-house experts and/or external experts from a consultancy) can be of added value to frame the process and help to overcome barriers in the collaborative process (INTERREG IVC, 2013). When knowledge boundaries across participants are considerable, translation and boundary objects (e.g. models or visualizations) may be essential to ensure a mutual understanding in communication (Crona & Parker, 2012; Vinke-de Kruijf, 2013).

On the basis of the presented literature, we hypothesize that the higher the quality and quantity of the interaction moments and activities and the better their facilitation, the greater the degree of substantive and relational learning.

5.3   Meso-level: organizational learning outcomes and conditions

The importance of organizational learning is widely acknowledged in studies concerning project-based learning (Bakker et al., 2011; Böhme, 2005; Colomb, 2007; Hachmann, 2008, 2013). Organizational learning includes both intra-organizational knowledge transfer as well as inter-organizational knowledge transfer and can be defined as "the process through which organizational actors – teams, units, or organizations – exchange, receive and are influenced by the experience and knowledge of others" (Van Wijk et al., 2008, p. 832). In European cooperation projects, an important aspect of organizational learning is the transfer and uptake of knowledge by the home organizations of the participants (i.e. inter-organizational knowledge transfer) so that knowledge can be used by the organization and does not get lost once the individual leaves the organization (Bakker et al., 2011; Böhme, 2005; Hachmann, 2008). However, organizational learning is unlikely to be limited to the formal partner organizations. Especially since partners often actively engage other organizations (e.g. as sub-partner or stakeholder) in local, regional or national subprojects (Colomb, 2007). More generally, lessons learned may be transferred to organizational actors inside the project region, horizontally (i.e. to other European regions and countries) and vertically ('uploading' to organizations

at the national and at the European level) (Hachmann, 2011; INTERREG IVC, 2013; Valkering et al., 2013).

The above shows that knowledge transfer (from the participant to the organization) can be understood as a key aspect of organizational learning. The process that contributes to such a knowledge transfer can be seen as an interaction process that includes: (1) a source sharing knowledge (in the form of information) to others; and (2) a receiver accumulating and assimilating information and integrating it with existing knowledge (Vinke-de Kruijf, Hulscher, et al., 2013; Wang & Noe, 2010). Both sides have a role to play in the successful transfer of knowledge created in a project (Bakker et al., 2011; Van Wijk et al., 2008). As for the outcomes of knowledge transfer, they can be assessed using a measurement tool that has been developed and tested in the literature on knowledge utilization (Knott & Wildavsky, 1980; Landry, Amara, & Ouimet, 2007).

As regards the conditions that influence organizational learning, we hypothesize that:
1. Partners (participants and organizations): The better the linkages of partners with relevant organizations and the better their position, the greater the degree of knowledge transfer.
2. Users: The higher the motivation and capability of potential users to absorb project results, which is likely to depend on their prior related knowledge and experiences, the greater the degree of organizational learning.
3. Dissemination strategy: The more proactive, specific and engaging the diffusion strategy of a project, the greater the degree of organizational learning.
4. Theme: The more proven, understandable and directly relevant the project results, the greater the degree of knowledge transfer.

The outcome and conditions of project learning are elaborated below.

Outcome: transfer of project results to organizations
Organizational learning basically involves that the knowledge that has been developed in the project (i.e. projects results, including lessons learned) is integrated into relevant organizations (Bakker et al., 2011; Van Wijk et al., 2008). This integration can manifest itself in various ways, including changes in the beliefs, attitudes and values of organizational members, organizational behaviour (Wolman & Page, 2002) and the knowledge bases and capabilities of an organization, which, in turn, may lead to an increase of performance and innovativeness (Van Wijk et al., 2008). Studies focusing on European cooperation projects report that organizational learning has occurred when a cooperation project leads to changes in management structures and policy styles, in the way policy concepts are understood or conceptualized or in collaborative relationships, practices or working methods (Colomb, 2007). In the home organizations, a project can lead to changes in individual or group working routines or methods as well as changes in the entire organizational culture, policies or practices. In addition, projects often contribute to raising awareness in the project region, even to the extent that other organizations in the project region begin to pro-actively support the translation of project results into policy change (INTERREG IVC, 2013). Within the specific context of climate change adaptation, organizational learning may lead to the assessment, management, sharing or shifting climate-related risks or no action at all (wait-and-see) (Berkhout et al., 2006)

One way of measuring organizational learning outcomes would be to assess the extent to which knowledge created in a project context has been documented and integrated into the organizations

involved (Bakker et al., 2011). However, such an assessment does not shed much light on the actual influence of the project results on relevant organizations. To measure this, one needs to go one step further and look at whether knowledge has been received, processed, assessed and utilized by organizations. Here, utilization may simply refer to the fact that lessons learned are taken into account in policy making, share or affect the nature of a decision or the labelling of an issue (Wolman & Page, 2002). However, the literature on knowledge utilization shows that the actual transfer and uptake of knowledge may have rather diverse impacts on organizations. Knowledge may be used to raise an issue, to formulate a new policy, to compare alternatives, to evaluate a programme, to mobilize support, to change ways of thinking or to plan new research. Moreover, in assessing the actual use of knowledge, utilization (including the adaptation and – partial – use or implementation) can to be just as important as non-utilization (consideration of information, rejection or ignorance) (Rich, 1997).

Knowledge transfer processes that lead towards the application or utilization of knowledge are generally conceptualized using process or phase-models. According to Rich (1997), knowledge utilization should be seen as a process (rather than an outcome) consisting of the phases of information pick-up, processing and utilization. Similar phase-models can be found in studies focusing on technology transfer (awareness, association, assimilation and application) (Trott et al., 1995) and impact assessment (awareness, association, alignment, acquisition and application) (N. Bressers, 2011). Another perspective on knowledge utilization is provided by Knott & Wildavsky (1980) who argue that utilization can take different forms, each of them being a link in the chain of utilization. Within this context, they distinguish between seven distinct levels of utilization: reception, cognition, reference, effort, adoption, implementation and impact. This model of knowledge utilization has been translated into measurement tools that assess knowledge utilization from the perspective of the person receiving knowledge (Crona & Parker, 2012) as well as of the source providing knowledge (Landry et al., 2007). Building on the latter stream of knowledge transfer and knowledge utilization studies (Crona & Parker, 2012; Knott & Wildavsky, 1980; Landry et al., 2007), we adapted existing measurement tools to make them suitable for the assessment of knowledge transfer from the perspective of cooperation project participants (see Table 11).

Table 11 – Six levels of organizational knowledge transfer. Adapted from the standards of utilization (Knott & Wildavsky, 1980), activities of knowledge transfer (Landry et al., 2007) and knowledge utilization scale (Crona & Parker, 2012)

1.	**Transmission**	Projects results have been shared with other organizational actors who were not directly involved in the project.
2.	**Presentation**	Project results have been presented in some kind of tailor-made form to organizational actors who can potentially use them.
3.	**Interaction**	Project results have been discussed with organizational actors within the context of relevant (organization-specific) working groups or the like.
4.	**Adoption**	There are clear indications that organizational actors actively support or make an effort to adopt some of the project results or project participants are asked for advice regarding the adoption of the project results.
5.	**Influence**	There are clear indications that the project results were used by organizational actors to contribute to the development of new or improved policies, products or services.
6.	**Implementation**	There are clear indications that the projects results have been implemented by organizational actors.

The first level of knowledge transfer is that project results 'reach' other individuals and organizations, which requires that information is being shared with other organizational actors (i.e. transmission). An organizational actor refers here to an individual, a group or an entire organization in the water management regime. These actors may be located in the organization of the project participant, in other organizations in the project region or in other European regions as well as in organizations at the regional, national or European level (note that knowledge transfer at the meso-level focuses on transfer to single organizations rather than networks of organizations). For example, a project may have produced newsletters, policy documents or other promotion materials that are disseminated in the partner organization or other organizations. The next level of knowledge transfer involves that those who receive the information also read and understand the information. This is more likely to be the case when knowledge is presented to other individuals and organizations in a tailor-made form. For example, a project may have produced organization-specific recommendations or included the organization of a seminar or conference. The third level is that lessons learned change the way other individuals or organizations perceive climate change adaptation and related issues, which is more likely the case when project participants discuss the project results with other individuals and organizations, for example, by pro-actively involving other organizations in the project or by discussing the project in an organization-internal working group. The fourth level involves that others start to actively support the translation of the project results into policy change or start making an effort to adopt the project results, which usually involves that they ask the source for advice. The fifth level focuses on whether project results influence policy or business outcomes. For example, project results may contribute to the development of new or improved policies as well as concrete products or services. The sixth and last level involves that project results are implemented in practice. This is the case when project results are implemented by organizational actors in the water management regime. In its original form, the 'chain of utilization' includes a seventh level, which refers to the impact of project results (i.e. do they have the desired effects). This level is not included in this research as the impact of climate change, and thus the impact of climate change adaptation, is yet unknown (Pringle, 2011). To determine the actual outcome of knowledge transfer, a progressive weight can be applied to the diverse levels (e.g. level 1 has a weight of 1, level 2 has a weight of 2 and so on) (Crona & Parker, 2012). When a certain level 'does not apply' it is not taken into account in determining the total outcome. When applicable, a distinction will be made between single-loop learning (incremental change) and double-loop learning (fundamental change).

