UNIVERSIDADE DE LISBOA

INSTITUTO DE CIÊNCIAS SOCIAIS

Societal Transformation and Climate Change Adaptation: PAR experiences in Portugal

Inês Almeida Dias Sobral de Campos

Orientadores: Professora Doutora Mónica Truninger de Albuquerque de Medeiros Sousa

Professor Doutor Gil Pessanha Penha-Lopes

Tese especialmente elaborada para obtenção do grau de Doutor em Alterações Climáticas e Políticas de Desenvolvimento Sustentável, especialidade Sociologia

2016

UNIVERSIDADE DE LISBOA

INSTITUTO DE CIÊNCIAS SOCIAIS

Societal Transformation and Climate Change Adaptation: PAR experiences in Portugal

Inês Almeida Dias Sobral de Campos

Orientadores: Doutora Mónica Truninger de Albuquerque de Medeiros Sousa

Doutor Gil Pessanha Penha Lopes

Tese especialmente elaborada para obtenção do grau de Doutor em Alterações Climáticas e Políticas de Desenvolvimento Sustentável, especialidade Sociologia

Júri:

Presidente: Professora Doutora Karin Elisabeth Wall Gago

Vogais:

- Karen O'Brien, Professor Faculty of Social Sciences of the University of Oslo, Noruega;

- Doutor João Manuel Alveirinho Dias, Professor Associado Aposentado Faculdade de Ciências e Tecnologia da Universidade do Algarve;

- Doutora Maria Paula Baptista da Costa Antunes, Professora Catedrática Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa;

- Doutor Gil Pessanha Penha-Lopes, Professor Auxiliar Convidado Faculdade de Ciências da Universidade de Lisboa, orientador;

- Doutor João Manuel Machado Ferrão, Investigador Coordenador Instituto de Ciências Sociais da Universidade de Lisboa;

- Doutora Mónica Truninger de Albuquerque de Medeiros Sousa, Investigadora Principal Instituto de Ciências Sociais da Universidade de Lisboa, orientadora

2016

RESUMO

A tese desenvolve-se através de quatro estudos de caso de adaptação às alterações climáticas e de transição das sociedades contemporâneas para percursos de desenvolvimento mais sustentáveis. A pesquisa assenta no princípio de que a adaptação das sociedades aos impactos das alterações climáticas deve contemplar tanto as gerações de hoje como as gerações futuras. É uma tese guiada por um conceito de adaptação às alterações climáticas que considera a possibilidade de uma transição sustentável para sistemas sociotécnicos e ecológicos transformados. É igualmente uma investigação assente em experiências transdisciplinares, isto é, envolvendo diversos sistemas de conhecimento, incluindo os contributos de comunidades locais e grupos de interesse. Por fim, a investigação foi desenvolvida no contexto de uma abordagem de investigação-ação participativa. Consequentemente, todo o trabalho desenvolvido no âmbito desta tese está assente em dois pilares: um pensamento sobre transições sistémicas para a sustentabilidade, ancorado numa visão complexa e não-linear da coevolução dos sistemas sociais, técnicos e ecológicos; e um pensamento ancorado na investigação-ação participativa (Participatory Action-Research – PAR).

A tese considera que as abordagens participativas podem ser instrumentais para apoiar a ação coletiva, simplificando processos complexos de tomada de decisão, promovendo a implementação de medidas de adaptação, e facilitando visões comuns para caminhos de desenvolvimento mais sustentáveis. É entendido também que, ao envolver um número alargado de investigadores de diversas disciplinas científicas, a investigação-ação é mais suscetível de integrar sistemas de conhecimento e informação produzidos no âmbito de diferentes campos de investigação e disciplinas científicas, conferindo, deste modo, a possibilidade de experimentar e testar diversas abordagens no estudo de transições e transformações. Estas considerações levaram a colocar cinco perguntas de investigação que convergem em uma hipótese principal.

A hipótese foi desenhada com base em três aspetos importantes que acompanharam o percurso de investigação. Primeiro, a hipótese considera a possibilidade de um processo de adaptação (às alterações climáticas) de carácter transformador. Segundo, resulta da investigação colaborativa desenvolvida no contexto de um grupo multidisciplinar, com o qual tenho trabalhado no âmbito do projeto Europeu «Bottom-up

Climate Adaptation Strategies towards a Sustainable Europe» [BASE]. Por fim, a investigação foi informada por diferentes interpretações e abordagens ao estudo das transições e da transformação social.

A tese está estruturada em seis capítulos e as suas discussões e conclusões centram-se em quarto artigos de investigação, dois dos quais publicados e outros dois submetidos a publicações internacionais *de arbitragem científica*. O Capítulo I oferece uma introdução geral, bem como uma descrição do meu percurso de transição pessoal, uma síntese do contexto científico da investigação desenvolvida e uma súmula dos objetivos deste estudo.

O Capítulo II apresenta os resultados de uma revisão de literatura sobre transições sustentáveis e transformação social. A literatura revista salientou diferentes perspetivas sistémicas, desenvolvidas ao longo das duas últimas décadas, incluindo: o estudo de Transições Sustentáveis, a abordagem da Resiliência de Sistemas Sociais-Ecológicos, e a Teoria das Práticas Sociais. Os três corpos teóricos oferecem o enquadramento analítico para os quatro artigos. No entanto, a função desta viagem teórica prende-se igualmente com as perguntas de investigação da tese.

O Capítulo III descreve a trajetória metodológica e o quadro analítico, que integra as diferentes componentes da investigação desenvolvida. As questões de investigação são expostas neste capítulo. A primeira pergunta (pergunta A) é de carácter teórico e consiste em perceber se os três campos de investigação podem ser complementares e conferir abordagens metodológicas integradas, úteis no contexto da governança de processos de adaptação às alterações climáticas. As duas seguintes questões (B-C) pretendem perceber como as ideias de transição e transformação no contexto das alterações climáticas se traduzem numa ação coletiva. Por fim, as duas perguntas finais (D-E) visam compreender como é possível influenciar uma ação coletiva para a adaptação às alterações climáticas que integre caminhos de desenvolvimento mais sustentáveis. Estas questões levam a identificar três objetivos de investigação e conduzem a uma hipótese principal: através do envolvimento reflexivo de diversos atores sociais, a vários níveis e escalas de governança, a investigação-ação participativa, no contexto da adaptação às alterações climáticas, promove resultados que podem influenciar caminhos de desenvolvimento mais sustentáveis. O capítulo metodológico explica igualmente o contexto do trabalho colaborativo e multidisciplinar que caracterizou a investigação-ação desenvolvida.

Os resultados da investigação dos casos de estudo são descritos e discutidos criticamente nos quatro artigos que compõem o Capítulo IV. A tese resulta de

experiências empíricas distintas, mas também do processo que acompanhou o desenvolvimento da investigação-ação participativa multidisciplinar. Este processo reflexivo está integrado no percurso metodológico. Tendo em consideração os distintos estudos de caso, os resultados são tanto a soma total dos resultados específicos de cada estudo, como também das interpretações e análises desenvolvidas nos artigos. Deste modo, os contextos científicos, as abordagens metodológicas e os resultados de cada estudo são apresentados sob a forma de artigos de investigação, que constituem, no seu conjunto, o âmago desta tese (Capítulo IV). Contudo, a análise integrada dos quatro artigos resulta igualmente nas respostas às cinco perguntas de investigação e à hipótese principal da tese.

Todos os artigos foram submetidos a publicações de arbitragem científica. Os artigos 1 e 3 foram publicados em Dezembro de 2015 e Janeiro de 2016, respetivamente. Os artigos 2 e 4 encontram-se ainda no processo de revisão.

O Artigo 1 foca a investigação-ação caracterizando esta abordagem e as suas aplicações no estudo e acompanhamento de processos de adaptação às alterações climáticas, bem como as ligações existentes - e por desenvolver -, com o estudo de transições sustentáveis. O Artigo 2 pretende perceber como o conceito de adaptação transformadora se traduz nas políticas e processos de adaptação às alterações climáticas em Portugal, investigando o papel da participação em processos de desenho de políticas, com base em entrevistas realizadas a atores políticos, técnicos de planeamento e ordenamento do território, bem como a técnicos e especialistas envolvidos no desenho de estratégias e planos de adaptação. Os artigos 3 e 4 relatam dois estudos de caso, desenvolvidos num contexto de investigação-ação participativa, em níveis e escalas distintas de governança. O Artigo 3 relata a análise retrospetiva de um estudo de caso no Alentejo. O projeto de investigação-ação foi implementado em conjunto com parceiros locais. O objetivo do estudo foi compreender o impacto de um projeto pioneiro numa aldeia, no conselho de Odemira, e a sua capacidade para promover um sistema social e ecológico mais adaptado e resiliente aos impactos das alterações climáticas. Por fim, o Artigo 4 centra-se nos municípios de Ílhavo e Vagos, na costa Atlântica, a Sul de Aveiro. O artigo descreve uma abordagem metodológica criada pelos investigadores e os participantes (i.e. representantes de diversos grupos de interesse), designada de *SWAP* [Scenario Workshop and Adaptation Pathways]. O artigo analisa como o processo participativo e a implementação da metodologia facilitou o desenho de um plano de ação

para a adaptação às alterações climáticas numa zona costeira, tendo em vista o médio e longo prazo.

O Capítulo V apresenta, de seguida, uma meta-discussão dos artigos, evidenciando o modo como a investigação foi capaz de responder às interrogações da tese e hipótese principal. Esta discussão refere ainda a importância de uma investigação científica e agendas políticas motivadas por um princípio de governança para a transformação. Por fim, o Capítulo VI é uma síntese dos principais resultados deste estudo e sugere novos tópicos e questões relevantes para a investigação na área da adaptação às alterações climáticas e desenvolvimento sustentável.

Os estudos empíricos ilustram como a investigação-ação participativa, implementada em conjunto com outros cientistas e atores sociais, pode ter um papel relevante em estimular processos de adaptação às alterações climáticas em Portugal. É considerado que a investigação-ação serve o propósito de criar resultados concretos, tais como estratégias, planos, visões coletivas para o longo prazo, e/ou a implementação de medidas de adaptação. Os estudos indicam ainda que, no contexto de processos de adaptação às alterações climáticas, a investigação-ação participativa mostra-se capaz de articular novos modos de governança, bem como abordagens multidisciplinares, no estudo de transições sustentáveis.

No entanto, os estudos de caso não proporcionam nenhuma certeza relativa ao futuro dos processos de adaptação, no médio ou longo prazo. É, contudo, entendido que o trabalho de investigação colaborativo, o diálogo, a participação e a reflexividade parecem ser características-chave para uma agenda científica centrada no desenvolvimento sustentável de uma sociedade em transformação. Em última análise, a tese é um argumento pela complementaridade, a colaboração e a ultrapassagem de fronteiras conceptuais e disciplinares.

Palavras-chave: Sustentabilidade, Transições, Adaptação, Transformação, Resiliência, Investigação-Ação Participativa, Estudos De Caso, Governança

ABSTRACT

The rationale for this thesis is based on the principle that the adaptability and resilience of societies to climate change impacts should be contemplated for those living today, as well as for future generations. This study is guided by a concept of climate change adaptation that accounts for the possibility of a sustainable transition to transformed socio-technical and social-ecological systems. It is also informed by multidisciplinary and transdisciplinary participatory action-research (PAR) experiences.

PAR approaches can be instrumental for supporting collective action, simplifying complex decision-making processes; and facilitating shared common visions towards more sustainable development pathways. PAR is more likely to integrate insights from different knowledge systems, by engaging a number of researchers from diverse scientific disciplines, while attempting to respond to local needs and empirical questions. PAR may thus offer a ground for experimenting with disparate approaches to the study of transitions and transformation.

The hypothesis that underlies this study suggests that, in climate change adaptation research, PAR promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance. The hypothesis was depicted on the basis of three important aspects that co-evolved with the development of this thesis. First, it acknowledges the possibility for transformational adaptation. Second, its definition resulted from my experiences in conducting collaborative research within a multidisciplinary group, in the context of an EU funded research project. Third, it is also based on my own conceptual journey into different interpretations and approaches to the study of transitions and societal transformation.

The thesis is structured in six chapters, and centred in four research articles. Chapter I provides a general introduction that starts with describing my personal transition, followed by the scientific context for the research developed; and ending with a description of the aims of the study and an outline of the following five chapters. Chapter II presents the results of a literature review on long-term sustainable transitions and societal transformation. The reviewed literature focused on different perspectives that have been developed over the previous decades, including the Sustainable Transitions Research Field; the Social-Ecological Systems Resilience Framework; and Social Practice Theory. Chapter III describes the methodological trajectory and presents an

analytical framework that integrates the different components of the research developed. These methodological components include five research questions and three research objectives, leading up to the main hypothesis. The chapter also explains the collaborative framework under which multidisciplinary action-research case studies were implemented. Findings from the case study research experiences are described and critically discussed throughout the four papers encompassed by Chapter IV. The succeeding Chapter V presents a meta-discussion of the papers that address the thesis' guiding questions and main hypothesis. In Chapter V, the key findings of the study are abridged.

The empirical studies illustrate that PAR, co-implemented by scientists and other social actors, is playing a role in igniting adaptation processes in Portugal. PAR does serve the purpose of creating adaptation outputs, such as strategies, plans, or long-term visions for more adapted, resilient and sustainable societies. Nevertheless, the case studies do not provide any certainties of whether the momentum for adaptation will be sustained over the medium or long term. Yet, collaborations, dialogue, participation and a continuous reflexivity on how future directions are paved seem to be key features for moving forward in a new sustainability agenda that integrates and transforms the negative effects of climate change. Thus, this thesis advocates for complementarity, collaboration and the overcoming of conceptual and disciplinary frontiers in climate change adaptation research, towards a governance for transformation.

Key-words: Sustainability; Transitions; Transformational Adaptation; Resilience; Participatory Action-Research; Case Studies; Governance

CONTENTS

ACKNOWLEDGMENTS

Gil Penha-Lopes, aside for his fantastic dynamism and his absolute support as co-supervisor of this thesis, is also the BASE coordinator. Not a word would have been written here, if it weren't for the self-confidence Gil has given me, by opening up immense opportunities to learn and grow both as a researcher and as a person. His trust for my work and continuous encouragement, belief and support are sincerely and deeply appreciated. As the coordinator of BASE, Gil has been both demanding and extremely supportive, and our friendship-based working dynamics has been a rewarding experience.

Thank you also Ângela Antunes for all the patience, logistic support and friendly smiles, throughout the field work developed in BASE, and to the CCIAM group at FFCUL. And thank you Raquel Brito for clarifying the many administrative doubts throughout the PhD course.

To all those who participated in the Amoreiras Village Convergence Centre, and in the Ílhavo and Vagos case studies, I am deeply thankful. I thank all those we were interviewed for granting their time to this project and making it much richer with their contributions. I thank equally the support provided by João Dinis from the Cascais municipality, who has been an unswerving and keen BASE collaborator.

Thank you my dear sister Isabel, an amazing writer, who patiently revised the English of all my papers. To my parents and dear sister Rita for their love and patience. To my dear friends for believing in me.

Finally, but not least, I am grateful for my two giant loves, Lara and Paulo, my life is blessed by them every single day.

LIST OF PAPERS

Paper 1. Campos, I., F. M. Alves, J. Dinis, M. Truninger, A. Vizinho and G. Penha-Lopes (2016) Climate adaptation, transitions, and socially innovative action-research approaches. *Ecology and Society* 21 (1):13. [online] URL: http://www.ecologyandsociety.org/vol21/iss1/art13/

Paper 2. Campos, I; Moreira Alves, F., Truninger, M.; Penha-Lopes, G. "Climate change adaptation strategies in Portugal. Participation and sustainable transitions" Submitted to *Journal of Public Deliberation*

Paper 3. Campos, I; Vizinho, A. Truninger, M; Penha-Lopes, G. (*2015) Converging for deterring land abandonment: a systematization of experiences of a rural grassroots innovation. Community Development Journal*, doi: 10.1093/cdj/bsv05

Paper 4. Campos I., Vizinho A., Coelho C., Pereira C., Alves F., Fonseca, A.L., Santos F. D., Costa H., Schmidt L., Penha-Lopes G., Scenarios and pathways - a long-term planning experiment for climate change coastal adaptation, *Planning Theory and Practice.*

TABLES

FIGURES

Chapter I
Introduction

Research in transition – a personal account

The motivation for joining the interdisciplinary PhD program Climate Change and Sustainable Development Policies[1], resided in a growing interest on the issue of Climate Change and Sustainability Research. My academic background is Social Sciences, namely Communication Studies, International Relations and Political Science. The interest on Climate Change and Sustainability resulted from a previous professional experience working with environmental NGOs. At the time of enrolment in the PhD course, I was coordinating, as a communication expert, the UN Millennium Development Goals Campaign in Portugal, and became increasingly interested in understanding how the world could deal with the repercussions of climate change in global development pathways.

The commitment to developing a PhD research has arisen from a specific methodological experience, known as Participatory Action-Research (PAR). The encounter with PAR ensued from the context of joining a multidisciplinary research group at Lisbon University – Climate Change Impacts, Adaptation and Modelling (CCIAM), which has been since 2014 integrated in the Centre for Ecology, Evolution and Environmental Change (cE3c) group[2]. Over the past three years, I have worked in a climate change adaptation research project with the CCIAM group. CCIAM's research approach is framed by the principle of linking science to practice and, whenever possible, proactively addressing societal challenges through promoting deliberative science-practice-policy interfaces and active collaborations. PAR has framed the empirical research developed throughout the past three years for this dissertation. By having the opportunity of being part of this group, I have *learned by doing* with CCIAM's working methods. Thus, more than an approach to scientific research, PAR has been a way of working and thinking in collaboration with a team of scholars from various disciplines

---

[1] The PhD program is described here: http://alteracoesclimaticas.ics.ulisboa.pt/en/ (last accessed 8th September, 2015)

[2] cE3c website: http://ce3c.ciencias.ulisboa.pt/ZZindex.php

and research backgrounds. Accordingly, the aim of the dissertation and the topics explored in the papers have been informed by this way of working and thinking. The collaborative and action learning principles of PAR enclose the writing of the four scientific papers that make up the body of the dissertation. Ultimately, the dissertation itself – from the initial explorations, to the case studies and final writing - describes my own PAR experience.

In the context of a transdisciplinary and multidisciplinary collaborative framework, the two main action-research case studies of this thesis (i.e. Amoreiras Village Convergence Centre and the Coast of Ílhavo and Vagos) have been coordinated by me within the scope of project BASE (described in the following subsection). All case studies involved contributions from other researchers, from various disciplines, scientific areas, in addition to the participation of local communities and stakeholders. The theoretical contributions, ideas and writing of the papers have been developed by me, hence I am always the first author in all papers that make up the results chapter of this thesis (Chapter IV). Nevertheless, while the four papers were guided by the objectives of this dissertation, they have been produced in the context of the action-research collaborative framework that steered the studies, from the initial questions to the final writing. Thus, the papers have a set of co-authors, and it is important to clarify the basis for establishing such co-authorship.

Two types of collaborations framed the co-authorships: internal and external collaborations. Internal collaborations were established from the beginning with every scholar and stakeholder who has been co-responsible for developing the case study research and/or participated at some stage in the empirical work (e.g. facilitating workshops; co-design methodologies). These collaborations refer to all those who were included as co-authors of the papers and who provided suggestions, feedback, and organized ideas and the sequence of arguments better. These suggestions were provided in the form of comments and, when appropriate, were integrated as text additions re-written by myself.

External collaborations refer to all those who offered key data for the participatory methodologies used, or whose research has been a point of departure for the case study. The best example is the Ílhavo and Vagos case study, which continued the research

initiated and developed by projects CHANGE[3] (Lisbon University) and AdaptaRIA[4] (Aveiro University). The scholars involved in these projects collaborated by providing essential data and information (e.g. maps, climate scenarios; stakeholder information). Therefore, these scholars have been included as co-authors in the papers, even if their contributions have been limited to the supply of specialized knowledge (e.g. vulnerability maps adapted and used in the participatory workshop), and key participations in the empirical work described in the articles. Such procedures of co-authorship, organization, and decision-making are more clearly depicted from the model of natural and life sciences. Given this is a dissertation framed under an interdisciplinary PhD programme, some procedures regarding co-authorship were adopted from that model. However, collaborations were from the beginning based on an open and transparent relationship between me and the co-authors, where ethical principles based on collaboration, collegiality and support were paramount. In fact, co-authorships are an outcome and a component of the PAR approach, since co-authorships establish strong ties among the researchers involved, who learn from each other and share their knowledge. However, this is not to say that reflexive thinking and a critical eye to the ethical consequences of such collaborations and co-authorships were not present in my mind throughout the whole research process. Research has always ethical consequences and these deserve the careful and thoughtful crafting of tools and instruments for co-production.

The collaborative framework has been undoubtedly a learning experience that changed my understanding of the role of the environmental science researcher. The point of departure has been a perspective on the incremental benefits that researchers could bring to society by producing relevant knowledge that addresses specific needs. However, while engaging directly with society through action-involvement and collaborative approaches, scholars can be proactive partners in promoting changes and contributing to resolving persistent sustainability problems. For instance, research may focus on a sustainability problem such as climate change by providing needed knowledge on future climate change scenarios based on different levels of greenhouse gas emissions, and as well by suggesting potential adaptations. Nevertheless, while directly collaborating with local communities, regions or countries, researchers may play a more proactive role,

---

[3] Link to the Portuguese project can be found here: http://www.changeproject.ics.ul.pt/ (last accessed, September, 2015)

[4] Link to the Portuguese project can be found here: http://climetua.fis.ua.pt/legacy/adaptaria/ (last accessed, September, 2015)

working towards changing current development pathways. Thus, science becomes incrementally transformed, as scholars themselves assume the role of stakeholders involved at the centre of societal action. Concurrently, PAR has characterized my personal transition, from a more detached attitude to a more proactive researcher, seeking to continuously learn from collaborations that are transformed and progress through knowledge, as well as from knowledge that is equally transformed through such collaborations. This personal transition has been similarly reflected on a conceptual-theoretical pathway.

Throughout the first year of my PhD research, the focus was on Sustainable Transitions. An extensive reading list was complemented by a course at Aalborg University (Copenhagen Campus, Denmark) on Sustainable Transitions, with lecturers such as Adrian Smith and Ulrik Jørgensen (May, 2013). At the time this course was taken, the same university was offering a course on Social Practice Theory, coordinated by Inge Røpke and Toke Haunstrup Christensen, which I attended and completed. These courses were opportunities provided and funded by project BASE. Both courses allowed a deeper insight into Sustainable Transitions and Social Practice Theory, highlighting their differences and potential complementarities, which, I argue, still remain largely underexplored in sustainability science. Throughout the following years these two bodies of literature offered guidance for designing the empirical research and developing analytical frameworks which have been, in large part, transposed to the written articles. Although Social Practice Theory ended up not being much used in the articles (other theoretical frameworks were chosen given their heuristic capacities in the analysis of the data collected), the concept of practice has been particularly relevant in guiding the empirical experience of conducting qualitative interviews in the Amoreiras Village Case Study. Moreover, Social Practice Theory has been central for this thesis' research questions (explained in Chapter III) and general discussion (Chapter IV).

Transition Research however has been the most prominent analytical influence for this PhD research. The Aalborg University course provided an in-depth overview of transition studies, and its main frameworks, concepts and applications, but has given equally a first-hand account by Ulrik Jørgensen of his proposal for an Arenas of Development (AoD) (Jørgensen, 2012) approach, as an alternative to the Multi-level Perspective developed by Frank Geels (Geels, 2010).

In 2014, I travelled to Rotterdam to participate in a workshop organized by DRIFT [Dutch Research Institute for Transitions] at Erasmus Rotterdam University, in the

context of Social Innovation. This provided the opportunity to listen and participate in discussions held by scholars who are pioneers in the development of the transition research field, including Transition Management. Throughout 2014 and 2015, I explored in greater depth the Social-Ecological Systems Resilience Framework (Folke *et al*., 2005), with a particular focus on analysing links, complementarities and differences between Sustainable Transitions and the Resilience Framework (Park *et al*., 2012). Thus, these two bodies of literature offered appropriate analytical frameworks for the empirical research developed, and were used in the four articles as the main conceptual underpinnings to understand and interpret the case study results. However, given that this thesis goes beyond the four articles, I articulate better SPT with these two other perspectives in the discussion chapter, advancing some insights for future cross-fertilization.

The BASE project

The empirical research, as well as the collaborative writing of the papers were developed within the European FP7 Project Bottom-up Climate Adaptation Strategies towards a Sustainable Europe (BASE) [Grant agreement No.308337]. BASE started in October, 2012 and will continue until October, 2016. The project is coordinated in Portugal by FFCUL [Fundação da Faculdade de Ciências da Universidade de Lisboa], and has been implemented by a team led by Dr Gil Penha-Lopes. Three months after BASE started, I had the opportunity of joining this interdisciplinary research team, as a research assistant.

In BASE, all case study research has been strongly centred on contributing to practical adaptation initiatives. This approach can be described as focusing on:

> «the conditions that are important to the community rather than those assumed by the researcher or for which data are readily available » […] «it employs the experience and knowledge of community members to characterize pertinent conditions, community sensitivities, adaptive strategies, and decision-making processes related to adaptive capacity or resilience. It is sometimes called a "bottom-up approach"» (Smit and Wandel, 2006:285)

BASE has been innovative by attempting to merge a *bottom-up* approach, with both the scaling up and the mainstreaming of adaptation in general policy contexts. On the one hand, scaling up implies comparisons between different communities to identify

the characteristics of effective adaptations in diverse socioeconomic, political and environmental contexts (Nelson et al, 2006). On the other hand, mainstreaming denotes that adaptation processes can be integrated in practical policy making (Smit and Wandel, 2006).

BASE has explored new arrangements for collaborative, transdisciplinary, reflexive and participatory approaches in research. Its innovative qualities served as an adequate setting to understand links between climate change adaptation processes, long-term societal transitions, and the relevance of participatory and reflexive research approaches in adaptation. In developing a Common Case Study Approach (one of the project's first deliverables), BASE has put in place a transdisciplinary and interdisciplinary research effort, and a methodological framework that sought to meet both the needs for participatory engagement and deliver knowledge on the characteristics of potential adaptations, which emerged from local, and context-specific experiments.

The empirical basis of BASE is centred on researching *bottom-up* case studies of adaptation to climate change across Europe. At FFCUL, as leaders of WP5 (the working group for developing case study research) and co-managers of WP4 (the working group for managing case study selection, methodological design and research outputs), our work started with designing a framework for case study selection and potential methodological approaches. It was agreed, within the FFCUL team, that the Portuguese case studies would be developed with participatory action-research approaches, and that analysis would follow two lines of enquiry: i) retrospective and reflexive (i.e. understanding and assessing past and present adaptation strategies, plans or actions) and ii) prospective action-learning (i.e. promoting or facilitating ongoing and future adaptation strategies, plans and/or actions). Both the retrospective and the prospective case study research had the goal of co-producing with stakeholders and communities involved adaptation outcomes, such as strategies and plans for the long-term, or establishing more efficient modes of working or developing a project together. Grounded on these premises, the working team engaged in a large scale screening of potential case studies. Case studies selected in Portugal accounted for distinct *Ex ante* criteria, including: type of climate change impacts; prospective/retrospective analysis; categories (e.g. public administration; organization; Eco Villa); workability (e.g. availability of stakeholders to work together); and sector (e.g. water resources; coastal; agriculture; biodiversity and ecosystems services, cities and infrastructures; human health). In Portugal, from an initial pool of about 40 potential case studies, three were selected: the Municipality of Cascais,

the coast of Íhavo and Vagos, and the Alentejo region. The latter integrated the analysis of micro adaptation projects, such as the Amoreiras Village Convergence Centre and Tamera EcoVilla, as well as a macro analysis of adaptation options for the Alentejo region. However, in order to select the case studies that could respond to the objectives of this thesis, a set of *Ex post* criteria were determined in the initial stages of the PhD research. This criteria will be explained in the context of the methodological trajectory described in Chapter III.

Sustainable climate change adaptation and the Portuguese context

This research has been triggered by an interest on the sustainability challenges posed by long-term climate change (CC) adaptation processes in Portugal. In CC Science, Adaptation refers to the ability of human and ecological systems to respond to the impacts and effects of CC (Parry *et al*., 2007). Adaptation can refer to a process, an outcome, or the condition of being adapted (Smit and Pilifosova, 2001; Smit and Wandel, 2006). CC adaptation is thus a dynamic quality that characterizes a particular system's state (Folke *et al*. 2010) at different temporal and spatial scales. A region or country may be well adapted in a moment in time, and more vulnerable at a later period, as external conditions change and create a new tipping-point that alters the balance of the previous system state (Hassnoot *et al.*, 2012). Thus, in addition to being a long-term process, CC adaptation follows an intrinsically dynamic and flexible pathway.

Long-term adaptation is likely to lead to changes in social (including political and economic), ecological and technical systems (Kates *et al*., 2012). If sustainability is taken as a normative direction, then adaptation studies could take into account the possibility for a sustainable transformative change of social, technical and ecological systems (Pelling, 2010). Moreover, given the slow reaction time of the climate system, even if greenhouse gas emissions were drastically reduced in the coming years, global temperatures are still expected to rise (Oppenheimer *et al*., 2014). Consequently, several scholars and practitioners argue there is little doubt that adaptation strategies will need to be undertaken and implemented in various regions of the world (Mimura *et al*., 2014).

In Portugal, CC adaptation is a growing political and social concern. The Portuguese National Adaptation Strategy (PNAS) was launched in 2010 and released its

first progress reports in 2013, a few months after the launch of the European Strategy[5]. The first stage of the PNAS (which concludes with the 2013 progress reports) is one of the objects of the empirical study that informs Paper 2 of this thesis. Thus, the PNAS process is described and analysed in this paper. The second stage of the PNAS (2014-2020) is now benefiting from the European Economic Area (EEA Grants) financial mechanism, which derives from funds granted by Iceland, Liechtenstein and Norway through the EEA Grants agreement[6].With three opens calls for financing CC adaptation projects in Portugal, EEA Grants funds are expected to support local level initiatives, from municipal planning to experimental adaptation projects and CC environmental education programs.

In 2014, severe winter storms threatened coastal regions in the country (e.g. Costa da Caparica; Ílhavo). That winter, coastal vulnerabilities were a recurrent news topic in Portuguese media discourses. Images of storms throughout the West Coast were broadcasted on TV, and the Portuguese Minister for the Environment; Spatial Planning and Energy referred 300 million Euros were available for protecting the littoral between 2014 and 2015[7]. Moreover, a group of researchers and experts was formed in 2014 to provide recommendations on the needed adaptation solutions and inform the National Strategy for Coastal Zones[8]. The following winter of 2015 was characterized by intense precipitation, which caused flooding events in Lisbon and other cities in the country. These events resulted in significant economic and material losses, as several shops and houses were severely damaged or destroyed. Images of a flooded Lisbon were broadcasted on national TV and social media. Concurrently, vulnerabilities to CC impacts began to being perceived as a real life possibility, by local populations and policymakers (Schmidt *et al.* 2014; O'Riordan *et al.*, 2014).

---

[5] The European Commission adopted, on April 2013, a Strategy on Adaptation to Climate Change. The Strategy is a non-binding policy recommendation that aims at promoting a more climate-resilient Europe, and is framed by three central objectives: promoting action by member states; "climate-proofing" action at the EU level and support a better informed decision-making process. A more detailed explanation can be found at: http://ec.europa.eu/clima/policies/adaptation/index_en.htm (last accessed 15th, September, 2015).
[6] See a description of the program at: http://eeagrants.org/Who-we-are.
[7] News is available on the website of the Portuguese Minister for the Environment; Spatial Planning and Energy, following this link: http://www.portugal.gov.pt/pt/os-ministerios/ministerio-do-ambiente-ordenamento-do-territorio-e-energia/mantenha-se-atualizado/20141017-maote-litoral.aspx (last accessed 9th July 2015)
[8] The final report of the working group for the littoral is available at: http://sniamb.apambiente.pt/infos/geoportaldocs/docs/Relatorio_Final_GTL2015.pdf (last accessed 9th September, 2015)

Notwithstanding the growing political and social interest in CC adaptation, while short-term action-plans exist for some regions (e.g. 10 year coastal defence action-plans), there are still no adaptation priorities and action-plans put forward for the long-term (O'Riordan *et al*., 2014). Likewise, the latest European Environmental Agency (EEA) report on national adaptation policy processes across Europe (EEA, 2014:55) states Portugal has yet to make a prioritization of adaptation options. The same report considered scientific studies produced by the University of Lisbon (i.e. "Climate Change in Portugal Scenarios, Impacts and Adaptation Measures" - SIAM I and II) have been strong triggers for the Portuguese National Adaptation Strategy, calling attention to the important role played by scientific research in this arena (Ibid: 31).

Nevertheless, several areas of interest in CC adaptation research are still under-studied in Portugal. Attention has hardly been given to assessing long-term effects to society of new technical landscapes due to CC adaptation (Smith and Stirling, 2010; Voß *et al*., 2009), or studies of how spatial and temporal scales of governance relate to adaptive capacity (Adger *et al*., 2005; Cash *et al*., 2006). Likewise, Portuguese studies have barely explored how governance mechanisms and community resource management (Armitage *et al*., 2008; Schmidt *et al*., 2014), learning arrangements and institutional dynamics (Folke *et al.,* 2005, Agarwal *et al*., 2012), as well as socially innovative initiatives (Seyfang and Haxeltine, 2012) may influence local adaptive capacity and social resilience. Finally, CC adaptation scarcely features in Portuguese research and policy agendas in relation to a broader societal transformation (Pelling, 2010). Conversely, a more technical and short-term view seems to be predominant, concerned with responding to perceived vulnerabilities (Schmidt *et al.*, 2014). Therefore, there is still a wide range of research topics that could benefit from contributions from the Social Sciences in Portuguese CC adaptation research. Moreover, in the context of European funding mechanisms for research and development, such as the Horizon2020 and the LIFE programme, CC adaptation is one of the main areas contemplated, and diverse calls for proposals ask for inputs from the Social Sciences[9].

This thesis addresses some of the referred research gaps in Portugal by drawing from transition and transformation studies, and focusing on how participation in research and policy making relates to long-term CC adaptation processes and action-plans in the

---

[9] For a more detailed account of these programs see the online information, available at: http://ec.europa.eu/clima/policies/adaptation/financing/funds/index_en.htm (last accessed on 9th July, 2015)

Portuguese context. Nevertheless, this research only begins to tap the surface of a wide range of topics concerning how society at large responds to and is integrated in CC adaptation processes in Portugal.

Adaptation as a transformative process: objectives and outline of the thesis

Climate Change (CC) adaptation is approached in this thesis from the perspective of sustainable development (Bruntland and World Commission on Environment and Development, 1987). The research is informed by an evolving concept of CC adaptation (further discussed under the last title of Chapter II), which is understood as an incremental and/or transformational process (IPCC, 2014a). The initial aim of this research was to understand how to govern long-term CC adaptation processes, and what does it mean to think of transformational adaptation in the Portuguese context. This initial aim was continuously refined throughout the literature review and empirical fieldwork. The process of fine-tuning the initial research concerns led to identifying a set of questions (explained in Chapter III) and three research objectives that culminate in the guiding hypothesis for this thesis. The hypothesis that underlies this study suggests that in CC adaptation research PAR promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance.

To address the research questions, as well as the main hypothesis, this thesis has been structured in six main chapters. Following this introductory chapter (I), Chapter II presents a review of the three bodies of literature which were, in some instances, applied to the case study research. Chapter III explains the methodological trajectory for the thesis, centred on CC adaptation case studies in particular vulnerable sites in Portugal. Chapter IV presents the main results through a set of four research papers. Chapter V offers a meta-discussion of the research papers and case study results, guided by the research questions presented in Chapter III. This chapter's discussion draws equally from the literature reviewed on Chapter II. Chapter V expands on the possibility of new research and political agendas for influencing sustainable development pathways. Lastly, the main findings of this thesis are encompassed by Chapter VI, and topics for future research are suggested.

Chapter II
Transitions, Practices and Transformation

Introduction

This chapter offers an overview of three bodies of work based on a literature review of Sustainable Transitions (Markard et al., 2012), of the Social-Ecological Systems (SES) Resilience Framework (Folke et al., 2010), and of Social Practice Theory (Shove et al., 2012). As explained in Chapter I, these three bodies of literature have been influential from the initial case study explorations to the final writing of the research papers. Sustainable Transitions have been a particularly relevant influence throughout this study, and the following overview offers a more detailed description of this literature. Since contributions from the SES Resilience Framework are further explored in Papers 2 and 3, this chapters' review of this research field is more succinct. Conversely, Social Practice Theory is not included in any of the Papers, but has been in the background of this research as a key perspective to think about social change, therefore I deliver a more elaborate account of the approach.

The theories and empirical approaches reviewed have been applied in the context of Climate Change (CC) research, although not necessarily from the point of view of adaptation. In Sustainable Transitions for instance, the main themes of research developed over the last decade have been related to the mitigation of anthropogenic CC (or the reduction of global greenhouse gas emissions), through the study of alternative production and consumption systems (Markard *et al*., 2012). Conversely, the SES Resilience Framework has been a fundamental approach in CC adaptation studies (Smit and Wandel, 2006; Walker *et al*., 2004). Over the last two decades, scholars from this multidisciplinary research field have contributed to the Intergovernmental Panel for Climate Change (IPCC) Reports (Denton *et al*., 2014). Social Practice Theory does not specifically focus on neither mitigation nor adaptation, but has been providing new insights on social change from a Social Sciences' perspective, namely on understanding how practices are embedded in uses of technology and ways of life that can inform both mitigation and adaptation strategies (Shove, 2003; Shove *et al*., 2009; Røpke and Christensen, 2012).

It seemed relevant to look into the methodological approaches and alternative modes of governance proposed by the different bodies of literature. Sustainable

Transitions and the SES Resilience Framework have both proposed governance approaches with the goal of addressing environmental problems. These approaches are based on participatory methodologies, as well as guided by long-term sustainable goals. Since the aim of this thesis is to investigate how participatory action-research relates to long-term sustainable changes, triggered by a particular type of environmental change, it seemed central to grasp how different research fields may offer useful insights to the study of CC adaptation processes. Long-term reflexive perspectives stand out as fundamental in approaching CC adaptation case studies because societies need to plan future adaptation pathways as responses to potential (although uncertain) impacts of CC. Therefore, plans and collective decisions will need to account for the dynamics posed by uncertainty, and for diverse levels of complexity when deciding on how to adapt. Moreover, climate action requires continuous monitoring and assessment. Thus, these literatures offer different possibilities for understanding and dealing with these complex processes of planning, without disregarding the key issue of how to deal with non-linear future changes towards more sustainable outcomes.

Furthermore, the following account sought to provide an overview of distinct forms of interpreting societal dynamics in long-term processes of change. Thus, the present chapter equally sets the ground to develop Chapter V, by providing an overview of the main theories, heuristics and conceptual frameworks.

Following this theoretical journey, the chapter closes on the concept of CC adaptation, relating how the adaptation discourse has developed over the last decades to account for transformation.

Sustainable Transitions

Context and background: ecological modernization and sustainable development

The Sustainable Transitions body of literature and empirical studies can be traced back to the Brundtland Report that led to an increasingly broader reflection on the concepts of governance and development through the definition of sustainable development:

> « […] development that meets the needs of the present without compromising
> the ability of future generations to meet their own needs. It contains within it
> two key concepts: the concept of 'needs', in particular the essential needs of
> the world's poor, to which overriding priority should be given; and the idea of

limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs. » (Bruntland and World Commission on Environment and Development, 1987:41)

Governance for sustainable development (Meadowcroft, 2009) is a collective engagement towards reforming socio-political practices and structures in order to encourage shifts to more environmentally, socially inclusive and sustainable pathways (Smith and Kern, 2009, Dryzek, 2010). Both governance for sustainable development studies and ecological modernization are integrated in the various theoretical and conceptual frameworks that make up the Sustainable Transitions research field.

Over the past 20 years, Sustainable Transitions studies have emerged as a social science response in the context of ecological modernization (Voß J., and Borneman, 2011). The latter is defined as a «sociological interpretation of how contemporary industrialized countries (try to) deal with the environmental crises» (Mol, 2000:46). Included in an ecological modernization approach is the idea of reflexive modernization, introduced by the late Ulrich Beck (Beck *et al*., 2003). This sociologist argues that within modern societies there is a continuous reflexivity – or a «non-linear notion of change» (Beck, Giddens and Lash, 1994:12) – that accompanies societal transformation. This can be understood as a transformation that results from the unintended secondary effects emerging from modernity's large scale development and eventually challenging established rules, institutions, structures, cultures and social practices (Beck *et al*., 2003). Risk society is «by tendency also a self-critical society» (Beck *et al*, 1994: 11). Thus, risk society theory introduces the notion that society itself is being revolutionized as an intended side effect of modernization (Beck, 2002a; Beck, 2002b), and that research should be concerned with understanding changes that are taking hold of the foundations of modern societal life (Beck *et al*., 2003).

Spaargaren and Mol (1992) interpret ecological modernization as a phenomenon that can be approached empirically and results from an ongoing reflexivity within institutions, governments, markets and industries through development processes, as a response to environmental problems. This approach evolved from an empirical outlook on how institutions shaped development through reflexivity, to establishing links to networked modes of governance for sustainability (Mol, 2000), focussing specifically on the part played by information technology in restructuring modern life and influencing environmental networked governance.

Consequently, the emergence of network governance represented a detour from a state-centred approach (Dryzek, 2010) towards a non-hierarchical type of governance. Power relations began being understood as fluid and transient processes; and relationships between actors as being embedded in interdependent processes of negotiation, collaboration, persuasion and mutualism (Voß and Kemp, 2006). This shift in political theory from government to governance (Dryzek, 2010) informed equally a strand of studies focussing on discourse, specifically on how political decision-making processes harbour discursive constructs, such as the concepts of storylines (Hajer, 1995; Smith and Kern, 2009), and how these constructs shape collective narratives and influence reflexive processes (Raven *et al.*, 2015).

Since Spaargaeren and Mol's work, the concept of network governance has been developed, among other fields, in sustainable development policy studies and has influenced new modes of governance proposed by transitions scholars (e.g. Transition Management described further ahead). Taking sustainable development as a dynamic and process-driven concept, Sustainable Transitions focused on the study of transitions towards more sustainable modes of production and consumption (Marckard *et al.*, 2012). Thus, the sustainability discourse (Smith and Kern, 2009) is a central component in the conceptual narrative, episteme and heuristics of these studies, which introduce a complex systems' perspective to sustainable development (Rotmans *et al.*, 2001; Kemp and Martens, 2007). Building on the Bruntlands' report idea that limitations are inherent to «the state of technology and social organization» transition literature characterizes these *limitations* as persistent problems, which are:

> « […] unstructured (Hisschemöller 1993) and highly complex because they are rooted in different societal domains, occur on varying levels, and involve various actors with dissimilar perspectives, norms, and values. » (Loorbach, 2010:164)

Transition research

After over a decade of transition research, Markard and colleagues (2012) produced an extensive literature review of the body of interdisciplinary and multidisciplinary influences to Sustainable Transition studies. Their theory diagram on the main scientific disciplines that have informed and shaped this literature, identified contributes from a broad array of disciplines, from economics to cultural studies. Considering the

multidisciplinary origins of Sustainable Transition studies, and the object of analysis (e.g. long-term transitions), the research field is characterized as having a macroscopic level of analysis (Grin *et al.*, 2010).