Condition: partners
The condition 'partners' refers here to properties of the participants and partner organizations, including their linkages with the potential users of the project results. One such property is their social relations. Studies concerning organizational learning show that strong and trustworthy relations have a positive influence on the flow of knowledge (Van Wijk et al., 2008). Similarly, a study concerning the use of research results shows that knowledge transfer is higher for researchers who frequently have person-to-person contacts with potential research users (Landry et al., 2007). Other studies show the transfer of knowledge is influenced by various dimensions of the social relation between sender and receiver, including the intensity of the connection, contact frequency and social similarity (Argote et al., 2003). Social relations and personal contacts play an important role when knowledge is shared in an informal and ad hoc manner and also when knowledge is documented in organization-wide databases. In addition, the presence of routines or structures for sharing knowledge (e.g. meetings) or storing knowledge (e.g. repositories or databases) may enhance knowledge transfer (Boh, 2007). Hence, the presence of linkages in the widest possible sense (i.e.

social relations and personal contacts as well as organizational routines and structures) are expected to have a positive influence on knowledge transfer.

Also whether the 'right' participants and partners are on board from the outset has an influence on organisational learning. Ideally, projected and actual project results match with the position or role of an organization. For example, the 'right' participants or partners of a project that is oriented towards the design of policy recommendations are organizational actors that actually develop or deliver policies or are in the position to influence policies or to transfer lessons learned to other actors. To actively involve, for example, policy makers is much easier for public authorities than for universities (INTERREG IVC, 2013). Being the 'right' actor is, however, not only about being in a position to formally adopt or use project results. It also about being motivated to share knowledge (i.e. devote resources and time) (Szulanski, 1996), having adequate knowledge of who to share knowledge with and how (Boh, 2007), including who are the relevant organizations in the water management regime (Vinke-de Kruijf, 2013).

On the basis of the presented literature, we assume that the presence of knowledge sharing mechanisms (relations, routines, structures) as well as the positioning of the participants and partner organizations influence organizational knowledge transfer.

Condition: users
In addition to source-specific factors (i.e. project participants) also user-specific factors may affect the transfer of knowledge. User-specific factors may be diverse. For example, an evaluation of an INTERREG programme shows that organizational learning may be inhibited by structural factors and behaviour (e.g. hierarchies, established procedures, lack of internal evaluation or general aversion to change) as well as other organization-specific factors such as a lack of time and resources for initiating change processes (INTERREG IVC, 2013). Moreover, the potential user may perceive the source as being unreliable, lack the motivation to use knowledge (e.g. 'not invented here') or lack the absorptive or retentive capacity to use knowledge (Szulanski, 1996). From the latter factors, especially the importance of absorptive capacity has been confirmed by a wide range of studies (Van Wijk et al., 2008). This capacity refers to an organization's ability to recognize, integrate and use new, external knowledge and is based on the premise that an organization needs prior related knowledge to integrate and use new knowledge (Cohen & Levinthal, 1990). Research confirms this premise: prior related knowledge and experience has a positive influence on the assimilation and use of new knowledge. Thus, whether organizational knowledge transfer (within and across organizations) occurs depends on whether new knowledge is related to what is known (Van Wijk et al., 2008). The importance of absorptive capacity is also confirmed in a study concerning project knowledge transfer, which shows that absorptive capacity is a necessary condition for knowledge transfer to the parent organization. In addition, a project need to be well embedded, either from a cognitive perspective (i.e. the partner organization and the project either have similar understandings of the system under concern) or from a relational perspective (i.e. the project is part of some kind of on-going collaboration) (Bakker et al., 2011). This corresponds with the finding that previous collaboration in European projects has a positive influence on organizational learning and change since this increases the general awareness and preparedness of the organization (INTERREG IVC, 2013).

Thus, project participants may experience enablers or barriers to knowledge transfer at the side of potential users (e.g. lack of motivation or capability to absorb knowledge resulting from the project),

of which the presence or absence of prior related knowledge and experience is probably the most important factor.

Condition: strategy

What and how knowledge transfer activities are designed and implemented as part of a cooperation project can influence learning as well. Research on pilot projects show that participants often have a wait-and-see attitude towards the diffusion of results to potential users. For example, diffusion does not have priority or is expected to occur by itself. Diffusion therefore starts with having a strategy and putting that strategy in place at an early stage of the project (Vreugdenhil et al., 2010). Research on international collaborative projects confirms that projects are more likely to have an impact when a proactive diffusion strategy is developed and implemented (and adjusted, if necessary) throughout the entire project. Ideally speaking such as strategy is not only proactive but also specific. This implies that it clearly describes what kind of impacts are aimed at, which actors can contribute to the achievements of such impacts and how the commitment of these actors will be obtained (Vinke-de Kruijf, 2013). An evaluation of INTERREG projects adds that the involvement of other actors (e.g. national institutions, other EU projects, politicians or interest groups at the EU level) has the most positive effect when these actors are involved throughout the project (INTERREG IVC, 2013). A probable explanation for this is that knowledge created in projects, and in pilot projects in particular, is often 'tacit' implying that project results are difficult to codify in databases and is best transferred when using direct and personal means of communication and especially when potential users are actively involved (Koskinen et al., 2003; Vinke-de Kruijf, Hulscher, et al., 2013; Vreugdenhil, 2010). The evaluation further shows that project impacts are generally higher in the lead partner region than in the regions of the other project partners (INTERREG IVC, 2013). Hence, there may be good reasons to suspect that activation of partners is beneficial in this respect. Based on the presented literature, we hypothesize that the more proactive, specific and engaging the project diffusion strategy, the higher organizational learning.

Condition: theme

Assuming that the project involves the right participants and partner organizations and has an adequate diffusion strategy, the impact of a project on organizational learning may still be limited when the project results are just not that relevant or attractive to relevant organizations. For example, results of a highly innovative project are less likely to be adopted and implemented on the short term as structural changes may be needed before they can be implemented (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). In addition to being too early, project results can also be too late. This is the case when the policy climate is no longer supportive of the innovation (Vreugdenhil et al., 2010) or the addressed problem has been solved already by other solutions or policy approaches (INTERREG IVC, 2013).

As for how knowledge properties influence the transfer of knowledge various reviews highlight the importance of 'causal ambiguity' (Argote et al., 2003; Van Wijk et al., 2008). Causal ambiguity arises when the reasons for success or failure remain unclear. It may relate to the 'tacit' nature of knowledge as well as to a lack of understanding of how knowledge interacts with its context (Szulanski, 1996). The problem with ambiguous knowledge is that it is difficult to communicate, interpret and absorb. This particularly affects the transfer of knowledge from one organization to another and is less influential when knowledge is being transferred within the same organization (Van Wijk et al., 2008). In the specific case of European cooperation projects, evaluators found that

while many projects generate outcomes that are of EU-wide relevance or of a wider European value, only a few also deliberately intended to do so (INTERREG IVC, 2013). In addition, partners often fail to extract more generalizable results (Hachmann, 2013). The inclusion of concrete pilot projects may have a positive effect on the transfer of project results as knowledge that has proven to be useful is less difficult to transfer (Szulanski, 1996). However, a potential problem with pilot project results is that generated knowledge may turn out being too context-specific as the project design or conditions are not representative (Vreugdenhil et al., 2010).

On the basis of the presented literature, we hypothesize that projects results are more likely to be transferred when they are proven to be useful, communicated in an understandable manner (with attention for what is context-specific and what is generalizable) and addresses themes that are (still) relevant to the organizations in the water management regime.

5.4   Macro-level: network and societal learning outcomes and conditions

Learning at the macro-level refers to learning processes that go beyond individuals, organization-internal groups or single organizations. It may take the form of network learning, i.e. the learning by collectives in a network that leads to changes in network properties or societal learning, i.e. the learning by entire communities of people that leads to changes in societal institutions (i.e. informal and formal rules, including social norms and values or formal regulations) (Diduck, 2010). More specifically, collective learning in a network context may lead to changes in the common rules and institutions of the network as well as the relations among actors in the network (Newig et al., 2010). Network and societal learning may involve triple-loop learning. Triple-loop learning refers to "a transformation of the structural context and factors that determine the frame of reference" and includes "a transition of actor networks where new actor groups come into play, boundaries and power structures are changed, new regulatory frameworks are introduced" (Pahl-Wostl, 2009, p. 359). References to network and societal learning can also be found in the literature on policy learning where learning by networks is associated with drawing lessons about policy instruments leading to programmatic change and learning in communities with the transfer of ideas leading to paradigm shifts (Bennett & Howlett, 1992). What distinguishes network and societal learning from the literature on policy learning in general is that the focus is only on "collectives". Within this context, the learning processes associated with more wide-ranging structural policy changes are sometime also referred to as "collective policy learning". Some kind of collective policy learning is generally needed to achieve a fundamental policy change, since such a change requires resources and support of multiple actors and stakeholders (INTERREG IVC, 2013).

On the basis of the literature about social and societal learning, policy entrepreneurs, pilot projects and transnational projects, we hypothesize that the following conditions contribute to network and societal learning:

1. Partners: The more formal and informal linkages project partners have in relevant networks and communities and are willing and able to influence them, the higher the degree of network and societal learning.
2. Context: the better interactions and information in the network and structural context are managed, the greater the degree of network and societal learning.
3. Scope: the more strategic partners are about the project scope, the greater the degree of network and societal learning.

Outcome: transfer of project results

Learning at the macro-level is associated here with knowledge transfer that contributes to changes in the structural network or societal context. Network or societal learning occurs, among others, when a project contributes to the fundamental adaptation of existing or the introduction of completely new policy instruments or concepts (INTERREG IVC, 2013), changes in the ways of working (single-loop learning) or common goals, rules and interrelations of a network (double-loop learning) (Newig et al., 2010) or the introduction of new actors or regulatory frameworks (Pahl-Wostl, 2009).

For structural change to occur, informal and formal negotiation and decision-making processes that involve various organizations are generally needed. Such processes are most likely to occur at the level of 'policy subsystem' where diverse actors (e.g. policy-makers, implementing agencies, interest groups) rely on the cooperative behaviour of other actors to pursue their goals and therefore form a network. What characterizes such a subsystem is complex inter-organizational relations of mutual dependencies, cooperation and competition (INTERREG IVC, 2013). In the public policy literature, such networks are often referred to as governance networks, which basically is a relatively stable group of autonomous but interdependent actors who interact on a regular basis. Such networks contribute to the production of public purpose and are often initiated, maintained or supervised by a steering actor (e.g. the state). Alternatively, networks may take the form of epistemic communities in which actors do not have the same interests but share the same basic causal beliefs and normative values or the form of transnational networks that are initiated by international organizations and in which actors have shared professional norms and a joint interest in problem-solving (Newig et al., 2010). In addition, learning at the macro-level may take the form of societal learning and involve communities of people living in a certain region or country (Diduck, 2010). For example, a project may lead to an increased awareness of the community of people living in a project region (INTERREG IVC, 2013).

Table 12 – Six levels of knowledge transfer to networks and communities. Adapted from the standards of utilization (Knott & Wildavsky, 1980), activities of knowledge transfer (Landry et al., 2007) and knowledge utilization scale (Crona & Parker, 2012)

1. **Transmission**	Projects results have been shared with networks or communities that were not directly involved in the project. The project was successful in generating a broader awareness of the project theme.
2. **Presentation**	Project results have been presented in some kind of tailor-made form to networks or communities who can potentially use them.
3. **Interaction**	Project results have been discussed in relevant networks or communities.
4. **Adoption**	Networks or communities support the translation of project results into policy change and make an effort to adopt some of the project results. They ask participants for advice regarding the adoption of the project results.
5. **Influence**	There are clear indications that the project results are used by networks or communities to contribute to the development of new or improved policies, products or services.
6. **Implementation**	There are clear indications that the projects results have been implemented by networks or communities.

As a comprehensive assessment of how a project did influence networks and communities is beyond the scope of the research, this influence will be estimated by looking at the knowledge transfer activities of the project. Within this context, we again use the levels of knowledge transfer as a

starting-point (see section 5.3 for a further explanation) and adapt them for the assessment of knowledge transfer to networks and communities (see Table 12). When applicable, a distinction will be made between single-loop learning (incremental change) and double-loop learning (fundamental change).

Condition: partners

In the previous section (5.3), we show that transfer mechanisms, partner-specific and user-specific factors influence organizational learning. The literature on policy entrepreneurs and networks reveals that similar factors influence network and societal learning. A recent study concerning policy entrepreneurship shows that while individuals and groups of individuals cannot manage or control policy change, they can be rather successful in influencing change processes (Huitema & Meijerink, 2010). What characterizes such entrepreneurs is that they are highly motivated as is indicated by their willingness to invest their resources (e.g. time) in promoting certain policy ideas (Kingdon, 1984). Successful entrepreneurs further appear to fully understand and know the context in which they are working, have a good reputation within their respective communities, good networking skills and perseverance. Furthermore, entrepreneurs often collaborate with other individuals who play complementary roles (Meijerink & Huitema, 2010).

The literature further shows that organizations can also act as policy entrepreneur. Whether an organization is capable of acting as policy entrepreneur depends, among others, on an organization's legitimacy, strength, resources and capacity as well as the ability of an organization to establish and maintain vertical and horizontal networking relations (Cots et al., 2009; Perkmann, 2007). The importance of an organization's position and relations is emphasized in other studies, which show that when actors have a stronger relation with a certain organization, they are more likely to accept and use knowledge that is provided by that organization (Crona & Parker, 2012). In addition, some organizations are simply good at influencing others due to their centralized network position and closeness to other organizations (which involves strong and trustworthy relations as well as shared visions and understandings) (Van Wijk et al., 2008).

Hence, we hypothesize that network and societal learning is more likely to occur when projects involve partners that have formal and informal linkages with other organizations in networks, are able and willing (i.e. have the motivation and position) to influence networks and policy processes.

Condition: context

Knowledge transfer is likely to be influenced not only by the partners but also by characteristics of structural context and the networks and communities in this context. As regards the characteristics of networks, the literature shows that knowledge transfer and learning are supported by the presence of relatively small, cohesive networks (although this may restrict double-loop learning) and the presence of a central actor who is relatively powerful or important (Newig et al., 2010). Furthermore, research shows that changes to the structural context are more likely in governance systems that are characterized by integrated cooperation structures (i.e. governance structures that support cooperation between actors or diverse sectors and governance levels) and advanced information management (flexible, open and shared information management, taking into account uncertainties) (Huntjens et al., 2011). On the basis of these studies, we hypothesize that the better interactions and information are managed in the network and structural context, the greater the degree of network and societal learning.

Condition: scope

The presence of a proactive, specific and engaging diffusion strategy and an understandable, generalizable and relevant project theme are mentioned in the previous section as conditions for organizational learning. While these factors do affect network and societal learning, the dynamics that are at work at the macro-level are much higher. Within this context, the literature on policy entrepreneurs shows that achieving structural change is not about having the right strategy or theme but rather about being strategic about who and what to include in the project scope. Research basically shows that successful policy entrepreneurs – i.e. individuals or groups of individuals who successfully influence policy change processes – are able to anticipate, recognize and make use of opportunities when they arise. This may involve the strategic framing of disasters or problems that fit the institutional and social context, developing and testing alternatives (e.g. pilot projects), building coalitions as well as connecting formal and informal networks (e.g. by means of venue manipulation, venue-shopping and/or the creation of new venues) (Meijerink & Huitema, 2010).