Rip and Kemp´s *micro*, *meso* and *macro* level framework has been a fundamental pillar of Sustainable Transitions. The framework was proposed in the context of a publication on CC (Rip and Kemp, 1998). The authors considered that Social Sciences needed to take into account the co-evolutionary dynamics of society and technology, in order to properly address the CC problem:

> «Central to this understanding is the link between global climate change and what we will call evolving sociotechnical landscapes, which are part and parcel of overall transformations of societies. » (Rip and Kemp, 1998:328)

Rip and Kemp thus introduce the notion of sociotechnical system and refer to transformative societal change. Sociotechnical landscapes are defined as:

> « […] a landscape in the literal sense, something around us that we can travel through, and in a metaphorical sense, something that we are part of, that sustains us. » (Ibid, 1998:334)

In this book chapter, the authors argue that social and technological changes evolve over three levels: *micro* (scripts, technical fixes), *meso* (technical regimes) and *macro* (sociotechnical landscapes) (Rip and Kemp, 1998:339). Taking stock of this important contribution, Frank Geels proposes, the Multi-level Perspective (MLP). The MLP uses the nomenclature of socio-technical *niches*, *regimes* and *landscapes* (Geels, 2005) and appears as a framework to study the co-evolving processes of transformative changes between the different system levels. Geels offers the following description of MLP:

> «MLP views transitions as non-linear processes that result from the interplay of developments at three analytical levels: niches (the locus for radical innovations), socio-technical regimes (the locus of established practices and associated rules that stabilize existing systems), and an exogenous sociotechnical landscape […]. The regime level is of primary interest, because

transitions are defined as shifts from one regime to another regime. » (Geels, 2011: 26)

In the MLP, power is an attribute that distinguishes the different types of socio-technical systems. The *regime* is the incumbent subsystem or constellation «that accounts for the stability of an existing socio-technical system» (Geels, 2011:28). The boundaries of regime, niches and landscape are defined in relation to the scope of the empirical object (Geels, 2011). In the MLP, system components interact in a dynamic flow (Geels, 2005) and complex processes of transformative change take place within and between sociotechnical systems. A transition is thus a long-term process (40 to 50 years) of radical and structural systemic change (Grin *et al*. 2010:11). *Regime shifts* may originate from niches that are empowered and become dominant (e.g. organic food in Denmark) or from pressures at the landscape level (e.g. economic crisis). Nevertheless, the rigidity of the boundaries between multi-level socio-technical systems has been contested (Jorgensen, 2012), even by Geels himself, who suggested considering these boundaries less hierarchical (Geels, 2011).

In the MLP, the concept of regimes provides an analytical framework to study how institutional configurations of use and actor practices accompany the historical path dependencies of technological innovations (Geels, 2005). These path dependencies refer to how societal systems can be locked-in particular ways of functioning, which are supported by the dominant regime. For instance, when cities were dependent on a horse-based transport system, dominant societal structures, such as rules and legislation, ways of being and experiencing city life, and even daily life practices were influenced by the horse transport system (Geels, 2005). Rip and Kemp (1998) equally highlighted these dynamics, with the example of the automobile:

> «the motorcar is not an isolated artifact, but the label for part of our sociotechnical landscape, made up of steel and plastic, concrete (the roads), law (traffic rules), and culture (the value and meaning of personal mobility)» (Rip and Kemp, 1998:335)

The discussion on the social embeddedness of technological changes continues to be central for CC and Sustainable Transition studies. (Westley *et al*., 2011; Park *et al*., 2012). Ideas regarding the direction of transitions, how they originate and develop have

been explored in proposals for a typology of *transition pathways*[10] (Geels and Schot, 2007), and for *patterns of transitions*"[11] (De Hann and Rotmans, 2011). Rotmans et al. (2001) proposed an *S-shaped curve* as a guiding framework for possible transition pathways. Pathways were not seen as deterministic, but rather as historical guides, still accounting for uncertainties, rebound effects and processes of collapse and emergence. Four stages were identified to explain the direction of long-term transitions: pre-development, take off, acceleration and equilibrium. Based on this curve, a few possible pathways would emerge. Once potential pathways were identified, the following direction would be to actively influence transitions towards radically more sustainable systems over the long-term.

Based on the MLP, different conceptual approaches and governance frameworks have been suggested and experimented in this research field (Markard *et al.,* 2012; Lachman, 2013), such as Strategic Niche Management (SNM) (Geels *et al*., 2008; Schot and Geels, 2008) and Transition Management (TM) (Rotmans *et al*., 2001; Loorbach, 2010). The latter have been considered forms of reflexive governance (Voß, and Bornemann, 2011) because of the underlying idea that transitions can be managed or influenced, and that such influence is promoted by the (reflexive) policy designs proposed. These modes of governance have developed empirical applications, which integrate action-research approaches (Wittmayer and Schäpke, 2014). In the following subsections, SNM and TM are described. However, this thesis' theoretical framework has been mostly informed by TM, which is described in more detail than other applications, including a subsection on the debates raised by the approach. Finally, Arenas of Development (AoD) emerges as a response to critical appraisals of Sustainable Transition studies based on the MLP, and a brief account of this proposal is also given.

---

[10] Pathways are presented by Schot and Geels as potential trajectories that transition processes may follow. Structural changes may be promoted by internal dynamics within the dominant socio-technical regime; by new niches becoming increasingly empowered, or by landscape changes which create pressures on the dominant regime (e.g. new contextual and exogenous conditions).

[11] In De Hann and Rotmans' paper, a set of possible configurations or patterns that characterize transitions are identified. Based on a functionalist perspective of how socio-technical systems provide for societal needs, the article offers a theoretical account of transition processes developing over time. These processes exhibit possible patterns, which are assembled through building blocks (i.e. a societal system adapting to a changing climate).

Strategic Niche Management

Informed by the micro, meso and macro levels framework (Rip and Kemp, 1998), Kemp and colleagues propose the Strategic Niche Management (SNM) approach as a form of promoting the integration of more sustainable technologies in dominant technological regimes (Kemp *et al.,* 1998). Considering that new technologies face a diversity of challenges, these authors propose that steering sustainable technological innovations requires a specific type of management that is able to account for a diversity of interrelated factors (e.g. cultural factors, production and demand, policies) that hinder the mainstreaming of new technologies. They propose SNM as governmental policy that may be used to accelerate changes in technological regimes. They offer the following definition of SNM:

> «Strategic niche management is the creation, development and controlled phase-out of protected spaces for the development and use of promising technologies and enhancing the further development and the rate of application of the new technology». (Kemp *et al*., 1998:186)

This management approach should carefully account for a set of elements, from the choice of technologies, to experimentation and the development of protective spaces for the innovation. SNM is equally proposed by Schot and Geels (2008) as a policy design for understanding and steering the dynamics of protective spaces where innovations can be tested and developed (Geels *et al*., 2008; Schot and Geels, 2008). Smith and Raven have proposed innovations should be shielded, nurtured and empowered in order to increase their possibility of entering mainstream markets (Smith and Raven, 2012). These scholars continue to study how protective spaces for niches can be best equipped to compete with incumbent regimes, by exploring the role of policy (Verhees *et al.*, 2015), and attempting to understand how to establish and operate within complex protective spaces (Raven *et al*. 2015).

Transition Management

Transition Management (TM) is a mode of governance that seeks to influence transitions in public policy, and reinstate long-term planning towards more sustainable outcomes

(Voß and Borneman, 2011; Frantzeskaki *et al*., 2012). The approach presents itself as a «prescriptive approach towards governance» and a «normative model» with the long-term goal of sustainable development (Loorbach, 2010:162). This mode of governance (Loorbach, 2007) has been described as an experiment attempting to «reinvigorate ecological modernization» (Smith and Kern, 2009:2), by decoupling economic growth from environmental degradation. TM draws equally from the heuristics of niche, regimes and landscape levels and is concerned with influencing a new generation of long-term planning (Loorbach, 2010; Frantzeskaki *et al*. 2012). It is an action-research oriented field that seeks to promote, influence and monitor sustainable transitions. The idea for actively influencing transitions in public policy and reinstating long term planning was suggested by Rotmans, Kemp and Van Asselt (2001). TM was presented as a way of combining transitions into a «management strategy for public decision makers and private actors» (Rotmans *et al.*, 2001) and was in fact adopted that year by the Dutch government and integrated in the 4th national environmental policy plan (VROM 2001) as a governance experiment (Smith and Kern, 2009). Less focused on the «managerial» idea, Derek Loorbach (2007) envisages TM as a «new governance approach to sustainable development», which implies a «new balance between state, market and society» (Loorbach, 2010:162). The process of policy design develops along a TM cycle with four key stages:

> «A strategic (Problem structuring, envisioning, and establishment of the transition arena); tactical (Developing coalitions, images, and Transition agendas); reflexive (Evaluating, monitoring and Learning) and operational (Mobilizing actors, executing projects and experiments). » (Loorbach, 2010:173).

In this thesis, Paper 4 (in Chapter 4) is informed by the TM literature. Particularly, the TM cycle was influential for developing the methodological and analytical framework for the Ílhavo and Vagos case study.

Critical accounts of Transition Management

TM experiments have been ongoing for the past 12 years[12], however the proposal raised several concerns and is continuously evolving, as lessons are drawn from long-term planning experiments. These critiques illustrate ongoing debates within Sustainable Transition studies. Particularly, two strands of criticisms to TM can be distinguished: those focusing on the managerial dimension of the proposal and its danger of not accounting for political processes and posing democratic challenges; and those centred on the «verticality» of the MLP approach and a tendency for addressing mostly the technological dimensions of socio-technical systems, consequently dealing superficially with individual and group practices.

Regarding the first strand of criticisms, Kern and Smith (2008) studied the Dutch Energy Transition, and concluded that while attempting to steer system innovations the TM model should pay closer attention to how power dynamics and organizational routines may undermine transition pathways. These authors refer to the energy transition experiment as optimistic regarding the role of governments, overlooking the political process of implementing a policy design in a polycentric power structure, where various coalitions of conflicting interests are at play and will not simply follow a managerial direction.

The success of TM in promoting sustainable transformations in the "real world" has been highly debated (Voß *et al*., 2009). Some studies indicate powerful agents tend to impose their own interests, thus undermining the democratic process of transitions (Hendrick, 2009; Voß and Borneman, 2011). Hendricks (2009) concludes it is important for TM to promote a higher interconnectivity between governance structures of managerial nature, and the polycentric nature of democratic systems. Smith and Kern's (2009) analysis of transition storylines in the Netherlands shows that instituting an original support base for the transition discourse influences how the discourse is put into action, when the sustainability discourse is pressured by other political agendas and interests (Smith and Kern, 2009). In the Dutch case, Smith and Kern argue, TM seems to have resulted from a window of opportunity where the transition discourse found its way to policy storylines (of the Dutch government), though this has not benefited from a

---

[12] For a description of TM case studies see Loorbach and Rotmans, 2010

sufficiently large support base, and has not been yet reflected in action (Smith and Kern, 2009).

Another strand of critiques to TM relates to its normativity towards sustainability and the fact that everyday practices are not accounted for (Shove and Walker, 2010). This strand of critiques originated from scholars who have developed studies informed by Social Practice Theory (explained ahead in this chapter). Scholars that critique the normativity of TM argue that this approach assumes a specific technology or mode of governance to be more sustainable, when future outcomes are highly uncertain (Jorgensen, 2012). With uncertainty at its background, such normative thinking can result in not accounting for other resources, such as local knowledge and bottom-up initiatives, or the role of individual and group practices in driving change.

Reviews and add-ons to the TM theory resulted mostly from the first type of critiques, referring to the dangers of this approach overlooking the impacts of polycentric political structures and organizations (Vob *et al*., 2009; Avelino and Rotmans, 2011; Voß and Borneman, 2011). However, in response to Shove and Walkers' normativity concerns and the absence of considerations of individual and group practices, there have been proposals for finding complementarities or «points of intersection» between Social Practice Theory (Shove *et al*., 2009) and the MLP (McMeekin and Southerton, 2012; Hargreaves *et al*., 2013). These potential complementarities will be equally the subject of this thesis' general discussion (Chapter V).

Alternatives to the MLP framework – the AoD approach

As an alternative to the MLP framework, the Arenas of Development (AoD) approach has been suggested by Jorgensen (2012). Arenas are described as «actor constellations and their collective sense-making activities» (Jorgensen, 2012: 997); and as «temporarily stable actor-worlds» (Ibid: 1001). The proposal offers a particular interpretation of the vertical dynamics between micro, meso and macro system levels (Rip and Kemp, 1998) in transition research. It presents itself as a «flat approach to boundaries and configurations» (Jorgensen, 2012:1001). This «flatness» does not take so much issue with the verticality aspect that a hierarchical system implies, instead it puts forward an idea of relationality. That is, boundaries between arenas are not predefined and rigid; they are continuously reconfigured through the performance of actors, who may hold multiple identities. Therefore, arenas appear as fluid and mobile (i.e. there is not a clear definition

of regime, niche or landscape), and changes in socio-technical systems are the incremental outcomes of this mobility. Jorgensen understands transitions as a societal transformation process, affecting multiple actors who engage in various practices and may move within conflicting spaces and interests. Therefore, the focus of the arenas system is on the performance of actors, who navigate through distinct configurations of actor-words. AoD attempts to also respond to the second strand of criticisms to TM and MLP, which have originated mostly from Social Practice Theory scholars.

Throughout the empirical research developed, I tried to apply AoD as an analytical framework. However, AoD seems to require a multi case study framework, where researchers are able to experience the ongoing relations between case studies and the transition processes they represent. These circumstances do not apply to the case study research developed between the summer of 2013 and 2015. Case studies were carried out separately and had no relation except all concerned CC adaptation.

Limitations of the transition studies field

Despite being a growing research field, empirical applications of transition frameworks and approaches have been found to be limited in various domains (Markard *et al.*, 2012). These limitations include innovations being understood mostly as technological innovations (Hargreaves *et al*., 2013) and the dominant geographical scope of transition studies (most have focused on western industrialized countries, particularly Northern Europe). Moreover, empirical research in the transition literature has been largely applied in the context of CC mitigation strategies (Loorbach and Rotmans, 2010). However, since CC adaptation may mean new material landscapes (e.g. a coast with a new dike that changes local socioeconomic dynamics); or new societal needs that ought to be met (e.g. less agricultural productivity due to land degradation may threaten food security), adaptation strategies may lead to a socio-technical transition (De Haan and Rotmans, 2011). Recent literature has been dealing with these research gaps. Empirical studies have begun addressing CC adaptation in the context of transitions (Nevens *et al*., 2012; Nevens and Roorda, 2013), and there is a growing focus on non-technological innovations (Seyfang and Haxeltine, 2012; Smith *et al*., 2014).

Social-Ecological Resilience Framework

The notions of transitions and adaptation originate from evolutionary biology and population dynamics (Rotmans *et al.*, 2001), and have influenced the transition research field, as well as the Social-Ecological Systems (SES) resilience framework (Folke *et al*., 2002; Folke *et al*., 2005), which evolved in distinct disciplinary fields. Although, arguably, the CC topic seems to be bringing the two research fields closer together (Park *et al*., 2012).

The Social-Ecological Systems (SES) resilience framework focuses specifically on how systems adapt and transform in a changing bio-physical and social environment (Folke *et al*., 2002; Adger, 2006; Folke, 2006). Resilience is the ability of a system to maintain its characteristics (of function and structure) when facing external changes (Walker *et al*., 2004; Nelson *et al*., 2007). The SES system may be flexible enough to rearrange itself around a potential array of alternate states and continue to function (Folke, 2006), until it reaches a *threshold* point, under which change becomes more radical (Nelson *et al*., 2007). Resilience is as well a *way of thinking* and analysing social-ecological system dynamics (Folke, 2006).

In this literature, transformation is a key property of the SES, described as the «capacity to create a fundamentally new system when the existing system is untenable» (Walker *et al*., 2006: 4). In this context, the regime is defined as a «set of systems states of the broader social-ecological system» (Folke *et al*., 2010; table 1.). The term *stability landscape* refers to «the extent of possible states of system space, defined by a set of control variables in which stability domains are embedded» (Ibid, table 1.). A regime shifts when moving from one system state to another within the stability landscape (Folke *et al*., 2010).

In SES, innovations are understood as another scale within the system that may provide opportunities to strengthen adaptability or to manage resilience (Nelson *et al*., 2007; Walker *et al*., 2006). Transformation can be either an unplanned process associated with the loss of resilience given the scope of external pressures, or a desirable and planned process (Nelson *et al*., 2007; Folke *et al*., 2010). Though, from an ecological point of view, there is no good or bad system states, from a social perspective system collapses are likely to be undesirable (Nelson *et al*., 2007). With the goal of encouraging positive and sustainable changes in SES, this research field introduced and developed modes of governance for adaptation and transformation processes. These modes of governance

integrate scientists as well as a diversity of other actors, such as local communities, groups, regions or even governments, in an action-learning process, combining different types of knowledge systems in co-managing local resources (Olsson *et al*., 2006; Armitage *et al*., 2008). The process of building adaptive capacity is thus understood as a joint endeavour that results from the combination of various systems of knowledge and learning experiences in responding to the challenges of complex adaptive systems and their co-evolving dynamics (Folke *et al.*, 2005). Nevertheless, the modes of engaging in action-learning experiences are neither linear nor simplistic, and much research has been done to identify and develop the best modes of engagement that support dialogue, knowledge exchange and the co-management of resources in social and ecological systems. One approach is the adaptive co-management framework (Folke *et al*. 2005; Armitage *et al*., 2008). This approach reflects the structure and functioning of social-ecological systems, and is guided by resilience thinking. As in Transition Management, there is an emphasis on *learning by doing*, and monitoring and reflexive action learning support safe experimentation (Folke *et al*., 2010). Adaptive co-management is thus an exploratory method that allows «the new identity of the SES to emerge through interactions within and across scales» (Folke *et al*. 2010:7), since the future system is seen as uncertain, unpredictable, and surprising (Walker *et al*., 2004; Folke, 2006).

Paper 2 (Chapter IV) touches on the concept of transformation based on this literature. Paper 3 (Chapter IV) draws from specific contributions from the SES Resilience Framework to support the analysis of the Amoreiras Village Convergence Centre.

Social Practice Theory

Context and background

Social Practice Theory emerges in the context of Practice theories (Schatzki, 1996; Reckwitz, 2002). The greatly diverse writings that adopt a practice approach have been instrumental as a social science response to climate change research as they provide analytical tools and explanations on how «new forms of living, working and playing» need to fundamentally change as a response to global problems such as climate change (Shove, 2010:1273). A variety of theoretical approaches to social practices were developed in Sociology and Philosophy over the last century, by scholars such as

Giddens, Bourdieu, Lyotard, Charles Taylor, Foucault, among others (see Warde, 2005 and Shove *et al.*, 2009). Over the turn of this century, the work of philosopher Theodore Schatzki (Schatzki, 1998) and the cultural sociologist Andreas Reckwitz (Reckwitz, 2002) identified and contributed to a *Practice Turn* in Social Sciences research (Schatzki *et al.*, 2002). Despite the variations among different interpretations put forward by Practice theories, Schatzki argued they had in common not focussing on the analysis of the individual *praxis*, nor on social organization as a contract (Schatzki *et al.*, 2002). Instead, these theories were centred on the analysis of what binds social and individual everyday life. Borrowing Alan Warde's words:

> «Practice theories comprehend non-instrumentalist notions of conduct, both observing the role of routine on the one hand, and emotion, embodiment and desire on the other. » (Warde, 2005:136)

From Schatzki and Reckwitz systematization of these theories, practices were proposed as a core unit for analysis because they structure individual, social and institutional life. Given they are considered a meso-level theoretical perspective, they allow for both a micro and macro analyses, since their focus may be on individual activities or move on to consider individual interactions as a «field of practices», expanding to the analysis of groups, communities or nations. (Schatzki *et al.*, 2001). Accordingly, Reckwitz defines practice as:

> «[…] a routinized type of behaviour which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. » (Reckwitz, 2002:202)

Reckwitz's notion of practice became instrumental in consumption studies with the work by Alan Warde (among many others), and in environmental studies with insights from Elizabeth Shove and colleagues (Shove, 2003; Shove *et al.*, 2009), as well as Gert Spaargaren and colleagues (Spaargaren and Oosterveer, 2010; Spaargaren *et al.*, 2012).

Practices and societal transitions

Reckwitz's definition of practice integrates the basic notion that there is a continuum of constellations of activities, which are interrelated and interdependent. Thus, practices exist because they are carried out by practitioners, and continuously reproduced over time and space, becoming *practices-as-entities* (Schatzki, 1998). A continuous flow of activities – or a set of interconnected *doings* and *sayings* – forms collective clusters of activities that are interdependent and coordinated, thus appearing as entities.

Practices-as-entities are interlinked by specific types of elements or the components of practices, which Schatzki refers to as: «action understandings»; «rules» and «teleoaffective structures» (Schatzki, 1998:89). This *teleoaffective* structure is a set of ends, means, doings, uses and emotions that govern practices within an existing context (Schatzki, 2010). Through practitioners' performances, or the ways practices are carried out, new practices emerge. *Practices-as-performance* (Schatzki, 1998; Schatzki, 2010) refer to the enactment of a practice by individuals, who are continuously reproducing *practices-as-entities* in the course of their activities in everyday life (Schatzki, 1998). Thus, the continuous repetition and reproduction of *practices-as-entities* is accompanied by an ongoing transformation of practices.

Schatzki's core distinction between practice as a recognizable entity across time and space, formed historically as a collective or entity, and the enactment of practices by individuals and groups who reproduce and transform entities, illustrates how the analysis of *time* and *space* is core to social practice theory. Henceforth, this theoretical approach introduces a new viewpoint to the study of societal transitions, which can be understood as transitions across time and space between different patterns of *practices-as-entities*.

From a social practice perspective, transitions are studied by analysing changes of stabilized individual and group practices that appear as collective entities (Shove, 2003), continuously restructured over time and space through a constant flow of clusters of everyday life activities (Shove *et al.*, 2009, Shove *et al.*, 2012). As a unit of analysis, practices account for an in-depth understanding to how clusters of activities orchestrate and shape everyday life (Gram-Hanssen, 2010, Truninger, 2011). Thus, practices offer an analytical lens to understand social actors' trajectories in the context of sustainable transitions (Geels, 2011; Spaargaren *et al*, 2012), yet with a focus on the practices of individuals and groups.

Practitioners' careers are interpreted as the product of a constant negotiation of practices in relation to different uses of time and space and often competing life projects (Ropke and Christensen, 2012). Everyday life takes place through a flow of practices-as-performance which are combined, routinized and organized in *projects* (Røpke and Christensen, 2012). The enactment of practices is thus a dynamic process. While some practices are enacted in a private setting, some are collective and involve a wide ranging number of practitioners. Nonetheless, within everyday life projects some practices may appear contradictory, because engagements are not always consistent. For instance, the willingness to lead a lower carbon lifestyle may not be consistent with everyday working hours and family responsibilities. David Evans research on household food waste (Evans, 2011) illustrates well this point by showing how the orchestration of everyday life influences cooking, eating and food waste practices. The study elucidates how inconsistencies are largely rooted in different meanings attributed to practices, in relation to time, space availability, as well as relations of power and dominance within a group or family. Nonetheless, individuals are not slaves to their practices. Though practices are said to be continuously recruiting practitioners, practices do have to make sense to those who adopt them (Røpke and Christensen, 2012).

Projects are translated in *path dependencies* (of practices-as-entities), that create lock-ins, or a «rigidity of the interlocking systems of practice which society is composed» (Shove, 2003:24). Thus, practice-as-entities are locked in path dependencies until they evolve and change, due to the influence of socio-material worlds where *practitioners* are engaged in. There are undoubtedly complex and interlocking systems of practice (Shove, 2003; Shove *et al*., 2009) that make up social life and it is through this combination of collective and private practices (where new practices are established and others disappear), that personal projects are formed and path dependencies emerge, and may produce more or less sustainable life projects.

A deeper reflection on social timespace has been explored by Theodore Schatzki (Schatzki, 2009). It is difficult to adequately describe Schatzki's understanding of social timespace without borrowing his own meaning laden words. He argues that «interwoven activity timespaces form a kind of infrastructure through which human activities coordinate and aggregate»; considering such infrastructure as «fundamental to social life» (Schatzki, 2009: 35). Schatzki elaborates on the dual qualities of timespace. In his proposal, the time component relates to the temporal structure of an activity, or its interrelations with personal and «collective past, present and futures» (Schatzki, 2009:

36). The spatial component is understood as integral to practice, relating to the way activities are integrated in a particular setting and the ends pursued through those activities. Both time and space are understood in Schatzki's language, as inherently connected and as *teleological phenomenon*:

> «The teleological structure of human activity is the future of activity and underlies place-path arrays. » [Schatzki, 2009: 38).

From this perspective the timespaces of practitioners constantly order and combine everyday practice projects. To explain the social dimension of timespace, Schatzki clarifies that practices are organized through *nets* of interwoven timespaces and therefore they depend on both the individuals' particular temporal existence and on the «common and shared temporalspatial features of people's lives on the social practices they carry out» (Schatzki, 2009:40). Thus, local routines and rhythms are integral components of both collective and individual practices. Moreover, Schatzki's reflections of social timespace provide a systemic view of practices, since he concludes that the «sum-total» of interrelated nets of practices «forms a gigantic, intricate and constantly metamorphosing web that forms the overall site of social existence» (Schatzki, 2009: 41).

This summary account of Social Practice Theory hints at central epistemological and ontological differences between these theories and transition and transformation approaches based on complex non-linear systems' perspectives. These differences have been at the core of critiques of Sustainable Transition studies from Social Practice Theory scholars, but they may equally point to significant complementarities between these bodies of research, which have yet to be developed in depth.

Adaptation – a concept in development

The previous literature review showed how different research fields are equipped to understand long-term transformative changes. It is now relevant to proceed this theoretical overview by focusing on the concept of adaptation, and how it has evolved over the previous decade. Influenced by transition and transformation studies, the concept of adaptation has gradually taken into closer account the idea of transformation. The glossary of the Third Intergovernmental Panel on Climate Change Report (IPCC, 2001) defines adaptation as:

«Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation. » (McCarthhy *et al.*, 2001:982)

However, the glossary of the Fifth IPCC advances with a definition that accounts for the possibility of transformational adaptation: «Adaptation that changes the fundamental attributes of a system in response to climate and its effects. » (IPCC, 2014a: 1758). The definition is quoted in full on Paper 2 (Chapter IV). The definition in the glossary is accompanied by a footnote referring that progress in science had led to the new entry, which differs in «breadth and focus» from the definitions used in previous reports. This updated definition seems to reflect the advancements made by research based on complex, non-linear and co-evolving systems' perspectives of CC adaptation. The updated definition appears to take stock of the views of scholars who propose that CC adaptation sets a new global political agenda that deliberatively encourages sustainable development pathways (Park *et al.*, 2012; O'Brien, 2012; Pelling *et al.*, 2014).

One of the proponents for a more expansive view of adaptation, Mark Pelling, points out that adaptation and mitigation are in reality a single domain for action and argues that the separation of mitigation and adaptation is «intellectually problematic» - though «politically necessary» -, because mitigation should be understood as a «subset of adaptation»:

«It [mitigation] is an adaptive act aimed at ameliorating or reversing the root causes of the anthropocentric forcing processes behind climate change. Changing lifestyles and technologies to reduce carbon are then acts of adaptation targeted at supporting mitigation. » (Pelling, 2010:39)

This argument is related to Pelling's view of adaptation as part of a social transformation or an «irreversible regime change» (Pelling, 2010:39), suggesting that adaptation appears as actions that increase resilience and promote a systemic transition. Similarly, Karen O'Brien and colleagues (O'Brien *et al.*, 2012) have called attention to how social contracts – i.e. agreements between the state and civil society, which establish the respective rights and responsibilities of each party (Ibid: 14) – may play a fundamental role when considering alternative and potential political responses to CC. The ways social contracts may influence governance responses to CC are discussed by O'Brien and

colleagues drawing from the resilience framework (Folke, 2010). In collective responses to CC, the existent social contract can protect the rights of citizens, and illuminate different parties on the rights and responsibilities of state authorities and citizens, as well as on issues of fairness and equality in responding to vulnerability and perceived or anticipated risks (O'Brien *et al*., 2012). This leads to arguing for the need to account for the rights of those living in the present, but also of future generations (O'Brien *et al*., 2012). A debate on the evolution of social contracts as a model of governance leads to understanding adaptation in the context of a new agenda for sustainable development, where the resilience and adaptability of «distant others» (Ibid, 2012:14) should be also accounted for. This reflection on restructuring the rights and responsibilities shared and held by diverse social actors that are collectively called upon to respond to perceived and/or expected social and ecological vulnerabilities, leads to consider a transformed societal system (Pelling, 2011).

Transformational adaptation could mean a new mode of governance that deliberatively encourages alternative development pathways, despite future climatic uncertainties. Such development pathways are centred on the rationale of assuring the adaptability and resilience of present and future societies. The emphasis would be less on adapting complex systems to present or future changing conditions, and more on confronting the depth of unsustainable development pathways and addressing the core causes of CC through a societal transformation:

> «This interpretation ascribes transformation to adaptive actions that have the reach to shift existing systems (and their component structures, institutions and actor positions) onto alternative development pathways, even before the limits of existing adaptation choices are met. » (Pelling *et al*., 2014: 2)

Thus, from this perspective, when considering how and when to adapt, the issue of future climatic uncertainty becomes less relevant, and the sustainability debate is brought to centre stage.

A more expansive concept of adaptation could be equally further incorporated in methodological frameworks for aiding decision-making and adaptation plans and actions (Pelling *et al*., 2014). The Dynamic Adaptive Policy Pathways proposed by Hassnoot and colleagues (2012) (and used in the case study related on Paper 4), for instance, is not necessarily linked to a concept of transformational adaptation. The methodological tool aims at aiding in planning adaptation policies and actions for the long-term (e.g. 100

years), by drawing on a series of potential pathways that will vary according to tipping-points. For instance, in a coastal area, rising sea levels over 40 cm, in the year 2040, may deem redundant an adaptation action, such as sand nourishment operations, and require another action, such as building a dike. The adaptation pathway is dynamic because it accounts for the different possibilities posed by tipping-points – if the sea does not rise higher than 40 cm in 2040, then sand nourishment operations will maintain the coastal region protected, yet if sea levels rise higher, a new policy must be adopted. The method was developed to aid policymakers and spatial planners in dealing with the uncertainty of future CC impacts (Hassnoot *et al*., 2012).

However, the idea of adaptation as a process that integrates mitigation and adaptation, as argued by Pelling and colleagues (Pelling, 2010; Pelling *et al*., 2014), makes the problem of uncertainty less important. Sustainability and resilience become the end goals for any form of collective action. The uncertainty of future climate scenarios should be informing, but not conditioning societal action towards more sustainable development pathways. Concurrently, a methodological proposal from Park and colleagues' for Adaptive Action Cycles (2012) - also referred by Pelling and colleagues (2014) -, attempts to integrate transformational adaptation. The Adaptive Action Cycles methodology is proposed under the hypothesis that an adaptation process oscillates along a cyclical progression between incremental action and transformation policies and actions. Moreover, Park and colleagues' article (2012) start off with a review of what these scholars refer to as transition and transformation theories, which are taken respectively from Sustainable Transitions and the SES Resilience Framework. Thus, this proposal by Park and colleagues (2012) is equally a methodological design that sets out a field for further experimentation with complementarities between Sustainable Transitions and the Resilience Framework.

A more comprehensive concept of adaptation and the proposal for a mode of governance guided by the transformational discourse, equally echoes the idea of reflexivity as proposed by Beck and the reflexive governance literature (Voß *et al*, 2006). Particularly, the idea that a meta-change accompanies societal transformation (Beck, 2002; Beck *et al*., 2003). Moreover, although Sustainable Transitions have focussed mainly on research topics related to mitigation, namely transitions to dominant socio-technical systems based on more sustainable technologies (Kemp *et al*., 2007; Loorbach and Rotmans, 2010), reflexive modes of governance developed in this research field (e.g.

Transition Management) could be fundamental contributes for promoting transformational adaptation processes (Nevens and Roorda, 2013).

Closing remarks

A more comprehensive interpretation of CC adaptation as a cyclical, non-linear and complex process of incremental or transformational change informed the methodological and analytical framework of this thesis. The investigation began by questioning how long-term transformative changes are being interpreted and studied in sustainability studies. This exploration led to selecting the three bodies of literature reviewed in this chapter. These bodies of literature offer distinct and particular perspectives on long-term societal changes, which are never considered as isolated dimensions, but instead integrate the inseparable interdependencies of social, material-technical and natural worlds.

The literature review sets the background for understanding the conceptual-theoretical frameworks that have been included and further developed in the four papers presented on Chapter IV. The theoretical journey equally illuminates some complementarities and differences between the three bodies of literature, which will be further discussed in Chapter V.

Transition Management (TM) is important for the methodological discussion of Paper 1 on the role of Participatory Action-Research in the study of long-term CC adaptation planning. The more expansive concept of transformational adaptation informs the analysis and discussion of Paper 2. In Paper 3, the SES Resilience Framework provides an analytical lens to understand how a group of innovators has been promoting more adapted and resilient rural communities in the Alentejo region of Portugal. Finally, TM and Arenas of Development (AoD) inform the methodological choices for the methods used and combined in the case study research and discussion section of Paper 4. Although Social Practice Theory is not used as an analytical framework for any of the papers making the main body of this thesis, it is brought back to shed some light over the meta-discussion centred on this thesis' research questions and presented in Chapter V.

Chapter III
Methodology

Introduction

This chapter provides a description of the methodological trajectory that guided this thesis. As described in Chapter I, the thesis has been developed in a multidisciplinary and transdisciplinary context. Likewise, the papers that make up the body of the dissertation were written by me, but included internal and external contributions of the group of researchers participating in the empirical work, and of stakeholders engaged in the case study research. Thus, the methodological process had to account for the different research dynamics, namely those pertaining to this study and those relevant for completing the project's BASE deliverables.

This chapter begins by describing the methodological trajectory from the initial explorative research to the central hypothesis, presenting and explaining the rationale for the research questions, the objectives and the main hypothesis of the case study research. The following section continues by providing a more detailed account of the different components of the analytical framework, namely the context for a collaborative research, the case study selection process and the characterization of the case studies, as well as the methods used in each empirical stage. The chapter concludes with a summary of how each paper was expected to deliver on the objectives of the case study research and contribute to responding to the hypothesis explored through this thesis.

Research questions, objectives and hypothesis

The rationale for this research began with the interest on the topic of Climate Change (CC) adaptation policies and action-plans in Portugal that would integrate a long-term perspective. This interest led to my reviewing three bodies of literature (see Chapter II), proposing conceptual and theoretical approaches with a focus on the issue of transitions and transformative changes over the long-term. While addressing these bodies of literature a first research question was formed, concerning how the three research fields could provide complementary insights and methodological approaches that would aid in governing CC adaptation processes towards more sustainable futures. I hypothesized that the multidisciplinary context of CC adaptation research would be more prone to

developing new methodologies or new applications of existent approaches and modes of governance (e.g. Transition Management; Strategic Niche Management; Adaptive Co-management; Dynamic Adaptive Policy Pathways) that deliberately attempt to influence or steer more sustainable and transformative development pathways.

Climate change research has not always been framed in the context of a transition or a transformative change. In fact, as explained in the final section of Chapter II, the idea of transformational adaptation is a recent concept in CC science. Moreover, although adaptation has always been viewed as a long-term process in IPCC reports (Parry *et al.*, 2007; Mimura *et al.*, 2014), this does not apply to the Portuguese context, where long-term planning for CC adaptation appears to be still in short supply (O'Riordan *et al.*, 2014). This recognition led to questioning how an adaptation concept is translated into the Portuguese context, namely in how scientific research, political strategies and action-plans, as well as civil society initiatives, are incorporating the idea of incremental and/or transformational adaptation, while responding to the societal challenges posed by CC. This rationale brought me to a series of interrelated research questions that guided the empirical studies. First, it was relevant to understand how CC adaptation is being interpreted by social actors. Is adaptation being mainly perceived as a set of technical options to address a local problem caused by global CC, or as part of a broader sustainability goal towards a more resilient society? This interrogation led to a following question concerned with how the adaptation concept (as incremental and/or transformational) could translate into public policy, into civil society initiatives, and in methodological approaches for CC adaptation research. It became equally pertinent to ask if CC adaptation policies and actions at different levels and scales of governance in Portugal are influencing new governance arrangements. Finally, it was relevant to understand if PAR approaches implemented by a collaborative body of researchers from various scientific disciplines, but also by policymakers and/or civil society initiatives, encourage a political and societal reflection on the possibility for influencing more sustainable development pathways. This question led to thinking if PAR could go beyond reflection, to promote real-life and concrete adaptation outcomes that would influence more sustainable development. Thus, to address the research questions, the analytical trajectory set out the following three research objectives:

(i) To characterize adaptation case studies at different levels and scales of governance, responding to distinct types of CC related impacts in Portugal;

(ii) To test, experiment and co-create participatory methodologies and approaches with local communities and stakeholders;

(iii) To produce and evaluate adaptation outcomes: visions, strategies, actions and plans in Portugal.

These objectives were pursued through the empirical case studies described in the following subsection. The investigation was developed based on a collaborative research framework, which allowed for experimenting with participatory action-research (PAR) in the context of Portuguese CC adaptation case studies. This experimentation equally granted the possibility to gain a better insight into some applications of the literature reviewed.

Finally, the research questions and objectives led to the main hypothesis of this thesis: In CC adaptation research, Participatory Action-Research (PAR) promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance. Table 3-1 below shows a synthesis of the research questions (A to E) of this thesis, leading up to the main hypothesis.

Table 3-1 Research questions and hypothesis of the thesis

Research questions
A. Do the three research fields – Sustainable Transitions; SES Resilience Framework; and Social Practice Theory - provide complementary insights and methodological approaches that can be sufficiently operationalized in order to aid in governing climate change adaptation processes?
B. What are the socio-political interpretations of climate change adaptation in Portugal?
C. How does the adaptation concept (as incremental and/or transformational) translate into public policy, civil society actions, and methodological approaches for empirical case study research?
D. How new governance arrangements at different levels and scales of governance are influencing climate change adaptation in Portugal?
E. Do participatory action research (PAR) approaches encourage a political and societal reflection on the possibility for influencing more sustainable development pathways?
Hypothesis
In CC adaptation research PAR promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance.

Three rationales led to posing the main hypothesis. First, PAR (explained and illustrated with two case studies in Paper 1, Chapter IV) is known to potentially create a

forum for a continuous engagement among researchers, policymakers, and civil society (Avgitidou, 2009; Wittmayer and Schäpke, 2014). Second, such fora for engagement may result in feedback loops in communications, interactions and reflexive processes among those who have been genuinely and properly involved, and who continue interacting even after the research period ends (Sondeijker *et al*., 2006; Sayce *et al*., 2013). Third, the up-scaling of interactive and reflexive decision-making processes in the context of policy-making, may support political commitments and the mainstreaming of discourses, policies and actions concerning the topic/s of interest (Stirling, 2006; Stirling, 2008). Thus, if the topic is CC adaptation, PAR may properly engage researchers, civil society groups and policymakers around the issue of CC adaptation in their community, city or region, cyclically generating collective discussions, and reflexive and deliberative processes. This engagement may result in the up-scaling of the CC adaptation topic among other social groups and individuals in the same community, city or region. Over the medium and long-term, these dynamics may lead to the mainstreaming of CC adaptation discourses in different arenas, from policy making to civil society initiatives. Therefore, PAR approaches are understood here as being implemented by multidisciplinary and transdisciplinary teams of scientists, and/or policymakers, and civil society groups, bringing together different systems of knowledge throughout the empirical research (McNiff, 2013). The case studies selected illustrate examples of different social groups who engaged in co-creating and implementing these approaches with researchers.

All case studies should be interpreted as ongoing experiences. Considering the cyclical nature of PAR (which is a subject addressed in Paper 1, Chapter IV), each case study has completed one reflexive cycle of PAR, from diagnosis and planning to implementation and evaluation. The PAR process should continue beyond the research involvement, and be led by the social actors engaged and interested in pursuing goals for more sustainable and resilient communities. Therefore, the case studies offer the possibility of observation and experimentation in a fraction of the time taken by a PAR experience, which is by nature, cyclical.

Collaborative research and case studies

To address the research questions, pursue the research objectives and test the main hypothesis, the empirical interventions focused on CC adaptation case studies in Portugal. Throughout the two years of empirical work, the research team maintained that mutualism and shared decision-making should be basic principles for progressing and articulating the work together. Thus, different responsibilities were distributed among team members for coordinating each case study's research.

I was given the responsibility of coordinating the research of one of the niche projects in the Alentejo case study (South of Portugal) – the Convergence Centre of Amoreiras Village. I was also given the responsibility of coordinating a coastal adaptation case study in Íhavo and Vagos (West Atlantic Coast, North of Portugal), for which my colleague André Vizinho (an environmental engineer), was also co-responsible.

My colleague Filipe Moreira Alves coordinated the Cascais action-research case study that informed two papers of this thesis. In the Cascais case study, and for the purpose of this thesis, I structured some analytical components and case study interactions, for which I was responsible and which informed Papers 1 and 2.

Throughout the BASE project I collaborated in several deliverables and research processes, which involved a continuous interaction with other consortium partners, also developing case study research in their countries. These interactions granted a comparative perspective on how the different research partners in the European consortium were implementing their case studies. In one of these deliverables, concerned with assessing national adaptation policies in European countries, I implemented a set of semi-structured interviews to Portuguese policymakers and specialists involved in the Portuguese National Adaptation Strategy (PNAS). These interviews were complemented by a documentary analysis of the PNAS and equally informed Paper 2.

Lastly, I participated in various other BASE field work activities. Although the results of those activities have not been used in this thesis, they provide further illustrations of the collaborative framework that characterized the BASE project and our case study research activities. I am a co-author in papers being currently produced by my colleagues as a result of these research activities. One example is the research on the Alentejo region. The case study approach to this region was subdivided into two directions. While my colleague André Vizinho coordinated the macro analysis of adaptation options for the Alentejo region, with a focus on the Agriculture and Forestry

sectors, I coordinated the study of a niche project (i.e. the Amoreiras Village Convergence Centre), with a focus on the societal dynamics of rural communities adapting to CC. Nevertheless, I cooperated on several occasions in the Alentejo case study, by designing workshop structures and questionnaires used during participatory events, facilitating workshops and collecting and analysing data. Two examples are provided below:

- The participatory state of the art workshop of CC adaptation in Alentejo, held in Beja, in November, 2013: a group of researchers, farmers and regional and national policymakers debated the state of the art and knowledge gaps of CC adaptation for the region.

- The participatory multi-criteria workshop of CC adaptation options for Alentejo, held in Beja in November, 2014: a group of farmers and representatives of farmer associations discussed and prioritized different adaptation options for the Alentejo region, which had resulted from an interview survey to farmers undertaken during the previous year.

Another example of the additional empirical work developed throughout the past two years is a national survey of a representative sample of Portuguese municipalities on local CC policies and programs. This survey was co-implemented by the CCIAM group (referred in Chapter I) and by the Institute of Social Sciences of the University of Lisbon, in the context of project BASE. The questionnaire used in this survey was initially designed by me and further developed with researchers from the Institute of Social Sciences, who continued implementing this activity. Presently, a research paper with the results of this survey is being produced and co-authored by me.

Thus, although I participated in various BASE research activities, the two action-research case studies which I coordinated (the Amoreiras Village Convergence Centre and the coast of Ílhavo and Vagos) and the two analytical case studies (Cascais and the PNAS) supplied the empirical data used in the four research papers. These case studies provided a multi-level and multi-scale analysis (Adger, 2001; Adger *et al*., 2005) of adaptation processes in the country. They offered the possibility to address the research questions (A to E, see Table 3-1), and to respond to the main hypothesis.