When translating the presented insights to European cooperation projects, various ways of being strategic about the project scope can be recognized. Partners can anticipate windows of opportunity by including the developing and testing of attractive responses in the project and demonstrating their feasibility through pilot projects (Meijerink & Huitema, 2010). Secondly, partners can be strategic about the way they frame the project. Important here is that the project theme is chosen and framed in such a way that it matches the institutional and social context (Meijerink & Huitema, 2010). For example, a bottom-up approach is unlikely to be successful in a centralized governance context (Vinke-de Kruijf, Teodosiu, et al., 2013) and solutions that require integrated and cooperative working styles will not be adopted when there is no interaction across sectors and scales or when actors fear to share information or to lose control (Mostert et al., 2007). In addition, one can be strategic about the framing of external events. For example, a disaster or pressing problem can be framed in such a way that it stresses the importance of the project theme. Within this context, the literature on policy entrepreneurs shows that crises can play an important role in raising public and political attention for an issue and offer opportunities for the implementation of new insights or proposals (Meijerink & Huitema, 2010). In addition to being strategic about activities and framing, one can also be strategic about who to involve. For example, a project can be used to deliberately create new forums or to connect informal and formal networks (Meijerink & Huitema, 2010). The latter aspect has also been highlighted in other studies, which show that the informal learning processes inside a multi-actor or participatory process often somehow needs to be connected to formal policy and decision-making processes. One way of organizing this is by giving executives or politicians a role in the project (Edelenbos et al., 2008; Pahl-Wostl, 2009; Vinke-de Kruijf, 2013). Lastly, the literature on policy entrepreneurs emphasizes the importance of perseverance, to see a transition process through to implementation (Meijerink & Huitema, 2010). Within this context, we expect that being strategic is also about building upon previous projects and looking for follow-up actions. Within this context, previous research shows that a single, innovative project is unlikely to set about a change in the structural governance context. Therefore, projects should rather be seen as building blocks of a longer term change process (Vinke-de Kruijf, 2013).

On the basis of the above, we hypothesize that projects in which actors are being strategic about the project scope (i.e. what they do, with whom and how) are more likely to contribute to structural change.

5.5   Concluding remarks

In the preceding sections, the processes and outcomes of learning are presented as distinct processes that occur at multiple levels. In describing the conditions influencing these levels, attention is paid only to feedback loops from the micro-level to the meso-level and the macro-level. The underlying reasoning is that what happens at the micro-level may lead to changes at the higher levels of organizations and the structural context (Pahl-Wostl et al., 2007). For example, we showed that the extent to which a project is 'open' to persons from the partner organizations and beyond may influence on organizational learning. What has not been taken into account is that the latter influence also works the other way around: the pro-active involvement of other actors appears to have a positive influence on learning inside the project as it helps to transform project experiences into lessons learned (INTERREG IVC, 2013). Also, project learning at the micro-level is influenced by the interactions between project participants and their home organizations (inter-organizational learning) (Sol et al., 2013). As we expect that these and other feedback loops are rather important, we consider succeeding an analysis of the conditions and outcomes at the micro-level (focus of the initial analysis) with an analysis of the interactions across the various levels (follow-up analysis).

The presented framework and the proposed research are subject to several limitations. One of these limitations is that the presented framework focuses on learning and therefore neglects other potentially important outcomes such as the reduction of particular vulnerabilities or the robustness of specific solutions. Another limitation is that the distinction between learning about climate change adaptation and other issues may be superficial as climate change adaptation objectives are often realized alongside other development issues (Moser & Ekstrom, 2010; Tompkins et al., 2010). Another limitation is related to our method of data collection, which will focus on participants. As a result, we can only estimate the extent to which knowledge is actually being used by organizations and networks.

6 European cooperation programmes and potential cases

To better understand what and how actors can learn from each other when adapting to climate change, we use European cooperation projects as cases. Chapter 1 already provided a general introduction of these projects and of the programme context in which they are implemented. In the first two sections of this chapter, these European programmes are introduced in more detail. The chapter ends with concluding remarks about generalizability and validity of the case study research. More information about the management, monitoring and evaluation of these programmes can be found in a separate plan for outreach, dissemination and engagement of potential users (deliverable No c of this research project).

6.1 Context of the cases: European programmes

This section introduces the two umbrella programmes from which cases will be selected: the European Territorial Cooperation objective and the research Framework Programme.

Territorial cooperation objective
The territorial cooperation objective stems from Europe's regional policies. Since the establishment of the European Economic Community in 1957, regional policy has been on the agenda with increased cooperation between European countries being an important aspect of that policy. This led to the establishment of a Directorate General for regional policy in 1968. Since 1975, the implementation of regional policy is financed through the European Regional Development Fund (ERDF). This fund basically aims to reduce the development gap between European regions (European Commission, 2014b). However, the current programmes for territorial cooperation were only introduced in 1990.

In 1988 – when Greece, Spain and Portugal were in the process of becoming an EU member – the European Commission introduced an overarching cohesion policy. This policy was meant to allow for the strategic orientation of investments and to actively involve regional and local partners. It had a particular focus on Europe's poorest and most backward regions and was implemented through multi-annual programmes. The policy particularly aimed to improve social and economic cohesion, i.e. reducing disparities between more and less developed European regions. With the introduction of the Lisbon Strategy in 2000, the focus of European policy has shifted. Central in the Lisbon Strategy (2000, re-launch in 2006) for the period 2000-2010 are growth, jobs and innovation. The Lisbon Strategy was followed by the 'Europe 2020' strategy (2010-2020) which focuses on smart, sustainable and inclusive growth. What the Lisbon Strategy and the Europe 2020 Strategy basically added to previous cohesion policy is the dimension of territorial cohesion, which is oriented towards sustainable development and competitiveness. This change is reflected in the budgets that are allocated to different fields of activity. In the last programming period (2007-2013), the total budget for regional and cohesion policy was € 347 billion. From this budget, 25% was allocated to research and innovation and 30% to environment and climate change (compared to only 15% in the preceding programming period) (European Commission, 2014b).

Cohesion policy basically encourages regions and cities from different EU Member States to work together and learn from each other through joint programmes, projects and networks. The policy is financed through the European Regional Development Fund, which intervenes in three objectives of regional policy: (1) convergence; (2) regional competiveness and employment; and (3) European

Territorial Cooperation (ETC). In this research, we particularly focus on programmes and projects that are implemented as part of the ETC objective (formerly known as the INTERREG community initiative). The first INTERREG programmes (31 in total) were launched in 1990 to stimulate cooperation across borders and built on in the next programming periods. Since then, the number of cooperation programmes has doubled and financing has increased more than eight-fold. Through concrete projects, the programmes basically aim to solve problems that cut across territorial boundaries and require a common approach. In the last programming period (2007-2013), the ETC objective is primarily implemented through the following three ERDF-funded programmes (so-called 'strands') that aim to enhance collaboration across European regions[9] (European Commission, 2014a):

1. Cross-border cooperation (INTERREG IVA) consisting of 53 programmes focusing on cooperation along internal EU borders with a total budget of € 5.6 billion.
2. Transnational cooperation (INTERREG IVB) consisting of 13 programmes focusing on cooperation between countries in larger areas, e.g. Northwest Europe, Baltic Sea and Alpine, with a total budget of € 1.8 billion.
3. Interregional cooperation (INTERREG IVC) consisting of an INTERREG programme for cooperation between regional and local bodies across Europe as well as three networking programmes with a total budget of € 445 million.

INTERREG programmes are developed against the background of the EU Cohesion Policy and need to be in line with Regulation No 1080/2006 on the ERDF. Following the Lisbon Strategy and the Horizon 2020 Strategy, cohesion policy for the period 2007-2013 (2006/702/EC) concentrates on promoting sustainable growth, competitiveness and employment. These objectives are translated into the following three priorities (1) improving attractiveness by improving accessibility, ensuring good services and preserving the environment: (2) encouraging research and innovation, entrepreneurship and the growth of the knowledge economy: and (3) creating more and better jobs. The environment and risk prevention are mentioned as important priority for cross-border, transnational as well as interregional cooperation. The ERDF regulation (No. 1080/2006) stipulates very similar priorities for territorial cooperation: (1) innovation (e.g. establishment of networks and promotion of technology transfer); (2) environment (e.g. water management, risk prevention, energy efficiency and environmental protection; (3) accessibility (e.g. transport networks and telecommunication services); and (4) sustainable urban development (e.g. urban networks, urban-rural linkages and cultural heritage). These four priorities are reflected in the priorities that are central in the various INTERREG programmes.

In the ERDF regulation, climate change adaptation is not explicitly mentioned. However, climate adaption is one of the key overarching goals of the EU and of the EU Cohesion Policy. In particular, the Gothenburg Strategy on Sustainable Development (2001, renewed in 2006) emphasizes the environmental dimension, including climate change and natural resources management. The Cohesion Policy is the main financial resource to deliver the Lisbon-Gothenburg Strategies. The actual translation of these priorities in national strategic reference frameworks is done differently by

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[9] Other programmes that are included in the ETC, but beyond the scope of this research, are the Instrument for Pre-accession Assistance (IPA), the European Neighbourhood and Partnership Instrument (ENPI) and the European Grouping of Territorial Cooperation (EGTC).

various countries. As participating countries also determine the priorities of the various INTERREG programmes, these programmes usually have a slightly different scope.