Case study selection and characterization

As referred to in the Introduction (Chapter I), the case study selection criteria were co-defined by the collaborative research team, in order to select the case studies that would best address the objectives of the BASE project. However, in order to select the case studies that could respond to the objectives of this thesis, a set of *Ex post* criteria was determined in the initial stages of the PhD research. *Ex post* criteria refers to criteria that have been determined based on empirical knowledge and observations. These criteria have been central to establish the grounds for pursuing the research objectives and guide the case study analysis developed in the articles. Thus, the criteria are an early result of the empirical research, but have equally provided tools to decide which case studies and conceptual frameworks would be analysed in the articles. The criteria are given in Table 3-2 below.

Table 3 -2 Ex post criteria for selecting case studies relevant for this thesis

Criteria	Focus of Analysis
Innovation	What is innovative in the case study? Is it a particular technique studied, developed or implemented? A mode of governance? A socially innovative initiative? A new methodology implemented to aid decision-making?
Actors involved and stakeholder groups	What type of actors are involved? Regime actors (i.e. actors representing dominant rules, structures and practices)? Innovators (i.e. *frontrunners* as referred by Loorbach, 2010)? And which particular stakeholder groups have been identified and involved?
Governance levels and scales	At what governance level has the case study been developed (e.g. Municipal? National level?), and at what scale (e.g. involving one or two municipalities?)
External pressures and climate related impacts	What are the external social and ecological pressures (e.g. land abandonment)? What are the climate related impacts (e.g. rising sea-level)?
Stage of the adaptation process	There are different proposals in the literature on how adaptation processes may be broken down into particular stages (Burton *et al.*, 2004; Schmidt-Thomé and Klein, 2013; Ford *et al.*, 2013). The suggested stages in this criterion are: vulnerability assessment; planning (including the prioritization of adaptation options); implementation; monitoring and evaluation. However, this simplistic outline is viewed as a cyclical and continuously evolving process, in the medium and long-term.

Based on the *Ex-post* criteria, the following Table 3-3 offers a characterization of the case studies that have been analysed throughout the four papers.

Table 3-3 Characterization of the case studies used in the research papers, based on Ex-post criteria

Case Studies	Timeline*	Innovation	Actors involved and stakeholder groups	Governance level and scale	External pressures and climate related Impacts	Stage of adaptation process
Amoreiras Village Convergence Centre (Village in Alentejo; South of Portugal)	June 2013 – March 2014	A permaculture design for a sustainable village in Portugal	Innovators: Social and environmental activists	Village	Increased average temperatures, leading to lower soil productivity and potential increase in land degradation and land abandonment	Planning and implementation
Ílhavo and Vagos (Coastal Zone; North of Portugal)	November 2013 – July, 2014	Collaborative long-term adaptation plan for the coast.	Regime actors: policymakers, spatial planners administrators; residents; business owners; farmers; fishermen	Inter-municipal	Erosion; rising sea-levels; extreme events	Vulnerability assessment and planning
Cascais (City; Centre of Portugal)	June, 2013-July, 2015	One of the first three Portuguese cities to have a Climate Strategy	Regime actors: Policymakers; spatial planners ***	Municipal	Heat waves; flooding; human health	Planning, Implementation and monitoring
Portuguese National Adaptation Strategy	October-December, 2014	Precedes the European Adaptation Strategy	Regime actors: Policymakers and spatial planners	National	All impacts expected for Portugal**	Vulnerability assessment

*Case studies are ordered according to the timeline of the research activities developed.
**The PNAS and its context is explained in further detail in Paper 2
***The Cascais action-research case study developed by my BASE colleagues included other stakeholder groups, namely residents, business-owners, NGOs, education and health officials. However, the stakeholders involved in the empirical data that informed this thesis, specifically Paper 2, are the ones listed here.

Case study research and objectives

This section explains in further detail the research activities, and how each case study responds to the objectives of the thesis. The order of case studies (listed on Table 3-3)

corresponds to the timeline of the activities implemented over the past three years for the purposes of this thesis.

Convergence Centre of Amoreiras Village

The first case study to be developed was the Convergence Centre of Amoreiras Village (ACC). The study is the subject of Paper 3. This case study responds mainly to the first two objectives. It provides a characterization of an adaptation case study in Portugal [objective (i)] and allows for experimentation with a methodological approach, i.e. the Systematization of Experiences (SE) [objective (ii)]. Nevertheless, the results of the SE lead to accomplishing objective (iii), as will further discussed in Chapter V.

The Systematization of Experiences (SE) is method for participatory assessments of ongoing or past projects, used in community and development studies (Mantilla, 2010). The method is described in Paper 3. A key characteristic of the SE is that it results in a collective self-evaluation of a community, with a focus on the outcomes, but also on the process of a past or ongoing project. The SE of the Convergence Centre was the first action-research experience developed in the course of the PhD research, and was marked by a particularly close involvement with the case study partners (i.e. the members of the Convergence Centre). The SE included the planning and facilitation of a three-day residential workshop, as well the organization of the information collected during the empirical research (which lasted roughly nine months) into a final report (in Portuguese) that was afterwards converted into Paper 3. The SE included distinct methodological stages (described in Paper 3). These methodological moments were co-created by the case study partners together with myself, based on other applications of the method (Mantilla, 2010). When applying the SE method, we were not too concerned to follow the manual strictly. Instead, the method was adjusted to account for the principles that shaped the ACC's mode of working, based on participation and collective decision-making. For instance, the program for the three-day workshop was co-created with the various participants, who suggested methodological techniques to be used, such as the World Café (described in Paper 3).

The SE comprised a continuous dialogue with the local partners, through emails, phone conversations and informal meetings. While developing the research, I spent a period of about forty days at the Amoreiras Village (July/August of 2013), followed by a number of four visits, which allowed for a personal experience of the village, of individual and group social practices, and of the work and influence of the ACC in the region. The

research included 17 in-depth interviews, almost all done throughout this period and before the residential workshop. These quite often progressed to more informal conversations, and in some instances were extended over one or two days.

Throughout the research period, I took up the role of a participant observant (Dewalt, 2010). I adopted the Dewalt's understanding of Participant Observation as a «method in anthropological fieldwork» (DeWalt, 2010:259). Thus, I combined in-depth interviews with participant observation of life in the ACC community, and followed DeWalts' perspective, who argues that:

> «[…]the method of participant observation requires a particular approach to recording observations (in field notes) and that the information the ethnographer gains through participation is as critical to social scientific analysis as more formal research techniques like interviewing, structured observation and the use of questionnaires and formal elicitation techniques. » (Dewalt, 2010:259)

I used a field diary, taking notes which were organized into the following sections:

- *Community events*. I participated in these events, such as parties, lunches and dinners, and took notes of my observations, reflections, or conversations heard. For example:

> «Community dinner and celebration: At one side a group of children was dancing by a bonfire. At the opposite side of the garden, Richard[13] was teaching "capoeira"[14] moves to other ACC members. An elder village woman watched. She had helped making dinner, and combined a local meat dish with a vegetarian option, which pleased both vegetarians and non-vegetarians members of the ACC. Against my expectations only one member of the ACC at the time was vegetarian. I associated vegetarianism to ecological thinking, and organic farming, promoted by the ACC member. Apparently this is not so. » (Own field notes, August, 2013)

---

[13] All names used are aliases
[14] "Capoeira" is a Brazilian martial art.

- *Community work*. Restoring a local house, and the SE project were the main focus of activities at the time (June-September, 2013). I took notes following each interaction with the ACC members during the SE. I also registered observations of the work being done to restore an old house which was referred to as the *volunteers' house*, because it was destined to provide housing to those who came for shorter periods of time to work at the ACC.

- *Individual and group practices of the members of the ACC*. Informed by a practice approach, I witnessed and registered some practices of the members of the Convergence Centre. I was interested in understanding if these practices were specific to rural life, and if and how the ecological principles of the ACC members were embedded in their everyday life practices. For example:

  «After giving a bath to her two children, Lana used what was left of the bathtub water to water her garden. She only used organic soap, so the water had no chemicals. "This water is really good for the soil", she explained. She used a small bucket to patiently take out the water left on the bathtub to the garden outside. "I filled this bucket three times, each bucket is one liter so that's three litters of water I would have wasted," she said. » (Own field notes, August, 2013)

- *Work experiences outside the ACC*. Since most individuals could not earn a living with their involvement in the ACC, they had found other sources of income. On one occasion I helped in harvesting the fruit *physalis* (also known as ground berries), while interviewing one of the members of the ACC, who was working in this field, located about a 10 km away from Amoreiras village.

The results of the Systematization of Experiences are given in Paper 3. However, the participant observation of the ACC could not be recounted in full within the scope of Paper 3, and raised several questions and ideas for further research, as discussed in Chapter V.

Coast of Ílhavo and Vagos

The coast of Ílhavo and Vagos case study illustrates the arguments of Paper 1 and is the main focus of analysis of Paper 4. The study was coordinated by me and co-developed

from the beginning with my colleague André Vizinho. The resulting methodological design and its implementation is the product of our continuous collaboration. All decisions and empirical stages of the case study were implemented together, except for the interviews to stakeholders (designed and conducted by me), which followed the participatory workshops.

This case study addresses the three research objectives. First, it offers a characterization of a case study in Portugal at a different governance level and scale than the ACC. The case study includes two municipalities and their various stakeholder groups, as well as representatives of a regional association of municipalities, and of national governmental agencies (see Table 3-3). Second, the study achieves objective (ii) by providing an example of a new combination of methodologies (i.e. the Scenario Workshop and the Adaptation Pathways and Tipping Points[15]), which resulted in a novel methodological approach co-created through the involvement of local communities and other stakeholders. Finally, one outcome of the methodological experience is a long-term adaptation action-plan for the coastal area, thus accomplishing objective (iii) (i.e. to produce adaptation outcomes).

The Coast of Ílhavo and Vagos case study involved a series of collaborations with previous research projects and the scholars involved, namely projects CHANGE and project ADAPTARia[16]. These projects and the information they provided for the Scenario Workshops and Adaptation Pathways are detailed in Papers 1 and 4. Therefore, it is important to note that, though coordinated by me, this large case study research resulted from the collaborative participation of a wide number of researchers, who are therefore integrated in Paper 4 as co-authors. For instance, the Scenario Workshops benefited substantially from the knowledge produced by CHANGE and ADAPTARia on coastal vulnerabilities to flooding, erosion and rising sea-levels. The Geographical Information System's maps used in the workshops were adapted from the maps produced by those two projects, with the permission and collaboration of the researchers involved (from the University of Aveiro and the University of Lisbon). These external researchers were also invited to participate in the workshops and contributed to the discussions and analysis of results. Finally, following the participatory events and interviews to stakeholders, an

---

[15] These methods are explained in Paper 4
[16] Links to the CHANGE and ADAPTARia projects' websites were given on Chapter I, footnotes 3 and 4.

economic cost-benefit analysis and a multi-criteria analysis of the adaptation options included in the final adaptation plan was undertaken by Aveiro university researchers, who were sub-contracted by BASE to deliver on this dimension of the study. Thus, the coast of Ílhavo and Vagos case study has had several analytical dimensions and required a multidisciplinary and collaborative scientific approach, which thanks to the combined efforts of different scientific disciplines, was reflected in the considerable number of co-authors listed on Paper 4. Nevertheless, sub-studies, such as the economic analysis, resulted from the initial purpose of co-creating with local communities, as well as regional and national stakeholders, a long-term adaptation plan for the coastal region. This plan was coordinated by me, together with my colleague André Vizinho, in the context of the BASE project.

The Cascais Municipality and the Portuguese National Adaptation Strategy

Aside from the two action-research case studies for which I have been directly responsible, two secondary analytical studies are important for this thesis: The Cascais Municipality and the Portuguese National Adaptation Strategy (PNAS).

The Cascais study, employed in Papers 1 and 2, has been an action-research case study led by my colleagues at the project BASE, and coordinated by Filipe Moreira Alves, between 2013 and 2015. I accompanied the Cascais PAR process from the beginning as a participant observer (Dewalt, 2010). I took notes in my field diary under the following sub-sections:

- *Workshop dynamics*. During the Cascais workshops participants were divided into groups to work on specific tasks (e.g. prioritizing a number of adaptation measures according to the importance for each sector). I participated in these smaller group discussions. My notes focused on how participants responded to the methodologies during the workshop sessions. For instance, noting down if participants appeared motivated or not, if they responded well to the techniques used, if the workshops were dynamic and flowing.

- *Comments on CC and CC adaptation*. Throughout the workshops participants referred to CC adaptation in different ways. Some did not distinguish between mitigation and adaptation. Concerning adaptation options, a frequent remark made related to the problem of financing adaptation. For example:

«Participants in my group felt a lot is being done by the municipality, regarding implementation. Specifically, concerning the problem of fires, technical specialists find that Cascais has put in place an effective plan to combat forest fires. Fires are related to adaptation, since higher temperatures and lower precipitation rates are likely to increase the occurrence of fires in the region, as is stated in the Cascais Strategic Plan for Climate Change. » (Own field notes, June, 2013)

- *Comments on a resilient and sustainable Cascais city*. These notes focused on the opinions expressed during the workshop sessions, regarding the value of the city of Cascais, and what participants perceived to be the core identities of the region, as well as the problems that needed to be addressed. For example:

«A city planner, referring to what she felt was the 'heart' of the city, said: 'It is not the beach, nor the golf, it's more a history of sun. People drive up here, in the winter weekends, they drive from Lisbon, for a taste of sun - that is Cascais.'» (Own field notes, June, 2013)

At the time the Cascais research was being undertaken, I was leading research on the other case studies. It was not possible to collaborate at every event organized throughout the Cascais study (the Cascais research activities are described in Paper 1, Table 4.1-3). Thus, these notes were taken in two out of the several workshops organized. I have facilitated and observed (together with other colleagues): the Cascais commencement workshop, where all departments of the municipality were represented to assess and prioritize adaptation measures for the region, including those of the Cascais Strategic Plan for Climate Change (Cascais, 2010); and a workshop with a focus on the Tourism sector held during the 2013 Greenfest event in Cascais, with the participation of Tourism entrepreneurs and residents. Aside from the workshops, I've also participated in implementing research activities, in two instances. First, I collaborated in designing the questionnaires used in the surveys. The Cascais case study included two surveys on the topic of CC adaptation in the municipality. One survey was carried out with municipal policymakers, planners and staff, the other with a representative sample of residents in the city. Second, for the purposes of Paper 2, I conducted a set of nine structured feedback interviews with the body of policymakers, spatial planners and technical specialists

involved in CC adaptation policies at the municipality, who also participated in the two-year PAR project. The interview schedule and results are recounted in Paper 2. Papers 1 and 2 draw from the participant observation of this research, as well as from the feedback data collected through these interviews. My colleague Filipe Moreira Alves and João Dinis from the Cascais municipality are included as co-authors in these papers, since the analysis I conducted resulted from a participant observation of the research they undertook.

The study of the Portuguese National Adaptation Strategy (APA, 2013) is an analytical case study. The interviews to policymakers and technical specialists from the Portuguese National Adaptation Strategy were conducted as part of a comparative study of European Adaptation Strategies carried out by the BASE consortium partners. Both the coordinator of the BASE project (Gil Penha-Lopes) and myself participated in this comparative analysis by providing inputs concerning the Portuguese National Adaptation Strategy (PNAS). Although this task was initiated by Gil Penha Lopes, who conducted a first interview, it was shortly after taken further by me. Thus, I adapted the interview schedule to the Portuguese context and conducted nine more interviews to PNAS policymakers and technical specialists involved. The interview schedules and their results are described in Paper 2.

The comparative discussion of these two CC adaptation processes (i.e. Cascais and the PNAS) at two levels of governance in Portugal is the subject of Paper 2, which draws from a total of 18 interviews, along with documentary analysis and participant observation of the Cascais adaptation planning experience. Although the two studies contribute to answering some of the research questions (as described in Chapter V, meta-discussion), they mainly address objective (i) by providing a characterization of two adaptation processes in Portugal, at the national and municipal levels of governance.

Closing remarks

Following the methodological trajectory described in this chapter, the four papers to be presented in Chapter IV describe in detail the choice of methods for each case study, and the specificities of the qualitative tools and techniques used. However, it is important to note that the methods used have been co-developed with other researchers involved and

with case study partners, through a collaborative framework that features action-research approaches. Nevertheless, throughout the study process, there has been a continuous effort to integrate methods that, while meeting the objectives of project BASE, would equally provide the grounds for responding to the objectives of this thesis.

Results of the action-learning and case studies experiences are presented through the four papers in the subsequent Chapter IV. These four papers attempt to provide responses to the research questions (see Table 3-1). The meta-discussion in Chapter V will expand on how each article responds to the questions and ultimately how the four papers and case study research confirm the hypothesis investigated. Figure 3-1 below summarizes the analytical framework for this thesis, based on the three objectives and case studies.
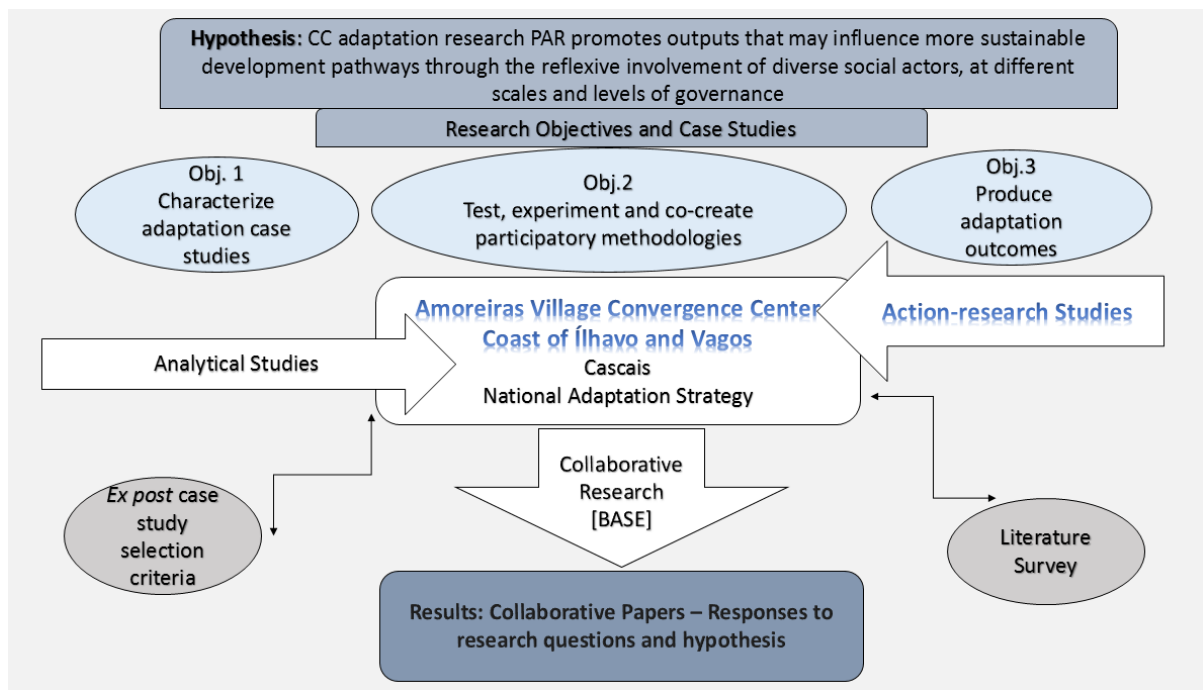
Figure 3-1 Synthesis of Analytical Framework: hypothesis, objectives and case studies

Chapter IV
Results

Introduction

The thesis is the outcome of distinct empirical experiences, but equally of the reflexive process that accompanied its multidisciplinary Participatory Action-Research (PAR) framing. This reflexive process is embedded in the course of the methodological path, which is interpreted as an outcome of the research carried out. Given the different empirical case studies, the results are as much the sum total of the specific pragmatic outcomes of each study, as of the interpretive and analytical accounts of the studies described in the research papers. Therefore, the particular scientific contexts, the methodological approaches and results of each case study are presented in the form of four research papers. However, the integrative analysis of the papers leads to answering the research questions and hypothesis of this thesis. Thus, the results should be considered from a two level perspective.

At the micro level, each paper addresses a specific research question, emerging from the particular case study. The aims of the papers equally derive from empirical questions, which resulted from the case study research objectives. However, at a meso level, when considering a meta-analysis of the four papers, the questions of the thesis are central. This meta-analysis will be the subject of the following Chapter V, while the focus of this chapter is on relating the case study research and provide the results from a micro level perspective.

All research papers have been submitted to peer-review journals. Papers 1 and 3 have been published[17], the other two papers are still under evaluation.

Paper 1 begins by offering an account of PAR in climate change adaptation case study research and its links to sustainable transition studies. The article results from a

---

[17] **Paper 1**. Campos, I., F. M. Alves, J. Dinis, M. Truninger, A. Vizinho and G. Penha-Lopes (2016) Climate adaptation, transitions, and socially innovative action-research approaches. *Ecology and Society* 21 (1):13. [online] URL: http://www.ecologyandsociety.org/vol21/iss1/art13/
Paper 3. Campos, I; Vizinho, A. Truninger, M; Penha-Lopes, G. (*2015) Converging for deterring land abandonment: a systematization of experiences of a rural grassroots innovation. Community Development Journal*, doi: 10.1093/cdj/bsv05

reflection on the empirical interactions developed in the context of a collaborative case study research on long-term sustainable climate change adaptation. Paper 2 arises from an interest in understanding how climate change adaptation strategies translate into adaptation action, by investigating the role played by participation in policy-making processes, based on interviews to policymakers, spatial planners and technical specialists. Finally, papers 3 and 4 relate two contrasting case studies where PAR approaches have been co-developed with local communities and stakeholders. Specifically, paper 3 offers an insight into a retrospective analysis co-developed with the case study partners, with the objective of assessing the impact of a grassroots innovation in a rural village, facing land abandonment and land degradation. Paper 4 describes and analyses how a methodological approach facilitated the making of a long-term action-plan in a vulnerable coastal region comprising two municipalities. The papers are followed by a list of references used in each article.

Paper 1

Climate adaptation, transitions and socially innovative action-research approaches

Inês Campos; Filipe Moreira Alves; João Dinis; Mónica Truninger; André Vizinho; and Gil Penha-Lopes

Centre for Ecology, Evolution and Environmental Changes (CE3C) Faculty of Sciences of Lisbon University*; Municipality of Cascais**; Institute of Social Sciences of Lisbon University***

Abstract

Climate Change may be a game-changer for scientific research, by promoting a science that is grounded on linking the production of knowledge and societal action in a transition towards more sustainable development pathways. The paper discusses Participatory Action-Research (PAR) as a way of thinking and leading investigations that may promote incremental and transformative changes in the context of Climate Change Adaptation research. The exploration is addressed in the Portuguese context, where PAR and sustainable transition studies are still marginal, and adaptation processes are a recent topic in political agendas. The characteristics of PAR are depicted, and two studies of adaptation illustrate how research and practice co-evolve through interactive cycles. The two studies are works in progress, they are not completed PAR processes. Climate change adaptation is an ongoing and long-term process. Moreover, in Portugal, as in many regions of the world, CC adaptation is a fairly new topic. Thus, both case studies are now initiating a long-term process of change and adaptation. Thus, completing one research cycle is a realistic expectation which the authors have upheld throughout the two case study experiences. Discussion of case studies considers how these experiences provide insights on the role of PAR for long-term regime changes. The concluding section points to the societal needs addressed by PAR, as a pragmatically oriented and a context specific research design. The approach can be complementary to other frameworks in sustainable transition studies, such as Transition Management (TM). Being more pragmatically oriented, PAR cycles may influence incrementally transformative changes that can be guided by TM's long-term design for governing sustainable transitions.

Keywords: Adaptation; Transitions; Participatory Action-Research; Portugal

Introduction

At the core of human evolution, adaptation and transitions are a constant and unavoidable challenge for people all over the world. However, considering the challenge of Climate Change, adapting to a changing environment may be only the tip of the iceberg; a societal transformation towards sustainability is needed to resolve the world's persistent problems (Westley et al. 2011, Pelling et al., 2014). Climate Change may be a game-changer for scientific research, by promoting a science that is grounded on linking the production of knowledge and societal action towards more sustainable development pathways (Pelling et al., 2014). In climate change science, adaptation refers to 'the process, action or outcome in a system (household, community, groups, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity.' (Smit and Wandel 2006: 282). In this context, research gains from continuously reflecting on how it promotes a transition towards better adapted societies (Pelling 2010, O'Brien 2012).

The study of sustainable transitions (Markard et al. 2012) has evolved in the past decades as a scientific response to the challenge of governance for sustainable development (Meadowcroft 2009, Miller et al. 2013). Long-term dynamics and an interdisciplinary paradigm are central features of sustainability research (Avelino and Rotmans 2010). A transition is a long-term process (25 to 50 years or more) characterized as a 'gradual, continuous process of change where the structural character of a society (or a complex sub-system of society) transforms.' (Rotmans et al. 2001:16). Sustainable transitions have been strongly rooted in innovation studies, from which emerges the nomenclature of 'socio-technical regimes', 'niches' and 'landscape' (Markard and Truffer 2008). The regime is a 'deep structure' (Geels 2011: 28) that maintains the stability of the societal system. Therefore, transitions are often denoted as regime changes, and it is desirable that these changes follow a sustainable direction (Loorbach 2010). Within or outside the boundaries of the regime, there are less dominant and innovative constellations – the niches. The landscape is identified in relation to the regime and niches, as a set of contextual features that influence these subsystems. Though many studies have focused on climate change related topics, the main emphasis has been on mitigation, such as studies of energy transitions and urban mobility (Kern and Smith 2007, Kemp and Rotmans 2004). More recently, climate change adaptation has been

approached from a sustainable transitions perspective, both conceptually and empirically (De Haan and Rotmans 2011, Nevens et al. 2013).

In the study of climate change adaptation, there is a significant body of literature arguing for the inclusion of participatory approaches in research (Amaru and Chhetri 2013, Fabricius et al. 2013). Participation allows for a continuous brokerage between scientific and lay knowledge as new governance and learning arrangements are expected to promote adaptability (Folke et al. 2005, Olsson et al. 2006,). These frameworks are supported by participation, community involvement and collective action (Adger 2013, Hobson and Niemeyer 2011). Studies have also linked transformation and transition literature in designing frameworks to investigate climate change adaptation, perceived as a cyclical, incremental and transformative process of change (Park et al. 2012, Kates et al. 2012).

Participatory action-research (PAR) is characterized by its continuous interactive cycles of research and action-engagement (McNiff 2013, Wittmayer and Schäpke 2014). Rather than following a linear, simplistic approach, PAR imposes a flexible, cyclical and co-evolving process that arises from the meeting of practitioners and researchers (Badham and Sense 2006). This dynamic feature seems appropriate for studies of adaptation and transition processes (Nevens et al. 2013). Thus, this article aims at understanding how PAR supports incremental and transformative change (i.e. a transition) in the context of adaptation. The analysis is based on two case studies in Portugal.

In Portugal, participation and deliberative processes have not been mainstream in political arenas, and adaptation planning activities are mostly characterized as managerial and top-down processes (Carneiro 2007, Alves et al. 2013). Planning adaptation is a new subject for the country's political agendas. A National Adaptation Strategy was proposed in 2010, but implementation is still at its early stages. At the local level, only three municipalities have a climate strategy. Participatory approaches are unusual in Portuguese environmental scientific research, and decisions resulting from participative processes are difficult to integrate in political arenas, mostly because they oppose conventional and standing decision-making processes (Carvalho-Ribeiro et al. 2010, Schmidt et al. 2014). Portugal has also not received much attention from the transition research field. A review of published studies drawing from research in the country revealed few (Murray at el. 2007, Boavida et al. 2013); and mostly focused on technological transitions for mitigating climate change impacts.

In the following section, the paper explains the PAR approach, including its relevance in transition research. The article continues by relating the methodology and reflexive analysis of the PAR cycles, including the methods used and the resulting insights. The following discussion section considers how these findings provide understandings on the role of PAR in the study of long-term regime changes. The conclusion points to the needs addressed by PAR and its complementarities with other frameworks for future research.

Participatory action-research (PAR)

The term 'action research' (AR) was coined by Kurt Lewin (1946) who introduced the concept with his 1946 paper – 'Action Research and Minority Problems'-, describing a looped action of research, used as a tool to resolve conflicts among marginalized societal groups (Susskind et al. 1999). Succeeding Lewin and later Paulo Freire's (Freire 1972) first applications of AR to promote social inclusion, consensus and democracy, the approach has been also extensively used in Medicine (Baun et al. 2006; Bradley 2007). AR differs from conventional research due to its cyclical nature. Action and research progress block by block, forming an 'interactive reflective cycle' (Baun et al. 2006:854). A three-step cycle of planning, implementation and evaluation is often used (Alrichter et al. 2002). However, variations to this cycle have been developed in environmental science. For instance, the integrated sustainability assessment approach uses a four-step cycle, including diagnosis before planning (Jäger et al. 2008).

When AR is implemented through a continuous involvement of social actors it becomes Participatory Action-Research (PAR), which relies on the assumption that those being researched should actively participate in the process of researching (McNiff 2013). PAR can be defined as 'an enquiry with people rather than on people' (Alrichter et al. 2002:130). Such 'enquiry with people' may lead to the self-mobilization of communities, where 'people participate by taking initiatives, independent of external institutions, to change systems' (Ashley et al. 2009: 24). Most often, PAR implies that researchers and participants co-determine the objectives, questions, and methodologies by tapping on 'the perceptions of practitioners within particular, local practice contexts' (Argyris and Schön 1989: 613). This process is linked to the characteristics of the action-group, composed of both researchers and participants (Audet and Guyonnaud 2013), and generally responsible for leading the research. This group should be established at the initial stages

of the process, but may take time to form or even be the result of a first cycle. These dynamics characterize the forms of engagement and relations of trust and legitimacy established between researchers and participants (Ashley et al. 2009).

AR in Sustainable Transitions

Conceptual frameworks for investigating the co-evolving multilevel dynamics of socio-technical systems argue for integrating more reflexive and deliberative designs (Hendriks and Grin 2007, Voß and Borneman 2011). Transition Management (TM) (Rotmans et al. 2001, Loorbach 2010) is a governance approach in which future visions are co-created and shared in order to define short-term objectives that can meet long-term goals. TM is considered a new mode of governance, for a new generation of long-term planning (Loorbach and Rotmans 2010, Loorbach 2010). The framework is AR oriented, and seeks to promote, influence and monitor sustainable transitions (ST) (Audet and Guyonnaud 2013). TM follows a four-stage cyclical method, engaging a group of selected 'frontrunners' (or 'niche actors') in a 'transition arena' (Loorbach 2010). Thus, the transition arena can be considered an action-group, whose members are selected by the researchers steering the TM experiment. Arena actors envision potential futures and design and implement different strategies to pursue those futures. Monitoring and reflexive activities support the advancement of the transition.

Methodology and Insights

This paper's application of AR emphasizes its participatory version (i.e. PAR). Taking stock of the literature reviewed, the discussion is illustrated by two case studies in Portugal: the Coast of Ílhavo and Vagos, and the Cascais municipality (henceforth referred to as Cases 1 and 2 respectively).

The studies have been implemented by the authors of this paper and are characterized in the context of climate change adaptation (see Table 4.1-1), according to a set of criteria: innovation (in the Portuguese context); stakeholder groups represented; external environmental pressures and climate related impacts; and stage of the adaptation process (e.g. assessment, planning, implementation, monitoring) (Schmidt-Thomé and Klein 2013). The objectives of the case studies were to promote sustainable adaptation processes, and investigate the socio-political, ecological and economic features of climate

change adaptation. As participants became involved, new case specific objectives were added to each study. The studies followed four-step cycles: diagnosis (of the problem), planning (the research activities), implementation (of the research activities co-created with the participants) and evaluation (of the results).

The studies are works in progress, they are not completed PAR processes. Climate change adaptation is not only an ongoing and long-term process, but also a fairly new issue in Portugal. Thus, both case studies are now initiating their adaptation processes, and the expectation of researchers has been to complete one research cycle. In both studies, researchers were concerned with forming an action-group who would continue to drive the adaptation process. In Case 1, this task was more demanding as social actors were largely disconnected from each other. In Case 2, forming an action-group benefited from the participants involved, who were active networkers, and with firm connections to other stakeholders. However, in Case 2 participants were mostly institutional actors, and representatives of local communities were poorly included. Furthermore, both studies comprised technical and non-participatory components, which resulted from identical needs and aimed at supporting the implementation of prioritized adaptations. The studies are recounted under the following subtitles, and research activities are summarised in Tables 4.1-2 (Case 1) and 4.1-3 (Case 2).

Table 4.1-1. Characterization of two climate change adaptation case studies in Portugal

Case studies	Innovation	Stakeholder groups represented by the participants involved	External pressures and climate related Impacts	Stage of adaptation process (Burton et al., 2004; Schmidt-Thomé and Klein, 2013)
Municipalities of Ílhavo and Vagos (Coastal Zone - North of Portugal)	Collaborative long-term adaptation plan for the coast	Municipal and district administrations; regional and central governmental administrations; the Aveiro Harbour; NGOs; Local university scholars; resident associations; fishermen and farmers associations; surf schools; beach business owners	Erosion; rising sea-levels; extreme events (climatic impacts already perceived)	Assessment and Planning
Municipality of Cascais (City -Center of Portugal)	One of first three cities in Portugal to have a Climate Strategy – (Cascais, 2010)	Municipality policymakers and spatial planners; health managers and officials; municipal school representatives; business owners; residents	Heat waves; Flooding; human health (climatic impacts are anticipated, based on future climate scenarios)	Planning and Implementation

Case 1

The region is located in the North of Portugal, on the Atlantic Coast of Ílhavo and Vagos municipalities. The area extends from the South of Aveiro Harbour along a coastal stretch of 20 km, between the sea and the Aveiro Lagoon. The region was recognized as one of the most vulnerable low-lying coasts in Europe insofar as storm surges and flood risks (Coelho et al. 2009, Schmidt et al. 2014). A sea level rise of up to a meter in 2100 would aggravate this vulnerability (Fortunato et al. 2013). Nevertheless, despite the already felt environmental pressures, previous research highlighted the absence of an adaptation strategy or action-plan (O'Riordan et al. 2014). Moreover, other studies found that residents in the region considered the University as a neutral institution that should facilitate planning (Schmidt et al. 2014).

PAR cycles and methods

The diagnosis stage was informed by the findings delivered by previous studies in the region, which were confirmed by initial conversations with stakeholders, who stated a plan was needed to respond to perceived coastal vulnerabilities and risks. Thus, researchers proposed facilitating the making of a long-term climate change adaptation action-plan.

A challenge for this study was to build trust between a diversity of stakeholders, so that all could reflect together on different and sometimes controversial adaptation options, reaching consensus. The Scenario Workshop (Andersen and Jæger 1999) method was found to provide a collaborative forum for discussion between diverse stakeholder groups, with the aim of creating a plan for the long-term. For the successful implementation of the method, it was fundamental to form a representative group of stakeholder interests. It was important that participants were leaders or influential persons in the groups they represented, but also prone to be involved in a productive discussion and collaborative process. Finally, involving political actors and all those who would be responsible for implementing a plan was also central.

The process of forming an action-group took time and a series of meetings with local stakeholders groups and/or their individual representatives were held. In these meetings people claimed there was not enough information provided on local climate change impacts. To respond to this information request, two seminars (open to anyone who wished to attend) were organized, with presentations on impacts and potential adaptations, preparing participants for the following research activities. The seminars contributed to establishing a relationship of trust between researchers and the participants, who afterwards were invited to join the subsequent scenario workshop sessions.

The scenario workshop method was implemented along two days. In the first day, participants critiqued potential future storylines, based on climate change scenarios, and developed a common, shared vision for their region. The second day was the making of the action-plan. Between the two workshop days, researchers gathered the needed information (e.g. secondary effects of different adaptation options) in order to prepare the second day's discussions. This information was shared (via email) before the second workshop day. During this interval, it was found that another method should be included to aid in deciding between different adaptation options and in designing a long-term action-plan. Thus, the Adaptation Pathways and Tipping-Points method was adopted. The method has been developed by Hassnoot and colleagues (2013) to support decision-

making in the context of long-term planning processes, which need to deal with a high level of complexity and uncertainty. Thus, integrated in the scenario workshop context, the method was meant to aid participants in working through the different levels and types of uncertainty, while co-creating an action-plan.

Throughout the following workshop session, participants designed the pathways. These pathways are represented by graphs where each horizontal line corresponds to an adaptation action, to be maintained until specific conditions are altered (e.g. sea-level rises above 40cm), and a new policy is needed (e.g. a dike needs to be built). The method allows identifying a set of possible actions (e.g. adaptation measures), which may change in time according to variations in the natural system. By integrating the adaptation pathways in the scenario workshop method, the final outcome was a dynamic adaptation plan for the following 75 years.

Following the scenario workshop, half of the participants were interviewed to evaluate the PAR activities. Workshop transcripts and interviews were helpful to set the goals for the follow-up research activities. Policymakers and spatial planners manifested the need for more information concerning the possible costs and benefits of implementing the plan. Thus, an economic cost-benefit analysis was developed for all the adaptation actions and technical variations listed in the final pathways. Lastly, a report with a synthesis of the results and conclusions of all the research activities was presented to participants, as well as a number of invited political, civil society and business representatives from other municipalities in the region. This final presentation closed a first PAR cycle, yet coastal adaptation in Ílhavo and Vagos is a work in progress.

In order to assure the research continues to support a transition towards better adapted communities, creating the action-group through the scenario workshop interactions was central. The latter included policymakers, residents and local researchers (who integrated the research team while delivering on the economic assessments). This group is applying for grants that may help finance further studies of the impacts of some adaptation options suggested. Studies are also being developed to replicate the planning experience in other regions in Portugal. Finally, building on the knowledge and experiences gained, the Ílhavo municipality is participating on a capacity building program for continuing developing the adaptation process with local and regional stakeholders. This program is benefitting from international financial mechanisms, currently managed by the Portuguese Environmental Agency.

Table 4.1-2. Coast of Ílhavo and Vagos PAR research activities

November, 2013 – February, 2014	February-March, 2014	April, 2014	May, 2014
Begin contacting representatives of various stakeholder groups Present the proposal for making an inter-municipal CC adaptation action-plan.	Municipal stakeholders gradually become active participants. Two Seminars. Presentations of researchers and invited speakers on climate change and adaptation strategies for coastal regions (average of 70 participants)	Scenario Workshop/ 1st Day (26 participants) Critique and Vision Critique of three extreme alternative future storylines (i.e. do nothing; protecting everything; relocate) Common vision for the coast in 2100: Local populations and infrastructures are protected; current coastline is maintained; natural ecosystem is preserved.	Scenario Workshop / 2nd Day (26 participants) Action-Plan Adaptation Pathways and Tipping Points (in 2040 and 2070) until 2100: Sand nourishment operations; strengthening the dune system with a sand dike; submerged detached breakwater (pending further studies); seawalls and groynes; monitoring of sea-levels and coastal erosion.
June-July, 2014	September, 2014-March, 2015	June, 2015	June, 2015
Follow-up semi-structured interviews (12 participants)	Economic Cost-Benefit analysis (November, 2014 – March, 2015): Assessment of the technical options for each adaptation measure, as well as of monetary costs, avoided costs and benefits.	Final presentation to stakeholders of the plan (June, 2015): Around 60 participants attend the presentation of a full report to the wider public	The action-group (i.e., policymakers, researchers from the local university) applies for grants for implementing the plan. Other municipalities experiment the same methodology for CC adaptation planning.

Insights

The first contacts with stakeholders pointed to a communication gap between local communities and decision-makers. Social actors had participated in other investigations, but complained their involvement did not produce real, perceivable outcomes, and their opinions had never been integrated in previous policy planning experiences. There was also a distrust of political actors, who allegedly were not well aware of the problem:

> «One thing I can't stand is hearing decision-makers talking about re-locating
> people on the first line, there is not a first line, it's all the same sea-level!»
> (Fisherman).

Researchers called on political actors to participate. During this research stage, storms destroyed beach bars, and endangered houses built on the shoreline. Images of these storms appeared on national TV. These conditions created a window of opportunity for a closer engagement. Policymakers and planners became more interested in the study, and some residents contacted directly the research group at the University of Lisbon expressing their interest in participating.

Since risks and vulnerabilities are already being felt, stakeholders were driven by the will to sustain their current way of life. This goal was explicit in the consensual vision of the group for the following 75 years that resulted from the first workshop, which could be summarised as: Local populations and infrastructures are protected; the current coastline is maintained; and the natural ecosystem is preserved. This vision entails objectives which are likely to be conflicting (i.e. holding the line and preserving the natural ecosystem). Nevertheless, maintaining the current state seemed to be the most important goal, as one resident stated:

> «I want to be part of a society that leaves the land as it is to my grandchildren. »

The active participation of all in the planning process was central for building trust:

> «For me the best was to be able to reason with politicians, find out we all want the same thing. » (Resident)

> «From the engineers' explanations, I learned a lot about the different options. » (Municipal planner)

Participants also remarked that visual methods, and being able to work directly with the adaptation pathways graphs, facilitated discussions and their understanding of the problem:

> «We were more present in the land, while using the drawings and graphs. » (Resident)

The final pathways (produced in the second workshop day) included a set of consensual actions until 2100. The main actions were: sand nourishment operations; a sand dike in a particularly vulnerable stretch; a submerged detached breakwater; seawalls and groynes, and monitoring of sea-levels and coastal erosion. Political commitment and lack of funding, however, were perceived to be important barriers for implementation. Participants believed the possibility for implementation would increase if it could be proven that the benefits of holding the present coastline would be higher than the costs of inaction.

> «Knowing the [monetary] benefits of these measures can be key to push for political commitment, but the costs are going to be high. » (Municipal planner)

Thus, following the workshops, researchers produced and presented the results of an economic assessment. The conclusions supported the priorities identified in the final pathways. Nevertheless, the analysis equally pointed to the need for further technical studies concerning options such as the submerged breakwater (which has never been done in the Portuguese Atlantic coast). Sand nourishment operations were equally found to have economic benefits that justified the high costs. Nevertheless, a new way of living in the coast may be inevitable:

> «No matter how much sand we put, you will never see those miles of dunes again. » (Local engineer)

Concurrently, a long-term adaptation process will mostly likely be transformational, because hard engineering infrastructures for holding the coastline will probably have significant effects on the ecosystem - despite the group's future vision for both holding the line and maintain the present system state.

Case 2

Case 2 is the city of Cascais, located about 25 km west of Lisbon. The region is a national and international touristic destiny, and the adaptation planning process is integrated in a broader transition towards a greener, more sustainable city. Cascais has been rated as a

top sustainable destiny (EUCC, 2013). The city is one among three in Portugal to have a CC adaptation policy. The CSPCC - Cascais Strategic Plan for Climate Change (Cascais, 2010) integrates a mitigation and an adaptation policy. At the onset of the PAR process, the adaptation document had only been known by a narrow set of municipal policymakers and scientific experts, suggesting a set of 15 integrated and cross-sectorial measures, considered priorities.

PAR cycles and methods

In 2013, the municipality's Agenda 21 Cabinet (Cascais adhered to the UNDP Agenda 21 program) and the research group partnered up with the goal of promoting implementation through a re-prioritization and assessment of potential adaptations to be substantiated by a diversity of stakeholders groups, including representatives of key municipal departments (e.g. health, education, communication), and other social actors. However, from an original plan of making two workshops, the PAR grew to include eight workshops, two surveys and a cost-effectiveness analysis.

The workshops and survey results respectively highlighted adaptation priorities and the main barriers and opportunities for implementation. The following economic analysis focussed on providing an assessment of some priorities identified through the set of workshops, thus delivering information requested by participants on the different costs and effectiveness of measures, with the purpose of aiding the decision-making process, and support political commitment. Finally, a set of structured interviews was done to nine policymakers and planning specialists involved in the Cascais strategic plan. These interviews aimed at evaluating the perceived strengths and weaknesses of the first PAR cycle, and the motivations for continue leading the adaptation process forward.