Research Framework Programme
At the European level, research, development and innovation are financed through three programmes: the Research Framework Programme (FP), the Competiveness and Innovation Programme (focus on small and medium enterprises and information technology) and Structural Funds (Cohesion Policy focusing on the regional level). From these programmes, the Research Framework Programme is most relevant to this research.

Research policy first appeared in a European Treaty in 1987. Since then, the programme budget has increased from several hundreds of millions to € 53.2 billion in the last programming period, FP7 (2007-2013). FP7 is the short name for the Seventh Framework Programme for Research and Technological Development. The overriding aim of FP7 is to promote and invest in excellent, world-class scientific research. In addition, the wide transfer, use and dissemination of research results to industry, policy makers and society is an important aspect of the programme (European Parliament and Council, 2006). The FP7 programme is divided into four blocks of activities: Cooperation (collaborative research on ten different themes), Ideas (European Research Council), People (Human potential, Marie Curie Actions) and Capacities (e.g. infrastructure, regions of knowledge). In addition, FP7 co-finances nuclear research and training and Joint Research Centres. The largest part of the budget (€ 32 billion, 60%) was meant for the cooperative programme, which primarily co-finances collaborative research projects that are implemented by a consortium with partners from different European countries (European Communities, 2006).

The cooperation programme basically finances collaborative (integrating or focused) projects, networks of excellence, and coordination and support actions. Between 2007 and 2012, the programme provided co-financing to 5,606 projects (signed grant agreements for concluded calls). These projects had an average number of 11.5 participants and received an average EU contribution of € 3.67 million (European Commission, 2013b). The cooperation programme is divided into ten themes, including an environment theme (the focus of this research). An evaluation report on the environment theme (published in 2011) shows that FP7 Environment financed 277 projects in its first three years (2007-2009)[10]. This included 153 collaborative focused projects (55%), 74 cooperation and support actions (27%), 45 collaborative integrated projects (16%) and only one network of excellence. In addition, there were 4 projects benefiting specific groups (Amanatidou et al., 2011).

Like in the entire FP7 programme, the most dominant participants in FP7 Environment were higher education institutes (mostly universities) and research organizations. The participation of private-for-profit organizations (industry, mostly small and medium enterprises (SMEs)) and public bodies (excluding research and education) is much lower (Amanatidou et al., 2011; European Commission, 2013b). In FP7 Environment most of the project participants represent EU member states (79%). Most of the financial contribution of the European Commission (EC) is received by 'older member' states. In 2007-2009, the top five countries (Germany, United Kingdom, The Netherlands, France and Italy) received about 50% of the EC financial contribution whereas the 12 countries that became a member states in 2004 and 2007 received only 7.2%. Compared to other FP7 themes, FP7

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[10] 418 grant agreements were signed in the cooperation programme for environment by May 15, 2013

Environment attracted most participants from non-EU countries (21%) (Amanatidou et al., 2011). However, collaboration with these countries is beyond the scope of this research.

6.2 Potential cases in various programmes

This section further introduces the programmes from which cases will be selected. First, the INTERREG programmes for cross-border, transnational and inter-regional cooperation are introduced. Next, the collaborative Research Framework programme for Environment is introduced.

Cross-border cooperation (INTERREG IVA)
According to the cohesion policy of the European Council (2006/702/EC), cross-border cooperation aims to integrate areas that are divided by national borders, but face common problems that require common solutions. As these problems vary from region to region, the various cooperation programmes tend to have different priorities. In some regions, actions focus on putting the basic conditions in place for cross-border cooperation, for example, through the establishment of cross-border activities and networks. In regions where these basic conditions are yet in place, the focus is rather on adding value to cross-border activities by increasing competitiveness, improving the joint management of water management and natural risks. The regulation on ERDF funding (No. 1080/2006) adds that ERDF assistance is meant to support the development of cross-border economic, social and environmental activities and may contribute to other cross-border activities such as promoting legal and administrative cooperation, sharing of human resources, integrating labour markets, and so on.

The cross-border programme currently consists of 53 different programmes (see Figure 4). Every programme is managed by a Secretariat and covers part of a border area between European countries. Potential participants generally include regional and local authorities, state authorities, non-governmental organizations and private enterprises who are located in the programme area (usually within ~ 150 km from the border). Depending on the GDP of the member state, co-financing varies between 50 and 85%. Most programmes also allow for the participation of partners outside of the programme area, either on their own costs or with a lower co-financing rate (20%). Projects need to include at least two partners from different countries in the programme area, with one of them acting as lead partner (responsible for project finances, organization and communication with the secretariat) (Eurosite, 2008).

Most of the INTERREG IVA programmes focus on rather small cross-border areas (so-called cross-border regions or Euroregions) and only include two countries. There are a few exceptions to this including the programme for the Adriatic (Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro and Slovenia), Baltic Sea (Estonia, Finland, Åland, Latvia and Sweden), Carpathian (Hungary, Poland, Romania, Slovakia, Ukraine), 2 Seas (France, England, Belgium and The Netherlands), Norg (Sweden, Finland and Norway), OKS (Sweden, Denmark and Norway), South Baltic (Poland, Sweden, Germany, Denmark and Lithuania), Gross-Grande region (Germany, Belgium, France and Luxembourg) and the Euregio Meuse-Rhine (Belgium, the Netherlands and Germany).

To identify potentially relevant projects (i.e. focused on climate adaptation in the water sector), we primarily rely on the KEEP database (see www.territorialcooperation.eu/keep), which includes 84 % of the cross-border projects (5,477 out of 6,538 projects, last update 6 June 2014). A search for completed projects focusing on environment and climate change (period 2007-2013) that include the

word 'climate' in the name, description or results of the project provides a list of 41 projects[11]. Most of the projects focus on climate change mitigation (e.g. energy efficiency). However, there are various projects that address climate adaptation in the water sector.
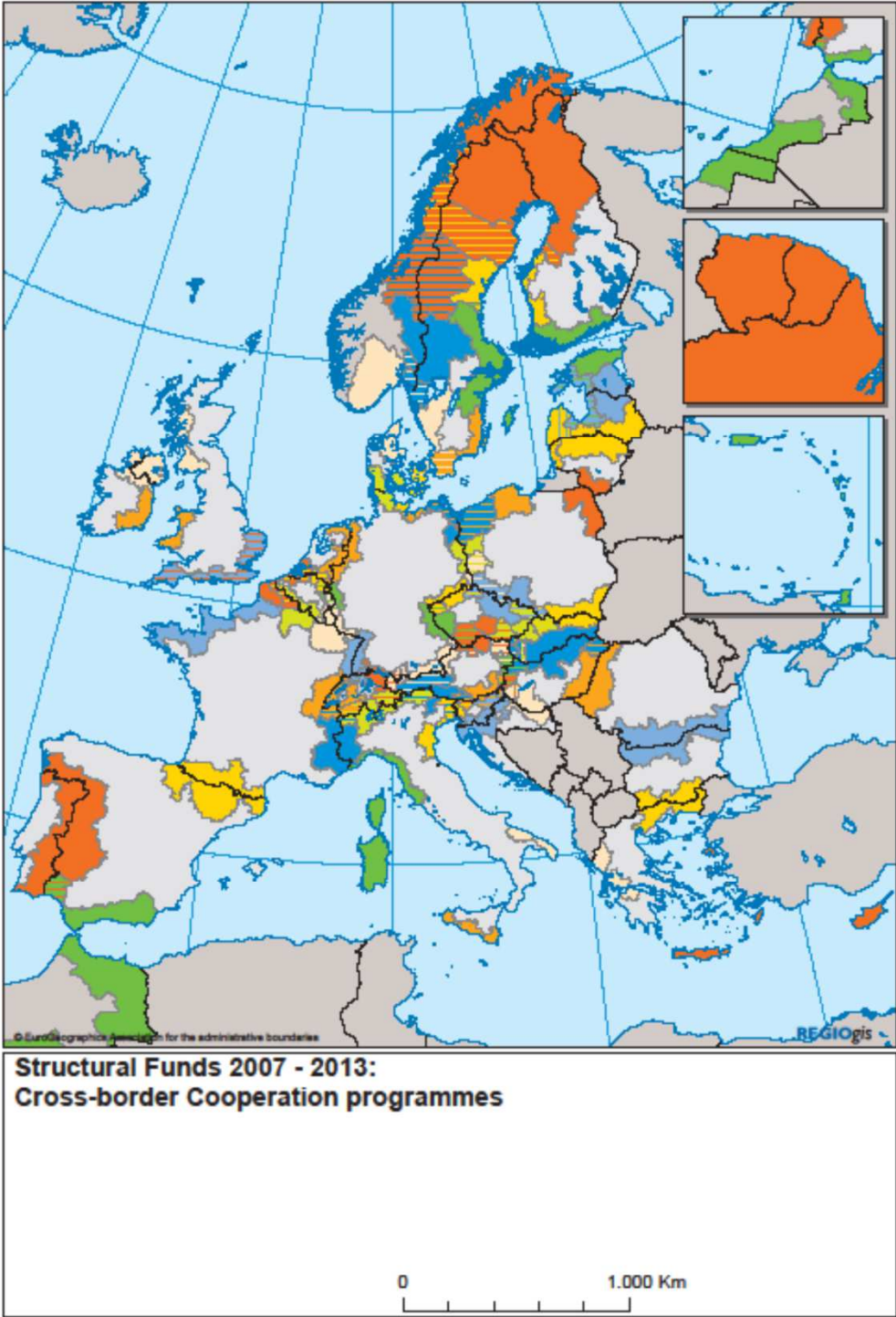

Figure 4 – Overview of cross-border cooperation programmes, period 2007-2013 © Eurographics Asociation for the administrative boundaries

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[11] By looking for the word 'climate', projects for which no information is provided in English are automatically excluded.