Thus, this PAR process was characterized by a sequence of responses to requests for additional types of information which lead to involving a multidisciplinary research team (i.e. sociologists, economists, environmental engineers). Researchers and municipal representatives of the Agenda 21 Cabinet formed the initial action-group. However, as the PAR cycle developed, the group grew to include other researchers, municipal stakeholders and city residents.

The final set of workshops were the following: a commencement workshop, where representatives from all municipal departments were present for a reassessment of the adaptation actions proposed by the Cascais strategic plan; six workshops designated as

'sectorial', which aimed at working through the different adaptation options for each sector of the strategic plan; and one resident's workshop.

In the commencement and sectorial workshops, a list of measures from the Cascais strategy and other sources (e.g. UNDP) was provided for discussion and ranking. Participants were tasked with particular exercises, first done individually, then discussed in groups, and finally shared with the whole group by appointed spokespersons. Towards the end of each workshop, individual suggestions were compared to the group rankings and a final prioritization of adaptations was agreed upon. The Tourism, Coastal and the Residents' workshops had a different structure. The Tourism workshop was a brainstorm on possible economic benefits and opportunities of adaptations for the sector. The Coastal involved mapping potential adaptation options for coastal regions. The Residents workshop brought together ten representatives from the six city districts to discuss how local community resources could complement adaptation strategies and actions (e.g. the possibility for green roofs, as a measure against floods).

Agenda 21 partners collaborated with researchers in conducting two surveys: first, a survey to the technical body of diverse municipality departments, and second, a survey to local residents. Both surveys were initially proposed by the municipal partners with the goal of understanding what were the perceived climatic vulnerabilities, the barriers and opportunities for implementing adaptations. The surveys' results highlighted additional information requests, namely the importance of economic analysis for promoting the implementation of adaptation actions considered priorities. Thus, an economic cost-effectiveness analysis was done for the top three priorities (i.e. green corridors, water retention gardens and the sustainable school), which resulted from the final aggregated results of the seven workshops.

Following this first cycle of research activities, a progress report was produced with the results of the workshops, surveys and economic analysis. The report was presented to municipal stakeholders. As in Case 1, the Cascais PAR process is still ongoing, led by the action-group formed by researchers and participants, now developing a second research cycle. This new cycle is focused on integrating the different adaptation options in other municipal policies and programs; and continuing developing economic assessments for implementing a set of 13 top priority measures. Priorities were identified in the seven sectorial workshops, but were not all assessed regarding costs and benefits during the first research cycle. Furthermore, a municipal budget has been allocated for implementing these measures.

Table 4.1-3. Cascais PAR research activities

Commencement Workshop/July, 2013 Revisiting the CSPCC	September 2013, Tourism Workshop (at the Cascais GreenFest)	November, 2013, Biodiversity; Residents, and Water Resources Workshops	February, 2014 Education and Health Workshops
Re-prioritize and substantiate adaptations for the Cascais Strategy (CSPCC) 20 policymakers and spatial planners of different departments, e.g.: Awareness raising; Water efficiency programs; Guaranty the reduction of diffused discharges or pollutants in the water; sustainable school, green corridors in the city	Brainstorm on adaptation actions that can promote a sustainable Tourism. Enumerate potential economic benefits of prioritized measures 45 municipal agents and business owners. e.g.: less water wasted should reduce costs for Touristic infrastructures.	Assess priority measures for these sectors Average of 10 participants on each workshop e.g.: Reforestation; urban farming; Reduce water waste; Eliminate water pollution focal points.	Assess priority measures for these sectors Education: 19 school representatives; teachers; municipal communication department Health: 18 hospital and health centre representatives; state and municipal policymakers e.g.: Information campaigns on climate change and heat waves; Legislation for bioclimatic construction
Survey to municipality (October – November 2013)	Survey to city residents (February-March, 2014)	Cost-effectiveness analysis (January-May, 2015)	Feedback structured interviews (June, 2015)
Online survey to municipal technicians and policymakers (99 responses) Main barriers identified for implementation: «Political will»; «Lack of funding» Main opportunities: «Reducing risk and vulnerabilities»; «Participation and citizen engagement»	Personal interview survey to city residents (1885 valid responses) Main barriers identified for implementation: «Political will»; «Lack of funding» Economic assessments of adaptations considered to be crucial to support action (89.7%)	Identify the costs, benefits, effectiveness and secondary effects of three most voted adaptation options: Green corridors Water retention gardens (as a measure to reduce waste in water) Sustainable school	Assess participatory experiences Learn about impact of PAR on policy integration, as the CSPCC is annexed to the 2015 revision of the Land Use Plan

Insights

In feedback interviews, municipal partners found that the prioritized cross-sectorial adaptation actions in the workshops, such as green corridors or the sustainable school (an environmental education program) (see Table 4.1-3), were congruent with the city's sustainability goals. According to feedback interviews to municipal partners all, except one, found that:

> «Climate change adaptation policies should contemplate medium and long-term action-plans to address perceived and expected climate change impacts, while promoting a transition to a more resilient and sustainable society.»

However, the two surveys identified that political will and lack of funding could be barriers for implementation. In the residents' survey, 89.7% of respondents found that economic assessments of adaptations would be crucial to support political commitment and the allocation of adequate financial resources. Thus, municipal partners strongly pushed for developing those studies, and a cost-effectiveness analysis was done to three adaptations considered priorities. The results of this analysis validated the top priorities as being cost-effective options.

In feedback structured interviews, municipal partners highlighted that PAR had provided a 'better policy integration among departments', 'better dissemination and knowledge sharing on the topic of climate change', a 'collective vision for the future of the municipality' and a 'better technical validation in supporting political decisions and planning processes'. Policymakers and spatial planners also referred that forthcoming PAR cycles should engage society at large. Those directly involved in the first cycle have been either from a municipal department or a partner institution (e.g. schools). Some stakeholders only participated once and were not genuinely involved, for instance in the case of the Tourism and Residents workshops. As a municipal partner stated:

> «More stakeholders need to be called, like local associations, farmers, and Tourism and Golf entrepreneurs. »

PAR was considered successful in promoting a higher level of policy integration that could support further implementation of the prioritized actions. This has been illustrated by the inclusion of the CSPCC, and the new recommended priorities, as an appendix to the 2015 revision of the Cascais Land Use Plan, which municipal stakeholders interviewed agreed to have been reinforced by the research.

Discussion

PAR is guided by the principle of linking knowledge and action (McNiff 2013). The question is if this way of practicing research supports incremental and transformative change (i.e. a transition) to a better-adapted and sustainable society. In addressing this question, case study experiences lead to a reflection on how PAR unleashes sources of adaptability in ways that conventional technical scientific research is not as able to.

PAR studies illustrate learning experiences (Collins and Ison 2009) of new modes of connecting social actors previously disengaged in planning together, establishing collaborations (e.g. Case 1), and facilitating social learning processes (e.g. Case 2). These experiences seem to encourage collective action dynamics (Adger et al. 2013), and offer the possibility to take into account the needs and expectations of a wider number of beneficiaries who had never been included in planning adaptations (Tompkins et al. 2008, Spaling et al. 2011). While facilitating new connections and relations between local groups and individuals (e.g. Case 1), PAR studies also helped to suppress the distance between private stakeholders and public actors by providing a strong body of updated knowledge (climatic, social and economic). The studies created a flexible methodological framework that embraces all levels of subject knowledge into a pragmatically well-explained path for decision support. For instance, both studies included economic analysis requested by local practitioners, who believed these data would support political commitment towards the implementation of the adaptations selected as priorities. Thus, the PAR cyclical dynamics encourage a continuous strategic reflection on how to steer the planning process and promote action. This co-evolution of action and research develops adaptability in ways that are not possible through more analytical and linear approaches, where the main focus is on devising concrete technical solutions, often imposed as an accomplished result to society (Voß and Kemp 2006, Stirling 2008). No doubt providing a body of technical-scientific knowledge has been important. Stirling (2008) discusses this point, which directs attention to the dichotomy between analytical (quantitative, expert-based) and participatory approaches (qualitative, deliberative, democratic) in relation to decision-making and social appraisal. In line with Stirling's reasoning, the case studies illustrate that both types of knowledge have been considered fundamental. However, PAR offers a structure for linking these two types of knowledge production in a reflexive planning process.

It has been argued that scientists need to move from professional, specialized research to be able to interpret and integrate different systems of knowledge, and acting as brokers in establishing a continuous dialogue and learning process between science and practitioners (Folke et al. 2005; Sayce et al. 2013). In both studies, the academics involved were from different scientific disciplines in the environmental and social sciences, but were also skilled and experienced facilitators of participatory techniques. The latter competences have been considered important to motivate participants and establish multidirectional channels for exchanging information and promoting a constructive dialogue (Sayce et al. 2013, Avgitidou 2009). Legitimacy and trust have been achieved, both by seeking strategic local partners (e.g. municipal policymakers) and by building successful narratives (Raven et al. 2015) around the societal and economic opportunities that could arise through adaptation.

The engagement dynamics observed raise the issue of power. Avelino and Rotmans's (2010:799) analysis of power relations in the context of transitions, distinguishes between innovative, transformative and constitutive exercises of power. PAR seems to mostly exert innovative power, it purposely promotes new relations, collaborations and dialogue between actor-groups who were previously disengaged. While interfering with established local power relations, PAR promotes the capacity of actors to create new fora for collective dialogue (e.g. Case 1) and new dynamics in institutional decision-making processes (e.g. Case 2), which may influence incremental transformative changes.

In PAR there are not *ex-ante* decisions on what type of actors to involve. Instead, this selection is a first result of an explorative engagement moment, and is grounded on a baseline knowledge of local needs, preferences, governance frameworks and dominant decision-making mechanisms. Throughout the action cycles there may not be a selective process, but rather an incremental engagement, as different stakeholders are gradually integrated in the planning process (e.g. Case 2). In the Portuguese context, a challenge for PAR has been integrating participatory outcomes in concrete policies, planning activities and development programs. Planning and environmental policy-making in the country have been characterized as institutionally puzzling, encompassing a panoply of governmental agencies (Schmidt et al. 2013); and typically informed by a top-down managerial approach (Schmidt et al. 2014). In this context, working with regime actors in changing the 'status quo' of policy making processes may be more effective than producing academic exercises with local stakeholders and innovators (Carvalho-Ribeiro

et al. 2010). This approach would be contrary to Transition Management (TM), where innovators, or niche actors lead the transition arena (Loorbach 2010). Although in TM (Loorbach 2010), dominant political interests and practices in ways of governing may be also a central obstacle for integrating new visions for the future and long-term goals in transitions experiences (Smith and Kern 2009, Meadowcroft 2009). However, by continuously adjusting itself to local contexts, and to the intricacies of political and administrative processes, PAR can work to influence sustainable transitions in the long-term, through its continuous action cycles for reaching short-term goals. Therefore, although case studies illustrate how PAR dynamics of engagement are sometimes contrary to TM experiments, from a long-term perspective, these dynamics may be complementary.

Conclusion

As a game-changer for science, climate change promotes a research practice in constant transformation that needs to be innovative, reflexive and recreate itself to meet the need of linking knowledge and action. From a system's thinking perspective, PAR could be said to emerge through the co-evolution of science and practice experiments, the two domains being interdependent components. PAR triggers new dynamics for collective decision-making that support a sustainable direction in transformational adaptation. The approach is able to uncover the intricacies of planning and political processes; taking a close account of context-specific challenges for implementation. These challenges may be difficulties in translating decisions resulting from participative processes into effective policies, which need to be addressed for promoting short and long-term political commitments. While building a support base from a wide group of stakeholders, PAR encourages socio-political legitimacy and trust on the results achieved, such as decisions made on adaptation priorities. Yet, rather than based on a conceptualization of niche and regime actors, inclusion in PAR is strongly linked to contextual factors, such as governance arrangements and mechanisms that support or constraint the integration of participation in policy-making. The action-involvement strategies may be contrary to Transition Management (TM), namely its proposal for selecting frontrunners and forming transition arenas. In PAR, the action-group is the product of a sometimes chaotic, unpredictable and incremental engagement process. Nevertheless, both PAR and TM can be complementary in transition studies. Being more pragmatically oriented, PAR cycles

can influence incrementally transformative changes that can be guided by TM's long-term design for governing sustainable transitions. Future research could benefit from articulating the two approaches in climate change adaptation studies.

Reference List

Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2013). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, *3*(2), 112-117. doi:10.1038/nclimate1666

Altrichter, H., Kemmis, S., McTaggart, R., & Zuber-Skerritt, O. (2002). The concept of action research. *The learning organization*, *9*(3), 125-131. doi:10.1108/09696470210428840

Alves F.L., Sousa L.P., Almodovar M., & Phillips M.R. (2013). Integrated Coastal Zone Management (ICZM): a review of progress in Portuguese implementation. *Regional Environmental Change*. 13 (5), 1031-1042. doi:10.1007/s10113-012-0398-y

Amaru, S., & Chhetri, N. B. (2013). Climate adaptation: Institutional response to environmental constraints, and the need for increased flexibility, participation, and integration of approaches. *Applied Geography*, 39, 128-139. doi:10.1016/j.apgeog.2012.12.006

Andersen, I. E., & Jæger, B. (1999). Scenario workshops and consensus conferences: towards more democratic decision-making. *Science and public policy*, *26*(5), 331-340. Retrieved, June 28th 2015, from: http://ncdd.org/rc/wp-content/uploads/2010/06/Andersen-ScenarioWorkshopsConsensusConfs.pdf

Argyris, C., & Schön, D.A. (1989). Participatory action research and action science compared: A commentary. *American Behavioral Scientist*, 32(5), 612-623. http://dx.doi.org/10.1177/0002764289032005008

Ashley, H., Kenton, N., & Milligan, A. (Eds.) (2009). *Participatory Learning and Action 60 – Community Based Adaptation to Climate Change*. Nottingham: Russell Press.

Audet, R., & Guyonnaud., M.F. (2013). Transition in practice and action in research. A French case study in piloting eco-innovations. *Innovation: The European Journal of Social Science Research* 26. (4), 398-415. doi: 10.1080/13511610.2013.850019

Avelino, F., & Rotmans. J. (2011). A dynamic conceptualization of power for sustainability research. *Journal of Cleaner Production*, *19*(8), 796-804. doi:10.1016/j.jclepro.2010.11.012

Avgitidou, S. (2009). Participation, roles and processes in a collaborative action research project: A reflexive account of the facilitator. *Educational Action Research*, *17*(4), 585-600. doi: 10.1080/09650790903309441

Badham, R. J., & Sense, A.J. (2006). Spiraling Up or Spinning Out: A Guide for Reflecting on Action Research Practice. *International Journal of Social Research Methodology*, *9*(5), 367–377. doi:10.1080/13645570600659540

Baun, F; Macdougall, & Smith, D. (2006). Participatory action research. *Journal of Epidemiology and Community Health*, 60(10), 854–857. doi: 10.1136/jech.2004.028662

Boavida, N.; Baumann, M.; Moniz, A.; Schippl J.; Reichenbach, M., & Weil, M. (2013). Technology transition towards electric mobility-technology assessment as a tool for policy design. Retrieved June 25th 2015, from: https://run.unl.pt/bitstream/10362/14158/1/WPSeries_04_2013Boavida_etal.pdf

Bradley, HA; & Puoane, T. (2007). Prevention of hypertension and diabetes in an urban setting in South Africa: participatory action research with community health workers. *Ethnicity and Disease*, 17, 49-51. Retrieved, June 25th 2005, from: http://hdl.handle.net/10566/182

Burton, I., Malone, E., Huq, S. (2004). Adaptation policy frameworks for climate change: developing strategies, policies and measures. In: B. Lim and Spanger-Siegfried (Eds.). *Adaptation policy frameworks for climate change: developing strategies, policies and measures*. United Nations Development Program. Cambridge: Cambridge University Press.

Carneiro, G. (2007). The parallel evolution of ocean and coastal management policies in Portugal. *Marine Policy*, 31 (4), 421-433. doi: 10.1016/j.marpol.2007.02.002

Carvalho-Ribeiro, S. M., Lovett, a., & O'Riordan, T. (2010). Multifunctional forest management in Northern Portugal: Moving from scenarios to governance for sustainable development. *Land Use Policy*, 27 (4), 1111–1122. doi:10.1016/j.landusepol.2010.02.008

Cascais (2010). Cascais Strategic Plan for Adaptation to Climate Change. Retrieved from: http://www.cm-cascais.pt/sites/default/files/anexos/gerais/ag21_plano_estrategico_cc_alteracoes_climaticas.pdf

Coelho, C.; Silva R.; Veloso-Gomes, F.; & Taveira-Pinto, F. (2009). Potential effects of climate change on northwest Portuguese coastal zones. *ICES Journal of Marine Science: Journal du Conseil*, *66*(7), 1497-1507. doi: *10.1093/icesjms/fsp132*

Collins, K.; & Ison, R. (2009). Jumping off Arnstein's ladder: social learning as a new policy paradigm for climate change adaptation. *Environmental Policy and Governance*, *19*(6), 358-373.doi: 10.1002/eet.523

De Haan, J. H.; & Rotmans, J. (2011). Patterns in transitions: Understanding complex chains of change. *Technological Forecasting and Social Change*, *78*(1), 90-102. doi:10.1016/j.techfore.2010.10.008

Dias, J.M, & Alves, F.L. (2013). *Risco de Cheias e Estratégias de Adaptação para a Zona Costeira e Lagunar da Ria de Aveiro.* [Flood risks and adaptation strategies for the costal zone and the Ria de Aveiro lagoon.] Aveiro University: CESAM - Centro de Estudos do Ambiente e do Mar. Retrieved, June 10th 2015, from: http://la.cesam.ua.pt/Documentos/Risco_de_Cheia.pdf

EUCC. 2013. *Enjoy the most: Quality Coast.* Cascais: Quality coast score sheet [online] URL: http://www.qualitycoast.info/?page_id=708=). [Accessed: 5th October 2015]

Fabricius, C.; Koch, E.; Turner, S.; & Magome, H. (Eds.). (2013). *Rights resources and rural development: Community-based natural resource management in Southern Africa*. London: Routledge.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, *30* (1), 441–473. doi: 10.1146/annurev.energy.30.050504.144511

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, & J. Rockström (2010). Resilience thinking: integrating resilience, adaptability and transformability. Ecology and Society, 15 (4), 20. http://hdl.handle.net/10535/7422

Fortunato, A. B., Rodrigues, M., Dias, J. M., Lopes, C., & Oliveira, A. (2013). Generating inundation maps for a coastal lagoon: a case study in the Ria de Aveiro (Portugal). *Ocean Engineering*, 64, 60-71. doi:10.1016/j.oceaneng.2013.02.020

Freire P. (1972). *Pedagogy of the oppressed*. Harmondsworth: Penguin

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, *1*(1), 24–40. doi:10.1016/j.eist.2011.02.002

Haasnoot, M.; Kwakkel, J. H.; Walker, W. E.; & Maat, J. (2013). Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. *Global Environmental Change*, 23 (2), 485–498. doi:10.1016/j.gloenvcha.2012.12.006

Hendriks, C.M., & Grin. J (2007). Contextualizing reflexive governance: the politics of Dutch transitions to sustainability. *Journal of Environmental Policy & Planning 9* (3), 333-350. doi:10.1080/15239080701622790

Hobson, K.; & Niemeyer. S. (2011). Public responses to climate change: The role of deliberation in building capacity for adaptive action. *Global Environmental Change*, *21*(3), 957–971. doi:10.1016/j.gloenvcha.2011.05.001

Jäger J.; Bohunovsky L.; Binder. J. (Eds.) (2008). *Methods and Tools for Integrated Sustainability Assessment.* Project Summary. Sustainable Europe Research Institute, Vienna, AUT. Retrieved, June 25th 2015, from: http://www.slu.se/pagefiles/58724/matisse.pdf

Kates, R. W.; Travis, W. R; & Wilbanks, T.J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, *109*(19), 7156-7161. doi: 10.1073/pnas.1115521109

Kemp, R., & Rotmans, J. (2004). Managing the transition to sustainable mobility. Vol I. *System innovation and the transition to sustainability: theory, evidence and policy*, 137-167. doi: 5bcvt2jnl8pwcdl7/

Kern, F., & Smith. A. (2008). Restructuring energy systems for sustainability? Energy transition policy in the Netherlands. *Energy Policy* 36 (11), 4093-4103. doi:10.1016/j.enpol.2008.06.018

Lewin, K. (1946). Action research and minority problems. *Journal of Social Issues* 2(4), 34-46. Retrieved June 15th 2015, from: http://bscw.wineme.fb5.uni-siegen.de/pub/nj_bscw.cgi/d759359/5_1_ActionResearchandMinortyProblems.pdf

Loorbach, D. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance*, 23(1), 161–183. 10.1111/j.1468-0491.2009.01471.x

Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, *42*(3), 237–246. doi:10.1016/j.futures.2009.11.009

Markard, J., & Truffer. B. (2008). Technological innovation systems and the multi-level perspective: Towards an integrated framework. *Research Policy*, *37*(4), 596-615. doi:10.1016/j.respol.2008.01.004

Markard, J.; Raven, R.; & Truffer, B. (2012). Sustainability transitions : An emerging field of research and its prospects. *Research Policy*, *41*(6): 955–967. doi:10.1016/j.respol.2012.02.013

McNiff, J. (2013). *Action research: Principles and practice*. London: Routledge.

Meadowcroft, M. (2009). What about the politics? Sustainable development, transition management, and long term energy transitions. *Policy Sciences*, 42 (4), 323e340. doi: 10.1007/s11077-009-9097-z

Miller, TR; Wiek A.; & Sarewitz, D. (2013). The future of sustainability science: A solutions-oriented research agenda. *Sustainability Science*: 1-8. doi:10.1007/s11625-013-0224-6

Murray, M. L.; Seymour, E. H., & Pimenta, R. (2007). Towards a hydrogen economy in Portugal. *International Journal of Hydrogen Energy*, *32*(15), 3223-3229.

Nevens, F., Frantzeskaki, N., Loorbach, D., Gorissen, L. (2012). Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, 50, 111-122. doi: 10.1016/j.jclepro.2012.12.001

O'Brien, K. (2012). Global environmental change II From adaptation to deliberate transformation. *Progress in Human Geography*, *36*(5), 667-676. doi:10.1177/0309132511425767

Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006) Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, *11* (1), 18. http://hdl.handle.net/10535/3412

Park, S. E., N. A, Marshall, E. Jakku, A.M. Dowd, S.M. Howden, E. Mendham, and A. Fleming. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22*(1), 115-126. doi:10.1016/j.gloenvcha.2011.10.003

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. London: Routledge.

Pelling, M., O'Brien, K., & Matyas, D. (2014). Adaptation and transformation. *Climatic Change*. 1-15, doi:10.1007/s10584-014-1303-0

Raven, R.; Kern, F.; Verhees, B.; & Smith, A. (2015). Niche construction and empowerment through socio-political work. A meta-analysis of six low-carbon technology cases. *Environmental Innovation and Societal Transitions*. doi:10.1016/j.eist.2015.02.002

Rotmans, J.; Kemp, R.; Asselt, M. (2001). More evolution than revolution: Transition management in public policy. *The Journal of Futures Studies, Strategic Thinking and Policy*, 3(1), 15–32. doi: 10.1108/14636680110803003

Sayce, K., Shuman, C., Connor, D., Reisewitz, A.; Pope, E.; Miller-Henson, M.;…& Owens, B. (2013). Beyond traditional stakeholder engagement: public participation roles in California's state wide marine protected area planning process. *Ocean & Coastal Management*, *74*, 57-66. doi:10.1016/j.ocecoaman.2012.06.012

Schmidt, L., Prista, P., Saraiva, T., O'Riordan, T., & Gomes, C. (2013). Adapting governance for coastal change in Portugal. *Land Use Policy*, 31, 314-325. doi:10.1016/j.landusepol.2012.07.012

Schmidt, L.; Gomes C., Guerreiro, S., O'Riordan, T. (2014). Are we all on the same boat? The challenge of adaptation facing Portuguese coastal communities: Risk perception, trust-building and genuine participation, *Land Use Policy*, 38, 355-365. doi:10.1016/j.landusepol.2013.11.008

Schmidt-Thomé, P., & Klein, J. (2013). *Climate Change Adaptation in Practice – from strategy development to implementation.* Sussex, UK: Wiley-Blackwell.

Seyfang, G., & Smith, A. (2007). Grassroots Innovations for Sustainable Development: towards a new research and policy agenda. *Environmental Politics*, 16(4), 584-603. doi:10.1080/09644010701419121

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, *16*(3), 282–292. doi:10.1016/j.gloenvcha.2006.03.008

Smith, A; & Kern, F. (2009). The transitions storyline in Dutch environmental policy. *Environmental Politics*, *18*(1), 78–98. doi:10.1080/09644010802624835

Spaling, H.; Montes, J., & Sinclair. J. (2011). Best Practices for Promoting Participation and Learning for Sustainability: Lessons from Community-Based Environmental Assessment in Kenya and Tanzania. *Journal of Environmental Assessment Policy and Management*, *13*(03), 343–366. doi:10.1142/S1464333211003924

Stirling, A. (2008). "Opening up" and "closing down" power, participation, and pluralism in the social appraisal of technology. *Science, Technology & Human Values*, 33 (2), 262-294. doi:10.1177/0162243907311265

Susskind L; McKearnan, S.; &Thomas-Larmer, J. (1999). *The consensus building handbook: a comprehensive guide to reaching agreement.* California: Sage Publications

Tompkins, E. L., R. Few, and K. Brown. 2008. Scenario-based stakeholder engagement: incorporating stakeholders preferences into coastal planning for climate change. *Journal of environmental management*, *88*(4): 1580–92. doi:10.1016/j.jenvman.2007.07.025

Voß J., & Borneman, B. (2011). The Politics of Reflexive Governance : Challenges for Designing Adaptive Management and Transition Management. *Ecology and Society*, *16*(2), 9. http://hdl.handle.net/10535/7593

Voß, J. P., & Kemp, R. (2006). Sustainability and reflexive governance: introduction. Reflexive governance for sustainable development, 3-28. In Voß, Jan-Peter, Dierk Bauknecht, and René Kemp (Eds.) *Reflexive governance for sustainable development*. London: Edward Elgar Publishing.

Westley, F.; Olsson P.; Folke, C.; Homer-Dixon, T.; Vredenburg, H.; Loorbach, D.,..., Van Der Leeuw S. (2011). Tipping towards sustainability: Emerging pathways of transformation. *AMBIO, a journal of the human environment*, 40 (7): 762-780, doi: 10.1007/s13280-011-0186-9

Wittmayer, J.; & Schäpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability science*, 1(14), 483-496. doi: 10.1007/s11625-014-0258-4

Paper 2

Climate change adaptation strategies in Portugal: participation and sustainable transitions

Inês Campos*; Mónica Truninger **; Duncan Russel ***; Filipe Moreira Alves*, and Gil Penha Lopes**

Centre for Ecology, Evolution and Environmental Changes (CE3C) Faculty of Sciences of Lisbon University*; Institute of Social Sciences of Lisbon University**; University of Exeter ***

Abstract

The paper examines how multilevel climate change adaptation strategies relate to sustainable transitions, by investigating the role played by participation in policy making processes. The empirical focus is Portugal, a country significantly vulnerable to climate change impacts. Adaptation to climate change is an embryonic topic in the national policy agenda, and participatory processes are not being strongly taken into account in decision-making and policy-making regimes. The article seeks to comprehend how climate change adaptation is understood by policy makers and spatial planners, how and why participation approaches are integrated, as well as links between participation and policy integration. Taking stock of a concept of transformational adaptation, while navigating through two planning experiences in the country, analysis points to distinct paradigms of adaptation, including the view of adaptation as part of a sustainable transition. More technical views of adaptation appear to be less guided by long-term perspectives of transformative societal changes, and the importance attributed to participation grows stronger as the adaptation planning processes progressed. A developing culture of participation seems to be both a driver and a result of a higher integration of adaptation at different policy levels. Promoting a paradigmatic view of adaptation as part of a sustainable transition may support a higher level of policy integration and contribute for translating transformational adaptation into long-term action-plans.

Key words

Transformational Adaptation, Adaptation Policy; Participation; Policy Integration

Introduction

In a world of constant technological, social and ecological changes, including anthropogenic climatic changes, the bigger question is if a societal transformation of global systems in the coming decades will translate into more sustainable societies (Westley *et al*. 2011; Pelling *et al*., 2014). Climate change (CC) science has produced future climate scenarios, reinforcing the need for more robust and effective adaptation strategies over the coming decades (Ciscar *et al.,* 2011; Parry *et al*., 2007). CC adaptation (CCA) is becoming an increasingly chief policy concern, given the political failure to date in reaching a comprehensive international agreement to mitigate further climatic changes. Due to lags in the climate system, human societies would still be affected by some degree of climate changes, even if global greenhouse gas emissions were immediately reduced to zero (Mimura *et al*., 2014). Reflecting the latest progress on CC adaptation research, the fifth Intergovernmental Panel on Climate Change report describes adaptation as:

> «The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects. » (IPCC, 2014:1758)

The same report also explicitly refers to CC adaptation as:

> «Incremental adaptation: Adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale. Transformational adaptation: Adaptation that changes the fundamental attributes of a system in response to climate and its effects. » (IPCC, 2014:1758)

Taking into account these advances on the CC adaptation concept, and the possibility of a transition, or a transformative change (Grin *et al*., 2010), towards a more sustainable societal system, this paper aims at understanding how multilevel CC adaptation strategies relate to sustainable transitions, by investigating the role played by participation in policy making processes. The article hypothesizes that a culture of participation in policy-making may play a role in translating strategies into action-plans.

The context for this research is Portugal, given it is a country significantly vulnerable to CC impacts (Santos *et al*., 2002; Santos and Miranda, 2006), and adaptation is a relatively novel topic in socio-political agendas (O'Riordan *et al*., 2014). Likewise, participatory dynamics have not been a mainstream culture in Portuguese policy-making regimes, but appear to be tiptoeing into CC adaptation processes (Schmidt *et al*., 2014). The hypothesis is explored based on documental analysis, on participant observation of workshops and meetings, and 18 semi-structured interviews to policymakers, spatial planners, technical specialists, and researchers involved in two official adaptation planning processes in the country.

The remainder of the paper maps out as follows: the following two sections offer an account of what is meant by transformation and participation, drawing from the Social-Ecological Systems Resilience Framework and the Sustainable Transitions research fields. Subsequently, the Portuguese context is depicted, as regards CC vulnerabilities and policy responses. The methodology section describes the analytical approach based on an empirical study of two ongoing adaptation policy processes at the central and local governmental levels. Afterwards, the results are presented and discussed. The discussion is centred on a set of reflective considerations on the co-evolving dynamics of participation and adaptation experiences, including policy integration and different paradigmatic views of adaptation. The conclusion summarizes the main findings, and highlights the potential of participation in policy-making for promoting a more integral perspective on CC adaptation that encourages a governance for transformation.

Transformation and transitions

In CC literature, transformation is often explained as a system state that evolves over the medium and long-term beyond the scope of incremental adaptation (Park *et al*., 2012; Kates *et al*., 2012). Specifically in the Social-Ecological Systems (SES) Resilience Framework (Folke, 2006), transformation is referred as a quality of the SES, much like adaptability and resilience (Folke *et al*., 2010). Once the co-evolving social and ecological components of the system (SES) adapt to external pressures, such as climate related impacts, the adaptability quality works through managing the resilience of an existent system state (Walker *et al*., 2006). The resilience quality will depend on a wide number of social and ecological determinants, or factors that influence the ability of a system to maintain the stability of its structures and functioning (Folke *et al*., 2005). Nevertheless,

once the SES system losses its resilience, it becomes transformed into another system state. This process of transformation translates into an irreversible regime change (Pelling, 2010), or a shift from a particular set of quasi-stable system states to another (Folke *et al*., 2010, see their Table 1).

In the Sustainable Transitions (ST) research field (Grin *et al*., 2010; Markard *et al*., 2012), the process of transformative change is referred as a transition. While the SES Resilience Framework approaches the interdependent and inseparable social and ecological components of the Earth System, ST focus on the co-evolution of social and technical systems. In this literature a transition is defined as a shift from a dominant socio-technical regime to another (Geels, 2010), leading to a transformative change (Grin *et al*., 2010). Although other exogenous pressures may lead this process, CC adaptation may be a building block or pattern in a transition (De Haan and Rotmans, 2011).

Transformational adaptation would mostly likely affect the social, the ecological, as well as the material and technological components that co-evolve in a system adapting itself to external changes (Park *et al*., 2012). Thus, the perspective of a transformational adaptation process translates into a more integral approach (O'Brien *et al*. 2009; O'Brien and Hochachka, 2010), and denotes a new agenda for sustainable development, one calling for a deliberative societal transformation (O'Brien, 2012). Transformational adaptation (Pelling, 2010; Park *et al*., 2012) offers equally a new ground for political responses to CC, which are considered still underdeveloped in CC adaptation research (Pelling *et al*., 2014).

Links between culture and CC are increasingly taken into account in transition and CC adaptation studies (Adger, 2010; Nielsen and Reenberg, 2010). On one hand, culture is part of the dominant socio-technical regimes (Grin *et al.* 2010), which have led to the current system state where greenhouse gas emissions increased. Culture equally frames different understandings of adaptation and policy strategies for prioritizing adaptation options and implementing action-plans (Adger *et al*., 2013). Conversely, as Adger and colleagues have argued (2013), culture is as dynamic and flexible as CC, and therefore can equally be influenced by ideas and discourses around the issue (Hulme, 2010). The relevance of culture makes CC adaptation extremely context-specific, and to some extent determined by local forms of governance (Folke *et al*., 2005), thus the importance of participation.

Participation

The SES Resilience Framework and the ST research fields developed conceptual approaches and governance designs to study transitions (Voß and Borneman, 2011; Smith and Stirling, 2010). These approaches integrate a culture of participation in decision-making (Folke *et al.*, 2005; Loorbach *et al.*, 2011). Participation is understood here as the involvement of people in decision-making processes, whether these people are researchers from multidisciplinary backgrounds, policymakers, and/or local practitioners and stakeholders affected by the problem (Lang *et al.* 2012). CC adaptation research seems to be evolving to include interactions between different research fields and collaborations of various disciplines, becoming a transdisciplinary and participatory scientific activity (Pohl and Hadorn, 2008). Participation has been considered a central determinant for increasing adaptive capacity (Engle and Lemos, 2010; Tomkpins *et al.*, 2010; Engle, 2011), because collective modes of decision-making are expected to be more inclusive and best suited towards local expectations, perceptions and needs (Smit and Wandel, 2006; Spaling *et al.* 2011), contributing to the empowerment of communities (Ridder and Pahl-Wostl, 2005). Thus, participation is advocated as a needed approach in policy responses to CC (Tompkins *et al.* 2008).

The Portuguese Case

As many other regions in the world, Portugal needs to prepare for future climatic changes (Santos *et al.*, 2002; Santos and Miranda, 2006). The country faces a diversity of challenges, from rising sea levels to heat waves, flooding and droughts. The Portuguese Atlantic coast is vulnerable to extreme climate events (Veloso-Gomes and Taveira-Pinto, 2003; Santos and Miranda, 2006). Sea levels may rise up to a meter by 2100 (Dias and Alves, 2013). These impacts are particularly concerning since 80% of the Portuguese population in the mainland is concentrated on 55 coastal municipalities (NSI, 2011). The National Risk Assessment study for CC Impacts in Portugal (PNACP, 2014) refers to heat waves as being particularly critical for human settlements, representing a high number of deaths, affecting elderly populations in the inland regions of continental Portugal (PNACP, 2014: 66). The same report states CC projections indicate the number of hot days (temperatures higher than 35ºC) should increase in the coming decades (idem: 68). Due to CC, an evolution in the precipitation patterns is expected to lead to a reduction

in the number of rainy days throughout the year and to an intensification of precipitation during the winter season. These dynamics are likely to result in the occurrence of a higher number of flooding events during winter (idem: 83). Furthermore, the country's Mediterranean agroforestry systems are facing serious land degradation and land abandonment problems, as well as a growing rate of desertification, which may be aggravated by future impacts (Ciscar *et al.* 2011; ICNF, 2013). Nevertheless, CC adaptation appears to be still at an early stage in the Portuguese political and civil society agendas (O'Riordan *et al.*, 2014). Likewise, participatory and deliberative processes have not been mainstreamed in environmental policy-making (O'Riordan *et al*., 2014; Schmidt *et al*., 2014). Instead, top down, technical, and managerial approaches to decision-making are most common. Currently, in Portugal (Mainland), there are only four official CC adaptation strategies, one national and three municipal. This study has focused on two of these policy processes.

Methodology

The empirical basis of the article investigates how policymakers, spatial planners and technical specialists involved in adaptation processes in Portugal view CC adaptation, and how participatory approaches are being integrated. The paper draws from two planning experiences that have been ongoing since 2010, at different governance levels. These are: the Portuguese National Adaptation Strategy [PNAS] and the Cascais municipality CC Adaptation policy. The following subsections describe the context for the two policies and the methods used to attain relevant information. Although in total 18 semi-structured interviews were done, the schedules had to be adjusted to the actor-groups interviewed.

Portuguese National Adaptation Strategy

The PNAS was promoted by the National Environmental Agency. On 1 July 2010 a governmental resolution publically launched the strategy. The PNAS acknowledged the need to respond to Portugal's vulnerability to CCs. The strategy was grounded on a diagnosis of impacts and vulnerabilities for Portugal developed by Lisbon University (Santos *et al*., 2002; Santos and Miranda, 2006), and was informed by the Intergovernmental Panel on Climate Change (IPCC) reports.

A sectorial approach was established, structured over four central guiding principles. Leadership was designated for nine sectors, and each working group was to develop studies and report after two years on potential adaptation policies and actions. A coordination group led by the National Environmental Agency, and with representatives of the National Municipalities Association and autonomous regions (Islands of the Azores and of Madeira), supervised the PNAS. The first progress report was delivered in 2013. The second stage of the PNAS is currently commencing and is expected to have a stronger focus on implementing adaptation options. Table 4.2-1 provides an overview of the PNAS process, as well as the methods used for collecting information, namely documental analysis and semi-structured interviews.

Documental analysis focused on the Resolution from the Portuguese Council of Ministers (Resolution 24; 18 March 2010); and the PNAS Progress Reports, 2013 (APA, 2013); as well as on a self-assessment survey of the PNAS delivered to the European Environmental Agency (EEA, 2014).

Seven semi-structured interviews were conducted with the leaders of the biodiversity, agriculture, forestry, desertification and water resources sectorial working groups. One interview was done to a representative of the National Environmental Agency. Other sectorial leaders were not available to be interviewed.

The interview schedule has been based on four main themes, shown in Table 4.2-2 (PNAS interview schedules). Additionally, two researchers interviewed collaborated with the biodiversity, agriculture and forests working groups in applying participatory methodologies. The researchers' interview schedule is also shown in Table 4.2-2.

Table 4.2-1. Overview of the PNAS process and methods used for this study

Portuguese National Adaptation Strategy [PNAS]	Guiding principles	Sectorial approach	Methods for analysis
2010 PNAS Resolution 2013 Presentation of Sectorial Reports 2013 – present: PNAS 2nd Stage	(i) Develop information and knowledge on CC impacts and potential adaptations; (ii) Reduce vulnerability and increase adaptive capacity; (iii) Participation, raising awareness and dissemination; (iv) International cooperation.	Nine Sectors: spatial and urban planning; water resources; security of people and goods; Health; energy and industry; tourism; agriculture, forests (includes desertification) and fishery; coastal zones; and biodiversity.	Documental analysis Eight Interviews to policymakers and specialists Two interviews to researchers involved in participatory workshops

Table 4.2-2. Interview to policymakers, technical specialists and researchers: themes and schedules

Themes	Interview to policymakers
Context of the PNAS	What were the drivers for creating a strategy? Has Portugal been innovative?
Characterize the role for adaptation policy and planning	Is adaptation policy a set of technical and scientific options or part of a broader transition to a more resilient and sustainable society?
The process	How working groups developed their tasks? Were participatory processes integrated? Why and How? Where they beneficial?
Implementation and policy integration	Have any adaptations been implemented? Are adaptation policies and measures being integrated in other sectorial policies?
Mainstreaming of adaptation policies	What should be the following steps for mainstreaming adaptation policies?
Themes	**Interview to researchers**
Involvement with PNAS	How did the involvement with the PNAS begin?
Participatory research	What were the researchers' tasks in implementing participatory processes? Who was engaged?
Participatory experiences	Benefits and weaknesses.

Cascais Adaptation Planning

Cascais city is located on the Atlantic coast, about 25 km from Lisbon. The city Mayor is a member of the Covenant of Mayors - a group of 350 municipalities who joined together to reduce up to 20% greenhouse gases by 2020. The municipality adhered in 2002 to the Agenda 21 initiative, which is a voluntarily implemented action plan for sustainable development, put forward by the United Nations Commission on Sustainable Development. Mirroring the PNAS, the Cascais Strategic Plan for Climate Change [CSPCC] was launched in 2010 and followed a sectorial approach. Likewise, Cascais framed its strategy around a diagnosis of impacts and vulnerabilities based on the IPCC socioeconomic scenarios; and drawing equally from Lisbon University's studies (Santos and Miranda, 2006). CC related impacts for the region include a rise in average annual temperatures; a decrease in annual precipitation, and more frequent occurrence of heat waves (Santos and Miranda, 2006; Ciscar *et al.*, 2011). These impacts could have negative effects on local socioeconomic development, which is strongly supported by a growing Tourism industry. Therein strategies for mitigating and responding to impacts were proposed in the CSPCC for six sectors considered most relevant: health, water resources, biodiversity, agriculture, coastal zones, and tourism.

CC adaptation planning in Cascais continued with a participatory action-research (PAR) project, implemented from 2013 to 2015. PAR is a structured action-learning process where objectives, methodological designs and the dissemination of results and conclusions are co-created, led and implemented by both scientists and practitioners (McNiff, 2013). The methodology was co-implemented by researchers from the University of Lisbon and the Cascais Agenda 21 Cabinet. The main objectives were to promote the momentum for planning and implementation through a participated assessment and prioritization of integrated and cross-sectorial adaptations, as well as disseminating and raising awareness on CC.

Information was collected regarding the perspectives of policymakers involved in the adaptation planning process (including the PAR project), concerning how CC adaptation is understood and the integration of participatory approaches. The methods used have been the analysis of official documents and policies; participant observation (DeWalt, 2010); and nine semi-structured interviews with policymakers, spatial planners and technical specialists. Document analysis was continuous throughout the process and included a critical assessment of the CSPCC and of the Cascais Sustainability Strategy

(Cascais, 2012). Participant observation was conducted during two out of the seven workshops develop in the context of the PAR project, namely in the *commencement* and *tourism* workshops. This approach involved both participating in the workshop discussions, as well as registering observations and taking notes on: workshop dynamics (how participants and facilitators worked together); the participants' comments on CC; participants' comments on a resilient and sustainable Cascais city. The workshops implemented are listed on Table 4.2-3. Towards the end of the PAR project, nine interviews were conducted with policymakers, spatial planners and technical specialists who had been involved in the CSPCC, as well as to one representative of the Cascais Agenda 21 Cabinet. Interview themes and the schedule are shown in Table 4.2-4.

Table 4.2-3 Workshops done in the context of the Cascais Participatory Action-Research (PAR) project

PAR Project 2013-2015	Stakeholders involved
Commencement workshop	19 representatives of all departments involved in drafting the CSPCC
Workshops: Biodiversity; Health; Education; Water Resources; Tourism, Residents	10 to 40 representatives of municipal departments; health and education professionals; non-governmental organizations; tourism entrepreneurs

Table 4.2-4. Cascais Interviews with policymakers, spatial planners and technical specialists: themes and schedule

Themes	Interview Schedule
Context for the CSPCC	What were the drivers for creating a strategy? Was the municipality innovative in developing the CSPCC?
Characterize the role for adaptation policy and planning	Is adaptation policy a set of technical and scientific options or part of a broader transition to a more resilient and sustainable society?
The adaptation policy-making process	How did working groups develop their tasks? Were participatory processes integrated? Why and How? Where they beneficial?
The PAR project	What have been the strengths of the PAR project? What could have been improved?
Implementation and policy integration	Have any adaptations been implemented? Are adaptation policies and measures being integrated in other municipal policies or plans?
Participation experiences	Benefits and weaknesses
Mainstreaming of adaptation policies	What should be the following steps for mainstreaming adaptation policies?