Cross-border cooperation programmes are often managed by so-called non-central government bodies who have been established within the context of cross-border cooperation initiatives. The first official region for cross-border cooperation was established in 1958 on the Dutch-German border (Enschede-Gronau). Since then, numerous of these Euroregions were established throughout Europe and their legal basis has improved. For most of the cross-border initiatives, INTERREG is by far the most important funding source (Perkmann, 2003). There are, however, significant differences between cross-border regions. Generally speaking, Euregions differ in terms of their composition and capacity (O'Dowd, 2003). More specifically, the Euregions differ considerably in terms of the autonomy of their cross-border organization (secretariat), the availability and diversification of resources for projects and their relative importance as player in the development of cross-border strategies (Perkmann, 2007). The capacity and functioning of these Euregions is likely to influence the development, implementation and effectiveness of cross-border projects making it more difficult to compare individual projects. To include these projects may be valuable though since cross-border organizations and projects have a flexible structure based on networks of public and private actors from different countries. The discussions among these actors may contribute significantly to building adaptive capacity at the regional scale. As such, cross-border collaborations can be considered particularly capable of mainstreaming climate change adaptation in regional development strategies (Cots et al., 2009).

Transnational cooperation (INTERREG IVB)
The cohesion policy of the European Council (2006/702/EC) reads that transnational programmes should seek to increase cooperation across European regions on matters of strategic importance. Of particular importance are the improvement of physical connections (e.g. transport corridors) as well as intangible connections (e.g. social networks), the prevention of natural risks, cooperation in maritime areas and river basins and the promotion of sustainable urban development, research and development and innovation networks (preamble 2.5 on transnational cooperation).

INTERREG IVB consists of 13 programmes, each with another geographic focus (see Figure 5). From these programmes, three do not provide information in English (Caribbean, Macaronesia and Indian Ocean) and are therefore beyond the scope of this research. The programmes are open to similar organizations. For example, the target group of the Northwest Europe programme consists of public authorities from the national, regional and local levels, private sector firms, universities and research institutes, communities and NGOs. Only the Southeast Europe programme differs notably from the other programmes in the sense that the programme includes a larger number and more diverse countries (16 countries in total). Being located at the border of the European Union, the programme actively seeks the full participation of non-Member States (including accession and potential candidate countries as well as third countries) who benefit from external Pre-Accession Assistance and the European Neighbourhood Policy Funding[12].

The programmes generally have a similar purpose and scope. For the Northwest Europe programme, the programme overview for 2007-2013 reads that transnational cooperation projects "are about experimenting and transferring knowledge through a series of joint actions and investments. They are helping speed up the local implementation of EU Directives by investigating ways to best transpose them" (INTERREG IVB NWE Programme, 2010, p. 4). Most of these projects have a length

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[12] http://www.southeast-europe.net, accessed: 23 June 2014

of ~ 3 years. The start date varies from 2008 up to 2013. Some projects will be completed only by the end of 2014 or even in 2015.
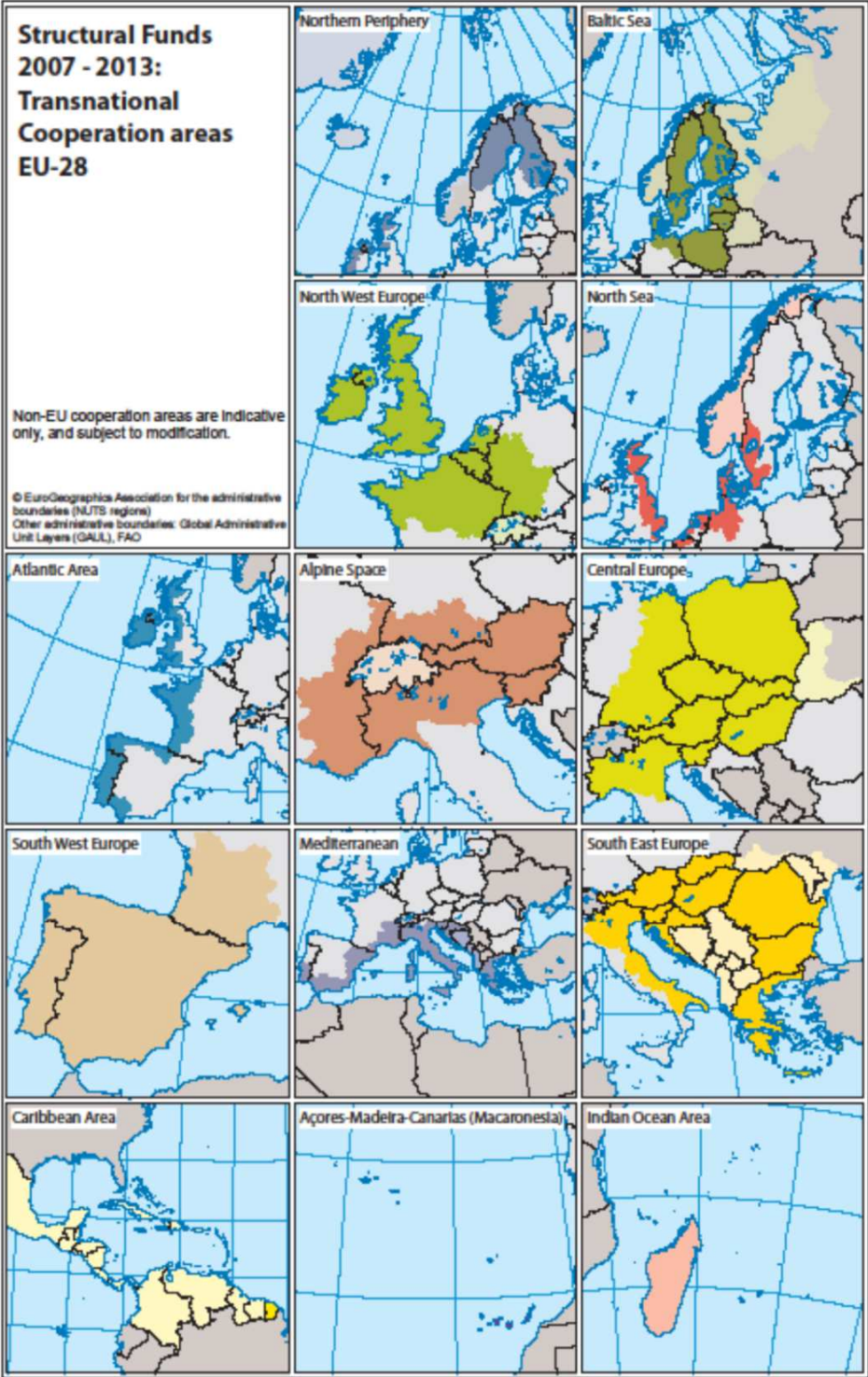

Figure 5 – Overview of transnational cooperation programmes, period 2007-2013 © Eurographics Asociation for the administrative boundaries

A review of the priorities of the various programmes shows that all aim at three or four of the following thematic priorities: (1) innovation; (2) accessibility or connectivity; (3) environment or water (including climate change); and (4) the sustainable growth, competitiveness or attractiveness of the region, communities or urban areas. All of the programmes have one or more projects

focusing on climate change adaption in the water sector. The substantive scope of these projects is generally related to one of the following issues:

- Strategies, solutions and governance of **coastal zones**, given climate change related problems such as coastal erosion, sea-level rise, water quality
- Increase of **floods and droughts** and its impacts on nature, agriculture, drinking water supply and urban areas
- Monitoring, governance and modelling of **lakes**, given climate change related problems of eutrophication.