Results

The initial stages of the Portuguese National Adaptation Strategy (PNAS) and of the Cascais Strategic Plan for Climate Change (CSPCC) can be characterized as learning periods. Documental analysis shows scientific research projects have been important triggers for the PNAS, according to the report on the self-assessment survey led by the European Environmental Agency (EEA, 2014:31).

All state interviewees pointed out the international context was a key driver for producing a national adaptation strategy. However, in Cascais only two interviewees attributed importance to international and national political agendas. Municipal interviewees referred to sustainability; followed by the goals of building a resilient city and improving quality of life, as the principal motivators for developing a strategy. The protection of people and goods were equally referred as important drivers.

Interviewees agreed that their respective policy processes had been proactive in the Portuguese context. It was noted by state policymakers and specialists that the European Adaptation Strategy was only launched in 2013, while the PNAS took off in 2010, after a three-year preparation period. Similarly, as was pointed out by municipal policymakers and spatial planners, Cascais is one of the three Portuguese municipalities (among 308) to have an adaptation strategy, and was thus innovative in the Portuguese context.

Nevertheless, PNAS leaders interviewed were adamant in pointing out the strategy comprised a set of guidelines, which needed to be integrated in sectorial policy instruments and to translate into solid actions for the future. Likewise, in Cascais, interviewees stated that «practical actions were missing».

Paradigmatic perspectives on Climate Change Adaptation

Having been involved in the process of planning adaptation over the past five years, all interviewees were asked to refer which of the following descriptions would better characterize CC adaptation planning and, except for one technical specialist in Cascais, all chose option b:

a. «Climate change adaptation policies refer to a set of technical and scientific options to resolve perceived and expected climate change impacts, such as rising sea levels and heat waves.»

b. «Climate change adaptation policies should contemplate medium and long-term action-plans to addresses perceived and expected climate change impacts, while promoting a transition to a more resilient and sustainable society».

Additionally, in the official PNAS reports, the words «sustainable» and «resilience» frequently appear associated with the idea of a better adapted society. This wording is congruent with the Cascais municipal documents on sustainable development, which characterize adaptation as part of a broader sustainability strategy for a more resilient city. Likewise, in the field notes taken in the Cascais workshops, stakeholders speak of «life quality», «better development» and «visions for a resilient future» when discussing adaptation options. Despite the PNAS interviewees revealing they agreed more with option b, in practice the way the PNAS has been led to date seems to translate the more technical and managerial option a. Contrariwise, in Cascais, particularly over the previous two years of adaptation planning, the experience seems to genuinely reflect option b.

Results equally point to relations between the different paradigmatic views regarding CC adaptation planning, and how policymakers and planners are guided by clear distinctions between mitigation and adaptation policies. Regarding the PNAS, interviewees referred to the importance of differentiating adaptation from mitigation policies in order to organize and systematize the existent knowledge needs and information on climate, as well as plan adequate responses. However, the distinction between mitigation and adaptation was not always present in Cascais. For, instance, when relating her thoughts on the impacts the current climate policy could have, one of the Cascais interviewees explained:

«It is essential that all stakeholders think about the true causes for climate change, and how the municipality can effectively decrease its carbon footprint. »

Notes from participant observation of workshops point to some interchangeability between the two concepts. Although the action-research project only focused on

adaptation, participants, who were for the most part well-informed on CC issues, found it consistently hard to separate the two topics.

Policy Integration

The integration of adaptation options in other governmental or municipal policies has been a concern at both levels of governance. In the PNAS, sectorial leaders stated that the first step had been to identify commonalities between existing policies, plans and strategies, and potential adaptation measures, to avoid replicating policies. This indicates a concern with promoting policy integration at the early stages of the PNAS. Likewise, in the EEA (2014) self-assessment survey on European NAS, Portugal reports to have integrated adaptation in several sectorial policies such as: health, agriculture; spatial planning instruments, river basin management plans, drought prevention and response, among others (EEA, 2014:83).

In the Cascais planning process, policy integration is a more recent development. Although the adaptation options in the CSPCC are characterized as «cross-sectorial», involving different municipal departments and at times responding to different impacts (e.g. Green Corridors in the city, would be a measure to respond to heat waves, but also provide some protection against flooding events), these integrated measures have still not been included in action-plans for the city. Currently, after two years of action engagement, the CSPCC has been included as a technical appendix in the municipality's general Land Use Plan. When interviewed, Cascais policymakers and planners were not in agreement regarding whether or not the PAR project had contributed to a higher level of policy integration, and opinions were divided. Four interviewees claimed they thought the project had been a positive influence, three claimed they thought policy integration would have happened anyway (at least for some adaptation measures), and two did not have an opinion on the subject. Nevertheless, the representative of the Agenda 21 cabinet emphasized that including the CSPCC as a policy document was not «binding», but was considered an important advancement for a higher level of policy integration. It was equally underlined that the body of municipal planners and technical specialists responsible for elaborating the Land Use Plan had participated in the action-research activities (i.e. the adaptation workshops). Therefore, the Agenda 21 representative argued that planners and specialists «have gained a stronger understanding of what the CSPCC guidelines mean in the context of local land use and urban planning».

Participation

Concerning how participation was incorporated, significant differences arise in the two policy processes. Nevertheless, in both instances participation has derived from a political decision. In the PNAS and in the CSPCC, dissemination, awareness raising and local engagement were identified on the onset as political priorities. In the PNAS, as noted by the interviewees: «the Resolution [2010 Resolution of the Portuguese Government] stated the process had to be participatory, so we followed this guideline». In Cascais, though there was not a policy guideline for including participation, official documents, particularly the 2012 Sustainability Strategy, advocate the need for stronger citizen and stakeholder involvement in decision-making. Including participation is therefore congruent with the municipality's governance framework. However, in both the PNAS and the Cascais adaptation processes, participation gradually gained a more central role.

The first stage of the PNAS process integrated some level of participation, but has been mainly a state-centred, managerial process, not driven to engage a wide range of stakeholders, nor local authorities or administrations in more context-specific bottom-up processes. Although all interviewees from the PNAS recognized the value of engaging citizens and stakeholders in CC adaptation, challenges were referred. First, except for the water resources sector, interviewees claimed they had never thought of policy for the sectors they represented in relation to CC adaptation (only mitigation had been considered). Having been called to deal with a new topic, interviewees claimed their first concern had been scientific and technical knowledge gaps. Participation was largely perceived as being less important. Second, when used, stakeholder engagement was a consultation exercise. There was not a genuine participatory process that involved a wide range of potential beneficiaries of adaptation. Lastly, the PNAS sectorial leaders interviewed voiced their doubts over the capacity of people to participate in decisions over long-term planning. As one remarked:

> «The memory of people and societies is relative, we are talking about long
> term process for the next 40 or 60 years. Will people be able to reflect on such
> futures through their present actions? »

The particular characteristics of sectorial leaderships and a low degree of buy-in into the added value of participation, resulted in a considerable disparity in the use of participatory approaches. Some groups (e.g. the security of people and goods; the fisheries subsector) did not include participatory events in designing their recommendations. Others, such as the biodiversity and the spatial and urban planning groups, discussed vulnerabilities and potential adaptations with stakeholders (e.g. business owners, local administrators and biodiversity experts). The biodiversity, agriculture and forests groups sub-contracted university researchers to implement the participatory events. These researchers found that though the workshops served to «validate the results of the vulnerability assessments» and to retrieve information about adaptation measures «that otherwise would be difficult to attain», the process was challenging, due to institutional paperwork, such as needing special permissions each time an event was organized. All interviewees agreed that participation is not a mainstream practice in the modes of working of Portuguese national administrative bodies.

In the Cascais experience, participation has been differently integrated in the adaptation planning process. Initially the process of designing the CSPCC (prior to the PAR project) engaged a very limited number of municipality technicians in assessing and prioritizing the suggested actions for CC adaptation in each sector. Regarding this period, an interviewee considered that there was not a close engagement, and that «direct dialogue did not exist, it was almost always unidirectional. » However, according to the same interviewee, the two years of action-engagement opened up the way to a more participatory and collaborative process, both among the different municipal departments, as with other stakeholder groups. The PAR project triggered a set of benefits from the point of view of planners and specialists. Interviewees agreed that the project had established a «bi-directional» and «direct» dialogue, because participants had the opportunity to share their knowledge. It was acknowledged that adaptation options were «improved» and «fine-tuned», as well as shared with the different organic units in the municipality. Table 4.2-5 summarizes the main benefits of the PAR project referred by interviewees (who were presented with a list of multiple choice options). Inter-department policy integration and knowledge sharing seem to have been the most acknowledged benefits. Creating a collective vision for the future and the participatory methodologies used were similarly acknowledged benefits.

Regarding the specific weaknesses attributed to the participatory processes, there was no references to difficulties in implementing participation, as was the case with the PNAS interviewees. Among a list of multiple choice options given (see Table 4.2-6), Cascais interviewees, referred two factors that could have been improved:

- «could have been more inclusive and involve more stakeholders»;

- «failed to explore potential secondary effects (negative and positive) of the prioritized adaptations»;

These different perspectives and experiences with participatory processes at the national and municipal policy levels, indicate that Cascais has been more innovative in the ways participation was included in adaptation planning, but less concerned with integrating adaptation in other policy instruments. However, the current step towards a higher level of policy integration, achieved with the CSPCC being annexed to the Cascais Land Use Plan, seems to be related to the participatory engagement implemented. Conversely, policy integration has been a preoccupation from the initial stages of the PNAS process, as has not been related to participation. However, stage two of the PNAS is currently commencing and integrates the needs and priorities identified in the first reports, by promoting the integration of adaptation policies in municipal planning and civil society organizations. This has been possible through the program AdaPT. Co-financed by the Portuguese Carbon Fund (15%), and the European Environment Agency European Grants financial mechanism (85%), the program is managed by the National Environmental Agency. Currently with 26 beneficiary municipalities, AdaPT is developing training projects to support the design and implementation of local plans. AdaPT represents an innovative stage for the PNAS, because it integrates a strong stakeholder engagement, developing a forum for a multi-level collaborative policy integration.

Table 4.2-5. Benefits of the Cascais PAR Project

Benefits of the Participatory Action-Research Project	Responses
Better policy integration among departments	6
Better involvement of various stakeholder groups	3
Better dissemination and knowledge sharing on the topic of CC among the municipality's departments	6
A Collective vision for the future of the municipality	5
Improved dialogue among policy makers and administrators involved in the planning process	1
Better technical validation in supporting political decisions and planning processes	2
Experience with new participatory methodologies	5

Table 4.2-6. Weakenesses of the Cascais PAR project

Weaknesses of the Participatory Action-Research Project	Responses
Could have been more inclusive, involving more stakeholder groups	6
A higher number of participants	0
Methodologies used did not provide appropriate results to support decision-making	0
Failed to explore potential secondary effects (negative and positive) of the prioritized adaptations	3

Discussion

In the two levels of governance studied, there is still a road ahead before policies translate into implemented action-plans, since both strategies are non-binding. Nevertheless, the two processes are pioneers of CC adaptation in Portugal. In a study of three municipalities in Australia, Measham and colleagues (2011) had found that a stronger institutional acceptance of adaptation at the municipal level, exists when central government strategies are also put forward. Likewise, in a study of seven municipalities in Norway, Dannevig and colleagues (2012) conclude that subnational level stakeholders appear to be influenced by central government guidelines and policy agendas. Baker and colleagues recommend that national strategies provide specific sets of guidelines to promote local adaptation (Baker *et al.* 2012). However, the Portuguese strategy does not purpose specific standards or requirements for CCA plans at the local level (EEA, 2014). Although the ongoing program AdapPT, currently initiating, may provide guidance from bottom experiences that could inform this dimension of the PNAS. Thus, in the Portuguese case,

the Cascais strategy could have benefited from the context provided by the PNAS, but did not receive specific guidelines.

Two paradigmatic perspectives of adaptation have been put forward: adaptation as a technical and managerial issue; and adaptation as part of a sustainable transition. These views seem to be co-existent and be complementary in serving the purpose of promoting transformative development pathways, one being more pragmatic and action oriented (the technical view), the other more ethically guided (the transition view).

In Cascais, participation seems to have promoted a higher level of policy integration. In a similar vein, Dannevig and colleagues (2012) concluded that participation in research projects and scientific support were fundamental for increasing local institutional capacities, and promoting policy integration of adaptation in sectorial policies and land use plans (Measham *et al.*; 2011; Dannevig *et al.*, 2012). However, the Cascais example is not illustrative of the wider Portuguese reality, since public participation in environmental planning has been found to be infrequent (Carvalho-Ribeiro et al., 2010; O'Riordan *et al.*, 2014).

Likewise, in the PNAS process, participatory engagement seems to represent a culture which is contrary to dominant institutional regimes, and faced some challenges and bottlenecks, reported by both the sectorial leaders and researchers interviewed. A study from Termeer and colleagues (2012) of European NAS found that a strong reliance on scientific experts and a distrust in the problem-solving capacity of civil society were common weaknesses of NAS. Similarly, this distrust was found in the Portuguese case. A wider participatory approach appears to have been equally constrained by the novelty of the adaptation topic for those involved in the planning process.

Conversely, in Cascais, although participation was still mostly restricted to a set of policymakers, planners and specialists (even during the action-research project), it was significantly valued by those who participated. Moreover, unlike the PNAS, where participatory events were a form of consultancy, in Cascais, participatory approaches were central to the planning process.

Nevertheless, PNAS sectorial leaders felt it would be important to engage civil society, and the national strategy seems to be currently moving in that direction. This direction points to a more diffuse, less managerial and rigidly structured process. National strategists seem to be open to the possibility of the multiple developments that may arise from involving local initiatives and administrations in pursuing long-term goals for more sustainable futures. Likewise, Cascais municipal planners who had experienced the

participatory engagement developed by the PAR project, argued for opening up the process to diverse societal groups, outside the bull's eye of municipal planning; because adaptation was being considered an issue that should involve society at large. These evolving perspectives on the role of participation in the two case studies may indicate that one way of translating a paradigmatic view of adaptation as transformation into adaptation policies and action is through promoting a culture of participation.

The two levels of governance appear to be encouraging the mainstreaming of adaptation policies and implementation processes in Portugal. The importance attributed to participation grows stronger as the adaptation process progresses. Concurrently, as the planning process gradually opens up to a wider societal arena, the idea that adaptation can be part of a sustainable transition seems to be more central, as opposed to adaptation as a set of technical and managerial procedures. Moreover, at times, the concept of adaptation as part of a sustainable transition, involving society at large, seems to blur the lines between mitigation and adaptation from the point of view of those involved in the planning processes. In Cascais, this can be explained by the fact that the CSPCC includes a mitigation and an adaptation document. Nonetheless, it may also indicate that understanding adaptation policy-making as part of a sustainable development process, leads to considering the root causes of the CC problem, and thus bearing in mind both mitigation and adaptation, as two inseparable strategies for a more adapted and resilient society.

Conclusion

The study shows two paradigmatic views of adaptation – adaptation as a technical and managerial issue; and adaptation as part of a sustainable transition process. More technical views of adaptation appear to be less guided by long-term perspectives. Thus, if current adaptation policy should be deliberately promoting alternative development pathways towards more sustainable societies (Pelling et al*., 2014), endorsing a paradigmatic view of adaptation as part of a sustainable transition among policymakers may be a relevant strategy for translating the idea of transformational changes into policy making. At both levels of governance, the importance attributed to participation grew stronger as the adaptation planning processes progressed. Thus, in this context, the development of a culture of collaboration and participation appears to be both a driver

and a consequence of a higher level of policy integration and the mainstreaming of adaptation policies.

Furthermore, thinking of adaptation as part of a sustainable transition, seems to lead to attributing less importance to distinguishing between mitigation and adaptation. Transformational adaptation, though not translated into concrete policies and plans, seems to lead policymakers to attributing more importance to the root causes of climate change, while still focusing on resolving the problems posed locally by climate change impacts. Arguably, removing a distinction between adaptation and mitigation may promote political responses, at multiple governance levels, that actively endorse alternative development pathways towards transformed and more sustainable societies (Pelling et al., 2014). These study's findings apply to Portugal, yet lessons learned can inform other countries now commencing their climate change adaptation process, and where participatory approaches are not mainstream in environmental policy. Furthermore, in climate change adaptation research, it may be relevant to think of a governance for transformation, rather than a governance for adaptation. If participatory approaches are linked to the transition view, than a governance for transformation needs to put in place a genuine and inclusive participatory process.

Reference List

Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R.,... & Wreford, A. (2009). Are there social limits to adaptation to climate change? *Climatic change*, *93*(3-4), 335-354. 10.1007/s10584-008-9520-z

Adger, W. N. (2010). Social capital, collective action, and adaptation to climate change. In Voss, M. (Ed.) *Der klimawandel*. Wiesbaden: VS Verlag für Sozialwissenschaften.

Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2013). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, *3*(2), 112-117. doi:10.1038/nclimate1666

Alves F.L., Sousa L.P., Almodovar M.,& Phillips M.R. (2013). Integrated Coastal Zone Management (ICZM): a review of progress in Portuguese implementation. *Regional Environmental Change*. 13 (5), 1031-1042. doi:10.1007/s10113-012-0398-y

APA [Agência Portuguesa do Ambiente] (2013) Estratégia Nacional de Adaptação às Alterações Climáticas [National Strategy of Climate Change Adaptation] (Report No. 1). Retrieved from: http://sniamb.apambiente.pt/infos/geoportaldocs/Consulta_Publica/DOCS_QEPIC/150515_ENAAC_Con sulta_Publica.pdf

Baker, I., Peterson, A., Brown, G., & McAlpine, C. (2012). Local government response to the impacts of climate change: An evaluation of local climate adaptation plans. *Landscape and urban planning*, *107*(2), 127-136. doi:10.1016/j.landurbplan.2012.05.009

Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., ... & Rey, D. (2010). Europe adapts to climate change: comparing national adaptation strategies. *Global environmental change*, *20*(3), 440-450. doi:10.1016/j.gloenvcha.2010.03.005

Burton, I., & Development Programme United Nations. (2005). *Adaptation policy frameworks for climate change: developing strategies, policies and measures*. Cambridge: Cambridge University Press.

Carvalho-Ribeiro, S. M., Lovett, A., & O'Riordan, T. (2010). Multifunctional forest management in Northern Portugal: Moving from scenarios to governance for sustainable development. *Land Use Policy*, *27*(4), 1111-1122. doi:10.1016/j.landusepol.2010.02.008

Cascais (2010). Cascais Strategic Plan for Adaptation to Climate Change. Retrieved from: http://www.cm-cascais.pt/sites/default/files/anexos/gerais/ag21_plano_estrategico_cc_alteracoes_climaticas.pdf

Cascais (2012) Cascais Sustainability Strategy [Estratégia de Sustentabilidade de Cascais]. Retrieved from: https://fenix.tecnico.ulisboa.pt/downloadFile/3779579693894/Estrategia_Cascais_preliminar.pdf

Ciscar, J. C., Iglesias, A., Feyen, L., Szabó, L., Van Regemorter, D., Amelung, B.,... & Soria, A. (2011). Physical and economic consequences of climate change in Europe. *Proceedings of the National Academy of Sciences*, *108* (7), 2678-2683. doi: 10.1016/j.agwat.2015.03.014

Dannevig, H., Rauken, T., & Hovelsrud, G. (2012). Implementing adaptation to climate change at the local level. *Local Environment*, *17*(6-7), 597-611. doi: 10.1080/13549839.2012.678317

De Haan, J.; & Rotmans, J. (2011). Patterns in transitions: Understanding complex chains of change. *Technological Forecasting and Social Change*, *78*(1), 90–102. doi:10.1016/j.techfore.2010.10.008

DeWalt, K. M., & DeWalt, B. R. (2010). *Participant observation: A guide for fieldworkers*. London: AltaMira Press.

Dias, J.M, & Alves, F.L. (2013). *Risco de Cheias e Estratégias de Adaptação para a Zona Costeira e Lagunar da Ria de Aveiro.* [Flood risks and adaptation strategies for the coastal zone and the Ria de Aveiro lagoon.] Aveiro University: CESAM - Centro de Estudos do Ambiente e do Mar. Retrieved, June 30, 2015, from: http://la.cesam.ua.pt/Documentos/Risco_de_Cheia.pdf

EEA [European Environmental Agency] (2013). *Adaptation in Europe Addressing risks and opportunities from climate change in the context of socio-economic developments* (Report No 3/2013). Retrieved from: http://www.eea.europa.eu/publications/adaptation-in-europe

EEA [European Environmental Agency] (2014) National adaptation policy processes in European countries. (Report No 4/2014). Retrieved from: http://www.eea.europa.eu/publications/national-adaptation-policy-processes

Engle, N. L., & Lemos, M. C. (2010). Unpacking governance: building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*, *20*(1), 4-13. doi:10.1016/j.gloenvcha.2009.07.001

Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, *21* (2), 647-656. doi:10.1016/j.gloenvcha.2011.01.019

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, *30*(1), 441–473. doi:10.1146/annurev.energy.30.050504.144511

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267. doi:10.1016/j.gloenvcha.2006.04.002

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, and J. Rockström. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15(4), 20. http://www.ecologyandsociety.org/vol15/iss4/art20/

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, *39*(4), 495–510. doi:10.1016/j.respol.2010.01.022

Grin, J., Rotmans, J., Schot, J. (Eds.) (2010). *Transitions to Sustainable Development – New Directions in the study of long term transformative change*. New York: Routledge.

Hulme, M. (2009). *Why we disagree about climate change: Understanding controversy, inaction and opportunity*. Cambridge: University Press.

ICNF [National Institute for Conservation of Nature and Forests] (2013). Estratégia de Adaptação da Agricultura e das Florestas às Alterações Climáticas [Adaptation Strategy for Agriculture and Forestry to Climate Change]. Retrieved from: http://www.apambiente.pt/_zdata/Politicas/AlteracoesClimaticas/Adaptacao/ENAAC/RelatDetalhados/Relat_Setor_ENAAC_Agricultura.pdf

IPCC, 2014 Agard, J., E.L.F. Schipper, J. Birkmann, M. Campos, C. Dubeux, Y. Nojiri, L. Olsson, B. Osman-Elasha, M. Pelling, M.J. Prather, M.G. Rivera-Ferre, O.C. Ruppel, A. Sallenger, K.R. Smith, A.L. St. Clair, K.J. Mach, M.D. Mastrandrea, and T.E. Bilir (Eds.). Annex II: Glossary In Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press.

Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, 109(19), 7156-7161. doi: 10.1073/pnas.1115521109

Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P.,... & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science*, *7*(1), 25-43. doi: 10.1007/s11625-011-0149-x

Loorbach D, Frantzeskaki N, Thissen WH (2011). *A transition research perspective on governance for sustainability*. In: Jaeger CC, Tàbara JD, Jaeger J (eds) European Research on sustainable development, Volume 1: Transformative Science Approaches for Sustainability. Springer, pp 73-90.

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions : An emerging field of research and its prospects. *Research Policy*, *41*(6), 955–967. doi:10.1016/j.respol.2012.02.013

McNiff, Jean. (2013). *Action research: Principles and practice*. London: Routledge.

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., & Morrison, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and Adaptation Strategies for Global Change*, *16*(8), 889-909. doi: 10.1007/s11027-011-9301-2

Miller, TR, Wiek A. & Sarewitz D. (2013). The future of sustainability science: A solutions-oriented research agenda. *Sustainability Science*, 1-8. doi:10.1007/s11625-013-0224-6

Mimura, N., R.S. Pulwarty, D.M. Duc, I. Elshinnawy, M.H. Redsteer, H.-Q. Huang, J.N. Nkem, and R.A. Sanchez Rodriguez (2014). Adaptation planning and implementation. In: Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of*

Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge and New York: Cambridge University Press.

Nielsen, J. Ø., & Reenberg, A. (2010). Cultural barriers to climate change adaptation: A case study from Northern Burkina Faso. *Global Environmental Change*, *20*(1), 142-152. doi:10.1016/j.gloenvcha.2009.10.002

NST [National Statistics Institute] (2011). Synthesis Reports, National Population Census. available online at: http://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=censos_ficheirosintese (last accessed on July, 2015)

O'Brien, K. O., Hayward, B., & Berkes, F. (2009). Rethinking Social Contracts : Building Resilience in a Changing Climate, *14*(2), 12. doi: http://www.ecologyandsociety.org/vol14/

O'Brien, K., & Hochachka, G. (2010). Integral adaptation to climate change. *Journal of Integral Theory and Practice*, *5*(1), 89-102. Retrieved June 20th 2015, from: http://integralwithoutborders.net/sites/default/files/resources/O'Brien_Hochachka_Proof.pdf

O'Brien, K. (2012). Global environmental change II From adaptation to deliberate transformation. *Progress in Human Geography*, *36*(5), 667-676. doi: 10.1177/0309132511425767

O'Riordan, T., Gomes, C., & Schmidt, L. (2014). The Difficulties of Designing Future Coastlines in the Face of Climate Change. *Landscape Research*, *39*(6), 613–630. doi:10.1080/01426397.2014.975108

Park, S. E., N. A, Marshall, E. Jakku, A.M. Dowd, S.M. Howden, E. Mendham, and A. Fleming. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22*(1), 115-126. doi:10.1016/j.gloenvcha.2011.10.003

Parry, M.L. Canziani, O.F. Palutikof, J.P. van der Linden P.J. and Hanson C.E. (Eds.) (2007). *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. London: Routledge.

Pelling, M., O'Brien, K., & Matyas, D. (2014). Adaptation and transformation. *Climatic Change*. 1-15, doi:10.1007/s10584-014-1303-0

PNACP [Portuguese National Authority for Civil Protection] (2014) National Risk Assessment for Portugal. Retrieved from: http://www.prociv.pt/RiscosVulnerabilidades/Pages/AvaliacaoNacionaldeRisco.aspx

Pohl, C., & Hirsch Hadorn, G. (2008). Methodological challenges of transdisciplinary research. *Natures Sciences Sociétés*, *16*(2), 111-121. Retrieved from: http://www.cairn.info/resume.php?ID_ARTICLE=NSS_162_0111

Ridder, D., & Pahl-Wostl, C. (2005). Participatory Integrated Assessment in local level planning. *Regional Environmental Change*, *5*(4), 188–196. doi:10.1007/s10113-004-0089-4

Santos, F. D.; Forbes, K.; & Moita, R. (Eds.) (2002). *Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures SIAM I*. Lisbon: Gradiva.

Santos, F.D & Miranda, P. (Eds.) (2006). *Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures SIAM II*. Lisbon: Gradiva.

Schmidt, L.; Gomes C., Guerreiro, S., O'Riordan, T. (2014). Are we all on the same boat? The challenge of adaptation facing Portuguese coastal communities: Risk perception, trust-building and genuine participation, *Land Use Policy*, 38, 355-365. doi:10.1016/j.landusepol.2013.11.008

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, *16*(3), 282–292. doi:10.1016/j.gloenvcha.2006.03.008

Smith, A.; Stirling A. (2010). The politics of social-ecological resilience and sustainable socio-technical transitions. *Ecology and Society*, 15(1): 11. http://www.ecologyandsociety.org/vol15/iss1/art11/

Termeer, C., Biesbroek, R., & Van den Brink, M. (2012). Institutions for adaptation to climate change: comparing national adaptation strategies in Europe. *European Political Science*, *11*(1), 41-53. doi:10.1057/eps.2011.7

Tompkins, E. L., Adger, W. N., Boyd, E., Nicholson-Cole, S., Weatherhead, K., & Arnell, N. (2010). Observed adaptation to climate change: UK evidence of transition to a well-adapting society. *Global environmental change*, *20*(4), 627-635. doi:10.1016/j.gloenvcha.2010.05.001

Tompkins, E. L., R. Few, and K. Brown. 2008. Scenario-based stakeholder engagement: incorporating stakeholders preferences into coastal planning for climate change. *Journal of environmental management*, *88*(4): 1580–92. doi:10.1016/j.jenvman.2007.07.025

Veloso-Gomes, F., & F. Taveira-Pinto. (2003). Portuguese coastal zones and the new coastal management plans. *Journal of Coastal Conservation* 9 (1): 25-34. doi: 10.1652/1400-0350(2003)009[0025:PCZATN]2.0.CO;2

Voß J., & Borneman, B. (2011). The Politics of Reflexive Governance : Challenges for Designing Adaptive Management and Transition Management. *Ecology and Society*, *16*(2), 9. http://hdl.handle.net/10535/7593

Walker, B. H., L. H. Gunderson, A. P. Kinzig, C. Folke, S. R. Carpenter, and L. Schultz (2006). A handful of heuristics and some propositions for understanding resilience in social-ecological systems. Ecology and Society 11, 1, 13. doi: http://www.ecologyandsociety.org/vol11/iss1/art13/

Westley, F., Olsson P., Folke C. , Homer-Dixon T., Vredenburg H. , Loorbach D.,…,Van Der Leeuw S.. (2011). Tipping towards sustainability: Emerging pathways of transformation. *AMBIO, a journal of the human environment*, 40, (7), 762-780, doi: 10.1007/s13280-011-0186-9

Paper 3

Converging for deterring land abandonment – a Systematization of Experiences of a rural grassroots innovation

Inês Campos*; André Vizinho*; Mónica Truninger **; and Gil Penha-Lopes*

Centre for Ecology, Evolution and Environmental Changes (CE3C) Faculty of Sciences of Lisbon University*; Institute of Social Sciences of Lisbon University**

Abstract

Anchored by a case study research, the paper asks if rural socially innovative initiatives in Portugal can be considered sources of adaptability and increased resilience to land abandonment and land degradation in a region vulnerable to climatic change. The paper retells a systematization of experiences of a grassroots innovation in the Alentejo region. Following the self-evaluation of the case study, the discussion reflects on the sources of social and ecological resilience created. These include facilitating new modes of participatory governance, a shared vision for a sustainable village, building up social capital and the steady collection of memories of traditional land use and resource management practices. In the final conclusions key findings are distilled and prospects for further research suggested.

Keywords

Resilience; Sustainable Village; Grassroots Innovation

Introduction

Today many Mediterranean rural regions in Southern Europe are dealing with considerable environmental, social and economic challenges, which may be agravated by climate change impacts. In the South of Portugal's Alentejo region, land abandonment and land degradation are severe problems with complex sociocultural, economic, and historical causes (Truninger and Freire, 2014). The European open market and a rise in intensive subsidized cereal cultures over the last decades, coupled with native characteristics of the soil and the effects of deforestation, led to increased soil erosion and reduced agricultural productivity, with consequences such as higher unemployment and massive migrations from rural to urban areas (Truninger and Freire, 2014; Figueiredo and Pereira, 2011). As local farmers migrate, traditional adaptive knowledge passed over generations may be gradually lost. Currently, various regions in Alentejo are vulnerable systems (Adger, 2006), which may progress to a state of desertification due to future climate related impacts (NAS/AF, 2013).

Addressing this social and ecological context, the research leading to this article had the main objective of understanding if socially innovative rural initiatives in Portugal can be considered sources of adaptability and increased resilience to land abandonment and land degradation. The adaptability and resilience taxonomy used here originates from the Social-Ecological Systems (SES) research (Nelson et al., 2007; Park et al., 2011). This literature investigates how systems adapt and transform in a changing bio-physical and social environment (Folke, 2006). Its object of analysis is the complex, non-linear, multi-scale dynamics of social-ecological systems, which are intrinsically connected and co-evolving (Folke et al., 2010). Among the central qualities of the SES heuristic model are the concepts of adaptability and resilience. Resilience is the ability of a system to maintain its characteristics when facing external changes (Walker et al., 2004, Nelson et al., 2007). Adaptation is the property that 'manages resilience' (Walker et al., 2006). Under pressure, the system is flexible enough to reorganize itself and continue to function (Folke, 2006), until it reaches a 'threshold' point under which adaptability is subsiding (Nelson et al., 2007). Thus, resilience refers to the system's robustness, but most importantly to its flexibility and capacity for renovation or re-organization (Nelson et al., 2007; Folke et al., 2010). In the resilience framework, moments of crisis are considered windows of opportunity for change (Folke, 2006). In these circumstances, communities may strengthen adaptability if they are able to provide capable institutions, develop

participatory modes of decision-making and collective action, and build on available resources and infrastructures to deal with social-ecological challenges (Folke et al. 2005; Olsson et al., 2006).

The collective engagement of local communities in participatory decision-making is not a common practice in Portugal (Carvalho-Ribeiro et al, 2010). However, a number of socially innovative grassroots innovations (Seyfang and Smith, 2007) have been appearing, with a focus on encouraging ecological practices, promoting participatory learning and collective action for more resilient rural communities (Gonçalves et al., 2013). Research on this type of innovation is still emerging (Smith et al., 2014) and is virtually an unexploited topic in the Portuguese context. Drawing from a case study, the article investigates the hypothesis that grassroots innovations can increase adaptability and resilience to climate change related impacts in vulnerable rural regions. The hypothesis considered that these innovations provide demonstration sites for ecological practices, and seem to be attracting the arrival of new families to scarcely populated aging villages. Yet, the empirical study led to identification and discussion of more significant sources of social and ecological resilience.

The article continues with a characterization of the case study, and a description of the methodology used. A results section will focus on individual and collective perceptions of the benefits and challenges experienced, as well as lessons learned. The discussion elaborates on the potential sources of resilience created, drawing from the SES literature. In the conclusions section, key findings are distilled and prospects for further research suggested.

Case study

After an initial screening of initiatives, the Amoreiras Village Convergence Centre (ACC) appeared as a pioneer rural innovation in Alentejo. Amoreiras Village is located in the municipality of Odemira in the Alentejo Region (South of Portugal), which is the biggest municipality in the country (occupies a total area of 1720, 25 km2), but is scarcely populated (26.000 residents). The ACC appeared in 2005 and, in its flyer, the project presents itself as a pilot initiative for the promotion of sustainable natural resource management and for the creation of active networks connecting city and country life. Project founders believe that resolving persistent problems in rural Alentejo means also encouraging a more attractive living experience. To make this happen the focus has been

as much on experimenting and disseminating ecological land use techniques, as on community art and social activities. The intent has been to create a convergence forum, where different people and organizations would be inspired to promote sustainable development.

Regional and local administrations have been important for the ACC. Odemira municipality provided a venue for the group to work at Amoreiras, while the local administration – the *Junta de Freguesia* – has been an important partner in diverse activity projects. In Portugal, *Juntas de Freguesia* are responsible for administrating local resources following municipal policies and guidelines, such as co-managing public spaces and schools.

In a broader landscape context, the ACC is part of a worldwide Permaculture movement, and has joined the Transition Towns movement in 2009, a network of community-led initiatives (Seyfang and Haxeltine, 2012). The ACC embraces Permaculture as a way of thinking and leading its work, albeit not all its members are attentive to this approach. Permaculture has been defined as a 'set of principles and practices to design sustainable human settlements' (Hemenway, 2009, p.5). Likewise, the European Commission's Youth in Action program has been an important institution, from which the group received volunteers from the European Voluntary Service.

ACC may be considered a Grassroots Innovation, based on the characterization provided by Seyfang and Smith (2007), which refers to communities being mobilized to create new systems of provision, and contributing to sustainable development by finding solutions for local problems.

Methodology

The article addresses the impacts of a grassroots innovation for adaptability and resilience in the Alentejo rural region. The empirical basis of the article is a participatory learning case study (Pretty, 1995). Participation has been considered important for adaptability (Engle and Lemos, 2010, Engle, 2011), because collective modes of decision-making are expected to be more inclusive and best suited towards local expectations, perceptions and needs (Smit and Wandel, 2006).Participatory approaches may equally stimulate social learning, characterized as an 'interactive reflection that occurs when we share our experiences (…) modelled on group learning processes.' (Armitage et al., 2008, p. 88).

The Systematization of Experiences (SE) (Mantilla, 2010; Carrillo, 2010) was the chosen methodology. SE has been used to evaluate rural development processes in a participatory way (Selener et al., 1996). It is an analytical and procedural approach, with a focus on drawing a final set of guidelines for the future, and understanding how different characteristics of the process have influenced a project's history, its results and impacts. Thus, it provides the setting for a social learning experience. A first manual of the SE is provided by Selener and colleagues (1996). The methodology may be adjusted according to the projects assessed, and various methods and tools maybe integrated (Tapella et al., 2014). Table 4.3-1 lists the different research interactions, its objectives, methods and tools used.

A coordinator group (CG) formed by researchers and ACC representatives was to supervise the SE. On a kick-off meeting, the ACC representatives presented a Timeline of their project until 2013, identifying specific periods differentiated according to the main goals and activities implemented, as Table 4.3-2 shows.

Table 4.3-1. Systematization of Experiences: methodological stages

Methodological stages (May, 2013 to March, 2014)	Objectives	Interactions, methods and tools
Preparation and joint discussions to co-delineate Methodology design	Define research questions Establish a coordinating group	Kick-off meeting with ACC Timeline of the Convergence Centre
Continue outlining methodological design [systematization questions]	Collection of systematization questions among ACC partners and former members	Analysis of 137 systematization questions; identify main themes
Interviews	Prepare and apply (17) interviews. Provide ACC with a synthesis report of results	Participatory interview schedule (meeting with the ACC group); 17 in-depth Interviews
Three-day Residential workshop	Design and implement workshop (26 participants)	Collective Design of WS program: World Café; Responses Session; Quantify Successes
Follow-up and synthesis	Final meeting, collecting results Producing systematization report for participants	Audio and video recordings; personal notes; photography; flipcharts

Table 4.3-2. Timeline of the Convergence Centre Project

Amoreiras Village Convergence Centre Timeline	2005-2013
Commencement and initial experiments (workshops and training on ecological topics and community art events)	2005-2007
Social program (cultural and community art activities; entertainment events; workshops on environmental and permaculture issues; activities for children; dissemination activities)	2008-2010
Sustainable village initiative (shared future vision; Permaculture design for a sustainable village)	2010-2012
New era (continuing implementing the Permaculture design; strengthen relations with regional administrators and business owners)	2012-2014

Collecting systematization questions

The CG agreed the systematization should be able to respond to the questions of a wider group of people and institutions with whom relations had been established. These groups included: present and past members of the ACC; individual collaborators and friends; organizations; members of the Transition Towns Network in Portugal; Permaculture Initiatives; and village residents. The CG collected and analysed the questions and subsequently shared them with all ACC members.

Interviews

Between July and September of 2013, seventeen participants were interviewed, out of a total of thirty-five who were members of the ACC for at least a period of one year. Interviewees were aged from 30-45 years old. Eight were male, and nine were female. Except for three persons, all were still living at Amoreiras Village or nearby. Two had completed high school, all others had completed university studies. Four were graduated in Environmental Engineering; four in Educational Studies; three in Fine Arts; one in Phycology; one in Geography; one in Biology; and one in Sociology. All names referred in interview quotes are aliases.

The leading researcher undertook a first version of the schedule and afterwards discussed and co-developed it with the ACC (see Table 4.3-1). Interviews lasted an average of two hours. This paper's account of the interviews condenses the main findings from seven questions listed on Table 4.3-3.

Table 4.3-3 Interview Schedule

Interview schedule
Why moving to the village to join the ACC?
What had been the best and worse experiences of living in the village?
What had been the best part of working in the ACC?
What had been most challenging?
What did she/he felt to have given to the village?
What did she/he felt to have given to the ACC?
What had been learned?
What visions for the future?

Residential workshop

A three-day residential workshop with twenty-six participants (including fifteen interviewees) took place in the village. Interview results were shared with the participants before the workshop. The workshop program was designed collectively. Each person made suggestions for methods and tools to be used; among these were: the World Café, the Responses Session, and the Quantify Success exercises. The World Café is a method for facilitating debate on a large-scale (Brown, 2010). Results were registered through audio recordings, which the notes participants took on flipcharts complemented. In the Responses Session, participants were invited to choose one or two systematization questions (posted on the wall), and organize themselves in small groups, with the objective of responding together to the questions. Recording devices were used by each group and all conversations were later transcribed. The Quantify Successes exercise (Kerth, 2001) had the objective of bringing attention to the achievements of the group over the years. Participants identified appropriate indicators to measure activities undertaken throughout the project's timeline. Afterwards, activity reports were used to quantify the different indicators. After the workshop, the quantification exercise was revised and all outputs of the SE were collected (e.g. audio recordings, flipchart notes, notes taken by participants, graphical illustrations, photographs).

Results

Systematization questions

The systematization questions informed the following methodological stages, but have also been a first result. 137 questions were received, from which sixty-three concerned the ways the project contributed to a more resilient village; thirty-three questions referred to the ways the ACC had sustain itself over the years; and forty-one to issues of communication and engagement.

Regarding the resilience topic, questions indicate local partners and villagers were well aware of the land abandonment problems in the region, and of the need to create a more sustainable territory. Sixteen resilience questions were from village residents, who were curious to know: «What benefits do you hope to bring to the village? » «Do you intend to stay for the long-run? » Villagers' questions express some perplexity regarding the presence of the new residents in a region where youth typically migrates to urban centres: «There is no future in the village – so why are you here?» Members of similar initiatives in Alentejo asked: «How many people became permanent residents in the village or of other villages nearby because of the ACC? » «What adaptation measures (e.g. to reduce soil erosion) have been implemented? ». These questions translate a concern with land abandonment and the need to prepare for the effects of climate change.

As regards the sustainability topic, the main concern was to understand how the project had been able to maintain itself over the years and how to ensure a more sustainable future. Examples include: «Were you able to create jobs for those involved? » «How did you fund your activities? » These questions signpost a concern with how the ACC responded to the issue of unemployment - a main cause for migrations to urban centres.

Finally, the questions on the issues of communication and engagement sought to understand how the project had developed participatory learning and governance mechanisms. It was perceived that the ACC had been successful in communicating its work to society, and partners were curious about the conditions that supported dissemination. Examples include: «How many people were directly involved by your work? » «What participatory methodologies were used? »

Individual experiences

Those involved in the ACC had also moved from a city to a very small rural village. Their individual habits, routines and ways of life changed significantly and were strongly interlinked to working commitments. Interview findings provide insights into the individual perceptions concerning the benefits and challenges of being involved in the project.

Regarding the benefits, interviewees had aspired for an opportunity to live in a rural area and enjoy a lifestyle that reflected their ecological values. This included being «close to nature», using low-carbon energy sources in their homes, and growing their own food. Fourteen claimed to have learned about ecological techniques and practices. This learning process resulted from the meeting of individuals with different competences, who were always interacting through their work and daily life experiences. Examples of the techniques learned included: growing organic food; learning about local native plants; acquiring practical experience with eco construction materials and techniques; and assembling their own solar water heaters and solar ovens.

Sixteen interviewees pointed out the importance of collecting traditional knowledge gained through daily interactions with local villagers, especially the elders. John felt that collecting traditional ecological knowledge was his most important task. These interviewees often used the words «listen», «observe» and «be patient» when characterizing the knowledge exchange they had been experiencing. John explained: «you need to be willing to listen, establish trust, and learn step-by-step. » He gave the example of a village elder, who had a small allotment: «It took me more than year of conversations, for him to begin teaching me something. » Another interviewee, Peter, referred he would have liked to create a local repository with documents, pictures, images, and audio recordings of local practices, «before they were lost forever to memory. » Conversely, three people had little interest in socializing with villagers. One interviewee talked about a «cultural shock», as it was hard for her to accept the «culture of drinking and hunting». Another felt «oppressed» by locals, and the constant «gossip». These three individuals were no longer living in Amoreiras at the time of the interview.

The group had contributed to counter land abandonment and rural exodus, fifteen stated. They had followed the opposite trend by moving from urban centres to rural areas. In total, they were parents to eleven children living in the village. The nearest school

«would probably have been closed were it not for our kids, » claimed Lana. These interviewees felt they had benefited the village by «just being here» (Luisa).

Referring to the ACC as a «family, » interviewees highly esteemed their life in the community:

«This has always been the reality in the village. We did not create a culture of sharing, exchange and mutual support. We just became part of it, » said Phillip.

All argued that their work had contributed to disseminate environmental awareness issues to society, particularly among village residents and local and regional partners and networks. The working methods of the group based on participatory approaches, were equally appreciated: «You can take these techniques anywhere, » says Jenny. - «We get really creative in our meetings. »

Regarding the challenges, after receiving from Odemira's Municipality a map of abandoned schools to explore, it took more than a year to find a suitable location. «I wanted to be outside, away from the computer, but those months we spent hours inside a car, » said Richard, «some schools were in ruins; we knew when we saw Amoreias - it was the place. » While settling at Amoreiras Village, they had a problem with housing, because villagers were apprehensive about renting to «strangers».

All interviewees mentioned the challenge of sustaining their livelihoods in the village throughout the years. Six people initially moved with a one year contract to work in ACC activities. Others arrived as volunteers, using their own financial resources and trusting that eventually the ACC would create jobs. Yet, job creation was only possible for short-term periods. Except for one, all had to find ways of earning money outside the ACC. Three ultimately left for financial reasons.

For some, adjusting to moving from a large city to work on a small rural village was difficult. As thirteen referred, tasks took longer than expected, and this was sometimes a source of frustration and stress. A lot of time was used up providing local services to villagers. It had been necessary to give way to the unpredictability of each day and to «an organic rhythm", says Luisa, making it very difficult to keep a working routine. Yet, Luisa notes, this was «part of the learning» process they were experiencing.

The usefulness of their presence in the village was questioned by two interviewees. Richard told a story he had heard of a politician, campaigning around a village in Africa:

«A villager asked the politician – 'Sir, do you know the story of the monkey? No, I don't. Well, a monkey was hanging from a tree, he saw a fish and decided to pick it up for fear it would drown' Sometimes», claimed Richard, «we were a bit like monkeys».

Richard's idea that the group also «tried to do too much» was prevailing, and fifteen agreed it would have been best to «focus on just one project and make it work» (Richard).

Shared conclusions and reflections

A set of shared conclusions and reflections results from the participatory experiences held throughout the residential workshop (i.e. the World Café, the Responses Session, and the Quantify Successes exercises). These findings relate to four topics of interest to participants, namely: the sustainable village system; the ACC as a demonstration site versus the need to learn from traditional practices; the financial sustainability of the project, and the successes achieved.

Participants highly valued the *sustainable village* initiative. This was a proposal for co-producing with the villagers a *dream village* based on the principles of Permaculture Design and the needs and aspirations of the villagers. The design should be grounded on a positive vision for the village and on a sustainability plan taking stock of the existent skills and resources. Figure 4.3-1 illustrates the conceptual model developed for the design.

Figure 4.3-1. Permaculture conceptual model for the sustainable village provided by Filipa Santos and André Vizinho (Vizinho et al., 2014)

Since implementation should be based on integrated solutions applied mostly with the villagers' own resources, the first step was to develop a shared vision for the future and a collective understanding of what a sustainable village would be. This was achieved through a series of street meetings and a door-to-door survey with residents, who identified their *village dreams*. The surveys allowed mapping the material and immaterial resources available, such as land allotments, competences, and demographics, to name a few. Once *dreams* were identified, working groups of villagers and administrators were tasked with finding strategies to implement them. It was recognized that most dreams would be materialized through collaborations with the parish administration (*Junta).* Although in some cases the municipality would need to intervene. The ACC equally used its own resources. The dream for a «prettier village», for instance, led to a group of volunteers whitewashing the village walls. Various village infrastructures were recovered during this period, such as the «social centre» (a space to organize meetings and parties) a public clothes washing area; and a soccer field. However, when the ACC suggested fixing walking paths and street benches, which were particularly important for the elderly population, «The Junta opposed, » said Philip. «They felt we were undermining their authority with the villagers. » After some time those areas were fixed. Similarly, for the children's playground (another village dream) Marta recounts that «volunteers would build it, they had a nice project designed, but people said building would be illegal without a municipal permit». The project was presented to the Mayor, and two years later the

playground was built (just before regional elections). During the following period the Permaculture design for a «dream village» was also completed and presented. Figure 4.3-2 shows one of its maps.
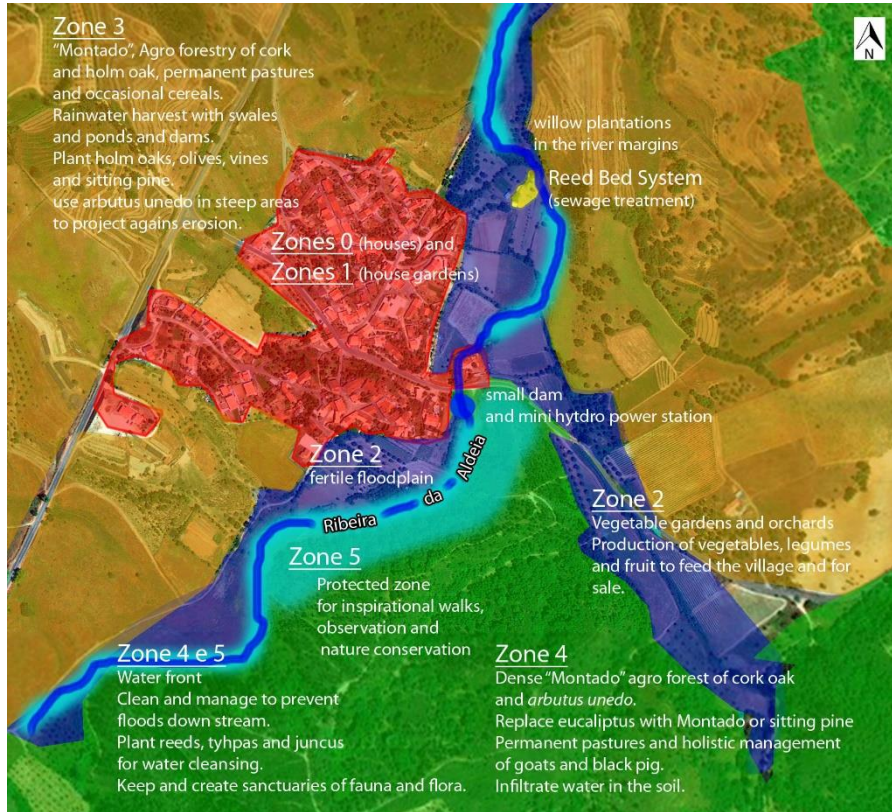
Figure 4.3-2 Permaculture design for a sustainable Amoreiras village provided by Filipa Santos and André Vizinho (Vizinho et al., 2014)

The issue of land degradation was frequently raised throughout workshop sessions. The main causes were attributed to intensive and industrialized agriculture in Alentejo, and to inefficient measures against soil erosion. It was agreed that the ACC had been able to demonstrate land use practices to fight the degradation of soils, such as the Permaculture Swale – a technique against landslides and for more efficient water retention in the landscape. There had been an effort to promote the use of more adapted species native to the region, as well as biodiverse farms. These practices were demonstrated in small scales, using the land of villagers. Conversely, it was believed that new and old techniques needed to be combined in order to deal effectively with current and future environmental pressures. ACC members sustained that the discourse of development policies for the region presented innovations as being the best option,

without first exploring the value of traditional knowledge. «Maybe the best impact we can have here, is not to have an impact» said Susan, supported by Mark and others who felt that traditional practices were undervalued by a «technical and urban society».

The project was not able to achieve financial sustainability, and there were no doubts this had been its main problem:

« […] The coming and going of people was frustrating, there was no money and people never stayed long, […] we couldn't apply for grants when we were unsure of who would do the work. » said Phillip.

Employment was created in some moments of the project, but for the most part, each person found hers or his own means of earning an income (e.g., renting their Lisbon homes, seasonal jobs elsewhere). Thus, the ACC was not able to create jobs and address a fundamental cause for land abandonment. A possibility suggested would be to develop a broad project (rather than having several activity projects), with tangible objectives, which would support financially all those involved. This strategy was thought to benefit from building stronger relations with regional administrators and landowners. It would also imply changes in the group's internal working structure and functioning. Participants were particularly interested in projects that would allow reinstating traditional land use practices, which had been abandoned.

Nevertheless, important successes had been achieved, particularly through the social dynamics introduced. Activities were measured in numbers for the previous eight years through the Quantify Successes exercise (see Table 4.3-4). Activity programs included ecology and demonstration events (Ninety-one); art and cultural programs (197); health and well-being (Twenty-two); dissemination activities (Twenty-nine); and others (Twenty-three). The social program and the sustainable village initiative were found to be the most active engagement periods (with 232 events done). The type of services provided to local population were a continued activity. Examples of these services included: teaching Portuguese lessons; assisting with using computers and the internet; helping with writing letters; and organizing activities for children. Communication and dissemination activities were considered important tools to promote awareness raising on environmental issues. It was concluded that the ACC had benefited from the strengths of its «sister» organizations, such as the Transition Towns Network in Portugal. These networks provided an important support in awareness raising activities by opening up

communication channels, such as contacts with media (newspapers, radio, TV), and supporting online dissemination activities.

Table 4.3-4 *Quantification of Success - Indicators and Numbers (2005-2013)*

Indicators of success	From 2005-2013
Convergents	35
Convergents living in the village	Average of 12
Activities organized	362
Houses rented	12
Convergents' children	11
Visitors participating in activity projects	2,400
Number of temporary collaborators	47
Number of village collaborators	24
Type of services provided to the local community	13
Infrastructures recovered	6
Number of international partners	30
Website visitors	18,1957
Mailing list addresses	50,000
Articles published (newspapers, blogs; magazines)	302
Master thesis about the village	3
Books produced (on local biodiversity and land use)	6
News broadcasted on national TV	2

Discussion

Rendering the self-evaluation of this group, the activities and projects developed since 2005 have aimed at tackling the core problems identified for the region. But can we consider that the village became a more adapted and resilient social-ecological system because of the presence of the ACC? Table 4.3-5 is a synthesis of ten potential sources of resilience the group identified through the SE.

Table 4.3-5 *Self-evaluation of the group on sources of resilience*

Self-evaluation of the group on sources of resilience
Demonstrating a new way of living in rural areas
New families and children
Participatory involvement of the local community
New governance arrangements and collective action
A more attractive village (cleaner, prettier and active)
Services to the more vulnerable groups (elderly and children)
Learning and collecting traditional ecological knowledge
Awareness rising and dissemination activities on environmental and sustainability issues
Integrated vision and planning of the village (Permaculture design)
Use of integrated and ecological solutions (Permaculture principles)

In the Social-Ecological Systems (SES) literature, studies have investigated how society re-organizes itself when faced with external pressures or moments of crisis (Nelson *et al*., 2002; Walker *et al*., 2006). Resilience studies have argued that collective action is a significant determinant for increasing adaptive capacity (Adger, 2003) and that local forms of governance and institutions play a central role for implementing effective adaptations (Folke *et al.*, 2005). Similarly, there is an important argument for relying on polycentric dynamics and deliberative decision-making process (Olsson *et al*., 2006; Berkes *et al*., 2003) that promote adaptability in complex social-ecological systems. New forms of governance or modes of deciding together on collective issues (Folke *et al*., 2005) have been proposed, such as adaptive governance (Olsson *et al*., 2006; Folke *et. al*, 2005). The innovation studied has not attempted to purposely use any of these approaches, of which participants were not even familiar with. Nevertheless, many of the processes developed echo the characteristics of adaptive governance. The best example has been the process of making a sustainable village design, leading to the first permaculture design for a village in Portugal (Vizinho *et al*., 2014). The design is based on a systems' perspective, acknowledging the co-evolving dynamics of human and ecological interdependencies, and taking a systematic account of how land, sociocultural and material resources can be integrated in a shared vision and action planning for the village system, making it more resilient and sustainable for future generations. The sustainable village design was co-created with the local community and thus embedded in a participatory governance experiment for co-managing local resources. After mapping the villagers' dreams and resources, working groups decided together on how to implement the dreams and make the best use of existent resources. These decision-making and co-management procedures led to collaborations with local administrations. At times, the ACC pressured administrations to act on fulfilling needs identified by village residents. Thus, a deliberative governance process begins emerging as the different social actors, with particular interests, power relations and available resources, engage through interdependent processes of negotiation and collaboration (Dryzek, 2010). Despite the results achieved, the governance process has waned since 2012, and did not apparently grow beyond the boundaries of Amoreiras village. There seems to be still a large potential for a more transformative change that may imply a new type of structure for the innovation, and a more effective institutional support, including adequate financial mechanisms to sustain the project.

Based on a comparative case study analysis, Folke and colleagues (2005) highlight four interrelated factors that are prevailing in complex systems facing periods of incremental or transformative change:

«Learning to live with change and uncertainty; combining different types of knowledge for learning; creating opportunity for self-organization towards social-ecological resilience, and nurturing sources of resilience for renewal and organization. » (Folke *et al.*, 2005: 452).

These four factors serve as guidelines to further characterize the innovators' impact within the village system. Looking back to the past eight years, participants appear to have mostly focused on creating opportunities for self-organization (e.g. resource management); and on exploring sources of resilience, for renewal and organization (e.g. a more socially active village). However, a learning process gradually brought a closer attention to the first two listed factors. The experiences in the village led to acknowledging the importance of rethinking how the traditional system had coped with past changes and learn from these memories. Thus, the group reversed its initial strategy of being a demonstration site, by focusing mainly on recovering traditional rural knowledge and acting as brokers between the village and society at large. This was enacted individually on a daily life basis, but also collectively through the sustainable village.

The topic of Traditional Ecological Knowledge has been approached in the SES literature (Berkes *et al.*, 2000; Fabricius *et al.*, 2013). On a survey of case studies of indigenous cultures around the world, Berkes and colleagues characterize the practice of Traditional Ecological Knowledge and its interrelations to local social mechanisms, which include the ways knowledge is embedded and internalized in institutional and cultural life, as well as dominant worldviews and values (Berkes *et al.*, 2000: 1255-1256). The ACC's willingness to collect local knowledge echoes equally the concept of a *social or collective memory* (Folke *et al.*, 2005; Colten and Sumpter, 2009) as a source of social-ecological resilience. Barthel and colleagues (2010) refer to «collectively shared mental maps for dealing with a complex world» (Ibid, 2010: 256). Their study investigates how a collective memory of practices, knowledge and experience is passed on among urban allotment gardeners, concluding that oral communication had been the most important form for conveying ecological practices between gardeners. Likewise, in the village,

participants spoke of the need to «talk» and «listen» to villagers in order to learn traditional land use practices. These interpersonal relations were time consuming and required perseverance in gaining local trust. While Barthel and colleagues conclude that social-ecological memory plays a pivotal role as a «carrier of knowledge and practice» (Ibid: 262), the question remains how to tap into this knowledge, when the local community requires effort and time to reveal its «secrets» to outsiders, who conversely are met with great challenges to finance their availability, time and effort. Arguably these «secrets» could remain unrevealed, participants could just be acting like «monkeys» saving the fish from the water, as one interviewee mentioned. Yet, there is a strong argument from participants, and rebounded in national studies (Do Rosário, 2004; NAS/AF, 2013), that the channels for transmitting collective memory in Portuguese traditional rural societies affected by industrialization and land abandonment trends have been broken. Therefore, new contexts need to be created to promote debates, discussion, participation and the sharing of knowledge. If the group is right to say that traditional knowledge holds many responses and ecological practices which have been devaluated and abandoned, then restoring this social memory maybe an important source of resilience. Moreover, the process of collecting and empowering traditional knowledge has been intertwined with new ecological practices (namely those based on Permaculture principles). A sustainable village would benefit from integrating the various knowledge systems in shaping a novel form of living in the territory. Thus, the participants may be considered to have acted as interpreters, facilitators and visionaries in a changing social-ecological system (see Folke *et al*., 2005 for an identification of roles based on a comparison of co-management case studies).

As a component and outcome of social memory, the concept of social capital (Adger, 2003; Ostrom and Ahn, 2003) refers to resources within communities amassed over the continuous relationships established through networking and learning arrangements (Kay, 2006). Social capital can be understood as a set of immaterial assets of individuals or communities that are reproduced and shared through the dynamics of networks. As social capital is incrementally build up, collective responses to environmental challenges are able to rely on a broader support base. Therefore, this type of capital is considered of central importance for adaptability (Adger, 2003).

In the case studied here, the first strategy of the ACC was to promote spaces and mechanisms for collective dialogue and decision-making. The group set up multiple occasions for community festivities and celebrations that created stronger ties with the

local residents, and promoted personal relations built on trust and friendship. The meeting of these communities possibly means the assembly of two social memories that have built up social capital. Furthermore, over the years, the ACC has been able to endorse new networks and social connections in the region. First, through joining existent networks such as the Transition Towns Network and a Portuguese network of Permaculture Initiatives. Relations were also established with other local communities and initiatives, including Eco villas and non-governmental organizations. These network relations supported the group's awareness raising activities. Finally, there have been collaborations with local administrators and landowners, though, as the group acknowledges, these relations would need to be further strengthened in the future. Thus, through its networking activities, the ACC has added to the social capital of the village by acting as a facilitator of connections. But also by bringing its own shared knowledge and expertise, such as the participatory methodologies which framed the learning and governance experiences implemented.

Regarding the impact of the innovation in countering land abandonment by contributing to populating the village with young families and children, more years would be needed to find out if this has been a temporary or a longer-term trend. The ACC has also claimed to support local quality of life in ways local administrations could not, by providing free services to more vulnerable residents in the village. Other studies would be needed to understand the impact of these activities, including a survey to local villagers to gain insights into their perspective.

Conclusions

The retrospective assessment confirmed the hypothesis that this type of community has provided new sources of adaptability and resilience in a Mediterranean system facing increased land abandonment and land degradation, which climatic changes may exacerbate. Yet, the study led to unexpected results regarding the ways the project promoted adaptability. First, the making of a permaculture design for a more sustainable and resilient village appears as a grassroots process of co-managing local resources, building new networks and promoting the sharing and connectivity between distinct, yet complementary, bodies of knowledge. Second, through the creative process of finding future and shared visions for a more sustainable village, participatory modes of governance new to the village were encouraged. These activities translate into an

unplanned governance experience, which could not be labelled or characterized into a specific framework, but which nonetheless embodied some of the characteristics of adaptive governance approaches. Thus, the ACC's role in the village can be characterized as a facilitator of new modes of governance, visionary of sustainable ecological futures, interpreter and collector of social memories, and a networker that builds up social capital.

Particularly in socio-political contexts where participatory learning and collective decision-making processes are not usual, grassroots innovations may provide new governance designs and social learning practices, built upon more fluid and relational societal dynamics, rooted in contrasting living experiences, worldviews and cultures, yet shaped within traditional rural societies. Furthermore, learning from local culture may represent a still underexplored pathway for adaptability in regions where traditional land use and resource management practices have been gradually lost to industrialized farming. However, without appropriately addressing the issue of unemployment and providing financial sustainability for their members, these type of initiatives may not make significant advancements in converging for deterring land abandonment.

Lastly, contrary to this article's case study of a group of urbanites who moved to a rural area with their own particular vision of change, it is important to examine local community driven initiatives without external influence. This could be useful in order to seek and implement innovative solutions for present and future challenges, which are endogenously found. However, possibly, not one perspective (exogenously driven initiatives) or the other (endogenously driven initiatives) are the only solutions for facing challenges in local communities. More research is needed to understand whether a mix of the two – towards hybridized forms of change – might work better, and what lessons can be drawn from such hybrid experiments.

Reference List

Adger, V. N. (2003). Social Capital, Collective Action, and Adaptation to Climate Change. *Economic Geography*, *79* (4), 387-404. doi: 10.1007/978-3-531-92258-4_19

Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, *16* (3), 268–281. DOI:10.1016/j.gloenvcha.2006.02.006

Adger, W. N., Barnett, J., Brown, K., Marshall, N., & O'Brien, K. (2012). Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, *3* (2), 112–117. doi:10.1038/nclimate1666

Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global environmental change*, *18*(1), 86-98. doi:10.1016/j.gloenvcha.2007.07.002

Barthel, S., Folke, C.,& Colding, J. (2010). Social–ecological memory in urban gardens—Retaining the capacity for management of ecosystem services. *Global Environmental Change*, *20* (2), 255-265. doi:10.1016/j.gloenvcha.2010.01.001

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological applications*, *10* (5), 1251-1262. doi: http://dx.doi.org/10.1890/1051-0761(2000)010[1251:ROTEKA]2.0.CO;2

Brown, J. (2010). *The world café: Shaping our futures through conversations that matter*. Retrieved, June 20th 2015, from: ReadHowYouWant. com.

Carrillo, A.T. (2010). Generating knowledge in popular education: From participatory research to the systematization of experiences. *International Journal of Action Research*. 3, 196-222. http://www.hampp-verlag.de/hampp_e-journals_IJAR.htm#210

Carvalho-Ribeiro, S. M., Lovett, A., & O'Riordan, T. (2010). Multifunctional forest management in Northern Portugal: Moving from scenarios to governance for sustainable development. *Land Use Policy*, *27*(4), 1111-1122. doi:10.1016/j.landusepol.2010.02.008

Colten, C. E., & Sumpter, A. R. (2009). Social memory and resilience in New Orleans. *Natural Hazards*, *48* (3), 355-364. doi: 10.1007/s11069-008-9267-x

Do Rosário, L. (2004). *Indicadores de desertificação para Portugal Continental [Desertification Indicators for Continental Portugal]*. DGRF - Direcção-Geral dos Recursos Florestais: Lisbon.

Dryzek, J. S. (2010). *Foundations and frontiers of deliberative governance*. Cambridge: Cambridge University Press.

Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, *21* (2), 647-656. doi:10.1016/j.gloenvcha.2011.01.019

Engle, N. L., & Lemos, M. C. (2010). Unpacking governance: building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*, *20*(1), 4-13. doi:10.1016/j.gloenvcha.2009.07.001

Fabricius, C., Koch, E., Turner, S., and Magome, H. (2013) *Rights resources and rural development: Community-based natural resource management in Southern Africa*. Routledge, London.

Figueiredo, J., & Pereira, H. M. (2011). Regime shifts in a socio-ecological model of farmland abandonment. *Landscape Ecology*, *26 (*5), 737–749. doi: 10.1007/s10980-011-9605-3

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267. doi: 10.1016/j.gloenvcha.2006.04.002

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, *30* (1), 441–473. doi: 10.1146/annurev.energy.30.050504.144511

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, & J. Rockström (2010). Resilience thinking: integrating resilience, adaptability and transformability. Ecology and Society, 15 (4), 20. http://hdl.handle.net/10535/7422

Gonçalves, H. J. D. C. F., Marta-Costa, A. A., & Cristóvão, A. (2013) Empoderamento de comunidades rurais como prática de revitalização de aldeias [Empowering rural communities as a practice to revitalize villages]. *DRd-Desenvolvimento Regional em debate*, *3* (2), 86-99. Retrieved June, 10th 2015 from: http://www.periodicos.unc.br/index.php/drd/article/view/451/368

Hemenway, T. (2009) *Gaia's Garden: A Guide to Home-Scale Permaculture*. New York: Chelsea Green Publishing.

Kay, A. (2006) Social Capital, the social economy and community development. *Community Development Journal*, 41 (2), 160-173. doi:10.1093/cdj/bsi045

Kerth, N (2001) *Project Retrospectives – A Handbook for Team Reviews*. New York: Dorset House Publishing.

Mantilla, G. E. V. (2010) Community systematization and learning: project management for change. *Community Development Journal*, *45 (*3), 367-379. doi: 10.1093/cdj/bsq030

NAS/AF [National Strategy for Agriculture and Forestry Adaptation to Climate Change in Portugal] (2013). Portuguese Strategy for Climate Adaptation in Forestry and Agriculture. Retrieved from: http://www.apambiente.pt/_zdata/Politicas/AlteracoesClimaticas/Adaptacao/ENAAC/RelatDetalhados/Relat_Setor_ENAAC_Agricultura.pdf

Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: contributions of a resilience framework. *Annual review of Environment and Resources*, *32* (1), 395. doi:/pdf/10.1146/annurev.energy.32.051807.090348

Neumeier, S. (2012). Why do Social Innovations in Rural Development Matter and Should They be Considered More Seriously in Rural Development Research? – Proposal for a Stronger Focus on Social Innovations in Rural Development Research. *Sociologia Ruralis*, 52, 48–69. doi: 10.1111/j.1467-9523.2011.00553.x

Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006) Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, *11* (1), 18. http://hdl.handle.net/10535/3412

Ostrom, E.,& Ahn, T. K. (2003) *Foundations of social capital*. UK: Cheltenham Edward Elgar.

Park, S. E., N. A, Marshall; E. Jakku; A.M. Dowd; S.M. Howden; E. Mendham; & A. Fleming. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22* (1), 115-126. doi:10.1016/j.gloenvcha.2011.10.003

Pretty, J. N. (1995). Participatory learning for sustainable agriculture. *World development*, *23*(8), 1247-1263. doi:10.1016/0305-750X(95)00046-F

Ridder, D., and Pahl-Wostl, C. (2005). Participatory Integrated Assessment in local level planning. *Regional Environmental Change*, *5* (4), 188 –196. doi:10.1007/s10113-004-0089-4

Santos, F. D., & P. Miranda (2006). *Climate change in Portugal. Scenarios, impacts and adaptation measure.*, Lisboa: Gradiva.

Selener, D., Purdy, C., & Zapata, G. (1996). *A participatory systematization workbook*. Silang, International Institute of Rural Reconstruction. doi:10.1016/0305-750X(95)00046-F

Seyfang, G. & Smith, A. (2007). Grassroots Innovations for Sustainable Development: towards a new research and policy agenda. *Environmental Politics*, 16(4) pp. 584-603. doi: 10.1080/09644010701419121

Seyfang, G. & Haxeltine, A. (2012). Growing Grassroots Innovations: Exploring the role of community-based social movements in sustainable energy transitions. *Environment and Planning C*, 30(3), 381-400. doi: 10.1068/c10222

Smit, B.; & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, 16(3), 282–292. doi:10.1016/j.gloenvcha.2006.03.008.

Smith, A.; Fressoli A.; & Hernán T. (2014). Grassroots innovation movements: challenges and contributions. *Journal of Cleaner Production*, 63, 114-124. doi: 10.1016/j.jclepro.2012.12.025

Tapella, E., & Rodríguez-Bilella, P. (2014). Shared learning and participatory evaluation: The sistematización approach to assess development interventions. *Evaluation*, *20 (*1), 115-133. doi: 10.1177/1356389013516055

Truninger, M. & Freire, D. (2014). Unpacking the Mediterranean diet: agriculture, food and health. In Domingos, N., Sobral, J. M. & West, H., (Eds.). *Food between the country and the city: ethnographies of a changing global foodscape.* London: Bloomsbury.

Vizinho, A., Santos, A.F., Gonçalves, J., Umann, M.,& Crespo, J. (2014). *Amoreiras, Permacultura para uma Aldeia. Portugal*. Aldeia das Amoreiras: GAIA.

Walker, B. H., L. H. Gunderson, A. P. Kinzig, C. Folke, S. R. Carpenter, & L. Schultz (2006). A handful of heuristics and some propositions for understanding resilience in social-ecological systems. *Ecology and Society*, 11(1), 13. doi: http://www.ecologyandsociety.org/vol11/iss1/art13/

Paper 4

Scenarios and pathways – a long-term planning experiment for climate change coastal adaptation

Inês Campos*; André Vizinho*; Carlos Coelho**; Carla Pereira**; Fátima Alves***; Mónica Truninger****; Filipe Duarte Santos*; Luísa Schmidt****; and Gil Penha Lopes*

Centre for Ecology, Evolution and Environmental Changes (CE3C) Faculty of Sciences of Lisbon University*; Civil Engineering Department, Aveiro University**; Centre for Environmental and Marine Studies, Aveiro University ***; Institute of Social Sciences of Lisbon University****

Abstract

The article explores how a reflexive planning experience may promote long-term climate change adaptation at the local level in a particular vulnerable costal region, in Portugal. The study offers an empirical application of transition studies in a new geographical and governance context. A novel combination of methods [SWAP] uses the Scenario Workshop and the Adaptation Pathways and Tipping-Points in the context of an action-involvement approach. SWAP has been useful in simplifying different types of complexities and uncertainties which constraint long-term planning and local action, in a complex institutional and decision-making context, where participation, inter-institutional dialogue and collaborations are not mainstream. The discussion reflects on insights of the empirical experience for transition studies. The conclusion considers how the research design attempted to work from the inside out to change the traditional modus operandi of administrative and governance cultures.

Key-Words:

Climate change adaptation; Long-term; Transitions; Scenario Workshop; Adaptation Pathway

Introduction

The need to respond to climate change impacts is unavoidable in many parts of the globe. This article tells the story of a reflexive planning experience for promoting long-term adaptation to climate change related impacts in a particularly vulnerable coastal region in Portugal. The study offers equally an empirical application informed by transition studies (Markard *et al.,* 2012).

Climate adaptation is concerned with understanding climate impacts and their consequences for society, but mainly focused on reducing vulnerability, or the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change (Adger, 2006), as well as in implementing sustainable solutions to benefit from possible opportunities (Smit and Wandel, 2006). It is desirable that adaptation, whether it proceeds through an incremental or transformative change, may lead to sustainable outcomes (Kates *et al*., 2012; Westley *et al*., 2011). The ability of communities, regions or countries to adapt is referred as *adaptive capacity* (Engle, 2011). Adaptation studies have sought to understand the *determinants* of adaptive capacity (Smit and Pilifosova, 2001). Particular determinants have been explored (Smith and Pilifosova, 2001) such as local forms of governance and participation in decision making (Engle and Lemos, 2010; Folke *et al*, 2005; Larsen and Gunnarsson-Östling, 2009).

Adaptation planning has been systematized according to who drives the process and to its timings. It may be planned (or anticipatory) and unplanned (or reactive) (Smit and Philifosa, 2001). Planned adaptation is frequently equated to public planning, while unplanned adaptation is sometimes understood as adaptive actions taken up by private actors (EEA, 2013). However, not all spatial plans can be labelled as reactive or anticipatory, and many share both characteristics (Tompkins et al., 2010). Regardless of the determinants and drivers for local adaptation, research seems to play an important role in capacitating institutional actors, providing scientific and technical information and promoting awareness raising (Dannevig *et al*., 2012; Juhola and Westerhoff, 2011). Likewise, there appears to be no doubt that long-term adaptation plans are increasingly a necessity (Burton *et al*., 2004). However, though step-based approaches to planning have been suggested (Klein *et al*., 1999), studies show the real world of spatial planning does not fit into idealized rationalistic constructs (Juhola and Westerhoff, 2011; Tompkins *et al*., 2010). Taking into account that the uncertainty of climate impacts and of the effects of adaptation solutions needs to be integrated at multi-scale and multi-level governance

systems (Baker *et al*., 2012; Pahl-Wostl, 2009), sequential and rationalistic approaches to planning do not seem the most adequate. Instead, more flexible, deliberative and reflexive approaches are required (Amaru and Chhetri, 2013; Olsson *et al.,* 2006).

Thus, this article discusses how an action-research (McNiff, 2013) reflexive planning experience has worked in promoting a long-term action plan in a coastal region where governance mechanisms and institutional arrangements have constrained adaptation, and where public involvement and participation have not been frequent. The hypothesis is that by providing a forum for collaborative and inclusive discussion on climate change adaptation, the experience encourages a long-term transition towards a sustainable and resilient community and territory. The study aims to offer an experience replicable in other coastal regions facing similar climate and governance challenges. Finally, by drawing on conceptual frameworks developed in the transition research field, the article delivers a new empirical application of these studies, in a governance and geographical context not yet explored.

The subsequent section offers a summary account of the transition research field, focusing on reflexive governance approaches, which have provided conceptual, analytical and methodological contributions for the empirical research. Section 3 briefly characterizes the current state of Portuguese adaptation and reviews previous research in the same coastal region, highlighting the societal needs this study sought to address. This section also describes the case study area, as well as its current vulnerabilities and expected climate related impacts. Section 4 describes the action-research approach. Sections 5 and 6 respectively report and discuss the results, reflecting on insights of the empirical experience for transition studies. The conclusion considers how the research process attempted to work from the inside out to change the traditional modus operandi of administrative and governance cultures, and what can be the added value of transition approaches to adaptation research.

Contributions from Sustainable Transitions

Transition studies are a multidisciplinary field of sustainability research, which emerged largely from Technology and Innovation Studies (Schot and Geels, 2008; Markard, and Truffer, 2008; Smith and Raven, 2012). Reflexivity is a key word in this literature, inherited from the work of Giddens and Beck on the risk of modern society and ecological modernization (Beck *et al*., 2003; Giddens, 2007). Beck's risk society theory introduces

the idea that society itself is being revolutionized as an intended side effect of modernization. In this context, governance is understood as a «process by which society defines and handles its problems» (Voß and Kemp. 2006: 9), which rather than being linearly solved, are «handled» and «steered» (Meadowcroft, 2009; Voß and Kemp, 2006) by various actor-worlds with multiple interests, needs and strategies. Conversely, specialized, managerial «command and control» governance processes, are characterized by a focus on isolating particular elements of complex realities, prioritizing goals, establishing cause-effect connections, and devising technical solutions, often imposed as an accomplished result to society (Voß and Kemp, 2006). These solutions tend to lead to unintended effects of first and second order (Meadowcroft, 2007; Lissandrello and Grin, 2011; Voß and Kemp 2006).

The co-evolving, complex, and nonlinear dynamics of socio-technical systems are the object of analysis of transition research. The Multi-level Perspective (MLP) (Geels, 2010; 2011) proposes that change occurs over an extended period of time (50 years or more) as a regime (the dominant socio-technical system; or the «deep structure» is transformed or replaced by another, through the emergence of socio-technical niches (innovations, alternative systems) and/or due to landscape pressures (exogenous contextual factors) (Geels, 2011). Therefore, a transition is as a process of systemic change within the societal fabric (Grin *et al*., 2010; Geels, 2010). There are different interpretations of the MLP (Grin *et al.,* 2010; Markard *et al*., 2012) and studies of transitions to sustainable development have taken various guises. These studies introduced conceptual designs that integrate participation, collaboration and deliberative modes of governance, in order to promote responses to persistent problems and influence sustainable transitions (Geels and Schot, 2007; Loorbach, 2010).

Transition Management (TM) is one application of the MLP that seeks to influence future transitions through a new generation of long-term planning (Kemp *et al*., 2007), and has been considered a form of reflexive governance (Voß and Bornemann, 2011). TM is an action-research oriented framework (Wittmayer and Schäpke, 2014), and began being developed in the Netherlands (Loorbach, 2010). The framework has informed research as well in other regions of the world. Particularly regarding climate adaptation, a study of the Southwest coast of Australia has applied an action-research approach based on the TM framework to assess gaps between planning processes and implementation experiences (Wood and Stocker, 2009). Nevertheless, an extensive survey of the transition research field (Markard *et al*., 2012) indicates TM has been

developed in a narrow set of geographical and governance contexts, and has mostly focused on socio-technical transitions that support mitigation of climate change.

TM uses a backcasting method (Rotmans *et al.*, 2001) where future visions are co-created and shared in order to define short-term objectives that can meet long-term goals. After forming «transition arenas» with a group of innovators, policy designs develop along a transition management cycle, with four key stages (Loorbach, 2010, p. 173). In TM participation is selective and limited to a number of *frontrunners* who are innovators holding important roles in leading or promoting networks (Loorbach, 2010). Frontrunners should be «pioneers, niche players», who «think out of the box»; but who should also «work well in a group process» (Loorbach and Rotmans, 2010: 243). Potential frontrunner candidates are screened through a selection process, so that a «balanced group» is formed.

Similarly to TM, the approach discussed in this article – designated as SWAP [referring to the combination of the Scenario Workshop and Adaptation Pathways and Tipping-Points methods] – is an action-research oriented approach evolving through an ongoing «learning-by-doing and doing-by-learning» design (Loorbach, 2010). In developing SWAP, given the particular socio-technical, administrative and political complexities of the case studied, it would be problematic to apply the TM framework as it has been proposed by Loorbach (2010). First, it was not clear if local actors were considering a long-term transition, or climate change adaptation as a societal need, or merely pushing for an action plan that could provide immediate and reliable coastal protection. Second, there was not a plan or an innovative adaptation experiment to be investigated (i.e. there were no identifiable niches). Likewise, there were no identifiable *frontrunners* or *niche players*, but rather a wide group of actor-worlds with strong interests in protecting and adapting the coastal system to the climatic impacts. These social actors were disengaged from each other, and not dynamically attempting to establish a base for collective action and dialogue. Finally, a complexity of overlapping jurisdictions for coastal management, as well as insufficient inter-institutional dialogue and public participation, had been found to constrain the making of collective long-term strategies (Schmidt *et al.,* 2014; O'Riordan *et al*., 2014). Thus, any attempt at long-term planning would first have to set the ground for more alternative modes of governance. Considering this context, SWAP resulted from the purpose of establishing with local actors, an arrangement for promoting a reflexive governance design that could facilitate the process of navigating through the uncertainties of climate change, guided by shared

visions for the future. It has been important to work with representatives of a wide range of local stakeholder interests, whether or not they were *niche players*. Nevertheless, the conceptual underpinnings of TM, namely the methodological cycle comprising future visions and reflexivity, and the idea of influencing a long-term planning experience through establishing an arena of engaged actors, have provided important contributions for the SWAP approach.

However, SWAP has equally taken into account critical assessments of TM. First, literature has called attention that forming a strong democratic and inclusive support base should be a priority for TM (Hendricks, 2009), in order to assure democratic outcomes and prevent that an overly malleable storyline is absorbed by dominant actors and interests (Smith and Stirling, 2010). Smith and Kern's (2009), analysis of transition storylines in the Netherlands pointed to the frailty of the transition discourse in surviving the status quo of dominant political and organizational structures. Likewise, studies of socio-technical systems and their co-evolving dynamics have been noted to leave out the political dimension (Smith and Stirling, 2010; Voß and Bornemann, 2011). These were core concerns SWAP needed to take into account, since the approach intended to challenge the status quo of current governance mechanisms and institutional arrangements, in order to promote long-term planning and participated decisions that could move beyond a mere academic exercise, and into practical policy-making (Carvalho-Ribeiro *et al*., 2010).

Another important influence has been Jorgensen's (2012) critical assessment of some central tenets of the transition research field. Jorgensen suggests the Arenas of Development (AoD) framework for the study of transitions (Jorgensen, 2012). Instead of identifying socio-technical regimes, niches and landscapes, Jorgensen proposes that research identifies and navigates through constellations of actor-worlds and their sense-making performances. From this perspective, though top policies or bottom actions may be drivers for change, the transition is the outcome of a series of conflicting interests, which affect and are affected by polycentric structures of power, within the socio-technical system. Subsequently, Jorgensen argues that the objective should be to develop a «governance from the inside approach» (Jorgensen, 2012: 999), where transition «managers» are embedded in the process, as much as other arena actors. As such, SWAP has attempted to integrate these ideas in the action-involvement process.

The Portuguese case

Portuguese coastal regions are already experiencing severe erosion problems, which may be aggravated by climate change impacts in the coming decades (Schmidt *et al*., 2014). However, both planned and autonomous adaptation processes are still beginning. A National Adaptation Strategy (APA, 2013) was launched in 2010, as a non-binding program and has so far advanced with vulnerability assessments and studies that have not yet translated into specific official guidelines for action planning (O'Riordan *et al*., 2014; APA, 2013). Conversely, at the local level only three municipalities (in a total of 308) have begun developing a strategy. Accordingly, Portugal appears in European reports as a very vulnerable country with highly adverse climate integrated impacts and low levels of adaptive capacity (ESPON, 2013).

The area studied by this article - the coastal stretch between Ílhavo and Vagos (see Figure 1) - has been recognized as one of the most vulnerable low-lying coasts in Europe when it comes to storm surges and flood risks (Alves *et al*., 2011; Dias *et al*., 2014; Santos *et al*., 2006). From the geomorphological point of view the study area is a dune barrier along a stretch of nearly 20 km, in the West coast of Portugal, belonging to the municipalities of Ílhavo and Vagos. It extends from the mouth of the Ria de Aveiro lagoon (main entrance of Aveiro Harbour) and the beach of Barra to the beach of Areão, along a low-lying sand spit between the sea and a lagoon (see Figure 4.4-1.). The territory is characterized by the presence of three urban settlements (Barra, Costa Nova and Vagueira) occupied by summer residencies, fishing communities and permanent residences. Land cover between these settlements is mostly composed of wetlands, sandy beaches and dunes, agricultural areas, roads, as well as touristic and harbour infrastructures.

Figure 4.4-1: Google Earth Map of the case study area: the two red balloons (from right to left) mark the sea front covered by the municipalities of Ílhavo and Vagos

The coastal area is highly exposed to a very energetic wave climate (Coelho *et al*., 2009), currently suffering from strong erosion, mainly due to a deficit of sediments associated with the reduction in river sediments supply (Pereira and Coelho, 2013). According to recent studies, sea level may rise up to a meter in 2100 (Dias and Alves, 2013; Schmidt *et al*., 2013). Changes are expected in wave direction, as well as an increase in wave height and extreme events (e.g. storms), already frequent during the winter months (Dias *et al*., 2014; Fortunato *et al*., 2013). Climate indirect impacts include: aggravated coastal erosion and loss of sandy beach areas and dune systems; recurrent ocean and fluvial floods; potential loss of revenues in tourism and nautical sports; and damages in coastal defence structures and urban infrastructures (Alves *et al*., 2014; Coelho *et al*., 2009). Changes in hydrodynamics and water salinity in the Ria de Aveiro would also have impacts on terrestrial and marine ecosystems and subsequently, in local economic activities, such as fishing and agriculture (Dias *et al*., 2014). Finally, the risk of a new connection between the sea and the lagoon, leading to a new inlet in the lagoon, would have severe consequences for coastal settlements, as well as to local ecosystems and socioeconomic activities (Coelho *et al*., 2009).

Locally, political agendas aim at maintaining the functioning of the beaches uses during the summer season, thus protecting investments and business, but are also concerned with deterring the devaluation of real-estate investments (Schmidt *et al*., 2013b). In responding to perceived and experienced risks, land use managers have relied only on short-term spatial plans and emergency actions (Alves *et al*., 2011). Two recent

129

vulnerability assessments concluded that to address the challenges of the coast, a concerted inter-municipal long-term action plan for the future would be needed (Alves *et al*., 2013; Schmidt *et al*., 2014). Previous studies equally highlighted a high perception of risk among local social actors (Schmidt *et al*. 2014; O'Riordan *et al*., 2014), although no long-term plan for coastal protection had been initiated. The existing Coastal Zone Management Plan (stretch Ovar-Marinha Grande) for the study area only presents a short-term strategy (with a horizon of 10 years). The main concerns of local stakeholders are the protection of people and goods and the risk of a new connection between the sea and the lagoon (Pinho *et al*., 2009; Schmidt *et al*., 2014). Moreover, O'Riordan and colleagues (2014) found local actors had not been involved in public meetings to discuss adaptation planning. Hence, there has been a general "discouragement and distrust on the part of social actors to participate, (…) or to be recognized as partners by the political powers in their various governmental settings." (O'Riordan et al., 2014:14).