Interregional cooperation (INTERREG IVC)

The cohesion policy of the European Council (2006/702/EC) reads that interregional cooperation programmes should primarily focus on the renewed Lisbon strategy (i.e. innovation, entrepreneurship and environment). Furthermore, exchange of experiences and best practices regarding urban development, modernization of services in the public sector and the implementation of cooperation programmes are encouraged. The programme has translated this policy into two areas of support: (1) innovation and the knowledge economy; and (2) environment and risk prevention. Support is provided to so-called regional initiative projects and capitalization projects. In regional initiative projects, cooperation can take the form of networking, the development of policy instruments or the establishment of mini-programmes. The focus of capitalization projects is on the transfer of already identified good practices into mainstream European programmes. Unlike the other INTERREG programmes, the interregional cooperation programme is not divided into various programmes. It has one Joint Technical Secretariat for the whole of Europe (based in Lille). Until July 2013, this secretariat was supported by four information points.

The INTERREG IVC programme area covers all 28 member states as well as Norway and Switzerland. Partners from non-EU member states can participate, but they are not eligible for co-financing of costs (partners from Norway and Switzerland can receive co-financing from national funds). For a project to be eligible, the geographical coverage should in principle go much beyond other INTERREG programmes. The last call even prescribed that projects should include partners from all four information point areas as well as partners from one of the recently accessed EU member states (this is subject to change as new countries join). The primary target group of the programme are regional and local public authorities. Other bodies governed by public law can participate as well. Private actors can participate, but at their own costs only. As for the number of partners, the starting point is the more intensive the cooperation, the lower the number of partners should be. The recommended number of partners is 8 to 20 for basic intensity cooperation projects (e.g. networking) and 10 to 15 for medium intensity projects.

In the last programming period, the programme approved 85 projects (42%) focusing on environment and risk prevention. From the regional initiative projects, nine focused on water management and 14 on climate change, including several projects on the interface of natural risks (including climate change and water). While climate change adaptation is central in various projects, only one project (Water Core) specifically focuses on adapting to the potential impacts of climate change in the water sector. The focus of these projects is primarily at the exchange of experience at the policy level. Pilot actions (e.g. the testing of a new approach) are eligible only when they are closely related to the exchange of experience. Activities of pure local character are not supported.

In this programme, climate change was selected as one of the twelve capitalization themes. For each of these themes, a team of (external) experts was asked to analyse, benchmark and capitalize on the knowledge that was generated by projects focusing on similar issues. The results of this capitalization process are laid down in reports and policy papers.

Framework Programme Environment (FP7-ENVIRONMENT)

FP7-Environment deals with challenges associated with the natural and human-induced pressures on natural resources and the environment. The programme aims to increase knowledge about the interactions between social and ecological systems as well as to develop new technologies, tools and services. Specific attention is being given to informing decision-makers, business leaders and ordinary citizens[13].

The programme focuses on four areas: (1) climate change, pollution and risks; (2) sustainable management of natural resources; (3) environmental technologies; and (4) earth observation and assessment tools (European Communities, 2006). These areas are divided into ten research priorities, including one focusing on climate change. Details about FP7 projects are provided on CORDIS[14]. A search and analysis of projects (using keywords such as flood, drought and adaptation) resulted in a list of 6 completed projects that focus on climate adaptation and water (4 other projects are still on-going). The projects either address a specific adaptation theme (e.g. droughts or flash floods) or adaptation issues in a specific context (e.g. freshwater ecosystems, coastal zones or mountain regions). All of them are not just about research but also about the development of concrete policy strategies or responses.

6.3   Concluding remarks

The proposed research will be based on the systemic comparison of an intermediate number of cases. The rationale for doing case study research is to study a small number of cases for the purpose of understanding a larger population of similar cases (Gerring, 2006). The case studies in this research are selected from a rather homogeneous population of cases: projects that were recently completed as part of the European programmes for territorial cooperation (INTERREG IV A, B and C) and for cooperative research (FP7). As European partners face similar conditions, we deliberately choose not to include collaboration with countries outside the European Union (although third countries can be partner in European programmes). Next to this geographic limitation, our case study selection is also limited in substantive terms; we only include climate change adaptation-oriented projects in the water sector.

The population from which we select our cases is a rather homogeneous one. Hence, we are confident that the results apply to other projects from that same population. Furthermore, some of our findings may apply to collaborative projects that have another substantive focus, were implemented in another period of time or another region. Any interferences related to these populations are, however, more speculative unless cases from other regions and thematic areas are included.

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[13] http://ec.europa.eu/research/environment/index_en.cfm?pg=environment, accessed 23 June 2014 (last update: 6 June 2014)
[14] http://cordis.europa.eu/fp7/projects_en.html

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Annex 1 – Case study description template

Introduction

This template is developed to provide a basis for case study descriptions of collaborative European projects that are used as case study in the research project KNOW2ADAPT. In this research, we compare the learning processes and outcomes of completed INTERREG and FP7-ENVIRONMENT projects that focus on climate change adaptation in the water sector. For this, we distinguish between three levels of learning:

1. Project learning (micro level): through their interactions, individual project participants can learn from and with each other. This may lead to new relational and substantive knowledge, insights and skills that are relevant to climate change adaptation.
2. Organizational learning (meso-level): project results can be transferred from the project to the partner organizations (colleagues, team or organization-wide) as well as to other organizations in the project region and beyond. This may eventually lead to changes in the organization culture, policies and practices or the implementation of solutions.
3. Network and societal learning (macro-level): individuals and organizations can transfer lessons learned to other networks and communities, which may eventually lead to more structural changes in water policies or practices.

For each case study project (10 to 15 in total), a description will be prepared (in excel) including the following parts:

- Part A – General information on the project to be prepared on the basis of project documents (e.g. the proposal, website, progress reports). Information will be verified with the project manager or coordinator.
- Part B – Specific information on project conditions that are potentially necessary or sufficient for learning. This part will be prepared on the basis of project documents and an interview with the project manager of coordinator. The information will be verified with other project partners.
- Part C – Participant or organization-specific information on conditions that are potentially necessary or sufficient for learning. For this part and part D, partner-specific information will be collected by means of interviews and questionnaires with persons who have been directly and intensely involved in the project. Ideally, the questions in Part C are answered by at least one respondent for every partner. No partner-specific information will be published, shared with other partners or programme secretariats.
- Part D – Participant and organization-specific information on learning outcomes.

On the basis of the case study descriptions, quantitative scores will be drawn regarding pre-defined indicators of learning. The quantitative scores (value from 0 to 1) of all case studies will be systemically compared with software for Qualitative Comparative Analysis. By systemically comparing conditions and learning outcomes, we hope to develop a better understanding of what combinations of conditions contribute to climate change adaptation-oriented learning.

Part A - General description of the project

Name	*Full name and acronym*
Programme	*INTERREG/FP*
Budget	*In € (overall and EU contribution (in %))*
Duration	*Months (beginning – end)*
Partners	*Number of partners and countries*
Website	*Address*
Theme	*What was the key challenge or issue that was addressed in the project?*
Rationale	*What was the rationale for starting the project (e.g. previous collaboration experience, pressing issue) and for selecting this theme for transnational collaboration (e.g. is the theme a common issue that could only be solved through collaboration or a similar issue that could be solved without transnational cooperation)?*
Objectives	*What did the project intend to be achieved by whom, for whom and how? Where would it be achieved (geographic scope)?*
	To what extent did the project objectives or work packages change over time?
Knowledge transfer actions (project level)	*What kind of interactions were organized in the project for the participants and partner organizations (e.g. partner meetings, workshops)?*
	What kind of opportunities for interaction (e.g. conferences, seminars, workshops) were organized at the project level to engage actors outside the project?
	What written communication means (e.g. websites, magazines, reports) have been developed at the project level to disseminate the project results to actors outside the project?
Partnerschip	*Partner name*
	Type of organization (e.g. local/regional authority, NGO, knowledge institute, university, …)
	Organization size
	Budget share (in %)
Actions and outputs	*What kind of actions were undertaken and what concrete outputs were produced in relation to one of the following aspects of climate change adaptation?* - *Understanding: detecting the problem, collecting information and (re)defining problem* - *Planning: developing, assessing and selecting options* - *Implementation: implementing options, monitoring and evaluation* - *Public awareness and participation: providing information, raising awareness and consultation of stakeholders*

Part B – Specific information on project conditions

Consortium (condition for project learning)