Likewise, inter-institutional dialogue and collaborations have been found to be very limited. Previous studies highlighted the lack of continuity in public policies and a high level of administrative complexity due to multiple institutional bodies responsible for coastal zone planning and management (Alves *et al*., 2011; O'Riordan *et al*., 2014). Local governments face equally problems in deciding between a diversity of technical options, while confronted with the challenge of financing adaptation in the long-term, particularly given insufficient national financial resources needed for coastal defence investments (Schmidt *et al*., 2014). To address these gaps this study has sought to promote an inter-municipal reflexive long-term planning experience, informed by conceptual frameworks developed in the transition research field.

Methodology: SWAP

The aim of this research has been to promote a long-term action-plan in a Portuguese coastal region, thus addressing the societal needs evidenced by previous studies in the region. Framed by an action-research approach, the combination of methods used has been designated as SWAP: the Scenario Workshop (Andersen and Jæger, 1999; Larson *et al*., 2009; Schmidt-Thomé and Klein, 2013), and the Adaptation Pathways and Tipping-Points (Hassnoot *et al*., 2013). To support the design of adaptation pathways, SWAP included a Multi-Criteria exercise (Salminen *et al*., 1998). Additionally the following sources of evidence and knowledge exchange were used: documental analysis of climate

scenarios and risk assessments for the area; informal meetings with each relevant actor-group; two seminars; and semi-structured interviews.

Documental analysis, climate scenarios and risk assessments

Documental analysis and literature review of vulnerability and risk assessments made for the area were essential to prepare the participatory engagement. Researchers who were involved in projects ADAPTARia (Dias and Alves, 2013) and CHANGE (Schmidt *et al.*, 2014) partnered with the research team and produced vulnerability and flood risk maps that supported the participatory events. ADAPTARia and CHANGE estimated impacts for the year 2100. The option was to use maps resulting from the worst case downscaled scenarios provided by both projects, because it was considered that the worst case scenario would allow participants to imagine more clearly possible impacts.

The worst scenario modelled by ADAPTARia used the intermediate scenario SRES A2 from the 4th Intergovernmental Panel on Climate Change [IPCC] assessment report (Parry *et. al.*, 2007; Solomon *et al.*, 2007) with two aggravating factors of uncertainty added, resulting on a sea level rise of 64cm for the year 2100. This scenario is referred as Scenario C4. ADAPTRia also modelled coastline changes using the same SRES A2 scenario, but without the aggravating factors of uncertainty, resulting on a sea level rise of 42cm for 2100, which is referred as Scenario C3.

The worst case scenario modelled by CHANGE was the SRES A1FI, from the 4th IPCC assessment report (Parry *et. al.*, 2007; Solomon *et al.* 2007), with a sea level rise of 1,56m for 2100, and a storm surge simulated period of 100 years.

Based on the scenario data and for the purposes of the SWAP workshops, ADAPTARia produced maps with shoreline position projections due to coastal erosion, considering sediment dynamics and climate change impacts (sea level rise, wave height, and direction frequency changes); as well as maps of probability of floods originating from the ocean coast and the lagoon. CHANGE produced maps for the risk of overtopping and floods, until 2100.

Initial engagement: Informal meetings and seminars

Stakeholder groups were first approached through seven informal meetings in the two municipalities responsible for administrating the coastline. Various actor-groups with

particular interests in the area; at various levels of governance were identified (Laranja *et al.*, 2008; Wood and Stocker, 2009). The meetings highlighted the need to provide a strong knowledge base to social actors on relevant topics. Thus, researchers organized two seminars, which included presentations from the researchers, as well as from invited speakers, on climate change impacts and adaptation options for coastal regions. An average of 70 people attended the seminars, ranging from administrators, policy makers, engineers and other technical bodies, to local residents and business owners.

Scenario Workshop

Participatory scenario methods have been developed in climate change adaptation research with the objective of involving individuals and groups in co-creating future visions for adapting their region or country (Larsen and Gunnarsson-Östling, 2009; Wood and Stocker, 2009). The application of the Scenario Workshop method used in SWAP (Andersen and Jæger, 1999; Schmidt-Thomé and Klein, 2013) includes three stages - critique, vision and action plan – proceeding along two day long workshops.

A representative group of 30 people was invited to participate in the workshops. Thirty was considered an optimum number of participants to achieve the aims of the workshop. Out of those invited, 24 came in the first day and 25 on the second day of the workshop. The group included representatives of: local and national administrative bodies (e.g. policy makers, planners and specialists), the National Environmental Agency; the Aveiro Harbour Administration; environmental organizations; the Aveiro University; local business owners; farmers, fisherman, and resident associations.

In the first session day, participants were informed about climate change projections for the area. Risk assessment maps were displayed on the workshop room's tables and served as a crucial graphical tool to support the discussions. Together with the maps, participants were presented with three extreme future storylines of their coast, for the following 100 years. The storylines were based on the scenarios and risk assessments referred, and were purposely extreme and normative (Larsen and Gunnarsson-Östling, 2009) to promote a critical discussion (Schmidt-Thomé and Klein, 2013). Presented (read by the facilitator) as fictional narratives, the storylines provided three alternative visions of what the future could be according to different courses of action. Table 4.4-1 provides a synthesis of these alternatives.

Table 4.4-1 Synthesis of alternative future storylines presented at the Scenario Workshop

a. Do nothing and maintain existing coastal defence structures, resulting in serious flooding events and damages to human settlements and infrastructures with great economic losses.
b. Protect everything, resulting in an artificial coast, with massive investments in a series of constructions (dikes and breakwaters), which radically change the natural landscape, as well as economic and social life in the region.
c. Relocate, allowing the sea to advance and coastal erosion to continue at will, some local settlements are abandoned, and the region gains a pristine ecological value.

Using the information presented (climate change scenarios, maps and storylines), participants were engaged in the critique and vision stages of the scenario workshop, by discussing in small groups the different alternatives. Common goals were identified and a fourth alternative emerged, which included characteristics from the three storylines presented. The same stakeholders were invited to meet again after four weeks, for the action-plan stage. The design of the action-plan was supported by a multi-criteria analysis and by the adaptation pathways and tipping-points method, described in the following sub-sections.

Multi-Criteria Analysis

A Multi-Criteria (MC) analysis of the potential adaptation measures in the common vision was presented to all in the second workshop day, and served to provide stakeholders with relevant information for designing the pathways. The MC showed scores, ranging from very high to very low potential costs, benefits, efficacy, uncertainty and secondary effects of possible adaptation measures. It was made clear to the group that the scores attributed to different criteria should be understood as a qualitative evaluation to support the choices of measures.

Adaptation Pathways and Tipping-Points

The Adaptation Pathways and Tipping-Points method used in the second workshop day has been developed by Hassnoot *et al*. (2013). It is a methodological tool to aid decision making and planning processes under conditions of great uncertainty for the long term. The resulting policies or measures shaping the adaptation pathways are flexible and dynamic. The pathways integrate changes in external conditions, which culminate on

particular tipping-points, or a moment in time when a measure ceases to be effective and a new policy needs to be integrated to respond to the new conditions.

To support the action-plan stage of the workshop, the scenarios used for identifying tipping-points were: the ADAPTARia scenarios C4 (strong climate change) and C3 (intermediate climate change). According to the two scenarios, tipping-points (rises in sea level and coastal erosion), were identified on the timeline for 2040, 2070 and 2100. To apply the method in a participatory context, researchers started by presenting a set of potential pathways and their respective tipping-points. The pathways had been printed and left in the room's working tables. Afterwards, participants were distributed in discussion groups and given the task of choosing or creating a new pathway that reflected their choices for the area. These new pathways were sketched by the groups on top of the original prints. The following step was for each group to present the pathways, while the facilitator designed the pathways, seen by the whole group in the room's projector. The final pathways were subsequently aggregated into a single pathway for the whole coast. This final visual representation of potential adaptation measures, according to tipping-points for the following 75 years, represented a synthesis of the resulting action-plan of the scenario workshop.

Interviews

Three weeks after the workshops, 10 out of the 25 participants were interviewed. Interviews had two central objectives. First, they should offer understandings regarding what was learned by social actors throughout the engagement processes, taking into account SWAP's objectives. Second, results would deliver suggestions regarding what could be important strategies to endorse the implementation of the action-plan. A semi structured interview schedule was based on a set of key questions as shown in Table 4.4-2.

Table 4.4-2. Semi-structured interview schedule

Was it relevant to plan for the long-term (i.e. 100 years); was it important to think so far ahead in time?
Did SWAP changed opinions regarding long-term planning?
What had been learned about climate uncertainty? Was it more likely to deter or to promote anticipatory adaptation and why? What about other types of uncertainty?
What have been the most positive and negative features of the participatory experience?
What should be the next steps for the research design in order to promote the implementation of the plan?

Results

Future vision

Initially, about a third of the participants in the room expressed doubts regarding current climate projections. Despite these doubts, in the first session of the scenario workshop, participants agreed that long-term planning was imperative. Their shared conclusions came together in a common vision of the coastline until 2100. In synthesis, this vision could be summed up as *protect who we are, where we are and what we do*; and includes the following common goals:

- «It is fundamental to hold the coastline up to 2100, protecting populated areas and existent infrastructures and constructions.
- It is fundamental not to allow the formation of a new inlet (between the sea and the lagoon), due to a disruption of the sand spit and the dune system.
- Relocation of populated settlements is not acceptable by all, except for non-urban areas, if necessary to advance with protection constructions.
- Keeping the beaches as they are is considered fundamental for economic activities, but also for preserving a local cultural identity and social life strongly intertwined with the presence of the beach.
- Harmonization between protecting the coastline and the ecological preservation of the lagoon system is desirable, to provide future generations with a sustainable and attractive coast to live. »

The first and last assumptions indicate a somewhat unrealistic expectation, since opting for both holding the line and for the ecological preservation of the beach and

lagoon systems may not be possible, because a permanent *hold the line* strategy should require hard engineering constructions, which could dramatically change the landscape. Following the vision stage, technical solutions for potential adaptation measures were discussed (see Table 4.4-3). The consensus reached by the end of the first workshop is illustrated on a final map of consensus (see Figure 4.4-2), where participants used stickers to graphically represent their preferred options for protection. Finally, there were some non-consensual ideas put forward: a progressive relocation of coastal zone constructions in Barra, Costa Nova and Vagueira (urban settlements); floodgates in the Ria of Aveiro as a measure for flood protection, and the removal of a groyne located just South of Vagueira beach, which some believed to be aggravating erosion (it had been technically explained that groynes protect the updrift site, but anticipate erosion problems downdrift).

Table 4.4-3. Potential Adaptation Options (results of 1st workshop day)

Coastal protection solutions	Further studies
Maintain existing coastal defence infrastructures	Should some groynes be removed? Doubts over a need for the reorientation of the Barra-Aveiro Harbour Southern groyne.
Reinforcing the existing structures along the southern part of the Ria de Aveiro (two low sand dikes)	Expropriation of farming lands; use of sediments from Ria dredging operations
Maintain the beaches with sand nourishment operations	Technical options: sand sediment transport via road from harbour dredgings or from forest areas; sediment transport via sea from beach North of Aveiro Harbour, or from offshore dredging; quantity of sand and frequency of operations
Strengthening and protecting the dune system	Technical options to be studied and assessed: building a sand dike with sediments from Ria dredging; dunes reinforced using geotubes; sediments from harbour dredging.
Dredging inside the Ria de Aveiro lagoon	No technical options discussed
Submerged detached breakwaters	Either in front of Barra beach or of Vagueira beach, or both. The intervention needs to be studied and tested in a pilot-experience
Seawalls and groynes	Seawalls as alternatives or as a complement to a submerged detached breakwater. Need for further studies and pilot-experience
Palisades and walkaways	No technical options discussed

Figure 4.4-2 Map of Consensus: the map is a photograph of the different interventions participants signalled using stickers.

Final dynamic pathways

During the second workshop day, discussions were geared towards tangible technical solutions and options necessary to achieve the goals identified, particularly the harmonization between holding the line and keeping the natural ecology of the region. These discussions were informed by the different scores given to the set of criteria in the multi-criteria (MC) exercise. The outcome of the discussions was the adaptation pathways until 2100, where each chosen measure is represented according to tipping points. The final adaptation pathways are seen in Figure 4.4-3 and illustrate the action-plan created.
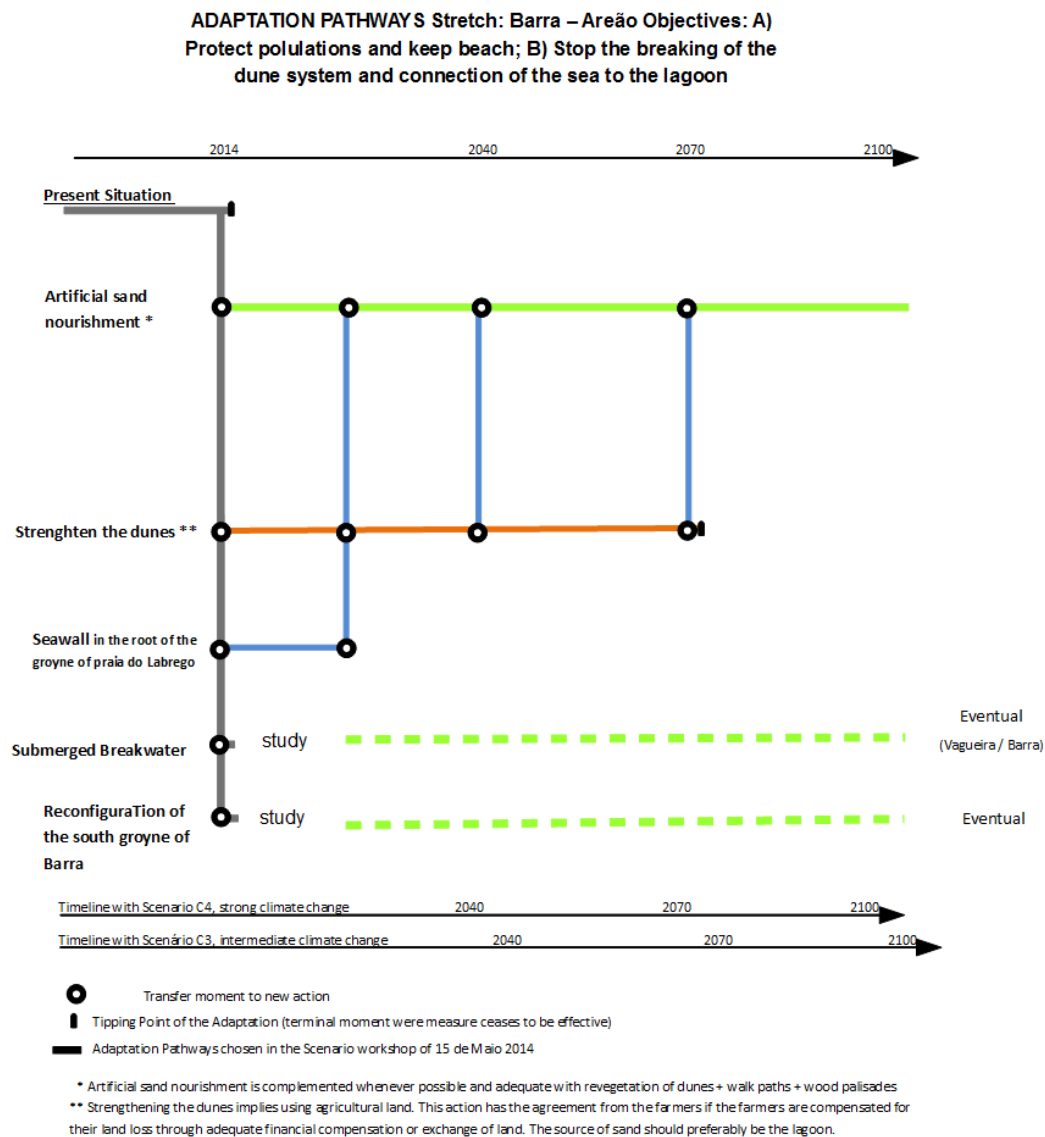
Figure 4.4-3. Final Adaptation Pathways (results of 2nd Workshop day): the pathways show the chosen adaptation measures, which may change in time according to the tipping-points

As shown in the final pathways the most consensual options for the future are:

- «From the present and up to 2100, sand nourishment operations. »

Experts in the group (e.g. engineers, spatial planners, specialists) tended to consider heavy engineering constructions as anticipating negative effects at downdrift, and to support measures such as sand nourishment operations, that would benefit not only the intervention location, but also the entire coastal system with the addition of sediments. This recommendation has been later reinforced in a report written by a working group

assigned by the Portuguese Environmental Minister to provide recommendations for the National Strategy for Coastal Zones. The report[18] evaluated for the first time the cost of different adaptation strategies in vulnerable stretches of the Portuguese West Coast up to 2100. Sand nourishment operations had been done in the past by the Aveiro Harbour Administration, who placed sediments from dredging operations directly onto the longitudinal drift to increase natural sediment volumes available to be transported. Technical options were discussed regarding where to collect sand sediments, and the quantities of sand until 2100. It was understood that there could be significant discrepancies in price ranges when using sediments from offshore and harbour dredging, using sea versus land transportation; and regarding the quantities of sediments used or the periodicity of the interventions. Finally, it was agreed that though additional studies were needed regarding potential technical options and their costs, sand nourishment operations should be part of the final pathway.

- «Strengthening the dune system (with a sand dike) to prevent a new inlet in the lagoon. »

The preferred resource option was to use sediments from lagoon dredging operations. This intervention was the most controversial for participants, because it implied the legal expropriation of farming lands and compensations to farmers. While some participants claimed this was a needed solution, others were suspicious of how the process would be endorsed so that farmers did not incur losses, including the owner of these lands, also present in these meetings. The presence of both technicians and representatives of government agencies helped clarify the legal procedures of expropriation for protection constructions. It was explained that all landowners would be compensated, either through land exchange or payments; which meant they would still be able to keep their farming activity. Only after this process was discussed, representatives of local farmers and landowners admitted the solution could be viable and it was included in the final pathway.

- «A seawall should be built at the root of an already existing groyne (Labrego beach, South of the Vagueira settlement), and construction should be completed by 2025.»

---

[18] The report is available at:
 http://www.apambiente.pt/_zdata/DESTAQUES/2015/GTL_Relatorio%20Final_20150416.pdf

Participants were well-aware of the particular vulnerability of this spot, which suffered from recurrent flooding due erosion. The solution of strengthening the root of the existent groyne was well accepted.

- «Two projects are suggested pending further studies (to be made until 2025): the submerged detached breakwater and the reconfiguration of the South breakwater of the Barra inlet. »

The submerged detached breakwater was suggested by the residents and business owners in the group. This intervention could radically change the ecological, social and economic dynamics in the coast. The measure was also supported by local policymakers, as being an option that would potentially provide the best and safest solution for the coast. However, one resident argued heavy constructions could have unforeseen effects for local ecology - «We don't want to bring the mountain to the beach», he claimed. Similarly, engineers and planners in the group were not as committed to this option, given uncertainties regarding how a submerged detached breakwater works in the Atlantic Coast with a strong energetic wave climate. The decision was to include a study period for this intervention (as well as for the reconfiguration of the South breakwater of Barra), and make a final decision based on the data provided.

- «Monitoring of sea-levels and costal erosion»

Potential adaptation options foreseen for 75 years period are dependent on the evolution of observed sea-level rises and coastal erosion. To anticipate these changes, periodic monitoring activities were included in the plan, and expected to be led by the Aveiro University and the Aveiro Harbour Administration.

Responsibility for financing and implementing the action plan

At the end of the workshop session, after the pathways were designed, participants were asked who they thought should be accountable for implementing and financing the action plan. This exercise was only done for the first 10 years. For all adaptation measures until 2025, the group referred there should be a joint financial plan: 70% to 80% would come from the European Union (EU) financial mechanisms; 30% to 20% from Portuguese governmental agencies and local authorities. Overall, responsibility for financing adaptation was attributed to public investment, namely the EU, central government and local authorities.

Finally, participants were invited to enumerate issues that could constrain or enable implementation. Financial resources, political commitment, institutional collaborations and participated modes of governance were considered by all as the most important. While the first two were thought to be constraints in the current socioeconomic context, the last two issues were considered potential enablers and promoters for pushing implementation forward.

Feedback on learning experiments and next steps for implementation

Interviews provide insights on how SWAP has met its objective of promoting long-term planning by providing a forum for participation and inter-institutional collaboration. A synthesis of the interview results is shown in table 4.4-4.

Table 4.4-4. Synthesis of Interview Results

SWAP Objectives	Synthesis of Responses
Provide an experience that promotes long-term planning	The need for a long-term planning has been valorised by all; Learned that potential adaptations included in the plan could be implemented through various technical options; Learned that a wide range of costs and technical options needed to be studied for each potential measure; Demystified assumptions regarding engineering interventions Erosion, more than climate change, has been a shared concern
A forum for participation and inter-institutional collaborations	Workshops provided a collaborative forum for discussion; Promoted mutual understanding among participants; Awareness of the problem of administrative uncertainty; Conveyed the meeting of different knowledge systems and experiences; Visual materials delivered a clear understanding of potential future risks; Learning experience of an alternative form of deciding together that could be replicated in their own institutions
Strategies for endorsing implementation of the dynamic adaptation plan	Technical studies for proposed engineering interventions (e.g. detached submerged breakwater) Economic assessments of different technical options for measures (e.g. Cost-Benefit Analysis) Engage media and society at large, dissemination and awareness raising

Some participants had clear ideas about the need for a long-term action-plan, namely university researchers involved and engineers. «What cannot happen is to act on emergency situations, it's extremely expensive and dangerous, » cautioned an engineer. Others were not as aware of the need to plan for the following 75 years, but recognized this was a goal to which they were more committed to after the SWAP. Policymakers and spatial planners (five of the respondents) held that they had become better aware of the need for several types of studies (e.g. economic, technical, and environmental) before final decisions could be made. A municipal planner claimed:

> «people always talk about politicians doing nothing; I think they never valorised planners in this country, and how we need to produce more studies.»

Local residents felt long-term planning was important because it meant more security for local populations and goods. However, two voiced doubts regarding climate change. Nevertheless, interviewees were well aware of the coastal erosion problem.

> «All you see there [pointing to the seashore], used to be sand, I remember when we had to walk and walk through the dunes to reach the water. »

It was found that workshops called attention to the technical complexities of coastal interventions. Eight interviewees referred they were surprised to learn so many options existed for each intervention. Furthermore, respondents claimed the SWAP brought attention to how technical options represented a wide diversity of costs - «knowing this does not solve our problem, but clarifies what needs to be done to decide, » said a municipality planner. Two others said SWAP had provided the opportunity to demystify a number of misassumptions about technical solutions, such as the idea that «putting sand on the drift is throwing it away» – says an engineer, referring to sediments from dredging operations placed directly onto the longitudinal drift.

All respondents considered public involvement in decision-making was quite unusual. «People are called for processes when these are already closed (…). There is a sort of inelastic perspective in the way administration works, » claims a municipal planner. Thereafter, five interviewees referred that replicating the collaborative and participatory decision-making experience of the SWAP in their institutions could make a difference. Particularly, planning adaptation was considered an area where stakeholder

engagement and participation needs to be further integrated: «regarding adaptation, sooner or later plans have to meet the needs of local populations and respond to the vulnerabilities they feel, » refers a representative of the National Environmental Agency.

SWAP seems to have promoted better mutual understanding among participants. A local farmer claimed he had valued the experience of «being heard in a room full of policymakers. » Conversely, planners said they had found that the method «facilitated the discussion between people with diversified types of knowledge» (says a local planner). All interviewees appreciated being part of a «multi-coloured dialogue» between so many «sensibilities». A municipal policy-maker noted that «decisions should be ideally made together by all those with vested interests in the region». Policymakers and experts characterized their experience as a learning process, from which they hoped to take ideas, methodologies and information to be used for future adaptation plans, or in mainstreaming adaptation through other strategies for the territory.

Interviewees referred that the visual materials used provided a very clear picture of the territory's vulnerabilities. A planner stated - «I knew about the risks, but the maps really tinted them. » The maps seem to have provided clear iconographic representations of the risks for the long-term, which appears to have supported the learning experience.

Planners and technical specialists interviewed referred the experience they had did not reflect real world planning activities, as one remarked - «that was paradise, out here it is a jungle and we [referring to different institutional bodies] hardly discuss issues together. » Conversely, it was emphasized by residents and business owners that collaborative planning was pointless unless some measures were implemented: «If there is plenty of sand on the beach that is a start, » says a resident. It was pointed out by two planners that the SWAP failed to include policy and administrative legal instruments, such as land use plans, which should be part of a strategy for the region, but were secondary to the discussion.

Lastly, regarding strategies for endorsing implementation, policy makers and planners were particularly interested in having economic assessments of costs, potential benefits and effectiveness of the interventions suggested. These groups considered it would be equally necessary to establish coordinated strategies and partnerships at different government levels (including European funds) to finance a final plan. Experts (i.e. engineers, planners) were concerned with developing more technical studies of the proposed engineering interventions, as well as putting in place the necessary administrative procedures to assure a continued inter-institutional collaboration to

support implementation. Residents, fishermen and farmer groups were more argumentative about the need for involving the media.

Discussion

SWAP begun by mapping locally a mosaic of interests, societal needs, relations of power and influence, as well as identifying the political dimensions (Voß and Bornemann, 2011), relevant for the case studied. By understanding the dynamics of engagement and collaboration between distinct polities with jurisdiction in the region (Voß and Bornemann, 2011), it became imperative to engage regime actors. Rather than selecting frontrunners, or niche players to work with, the criteria for selection was to involve all those who would be important for the implementation of the plan, and who would benefit from the adaptation process. This decision derived from a need to encourage new decision-making arrangements in order to support the mainstreaming of long-term approaches to planning (Carvalho-Ribeiro *et al.,* 2010; O'Riordan *et al.,* 2014). The inclusion of mainly regime rather than niche players in the core action-group is a distinct feature of SWAP, compared to transition management (TM). This feature derives from the context of adaptation studies, since adaptive capacity is largely supported by collective action and by the build-up of social capital (Adger, 2003); rather than by innovative networkers (Loorbach, 2010). Albeit the latter cannot be disregarded as they may have an important role to play in the process.

In this study sustainable adaptation has been taken as a moving target in a long-term trajectory. One of the first results of SWAP has been a consensus understanding between social actors that went beyond a mere concern with coastal protection, and towards shared future visions. This process indicates that a discussion on long-term planning cannot be detached from the idea of a transition, since participants are led to imagine their region in 25, 50 and 75 years, as a range of potential material landscapes may emerge.

From a «governance from the inside» (Jorgensen, 2012) point of view, actors do not hold a systemic vision of the transition process, but instead are linked to a specific set of interests and worldviews that should be accounted for in attempts to influence transitions. This small-scale experiment showed how different actor-worlds handled the governance process. Some groups were more worried with coastal protection; others with maintaining the natural beauty of the region. Likewise, there have been distinct

perspectives regarding the next priorities for endorsing implementation. Admittedly this set of distinct performances has a role to play in steering forward the adaptation process. Economic and technical studies should be fundamental to benefit from financial mechanisms and collaborations. Involving the media, in a region where public participation has been the exception, is likely to raise awareness and provide a higher level of socio-political legitimacy (Lovell, 2007) to sustain the implementation of the plan, and even the upscaling of the experience to a larger coastal region. Nevertheless, this multi-actor arena resulted in a consensual action-plan towards a more sustainable future. Idealizing the trajectory for this transition, allowed for an important flexible and dynamic exercise, able to reflect different types of contextual uncertainties (e.g. technical, climatic, administrative). SWAP seems to have also promoted long-term planning by providing an actual *hands-on* learning experience. Using visual materials to illustrate risks, vulnerabilities, adaptation options, and shared future visions for the coastline, helped creating iconographic representations of past, present and future states of the coastal system. Climate change adaptation actions were useful at different times, depending on the degree of local impacts, tipping points and other conditions (such as financing, or social and environmental secondary impacts of the implemented actions) (Haasnoot *et al.,* 2013).

As in this study, Schmidt et al. (2014) found that responsibility for financing adaptation was attributed to public funding, particularly to the European Union and Portuguese government. Consequently, given the ongoing governmental budget cuts and the economic and financial crisis the country has been facing over the last years, this allocation of responsibilities raises a considerable uncertainty regarding political and financial commitments. Nevertheless, one of the final adaptation options (sand nourishment operations) has been also a later recommendation for coastal adaptation in the most vulnerable regions of the Portuguese West Coast, on a report delivered March, 2015 to the Portuguese Environmental Minister for the Environment, Spatial Planning and Energy[19] .The meeting of these two arenas of development may equally support a sustainable transition to a more adapted coastal system.

---

[19] Report is available at:
http://www.apambiente.pt/_zdata/DESTAQUES/2015/GTL_Relatorio%20Final_20150416.pdf   (last accessed 9th July 2015)

Conclusion

The reflexive governance experience developed in this study - SWAP - has attempted to appropriately respond to the societal needs of the territorial and governance contexts of the socio-technical system studied. Climate uncertainty was integrated by combining the strengths of the scenario workshop in promoting a shared vision for the territory, with the adaptation and tipping-points method for aiding the design of a dynamic action-plan. By creating an informal space for dialogue between diverse actor-worlds, with particular sensibilities, knowledge domains and interests represented, SWAP simplified technical complexity. Several issues were clarified and demystified, although significant challenges still remain. Nevertheless, SWAP made it possible to clearly recognize the main needs for future adaptation in the region. Likewise, it contributed to identifying potential enablers in the administrative process, such as more collaborative and deliberative approaches to decision-making.

SWAP has broken the ground for future research by shaking the conventional modes of local governance and providing a "niche" governance experiment (Grin *et al.*, 2010) for envisioning and deciding on shared futures, raising awareness regarding the need for long-term planning, and preparing relevant actor-worlds for a continued engagement and reflexive process. Inspired by the Transition Management (TM) framework (Loorbach, 2010), yet taking into account critical reviews of transition experiments, particularly Jorgensen's proposal for "Arenas of Development" (AoD) (Jorgensen, 2012), SWAP provided a new empirical application based on conceptual contributions from transition research. Thus, the experience equally illustrated complementarities between different frameworks that have been proposed for approaching prospective-oriented studies of transitions. Nevertheless, in a transition timeline, SWAP represents merely the ground-breaking moment for a more consistent governance for sustainable adaptation in the region, which should ideally be led by local social actors. Furthermore, there is still an untapped potential for the transition research field in supporting long-term planning in the context of climate adaptation, particularly in governance landscapes where collaborative dynamics and participated decisions are challenging to translate into politically binding long-term plans.

Reference List

Adger, W. N. (2006). Vulnerability. *Global Environmental Change*, 16, 268–281. doi:10.1016/j.gloenvcha.2006.02.006

Altrichter, H., Kemmis, S., McTaggart, R., & Zuber-Skerritt, O. (2002). The concept of action research. *The learning organization*, *9*, 125-131. doi:10.1108/09696470210428840

Alves F.L., Silva J.V., Pereira C.A., & Sousa L.P. (2011). Ten Years Assessment of ICZM Principles Applied at Local Scale: Ria de Aveiro Case Study. *Journal Of Coastal Research*. 64,1311-1315.

Alves F.L., Sousa L.P., Almodovar M. & Phillips M.R. (2013). Integrated Coastal Zone Management (ICZM): a review of progress in Portuguese implementation. *Regional Environmental Change*. 13, 1031-1042. doi:10.1007/s10113-012-0398-y

Alves F.L., Sousa L.P., Esteves T.C., Oliveira E.R., Antunes I.C., Fernandes M.D.,...,& Pereira M. (2014). Trend Change(s) in Coastal Management Plans: the integration of short and medium term perspectives in the spatial planning process. *Journal Of Coastal Research*. SI 70, 437-442. doi: 10.2112/SI70-074.1

Amaru, S., & Chhetri, N. B. (2013). Climate adaptation: Institutional response to environmental constraints, and the need for increased flexibility, participation, and integration of approaches. *Applied Geography*, 39, 128-139. doi:10.1016/j.apgeog.2012.12.006

Andersen, I. E., & Jæger, B. (1999). Scenario workshops and consensus conferences: towards more democratic decision-making. *Science and public policy*, *26*(5) 331-340. Retrieved from: http://ncdd.org/rc/wp-content/uploads/2010/06/Andersen-ScenarioWorkshopsConsensusConfs.pdf

Avelino, F., & J. Rotmans. (2011). A dynamic conceptualization of power for sustainability research. *Journal of Cleaner Production*, *19*, 796-804. doi:10.1016/j.jclepro.2010.11.012

Baker, I., Peterson, A., Brown, G., & McAlpine, C. (2012). Local government response to the impacts of climate change: An evaluation of local climate adaptation plans. *Landscape and Urban Planning*, *107*, 127–136. doi:10.1016/j.landurbplan.2012.05.009

Berrang-Ford, L., Ford, J. D., & Paterson, J. (2011). Are we adapting to climate change? *Global environmental change*, *21*, 25-33. doi:10.1016/j.gloenvcha.2010.09.012

Carvalho, A., Schmidt, L., Santos, F. D., Delicado, A. (2014). Climate change research and policy in Portugal. *Wiley Interdisciplinary Reviews: Climate Change*, 5, 199-217. doi: 10.1002/wcc.258

Coelho, C., Silva, R., Veloso-Gomes, & F., Taveira-Pinto, F. (2009). Potential effects of climate change on Northwest Portuguese coastal zones. *ICES Journal of Marine Science: Journal du Conseil*, 66, 1497-1507. doi: 10.1093/icesjms/fsp132

Dias, J.M, & Alves, F.L. (2013). *Risco de Cheias e Estratégias de Adaptação para a Zona Costeira e Lagunar da Ria de Aveiro*. [Flood risks and adaptation strategies for the coastal zone and the Ria de Aveiro lagoon.] Aveiro University: CESAM - Centro de Estudos do Ambiente e do Mar. Retrieved from: http://la.cesam.ua.pt/Documentos/Risco_de_Cheia.pdf

ESPON (2013) Climate Change and Territorial Effects on Regions and Local Economies. Report. Retrieved from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.449.9185&rep=rep1&type=pdf

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, & J. Rockström. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15, 20. Retrieved from: http://www.ecologyandsociety.org/vol15/iss4/art20/

Ford, J. D., Berrang-ford, L., Lesnikowski, A., Barrera, M., & Heymann, S. J. (2013). How to Track Adaptation to Climate Change : A Typology of Approaches for National-Level Application. *Ecology and Society*, *18*, 40. Retrieved from: http://dx.doi.org/10.5751/ES-05732-180340

Fortunato, A. B., Rodrigues, M., Dias, J. M., Lopes, C., & Oliveira, A. (2013). Generating inundation maps for a coastal lagoon: a case study in the Ria de Aveiro (Portugal). *Ocean Engineering*, 64, 60-71. doi:10.1016/j.oceaneng.2013.02.020

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, *36*, 399–417. doi:10.1016/j.respol.2007.01.003

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, *39*, 495–510. doi:10.1016/j.respol.2010.01.022

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, *1*, 24–40. doi:10.1016/j.eist.2011.02.002

Grin, J., Rotmans, J., Schot, J. (Eds.) (2010). *Transitions to Sustainable Development – New Directions in the study of long term transformative change*. New York: Routledge.

Haasnoot, M.; Kwakkel, J. H.; Walker, W. E.; & Maat, J. (2013). Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. *Global Environmental Change*, 23, 485–498. doi:10.1016/j.gloenvcha.2012.12.006

Hadorn, G., Bradley, D., & Pohl, C. (2006). Implications of transdisciplinarity for sustainability research. *Ecological Economics*, *0*. Retrieved from: http://www.sciencedirect.com/science/article/pii/S0921800905005781

Howlett M, Fraser S, Mukherjee I, Woo JJ (2015) From tools to toolkits in policy design studies: the new design orientation towards policy formulation research. Policy Polit 43, 291-311.

Jäger J., Bohunovsky L., Binder J. (Eds.). 2008. *Methods and Tools for Integrated Sustainability Assessment.* Project Summary. Sustainable Europe Research Institute, Vienna, AUT. Retrieved from: http://www.slu.se/pagefiles/58724/matisse.pdf

Jørgensen, U. (2012). Mapping and navigating transitions—The multi-level perspective compared with arenas of development. *Research Policy*, *41*(6), 996-1010.doi:10.1016/j.respol.2012.03.001

Juhola, S., & Westerhoff, L. (2011). Challenges of adaptation to climate change across multiple scales: a case study of network governance in two European countries. *Environmental Science & Policy*, *14*, 239–247. doi:10.1016/j.envsci.2010.12.006

Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, 109, 7156-7161. doi: 10.1073/pnas.1115521109

Kemp, R., Loorbach, D., & Rotmans, J. (2007). Transition management as a model for managing processes of co-evolution towards sustainable development. *International Journal of Sustainable Development & World Ecology*, *14*, 78–91. doi:10.1080/13504500709469709

Kwadijk JCJ, Haasnoot M, Mulder JPM, Hoogvliet, MMC, Jeuken, ABM, Van der Krogt RAA, Oostrom NGC, Schelfhout HA, Van Velzen EH, Van Waveren H, De Wit MJM. (2010). Using adaptation tipping points to prepare for climate change and sea level rise: a case study in the Netherlands. *WIREs Climate Change* 1,729-740. doi:10.1002/wcc.64

Larsen, K., & Gunnarsson-Östling, U. (2009). Climate change scenarios and citizen-participation: mitigation and adaptation perspectives in constructing sustainable futures. *Habitat International*, 33, 260-266. doi:10.1016/j.habitatint.2008.10.007

Loorbach, D. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance*, 23, 161–183. doi:10.1111/j.1468-0491.2009.01471.x

Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, *42*, 237–246. doi:10.1016/j.futures.2009.11.009

Lopes, C. L., Silva, P. A., Dias, J. M., Rocha, A., Picado, A., Plecha, S., & Fortunato, A. B. (2011). Local sea level change scenarios for the end of the 21st century and potential physical impacts in the lower Ria de Aveiro (Portugal). *Continental Shelf Research*, *31*, 1515-1526. doi: S0278434311002391

Markard, J., & Truffer, B. (2008). Technological innovation systems and the multi-level perspective: Towards an integrated framework. *Research policy*, *37*, 596-615. doi:10.1016/j.respol.2008.01.004

Markard, J.; R. Raven; & B. Truffer. (2012). Sustainability transitions : An emerging field of research and its prospects. *Research Policy*, *41*, 955–967. doi:10.1016/j.respol.2012.02.013

McNiff, J. (2013) *Action research: Principles and practice*. London: Routledge.

Nevens, F. & Roorda, C. (2014). A climate of change: A transition approach for climate neutrality in the city of Ghent (Belgium). *Sustainable Cities and Society*. *10*, 112-121. doi:10.1016/j.scs.2013.06.001

Nevens, F., Frantzeskaki, N., Loorbach, D., Gorissen, L. (2012). Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, 50, 111-122. doi: 10.1016/j.jclepro.2012.12.001

O'Riordan, T., Gomes, C., & Schmidt, L. (2014). The Difficulties of Designing Future Coastlines in the Face of Climate Change. *Landscape Research*, *39*, 613–630. doi:10.1080/01426397.2014.975108

Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006). Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, 11, 18.Retrieved from: http://www.ecologyandsociety.org/vol11/iss1/art18/

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*, *19*, 354–365. doi:10.1016/j.gloenvcha.2009.06.001

Park, S. E., N. A, Marshall, E. Jakku, A.M. Dowd, S.M. Howden, E. Mendham, & A. Fleming. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22*, 115-126. doi:10.1016/j.gloenvcha.2011.10.003

Parry, M.L. Canziani, O.F. Palutikof, J.P. van der Linden P.J. & Hanson C.E. (Eds.) (2007). Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press. Retrieved from: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. London: Routledge.

Pelling, M., O'Brien, K., & Matyas, D. (2014). Adaptation and transformation. *Climatic Change*, 1-15 doi:10.1007/s10584-014-1303-0

Pereira, C., & Coelho, C. (2013). Mapping erosion risk under different scenarios of climate change for Aveiro coast, Portugal. *Natural hazards*, *69*, 1033-1050. doi: 10.1007/s11069-013-0748-1

PNAS (2013) Relatório de Progresso Estratégia Nacional de Adaptação às Alterações Climáticas [Progress Report Portuguese National Adaptation Strategy for Climate Change] Retrieved from (December, 7th, 2015): http://www.apambiente.pt/_zdata/Politicas/AlteracoesClimaticas/Adaptacao/ENAAC/RelatProgresso/Relat_Progresso.pdf

Rip, A., Kemp, R., Rayner, S., & Malone, E. L. (1998). Technological change. *Human choice and climate change. Vol. II, Resources and technology*, 327-399. Columbus, OH: Battelle Press.

Santos, F. D., Miranda, P. (Eds.) (2006). *Climate change in Portugal. Scenarios, impacts and adaptation measures*, SIAM II Project. Lisboa: Gradiva.

Schmidt, L., Delicado, A., Gomes, C., Granjo P., Guerreiro, S., Horta, A.,… Penha-Lopes, G. (2013a). Change in the way we live and plan the coast: stakeholders discussions on future scenarios and adaptation strategies. In: Conley, D.C., Masselink, G., Russell, P.E. and O'Hare, T.J. (Eds.) Proceedings 12th International Coastal Symposium (Plymouth, England) *Journal of Coastal Research*, Special Issue No. 65, 1033-1038, ISSN 0749-0208. Retrived from: http://ics2013.org/papers/Paper4333_rev.pdf

Schmidt, L., Prista, P., Saraiva, T., O'Riordan, T., & Gomes, C. (2013b). Adapting governance for coastal change in Portugal. *Land Use Policy*, 31, 314-325. doi:10.1016/j.landusepol.2012.07.012

Schmidt, L.; Gomes C., Guerreiro, S., O'Riordan, T. (2014). Are we all on the same boat? The challenge of adaptation facing Portuguese coastal communities: Risk perception, trust-building and genuine participation, *Land Use Policy*, 38, 355-365. doi:10.1016/j.landusepol.2013.11.008

Schmidt-Thomé, P., & Klein, J. (2013). *Climate Change Adaptation in Practice – from strategy development to implementation.* Sussex, UK: Wiley-Blackwell.

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management*, *20*, 537–554. doi:10.1080/09537320802292651

Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy*, *41*, 1025–1036. doi:10.1016/j.respol.2011.12.012

Solomon, S., Qin D.; Manning, M.; Chen, Z.; Marquis, M.; Averyt, K.B.,… Miller, H.L. (Eds.) (2007). Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press. Retrieved from: http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html

Sondeijker, S., Geurts, J., Rotmans, J., & Tukker, A. (2006). Imagining sustainability: the added value of transition scenarios in transition management. *Foresight-The journal of future studies, strategic thinking and policy*, *8*, 15-30. doi: http://dx.doi.org/10.1108/1466680610703063

Sondeijker, S.A.G.C. (2009). Imagining Sustainability: Methodological building blocks for transition scenarios. Erasmos University Rotterdam. Retrieved from: http://hdl.handle.net/1765/17462

Tompkins, E. L., Adger, W. N., Boyd, E., Nicholson-Cole, S., Weatherhead, K., & Arnell, N. (2010). Observed adaptation to climate change: UK evidence of transition to a well-adapting society. *Global environmental change*, *20*, 627-635. doi:10.1016/j.gloenvcha.2010.05.001

Veloso-Gomes, F., & F. Taveira-Pinto. (2003). Portuguese coastal zones and the new coastal management plans. *Journal of Coastal Conservation* 9 (1), 25-34. Doi: 10.1652/1400-0350(2003)009[0025:PCZATN]2.0.CO;2

VISIO (2010) [Computer Software] Microsoft: https://products.office.com/pt-pt/visio/flowchart-software

Walker WE, Haasnoot M, Kwakkel JH (2013) Adapt or Perish: A Review of Planning Approaches for Adaptation under Deep Uncertainty. *Sustainability*, 3, 955-979. doi: 10.3390/su5030955

Westley, F.; Olsson P.; Folke, C.; Homer-Dixon, T.; Vredenburg, H.; Loorbach, D., ...,Van Der Leeuw S. (2011). Tipping towards sustainability: Emerging pathways of transformation. *AMBIO, a journal of the human environment*, 40, 762-780, doi: 10.1007/s13280-011-0186-9

Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*,*28*, 325-336.