Balanced diversity	*To what extent were partner organizations representing diverse roles and functions (e.g. research organizations, authorities, interest groups)? Are there striking similarities or differences between partners in terms of region-specific development contexts or prior knowledge and experience related to the project theme? Did partners work on similar or common problems? Was the theme being addressed as relevant in the various partner regions?*
Complementary knowledge	*What kind of roles and functions did directly and intensely involved participants fulfil inside the project and in their organization? Was there a balanced involvement of persons with substantive, procedural and political knowledge (e.g. experts, policy advisors, decision-makers)?*
Previous collaboration	*To what extent were partners acquainted with each other? Did (some of the) partners cooperate with each other before? If yes, how did these previous experiences influence the collaboration? – think about social relations, trust, and cognitive blockage.*

Interaction process (condition for project learning)

Interactions	To what extent did all participants have equal opportunities to engage in the project activities? Did you experience that people were withholding information? Was all project information accessible to everyone? To what extent were networking activities long enough and allowing for informal contact so that actors could develop relations, a common language and trust?
Activities	To what extent was the project designed to really collaborate and work together? To what extent were project activities innovative and challenging the status quo? To what extent were networking activities organized around specific themes, goal-oriented and logically connected? What was the quality of the interactions and discussions, e.g. were policy or (other) external experts involved to allow for high-quality interactions?
Facilitation	To what extent were activities facilitated by professional facilitators? Was there explicit for evaluation, reflection and learning? Were any specific methods used to stimulate knowledge exchange and learning? In case of considerable knowledge boundaries (i.e. country, sector, discipline, organization) and related barriers, has enough been done to overcome these boundaries (e.g. translation, visualization techniques, site visits)?

Theme (condition for organizational learning)

Proven	To what extent has the project produced concrete evidence that the project results are useful?
Understandable	To what extent were the project results communicated in an understandable manner and therefore easily to be interpreted and absorbed by others?
Relevant	To what extent were the project results (still) relevant by the end of the project? To what extent were regional project results representative enough to be relevant to other regions? To what extent did project partners extract more generalizable results that are potentially relevant to other organizations?

Strategy (condition for organizational learning)

Proactive	To what extent has a communication and dissemination strategy been developed and implemented at an early stage of the project? To what extent have dissemination activities between pursued throughout the entire project?
Specific	To what extent was clear who could be the potential users of the project results? Did the project have a concrete strategy and action plan on how to transfer knowledge to these users or how to obtain their commitment?
Engaging	To what extent were all project partners given a role in disseminating the project results? To what extent did you yourself actively engage colleagues or people from other organizations in the project or your regional pilot?

Part C – Partner-specific information on conditions

Participants (condition for project learning)

Motivation	Did you have the feeling that you had knowledge and experience that was relevant to the project? Could you learn a lot from the project? Were you looking forward to participate in the project? Did you expect to learn from the project? Are you generally open to acquire new knowledge and ideas? Did you experience sufficient support and resources from your organization?
Opportunity	Did you have the opportunity to stay involved in the project over a longer period of time? Did you have sufficient opportunity to interact with others in the project? How many networking activities did you attend?
Ability	Did you participate in an international project before? Did you feel comfortable communicating in the project language? Did your language skills at any point cause that you withheld from interactions?

Partners/participants (condition for organizational learning)

Linkages	How often do you have person-to-person contact with people who can actually adopt or implement the project results inside your own organization? How long have you been working with these people? What routines of structures have been put in place in your organization to stimulate knowledge transfer? And for the transfer of knowledge to people in other organizations in your project region and beyond: what social relations do you have, since when and what routines or structures for knowledge sharing are in place?
Partner-specific factors	To what extent were you willing to invest time and resources in transferring the project results to others? To what extent did you know to whom best to transfer the project results? To what extent are you in the position to influence decisions or to change routines inside your organization? And to what extent are you or your organization in a position to influence other organizations in the project region and beyond e.g. does your organization have an influence on regional or national policies?

Partners (condition for network/societal learning)

Linkages	To what extent does your organization collaborate with other organizations in governance networks? Are there any concrete routines or structures in place within these networks to transfer knowledge? Is there any How intensive are the contacts between your organization and the networks or communities in the project region who can use the project results to make changes to the structural context? And with networks and communities at higher levels (national or European) or in other regions and countries? How strong are your relations with these networks or communities?
Partner-specific factors	To what extent do you know and understand the structural context for water management and climate change? To what extent were you– in collaboration with others – willing to invest time and resources transferring project results or influencing networks and communities? To what extent does your organization have the legitimacy, strength, resources and capacity to influence networks and communities – both horizontal and vertical – and thereby changing the structural context?

Scope (condition for network/societal learning)

Activities	To what extent did you or your organization strategically include the testing, development or demonstration of certain policies or responses with an eye on having them implemented at a larger scale?
Framing	To what extent did you or your organization frame the project theme in a specific way to match the institutional and social context for water management and climate change adaptation? In case of relevant external developments (e.g. disaster or crisis), did you or your organization frame the event in such a way that the project theme became more relevant?
Actors	To what extent did you or your organization strategically involve other organizations to create new networks or fora? To what extent did you or your organization strategically involve actors at policy making or decision making positions or informal networks?
Long-term perspective	To what extent did you or your organization approach this project as a step in a larger change process? Did the project build upon the outcomes of previous projects or result in follow-up actions?

Users (condition for organizational learning)

Prior related knowledge	To what extent did your organization have relevant prior knowledge and experience (e.g. participate in a similar project)? To what extent did you experience that the project results correspond with knowledge and experience in other organizations?
Other structural factors	To what extent is your organization open to evaluation, learning and change? Did you experience any specific barriers to the transfer of knowledge at the side of potential users?

Context (condition for network/societal learning)

Network	To what extent do relevant networks or communities have one influential or powerful actor who can support the transfer of knowledge?
Structural context	To what extent is the relevant structural context characterized by integrated cooperation structures and advanced information management?

Part D – Partner-specific information on outcomes

Substantive learning (outcome of project learning)

Understand	To what extent did you become more aware of, better understand, acquire new knowledge or better able to understand CCA: detecting and framing (information about) problems and potential responses (e.g. better overview of the system)? To what extent does this new knowledge/skills really challenge or change your values and assumptions?
Plan	To what extent did you become more aware of, better understand, acquire new knowledge or better able to plan for CCA: developing, assessing and selection options? To what extent does this new knowledge/skills really challenge or change your values and assumptions?
Implement	To what extent did you become more aware of, better understand, acquire new knowledge or better able to implement, monitor and evaluate CCA strategies and actions? To what extent is this ability really different from what you used to be able to?

Relational learning (outcome of project learning)

Understand	To what extent did you experience an increase of awareness, understanding or knowledge about: actors and networks in CCA (who they are, their interests and resources) and mutual dependency relations? To what extent did these new insights and knowledge challenge or change your values and assumptions?
Plan & implement	To what extant did you acquire concrete experience and are you therefore better able to communicate and interact with relevant actors and networks (including the building of relations and the increase of trust)? To what extent is this ability really different from what you used to be able to?

Organizational learning outcomes

Transmission	To what extent did you share the project results inside your own organization, e.g. did you publish them on an internal website or send reports to colleagues? And to other organizations in the project region and beyond?
Presentation	To what extent did you provide a tailor-made presentation of the project results inside your own organization, e.g. did you present them to a group of colleagues or to the management board? And to other organizations in the project region and beyond?
Interaction	To what extent did you discuss the project results (and how they can be used) with people inside your own organization? And with other organizations in the project region and beyond?
Adoption	To what extent do people inside your own organization support the adoption of some of the project results? Have you been asked for advice? And in other organizations in the project region and beyond?
Influence	To what extent are the project results inside your own organization used to improve existing routines, policies, products or services? And in other organizations in the project region and beyond?
Implementation	To what extent are the project results actually implemented by your own organization? E.g. has there been changes to the organization culture, routines or policies? And by other organizations in the project region and beyond?

Network and societal learning outcomes

Transmission	To what extent did you share the project results with networks or communities that were not directly involved in the project? To what extent was the project successful in generating a broader awareness of the project theme?
Presentation	To what extent did you provide a tailor-made presentation of the project results to networks or communities who can potentially use them?
Interaction	To what extent did you discuss the project results (and how they can be used) in relevant networks or communities?
Adoption	To what extent did networks or communities make an effort to translate some of the project results into policy change or make an effort to adopt the results? Have you been asked for advice?
Influence	To what extent did the project results contribute to the development of new or improved policies, products or services in networks or communities?
Implementation	To what extent are the project results actually implemented by relevant networks or communities, thereby changing the structural context?