Wittmayer, J. M., & Schäpke, N. (2014). Action, research and participation: roles of researchers in sustainability transitions. *Sustainability science*, 1, 483-496. doi: 10.1007/s11625-014-0258-4

Wood, D., & Stocker, L. (2009). Coastal adaptation to climate change: Towards reflexive governance. *The International Journal of Science in Society*, 1, 137-145.

Chapter V
General Discussion

Introduction

This chapter offers a meta-discussion of the papers and case studies, guided by the questions and hypothesis of this research. The objective is to provide a synthesis view of how the set of papers address the research questions. The case studies are also discussed from a comparative perspective. The chapter is structured around three sections.

The first and second sections are guided by the research questions A to E (presented and explained in Chapter III) and the hypothesis of this thesis. Responses to questions A to E are provided taking stock of the final conclusions of each paper, but also of the case studies, of the research experience, and the literature reviewed. In the Portuguese context, which is our territorial focus, these questions have still not been properly addressed, and they offer a vast field for analysis for social scientists working in CC adaptation research. The questions are purposely broad, taking account of the potential diversity of empirical experiences that were undertaken for this thesis. Guided by these questions, the case studies should provide a characterization of how Portuguese society is responding to CC. The responses given are not exhaustive, further research on a wider number of adaptation case studies, as well as continued observations of how these case studies will develop over time would complement these findings. Nevertheless, these explanations are expected to provide some relevant insights, in addition to opening doors for new research concerned with transformational adaptation processes.

The first section of the chapter, begins by addressing question A, which deals with a theoretical conceptual concern. Questions B and C are about understanding how the ideas of transition and transformation in the CC context can translate into collective action. Questions D is concerned with the opposing strategy, by asking what is being done to influence action towards more sustainable pathways.

The second section of the chapter addresses the last question (Question E) and the hypothesis of this research. The response to question E triggers an in-depth discussion informed by my experience and observations throughout the Participatory Action Research (PAR) case studies, and expands on the challenges and benefits of multidisciplinary and transdisciplinary PAR. Thus, I respond to the hypothesis that CC adaptation research PAR promotes outputs that may influence more sustainable

development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance.

Finally, the third section discusses the idea of a governance for transformation that results from the research process. This idea emerges from the reflexive process that accompanied the case study, the analysis of results and the writing of this thesis. Thus, proposing a governance for transformation is not a direct response to any of the guiding research questions, but rather an outcome of the overall research process with its accompanying iterative reflexive thinking.

Responses to research questions (A to D)

A. Do the three research fields – Sustainable Transitions; SES Resilience Framework; Social Practice Theory - provide complementary insights and methodological approaches that can be sufficiently operationalized in order to aid in governing CC adaptation processes?

Responding to this research question based on observable experiences would require more in-depth research on how similarities and differences between these bodies of knowledge, and their methodological approaches could be applied to CC adaptation. In fact, given the complexity of these literatures, this would most likely be a subject for more than one thesis and demand a significant number of empirical studies. Nevertheless, the literatures reviewed in this thesis provide some clues to explore the hypothesis for complementarities between the different research fields.

Sustainable Transitions (ST) and the Social-Ecological Systems (SES) Resilience Framework are fundamentally very similar in their conceptual underpinnings and systems view perspectives (Van der Brugge and Roel van Raak, 2007). Both were important contributions for producing the analytical frameworks of the four research papers. Yet, the literature reviewed in Chapter II also offers a theoretical passage through Social Practice Theory (SPT). SPT can be characterized as a middle range theoretical perspective, combining theory and empirical research, which does not fall under individualist and holistic approaches (Shove *et al*., 2012), but is situated in-between individuals, groups and society at large. SPT is also not specifically focused on innovation and transitions, but on understanding the social world through the study of practices.

ST and the SES resilience framework offer mainly macro level perspectives that address long-term structural processes of change (Grin *et al*., 2010; Park *et al*., 2012).

SPT provides a meso-level analytical perspective to understanding societal and material life, which may be applied in studying individuals, groups, regions, countries or the world, depending on how practices are clustered in systems of collective entities or performances (Shove *et al.*, 2003). Thus, SPT as a meso-level perspective can both offer a micro and macro analysis to the study of societal change. Despite not having been integrated in the research articles, SPT provided guidance for deciding on methodological choices and research objectives, and is thus included in this discussion. Using SPT in the papers would require articulating the approach with SES or ST in the analysis of the same empirical material, namely the Amoreiras Village Convergence Centre and the Ílhavo and Vagos case studies. This exercise was felt to be too complex to do in a single paper for a number of reasons.

First, there was no conceptual or empirical framework found in the literature articulating SPT and the SES Resilience Framework. Citations using the word *practices* abound in the SES literature (Berkes *et al.*, 2002; Folke *et al.* 2005), but practices are not understood as the *entities* and *performances* described by SPT scholars. From a resilience thinking point of view «shifts between states in ecosystems are increasingly a consequence of human actions that cause the erosion of resilience» (Folke *et al.*, 2006:258). Thus, references to practices in the SES literature concern those «human actions», or the ways communities or individuals relate to the natural environment, such as agricultural practices (Olsson *et al.*, 2006) or land management practices (Lebel *et al.*, 2006). However, in the context of CC, integrating a SPT approach in a SES study could be particularly relevant because adaptability appears described as «the collective capacity of the human actors in the system to manage resilience» (Walker *et al.*, 2004:5). Thus, «human actions» largely determine the extent to which a system is able to maintain its resilience and stability, when facing external pressures. Understanding these «actions» from an SPT perspective could provide important insights for adaptability and resilience studies. Nevertheless, in the literature survey contributions attempting to apply SPT in the context of an SES study were lacking and vice-versa. This is an important gap to be tackled in future studies.

Second, although some proposals have been made to explore complementarities between SPT and ST (McMeekin and Southerton, 2012; Hargreaves *et al.*, 2013), as well as a comparative analysis of concepts and governance approaches in ST and the SES resilience framework (Smith and Stirling, 2010; Park *et al.*, 2012), complementarity between these research fields is still not well consolidated in the literature. Concurrently,

it was felt that in order to sustain analytical frameworks based on a comparison or cross analysis of the three bodies of literature, the same case studies would need to be investigated drawing from the different methodological and analytical approaches proposed by each research field.

However, the literatures reviewed do illuminate some points of intersection between the three research fields under analysis (Table 5.1). These points of intersection stimulate a comparative discussion of the different conceptual frameworks, and include: their systemic perspectives; the concepts of innovation; regimes; landscape; lock-ins and path dependencies; as well as transition/transformation.

Table 5.-1 Sustainable Transitions, Social Practice Theory and Social-Ecological Systems: Points of Intersections between the three research fields

Systemic perspective	Innovation	Regime	Landscape	Lock-ins and Path dependencies	Transition	Transformation
Sustainable Transitions: Co-evolution and a complex systems' approach	Emerges from realignments between vertical levels. Is the main attribute of niche socio-technical systems	Dominant socio-technical system	Exogenous contextual factors	System state is in a lock-in situation, resulting in a path dependency	Transition is a shift from one socio-technical regime to another	A transition leads to a societal transformation, since it is a radical regime shift.
Social-Ecological systems: Co-evolution and a complex systems' approach	Emerges as another scale within the system. Is an opportunity for change	A set of quasi-stable system states	A set of control variables that integrate stability domains	High resilience of SES maintains the system's state unaltered	Irreversible regime change	When a SES system loses adaptability, it is transformed
Social Practice Theory: co-evolving clusters or webs of social practices (i.e. practices-as-performance)	Emerges from the horizontal circulation and integration of different elements of social practices.	Sum-total of interrelated nets of practices 'forms a gigantic, intricate and constantly metamorphosing web that forms the overall site of social existence' (Schatzki, 2009: 41)	Embedded in practices, through generative and endogenous dynamics of practice.	Path dependencies of practices-as-entities, create lock-in situations (dense practices, one practice being highly co-dependent with many other – changing one practice requires the changing of several)	New collective and historical practices-as-entities emerge through practices-as-performances	Interlocking systems of practices-as-entities are radically changed through performances.

As shown in Table 5.1 above for ST and the SES Resilience Framework, the ideas of *co-evolution* and *complex systems thinking*, the important role of *innovations* in transitions, as well as the concepts of *regime* and *landscape*, of *transitions* and *transformation*, are fundamentally very similar in the two research fields (Park *et al.*, 2012). These concepts have originated from Evolutionary Biology (Futuyma and Moreno, 1988; Kitano, 2002) and Ecology studies (Holling, 1973; Holling, 1996).

Sustainable Transitions (ST) are based on a complex systems' approach and on the concept of co-evolution. Societal subsystems, including economic, cultural, technological, ecological and institutional, co-evolve through transitions or transformative systemic changes (Geels, 2011). The co-evolution and complex systems' perspective is equally characteristic of the Social-Ecological Systems (SES) Resilience Framework (Folke, 2006). In ST the emphasis is on the vertical dynamics between multi-level systems, which are understood as «functioning scale levels or degrees of structuration» (Grin *et al.*, 2010:4). Similarly, in the resilience framework, the complex systems' view is based on the scale of the changes occurring, and the scope of system states affected and unable to adapt to external pressures, eventually leading to alternate system states and resulting in a social-ecological transformation (Walker *et al.*, 2005). Such transformations may or may not mean a more sustainable system.

Nevertheless, despite a very similar systemic perspective, SES integrates social and ecological components, which are inseparable. Conversely, the ecological component is marginally addressed in ST, which focus on the interdependencies and co-evolution of *socio-technical systems*. Despite growing interest in socially innovative initiatives (Seyfang and Haxeltine, 2012; Seyfang et al., 2013; Kirwan et al., 2013), ST has concentrated mainly on sustainable journeys that accompany technological changes (Kemp and Volpi 2008; Kern and Smith, 2008). However, the SES Resilience Framework is a dominant approach in studies of the causes and consequences of climate change on the climatic, social and ecological global systems (Armitage, 2005; Adger *et al.*, 2005; Armitage *et al.*, 2008).

In ST, long-term, co-evolving changes are the outcome of the dynamics along three system levels: innovations or *niche experiments*; a dominant socio-technical structure or *regime*; and long-term exogenous developments or *landscape* (Geels, 2010). Innovations (which can be technological or social) are at the centre of transition processes and emerge as persistent problems, or exogenous landscape pressures, that threaten the

ability of regimes to continue to fulfil societal needs based on the dominant rules, structures and functioning (De Haan and Rotmans, 2011). The three system levels translate functioning relations between different subsystems or constellations of societal structures, cultures and practices (Grin *et al*., 2010; De Haan and Rotmans, 2011).

In the SES resilience thinking framework the social and natural worlds are interdependent and co-evolving systems (Walker *et al*., 2004; Folke *et al*., 2010) Innovations are understood as another scale within the system, and are considered as a pool of potential opportunities that may strengthen adaptability or contribute to managing resilience (Nelson *et al*., 2007; Walker *et al*., 2006). Therefore, moments of crisis are approached as windows of opportunity for change and from which innovations emerge (Folke, 2006). Concerning the global SES system, studies of the critical thresholds or tipping points for maintaining stability in the Earth system (Rockstöm *et al.* 2009; Steffen *et al*., 2015) have underlined the need to build a more resilient global SES, centred on innovation and novelty (Folke *et al*., 2010). Altering the patterns of human action is considered fundamental to prevent a catastrophic transition to a transformed global SES. Innovation and novelty are therefore at the core of resilience thinking as much as of ST.

While in ST regimes are the dominant socio-technical system and transitions occur as regimes are radically altered and other niches become dominant structures over the long-term (Geels, 2010), in SES, a regime is a set of systems states within a particular array of potential states – referred to as a *stability landscape* (Folke et al., 2010). A transition is not defined as a shift between one regime to another, but as a process where the resilience quality of the SES is no longer able to respond to external pressures, and the system eventually collapses or is fundamentally transformed into an alternative quasi-stable system state (Folke et al., 2010:4).

The identification of these points of intersection likewise applies to Social Practice Theory (SPT). In SPT there is not a direct reference to co-evolving systems, and regime and landscape are not in the nomenclature and heuristics of this approach. SPT has a more horizontal and relational understanding of system's dynamics (Shove, 2003; Hargreaves *et al.* 2013), when compared to the vertical three-level dynamics proposed by ST. Nevertheless, SPT introduces a new perspective to the study of transitions, which can be considered as transitions across time and space between different patterns of *practices-as-entities*. This perspective has been explored by Hargreaves *et al.* (2013), who draw from the Multi-level Perspective (MLP) (which is an ST conceptual framework), and from Shove and Pantzar (2010)'s proposal for points of intersection between MLP and

SPT, to investigate crossovers between practices and transitions. Practices are understood as recognizable *entities* across time and space, historically formed as collectives, but also as the enactment of practices by individuals and groups who reproduce and transform practices as entities (Shove et al., 2009; Schatzki, 2009). These recognizable clusters of entities across time and space form systems of practice that can be considered to be embedded in regimes (Hargreaves et al., 2013). Hargreaves *et al.* (2013), suggest there is a «constant interplay between regimes and practices», and «both are constantly made and remade in each other's image» (Hargreaves et al., 2013: 409). Likewise, given the horizontal approach of SPT, the landscape exists embedded in social practices, through generative and endogenous practice dynamics.

Innovations derive from the making of or linking between the elements of practice (meanings-materials-competences). There is not a strong focus on innovation in SPT studies, normalization and innovation potentially emerge from the reproduction of practices, on a temporal and spatial multi-scale basis. Thus, collective and historical changes result from the horizontal circulation and integration of the different elements of practice (Hargreaves *et al.*, 2013). Therefore, these authors suggest that to fully understand transitions there is a need for three distinct but interrelated lines of enquiry: (i) transitions in socio-technical systems; (ii) transitions in practices; and (iii) intersections between regimes and practices in the course of transition processes. SPT may highlight the unpredictability of transition trajectories, or the unforeseen and potentially chaotic processes of change, by zooming in on the unit of practice, which results from both the individual praxis and the material temporal world where practices are embedded.

As in ST and in the SES resilience framework, SPT does not consider the social dimension in isolation, since materials, spaces, meanings and systems of knowledge are embedded in practices. Thus, a practice is treated as the unit in a system of practices that results from both material and social dimensions. Systems of practices revolve around particular spatial and temporal dynamics, as *practices-as-performances* continuously restructure *practices-as-entities* (Shove *et al.,* 2009). *Entities* shape and characterize a particular system of practices, which integrates multiple everyday life projects, altogether co-creating collective systems, forming clusters and webs of practices (Shove et al., 2009).

Finally, the notion of *path dependency* appears as well in the three bodies of literature. Practices are translated into path dependencies (of practices-as-entities). In ST,

path dependencies are the outcomes of lock-in situations that occur when the dominant socio-technical system is unable to change. In the resilience framework, path dependencies happen when a highly resilient social-ecological system maintains its system state unaltered (Folke, 2006).

The potential for cross-fertilization between distinct conceptual frameworks

This subsection illustrates the previous explanation of the identifiable points of intersection, by drawing from the case studies and the different research papers. The papers offer clues into possible empirical applications that could benefit from potential cross-fertilization between these research fields. Conceptual differences may highlight different dimensions of the object of study, and these taken together may illuminate diverse features of the case studies enabling a more robust, sophisticated and integrative analysis (that is not necessarily fully exhaustive or comprehensive).

Paper 1 stresses the above claim by proposing that PAR, being a flexible and dynamic approach, is not restricted to a particular research field or conceptual underpinning. Participatory experiences may point to particular knowledge needs that can only be addressed by drawing from distinct research fields, or even from different conceptual frameworks developed by the same research field (e.g. the Multi-level Perspective and the Arenas of Development, both proposals under ST).

As Paper 1 equally argues, PAR case studies illustrate that distinguishing between regime and niche players is not always straight forward or even useful. In CC adaptation case studies the initial group will be formed regardless of whether participants can be considered regime actors or *frontrunners* - as is the case with those included in a Transition Arena (Loorbach, 2007). Thus, in CC adaptation research, it may not be useful to create a Transition Arena, because the goal is to promote a sustainable adaptation process, which will involve the participation of myriad types of social actors, who may not even be known from the outset.

Paper 2 provides another example of an analysis which could benefit from more than one framework. The paper's conceptual framework is informed by both ST and the SES resilience framework, since transformation is defined based on notions from these two research fields. However, the analysis could have been developed by applying either the Arenas of Development (Jorgensen, 2012) or the Multi-level Perspective (Geels, 2010), since the focus of the paper is on two co-evolving levels of governance in the context of Portuguese CC adaptation policy.

The empirical material of Paper 1 and Paper 2 could be explored also through a SPT based analysis. SPT enables observation of how practices-as-performances of researchers from multidisciplinary backgrounds translate into innovative forms for developing CC adaptation research (Paper 1), and how participatory practices and collaborations are experienced in the daily institutional contexts of policymakers, spatial planners and technical specialists involved in CC adaptation policymaking (Paper 2).

Paper 3 (on the Amoreiras Village Convergence Centre) could benefit from integrating the contributions of ST, such as the insights developed by scholars who have focused on grassroots innovations (Smith et al., 2014), and studies on how to promote protective spaces for innovations (Raven et al., 2014). Moreover, an SPT analysis could contribute to understanding how individuals who moved from an urban setting to a rural area motivated by dreams (projects) of sustainable lifestyles, were integrated in new collective systems of practice (Shove et al., 2009). The analysis could equally show how the careers of practice of this group of individuals have been influential in a transition to more sustainable rural communities, complementing the enquiry followed in the paper, based on the SES Resilience Framework.

In Paper 4 (the coast of Ílhavo and Vagos case study), the analytical framework was informed by ST. The paper's discussion draws from insights on two distinct proposals from ST – namely, Transition Management (TM), and the Arenas of Development (AoD). By focusing on the reflexive dimension of governance, the paper follows a fluid and relational approach to the case study analysis, as suggested in relation to AoD (Jorgensen, 2012). AoD proposes to speak of actor-worlds or arenas of change, where social actors interact, navigate and relate to each other throughout a transition process. Yet, the analytical framework and the methodological combination of the Scenario Workshop and Adaptation Pathways methods follows the rationale of a Transition Management cycle (see Chapter II), as guidance for a reflexive approach to a governance process that moves from a collective vision towards an operational action-stage. An alternative framework for analysing this empirical material could be to bring forward concepts from the SES resilience framework, such as resilience and transformation. Drawing from the SES approach could result in highlighting other possible ecological changes in the region - aside from the already felt loss of beach fronts and vulnerability to extreme weather events. Throughout the discussions on the needed adaptation options, more attention could have been given to the natural system, which would possibly result in proposals for more ecological and «green» solutions (EEA 2010 and 2013) in the final adaptation plan.

Moreover, one of the conclusions of Paper 4 is the need for further studies on the specific economic, social and environmental benefits of the suggested adaptation solutions. Concerning the study of economic benefits, it has been suggested in the literature that social practices offer important contributions for Ecological Economics studies (Røpke, 2009). Thus, in this case study analysis, SPT could be applied in investigating how everyday projects of local residents and tourists could translate into possible economic benefits. An implemented measure could maintain an already existent and prioritized practice in the context of local everyday life projects, but it could also lead to altering practices-as-performance. For instance, building more palisades and walkways to help secure the dune system could support the practice of exercising and walking, as some stakeholders in this case study referred to, in the final feedback interviews. These findings could feed into the dynamic adaptation pathways for the coastal region.

In synthesis, the four papers, and the case studies they refer to, offer a number of possibilities for future case study research and analysis on exploring complementarities between the three bodies of literature. The literature review and the empirical fieldwork pointed towards a strong possibility for useful complementarities between these bodies of knowledge in the context of CC adaptation studies.

B. What are the socio-political interpretations of climate change adaptation in Portugal?

This question was addressed directly in the context of Paper 2. The paper proposed two paradigmatic understandings of adaptation: adaptation as a technical and managerial issue; and adaptation as part of a sustainable transition. These two paradigmatic views are extremes and most likely exist in hybrid forms. Depending on the stage of the adaptation planning process and the type of social actors involved, one paradigmatic view may prevail over the other. The main reason for making this distinction has been to provide a guide that could help understand how a concept of transformational adaptation may translate into policymaking and action. Thus, the present question B, and question C (i.e. how does a transformational adaptation concept translate into public policy, civil society actions, and methodological approaches for empirical case study research?) are strongly intertwined.

Nevertheless, while addressing question B, Paper 2 draws merely from the accounts of policymakers, spatial planners and technical specialists who were involved

in distinct adaptation policy processes at two governance levels in the country (i.e. municipal and national). The other papers, and particularly Papers 3 and 4 indirectly provide responses to this question from the point of view of other social actors involved in CC adaptation processes, such as the members of the Convergence Centre or the residents and stakeholders involved in the case study of Ílhavo and Vagos.

Considering the first paradigmatic view of adaptation, CC adaptation is understood mostly as a technical and scientific rationale for solving perceived and anticipated problems due to CC impacts. In the second paradigmatic view, adaptation is perceived as part of a broader sustainable transition to a transformed societal system. While bearing in mind the perceptions and aspirations of social actors regarding the possible outcomes of a long-term adaptation process, it may be argued that these two paradigmatic understandings translate into two desirable possibilities for the future of the societal system that is adapting itself to the effects of CC. Thus, social actors may aspire to an adaptation process that leads to incremental changes or one that triggers a transformative change.

In the Amoreiras Village Convergence Centre (ACC, Paper 3), empirical actors often spoke of transitions, of resilience and sustainability. It is also referred to in the paper's case study characterization that the ACC is a member of the Transition Towns Network, which is a global network of initiatives that aim to develop sustainable, resilient and low-carbon communities (see Seyfang and Haxeltine, 2012). Thus, from the point of view of the ACC community, CC adaptation appears to be deep-rooted in a wider sustainable transition to more resilient and well-adapted societies.

In the coast of Ílhavo and Vagos (Paper 4), technical discussions on costs and engineering options predominated, and the final adaptation pathways are about specific technical options (e.g. sand nourishment operations, submerged breakwater). The pathways appear to support a future vision anchored in an incremental adaptation process. There is not an integral view of how co-evolving dominant structures, cultures and practices (Grin *et al*., 2010) could be affected. The predominant interpretation of adaptation seems to relate mostly to a technical and managerial perspective. However, in the Íhavo and Vagos study, my intention was to promote a long-term and systemic view of CC adaptation, by framing adaptation in the context of a need for a transition to a more sustainable way of living and managing the coastal system. Nevertheless, the predominance of technical and engineering viewpoints in the action-plan for the

following 75 years may also have been due to the types of knowledge and personalities of the participants in the action-group.

C. How does the adaptation concept (as incremental and/or transformational) translate into public policy, civil society actions, and methodological approaches for empirical case study research?

As referred to above, the previous discussion is strongly interlinked to this one, which also takes into account the two paradigmatic interpretations of CC adaptation.

Incremental adaptation is about maintaining a system's structuring and functioning as much as possible, despite external pressures and changes. Thus, a more technical and managerial paradigmatic view guiding policymaking and adaptation processes may aspire to the development of an incremental adaptation process, where new technical landscapes will maintain the current way of life. This may imply the continuous application of a number of grey adaptation measures (EEA, 2010) to assure the system is largely unaltered. These type of measures refer to structural approaches, such as engineering constructions that aim at the protection of people and goods (e.g. a breakwater or a dike). In the Ílhavo and Vagos case study, incremental adaptation was illustrated for the participants of the SWAP, in the first workshop sessions, in the form of the future storyline b (see Paper 4, Table 4.4-1). This storyline, which was afterwards critically discussed by the participants, described a future where sequential adaptation actions would hold the shoreline and protect people and goods, at the cost of extremely high financial investments, and the advent of a grey landscape of hard engineering constructions. Concurrently, the final plan for the coast is based on «grey» infrastructure measures (EEA, 2010). Aside from the grey measures proposed, more integrated approaches are missing, such as rethinking long-term land use plans for coastal regions, or integrating awareness raising campaigns, and promoting the upscaling of participatory involvement and collective action for protecting the coastal system. Thus, the case study still needs a more systemic and integral perspective. Adaptation is understood mostly as an incremental process, and it is questionable if keeping the current ways of living on the coast is doable or possible, given the potential risks posed by CC impacts in a system already extremely affected by coastal erosion. Moreover, as referred to in Paper 4, participants were equally adamant about keeping the natural ecosystem and protecting people and goods. These two goals can be conflicting if heavy engineering works are

implemented, such as a detached submerged breakwater. Thus, over time, the case study may evolve from an incremental adaptation process towards a transformed system. Grey measures in the long run may result in transformational adaptation (Kates *et al.*, 2012), if a particular new technical landscape radically changes local governance structures, cultures and practices. Conversely, it could be argued that if grey measures were not considered in a CC adaptation plan, over the long-term, an undesirable systems' collapse would be more difficult to prevent, and eventually the end result could equally lead to a grey landscape. Thus, despite the more technical paradigmatic view of adaptation guiding the planning process, there is no reason to assume the end result will be incremental or transformative.

On the other hand, transformational adaptation refers to a system which is radically transformed as it attempts to adapt to external changes. In this case, adaptation can be described as a pattern in a transition process towards a transformed system (De Hann and Rotmans, 2011).

In Amoreiras Village Convergence Centre (Paper 3), the Sustainable Village Initiative mentioned in the paper was about setting forward a transition to a more sustainable rural system, and thus the final permaculture design for the village illustrates a future vision for a social-ecological system, which would result from a transformational adaptation process. The social actors involved in the Convergence Centre also recognized the importance of «green» and «soft» measures (EEA, 2010 and 2013), which were the most implemented, over the eight year project assessed through the Systematization of Experiences. *Green* measures refer to ecosystem-based approaches in dealing with external impacts. *Soft* measures are non-structural approaches, such as public policies, modes of governance and managing local resources, dissemination and awareness raising, or economic based methodologies for responding to or reducing local impacts, risks and vulnerabilities (EEA, 2010). While guided by a paradigmatic view of adaptation as part of a sustainable transition to a transformed societal system, green and soft measures were central to the ACC project. For instance, planting native and well-adapted plant species in a region is a green measure. However, the ACC would be more likely to have applied these type of approaches more intensely if the project had benefited from a land property for experimenting with alternative farming and land use techniques.

Similarly, in the Cascais adaptation planning process (Papers 1 and 2), where policymakers, planners and specialists envisioned adaptation as part of broader sustainable transition, awareness raising and dissemination on the issue of CC adaptation

(i.e. a soft measure) had been listed as a priority in the municipality's climate strategy. Likewise, one of the adaptation measures integrated and prioritized in the revised Strategic Plan for Climate Change (following the PAR project) has been to establish green corridors in the city, which is a green approach.

Nevertheless, the aspirations of the ACC for a better adapted and transformed Alentejo, and the views regarding CC adaptation as leading to a more resilient and sustainable Cascais city, do not mean that while adapting to CC these systems will be radically transformed. The adaptation process may be characterized by incremental changes or be transformational.

In sum, the case studies show that both paradigmatic understandings of CC adaptation are triggering bottom-up actions in Portugal, and that both seem to be anchoring societal actions towards long-term planning. More idealistic and ecological communities such as the ACC seem to be driven by the idea of transformation. Other types of social actors, currently dealing with perceived impacts (e.g. case of Ílhavo and Vagos), seem to be strongly motivated by the need for protection and more prone to look for "hard" measures (EEA, 2013) that can provide material proof that their problem is being addressed (e.g. a breakwater). Ultimately, both views may lead societal action towards either an incremental or transformational adaptation.

D. How are new governance arrangements, at different levels and scales of governance, influencing climate change adaptation in Portugal?

The three action-research case studies do not address all major CC impacts expected for Portugal, as identified by the PNAS (APA, 2013). However, the focus of this thesis has been on new governance arrangements in the context of CC adaptation in Portugal. The case studies illustrate the disparity of existent and potential innovative arrangements, from grassroots forms for addressing local needs and promoting decisions resulting from participatory and collective processes (e.g. the Amoreiras Village Convergence Centre), to partnerships between state, market and civil society representatives, sharing a common goal (e.g. the coast of Ílhavo and Vagos).

In the Amoreiras Village Convergence Centre (ACC), a group of innovators partnered up with BASE to develop a retrospective assessment of the project that had been implemented. This assessment allowed me to understand the different dimensions of this group's work, such as the governance experiences implemented, the methods used

throughout their working experiences and the lessons learnt from living in a rural village in Alentejo, working to converge for addressing land abandonment in the region.

In Ílhavo and Vagos study, the social groups involved have been representatives of a number of central and regional administrative structures, as well as civil society and market actor groups. Yet, active engagement was developed on neutral ground. Events did not take place at the official premises of any of the public offices involved, and were not led by any specific stakeholder group. The establishment of an open forum for dialogue among the diversity of social actors involved has been an innovative governance experiment.

Thus, the two PAR case studies described in Papers 3 and 4 illustrate socially innovative governance arrangements beyond-the-state (Swyngedouw, 2005). These governance arrangements integrate the participation of civil society, market and state actors shaping polycentric power ensembles. They differ from more traditional state-centred, command and control ways of governing (Swyngedouw, 2005; Dryzek, 2010), and seem to prevail as forms that emerge through political and social responses to CC.

The case of the Portuguese National Adaptation Strategy (PNAS) illustrates a more conventional form of governance, yet state actors appear to be reaching out to other subnational stakeholders (e.g. municipalities) and civil society groups (e.g. NGOs), promoting new collective decision-making processes. Although the PNAS begins as a state-centred process, given that it fundamentally concerns a variety of context-specific local problems (e.g. CC impacts), it seems to be attempting to validate itself further as a national strategy by opening up to civil society groups, as referred to in Paper 2. The Cascais CC adaptation planning process illustrates an innovative governance arrangement in the context of Portuguese municipalities. In this city, policymakers, spatial planners and members of the municipality's technical staff, partnered up with a research project to implement an action-research investigation, which should both lead to a participatory revision of the existent adaptation strategy for the city (Cascais, 2010), and to disseminating and raising local awareness on the CC adaptation topic.

Different levels of governance can be equally characterized in these case studies in relation to the type of actors involved, namely whether they have been mainly regime or niche actors (Loorbach and Rotmans, 2010). Among the case studies, the Amoreiras Village is the furthest apart from regime actors, since the initiative has been led by innovators, or niche players (Loorbach, 2010), who developed the Convergence Centre project. Although the Cascais study involved regime actors, nevertheless, Cascais can be

characterized as a niche-regime (Geels, 2005) in the landscape of Portuguese municipalities. The municipality has been innovative in its approach to climate policy, first by developing a CC mitigation and adaptation strategy; second by integrating a partnership with university researchers to implement a participatory assessment and prioritization of adaptation options based on the strategy. In Ílhavo and Vagos, the action involvement was put into motion by university researchers, who were the proponents for the study and may be considered innovators in context of the SWAP experience.

The new governance arrangements emerging in the context of CC adaptation, can be similarly described in relation to how they are supporting higher policy integration and the mainstreaming of CC adaptation in Portugal. Policy integration refers to the integration of adaptation policies and strategies, such as the PNAS, in other public sectorial policies (Lenschow, 2002). In the case of the PNAS, despite the current developments, more time is required to observe progress on how sectoral policies integrate the topic of adaptation over the following years. In the Cascais study, the two years of action-research may have promoted the integration of the Cascais Strategic Plan for Climate Change as an appendix to the current municipal Land Use Plan. In the coast of Ílhavo and Vagos, we were careful to involve representatives of both municipalities, of the regional association of municipalities, and of the National Environmental Agency. One of the main reasons for integrating participants of these institutions was to promote a higher level of inter-institutional dialogue and the integration of CC adaptations in other sectoral policies at the local, regional and national level. Thus, these governance arrangements were designed to promote CC adaptation with a multi-level and multi-scale focus.

In the Amoreiras Village Convergence Centre, the issue of policy integration was not considered. Nevertheless, the existence of grassroots innovations such as this in vulnerable regions like Alentejo, calls attention to the need for a concerted action-plan that addresses land abandonment and land degradation problems in the region, which may be seriously aggravated by CC impacts. Not surprisingly, one of the interviewees from the PNAS responsible for the Agriculture and Forestry sector argued for the recovery of traditional land use practices as a preventive strategy for land degradation in Portugal.

The empirical research developed suggests the possibility that policy integration may be strongly influenced by implementing participatory approaches and awareness raising activities specifically targeting policymakers. Although the PNAS refers to awareness raising and dissemination as one of the pillars of the strategy, this discourse

needs to be targeted to multiple actor-groups. As part of a strategy for promoting a stronger policy integration, not only the communities who are being or may be affected by CC impacts, but also policymakers and spatial planners who are not directly involved in CC and other environmental policies (e.g. the Ministry of Finances; the Minister of Education) should be central receivers of CC communication and dissemination activities. In the Cascais case study, policy integration seems to have been influenced by a participatory process that involved local policymakers, spatial planners and technical specialists in a series of group discussions on the issue of CC. Should the same type of participatory involvement be developed in the context of the PNAS - for instance, by facilitating discussions among leaders of each sector in the strategy, regarding the different adaptation options, strategies and priorities – this could possibly lead to a higher level of policy integration.

A similar rationale applies to the issue of mainstreaming, which refers to the topic of CC adaptation entering diverse political and civil society discourses (Smit and Wandel, 2006). While more research would be needed to observe over time how CC adaptation propagates into different public spaces and discourses, it appears that participatory processes are well-equipped to create a diversity of communicative links between distinct arenas of development (Jorgensen, 2012), promoting the mainstreaming of the adaptation topic over distinct social groups, from political, to civil society and market spheres.

Research question E and hypothesis

E. Do participatory action research (PAR) approaches encourage a political and societal reflection on the possibility for influencing more sustainable development pathways?

Based on the arguments made in the papers, I conclude that PAR does encourage a political and societal reflection on the possibility for influencing more sustainable development pathways. Paper 1 considers that PAR may be a socially innovative research approach in the context of CC adaptation. It is maintained that PAR triggers new governance arrangements and collective decision-making processes that support CC adaptation and long-term planning. From the point of view of Paper 1, the cases studied represent a fraction in time of a long-term process. The empirical interactive relations illustrate how PAR can contribute to long-term thinking and action. Action-research

reproduces circular dynamics of engagement, promoting feedback loops of reflective action-oriented moments towards a distant and continuously redefined sustainability goal.

Despite the views of the different social actors involved at diverse levels and scales of governance (i.e. from the National Adaptation Strategy to the Convergence Centre), creating a common vision is essential to understanding the meanings of a more sustainable future, and PAR can be a tool to achieve this.

In the Portuguese National Adaptation Strategy (PNAS), PAR has not yet been applied. Moreover, the first PNAS sectoral reports do not result from a wide and genuine participatory process (see Paper 2). Since the PNAS is still at its planning stages (EEA, 2013), it is highly uncertain how the strategy will translate into sustainable CC adaptation in Portugal.

In all other case studies, PAR encouraged a political and societal reflection on the distant future. Yet, it is unclear how this reflection may result in more sustainable development pathways. The case of Ílhavo and Vagos is most likely the best example. The coming together of different social actors in an informal environment resulted in a shared future vision for the coast and an adaptation plan for the following 75 years. Nevertheless, this action-plan cannot yet be considered a radically different vision for the future of the coast, and it does not thoroughly account for the myriad of societal responses to the *grey* measures (e.g. submerged breakwater) that were preferred by participants. The action-plan did not allow for more radical options (e.g. re-localization of some urban settlements), which had been suggested by a few stakeholders in the first workshop, but were not consensual and thus not integrated. Yet, the *making* of the plan was an innovative governance experience in the Portuguese context, able to address future uncertainties and complexities, and account for some level of reflexivity throughout the planning experience. The use of the Adaptation Pathways and Tipping Points (Hassnoot *et al.*, 2013) tool in the methodological design delivered this dynamic and reflexive qualities.

Still, does PAR go beyond encouraging a collective reflection, is it reasonable to claim that PAR (in the context of CC adaptation) encourages the co-production of adaptation outputs that promote a long-term vision for a more sustainable future? The main hypothesis of this thesis implies that PAR allows for reflexivity among participants, and that such reflexivity creates a set of conditions that are favourable to the production of CC adaptation outputs of the research and action processes. Such outputs should emerge in the context of more sustainable developmental pathways. Thus, if PAR

facilitates a societal and political reflection on CC adaptation and long term sustainable pathways, then it is possible to respond to the main hypothesis of this study:

CC adaptation research PAR promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance.

A meta-analysis of the four research papers and the case study results indicate that the hypothesis can be confirmed to a certain degree, yet several doubts remain on the impact of PAR over the long-term. In the cases studied, PAR promoted the co-development of adaptation outputs guided by long-term sustainability goals.

Throughout, the experience and observations of the PAR studies indicate that there is a need to relate to participants at deeper levels, taking time to integrate and deliver different knowledge, objectives, questions, and results at various stages of the research (Stokols, 2006). The action-research experiences equally linked social actors, previously disengaged, in a participatory process creating space and time for dialogue and collective decision-making. The methodological designs have been adapted, co-created and fine-tuned with local case study partners, together with a scientific interdisciplinary (i.e. involving multiple scientific disciplines) and transdisciplinary team (i.e. involving different systems of knowledge, including local and traditional knowledge). New governance arrangements may stem from these experiences, because they have connected social actors who were previously disengaged and provided pragmatic structures to pursue shared goals and aspirations. These pragmatic structures (such as the SWAP) were motivating for stakeholders, namely to policymakers, planners, technical specialists, as well as residents and other social actors, involved in planning activities. In the coast of Ílhavo and Vagos, stakeholders noted frequently they thought planning and decision-making processes should benefit from integrating the innovative methodologies that they had experienced. As one city planner said «I hope those participating can take the methodologies used to their institutions. » The plan itself is an adaptation output, guided by a shared vision of a more sustainable and resilient future in the region. A local resident also stated he was «happy to help create a world that is good for my grandchildren and their children. »

In the Cascais feedback interviews, stakeholders claimed they had greatly appreciated their involvement and the knowledge gained. This knowledge concerned CC

issues, but also learning and experimentation with the new participatory methodological techniques. Cascais stakeholders considered this learning process to be a valuable tool for progressing on supporting the implementation of CC adaptation policies and measures. This output can be thus understood as a higher level of adaptive capacity for those involved in the adaptation process.

If PAR can support the production of adaptation outputs, guided by a long-term sustainability direction, then the approach should be well integrated in planning and policymaking activities, as well as in projects for implementing CC adaptation programs. Thus, institutional and organizational life (in State, market and civil society realms) may gain from adopting PAR, while responding to CC, and encourage an active progress towards sustainable development pathways.

Participants in the Ílhavo and Vagos case study also manifested (throughout the workshops and feedback interviews) their willingness to influence a more sustainable future. A policy planner from one of the local municipalities, stated:

«If we don't care about our coast, no-one will. My family is from here,
I live here with my husband and children, and hope my work contributes
to my children's future here. »

Despite the divergent views of the social actors involved at diverse levels and scales of governance (i.e. see the paradigmatic perspectives on CC adaptation in Paper 2), creating a long-term collective vision is essential to understand the collective meanings and perceptions of what a more sustainable future will be.

In the Amoreiras Village Convergence Centre (ACC) (Paper 3), one key finding of the Systematization of Experiences (SE) is that PAR – implemented over the years by the ACC - has continuously promoted a societal reflection on local sustainability issues, including the challenges posed by CC. This reflection resulted in adaptation outputs, such as the Sustainable Village Design (see Figures 1 and 2 of Paper 3). Note that this design would not be possible without the participatory engagement of the villagers, since it depended on the information collected among all local residents regarding the existent resources of land, materials, competences, and so on. The design also accommodated the villagers' dreams (see Paper 3). Therefore, this output was dependent on the participation of the local community. Moreover, the sustainable village project was part of a research cycle that followed previous activities implemented by the group, and resulted from a

collective evaluation of what had been learned, and what new directions should be followed.

Similarly, for the ACC, the Systematization of Experiences (SE) represented an evaluation of the chain of multiple cycles of interventions that had shaped the story of the project, over the previous eight years. As the research progressed, I experienced first-hand the participants' innovative modes of working. PAR has been integrated into the very foundations of this innovation, and was included since the beginning as a chief approach. As noted by one of the project founders (Phillipe):

> «Action-research has always been a pillar of the Centre. Moving from one development stage to the other, through a cyclical reasoning that is rooted in the aspirations of the collective formed by us and the local community. »

The SE aimed at leading the ACC into its new cycle, by allowing the group's collective evaluation of the previous cycles. All participants interviewed claimed they were witnessing the beginning of a «New Era» for the ACC, and were unsure of how to proceed, of which strategies should be pursued, and what should be left behind. There was a common sense of uncertainty regarding the future of their project. Resolving this uncertainty was of vital importance for the participants, since living in the village and dedicating their work to the ACC were two intertwined features of their life projects. Accordingly, over the course of the interviews and throughout the workshop sessions, participants stated that they hoped the SE could provide the needed answers. As Claudia claimed «I hope to find some clarity. All I have now is questions, many questions, with many answers. »

Therefore, the SE responded to two goals: those of the participants who needed to assess their experiences and co-determine what the following stages for the project should be; and those of the researchers who were interested in investigating the influence of local communities for increasing adaptability and resilience to CC related impacts in the Alentejo region. Consequently, for the participants, as well as for the researchers, the main output of the SE resided in a collective reflection regarding the achievements of the project over the years, highlighting also the project's weaknesses and needs. These two goals met through a PAR experience that was simultaneously the end and the beginning of a new cycle, from the point of view of the participants. Thus, the retrospective

assessment of the ACC, implemented through the SE, showed that, in this case study, PAR allowed for a cyclical and reflective activity over the years that accompanied the societal changes at Amoreiras Village. It would now be up to the ACC and other projects alike to continue following these sustainability goals, and contribute, through the outputs they co-create, to a collective effort for promoting a more adaptable and resilient Alentejo.

Although based on the case study experiences it can be argued that PAR promoted reflexivity, as well as outputs, the case studies do not provide evidence that the outcomes of PAR cycles will necessarily trigger new developmental pathways. This possibility may be more robust if PAR cycles can be complemented by modes of governance and particular methodological applications – such as Transition Management or Adaptive Co-management - that deliberatively lead the adaptation processes in this direction. Alternatively, both the systematization of experiences (SE) and the scenario workshop and adaptation pathways (SWAP) methods could be reproduced in different contexts, or even combined in future research as a way of promoting reflexive action (SWAP) and assessing and learning from past experiences (SE).

The challenges of PAR

When considering how far PAR has gone in order to encourage the possibility for influencing more sustainable developmental pathways, it is relevant to note some of the challenges of implementing the approach.

Adaptation research is an interdisciplinary scientific activity, as it involves interactions between different research fields and collaborations of various disciplines. These interdisciplinary interactions may be challenging for researchers, since different scientific disciplines have their own epistemological inclinations, languages and working tools. Sometimes the same word is understood differently depending on the scientific field. In the context of a PAR approach, the experience of transdisciplinary research becomes even more challenging. For instance, in the coast of Ílhavo and Vagos case studies, engineers from the Aveiro University contributed with multi-criteria and economic assessment studies of the different technical options for each adaptation measure. Learning the «engineering language» was part of the work of interpreting the different technical options for each measure, and was equally a learning experience for the workshop participants and a social science researcher, such as me. Moreover, it became necessary to integrate this knowledge in the participatory workshops and the adaptation pathways discussions. The «engineering discourse» had to be gradually

conveyed and learned by participants, until all were at ease with concepts such as «submerged breakwaters» or «sand dikes».

Considering the cyclical nature of PAR (see Paper 1), one challenge has been to finalize the participation in the action-research case studies, while still promoting the continued engagement of local actors. Particularly in Ílhavo and Vagos, the prospect for follow-up research activities left case study partners open to a continued engagement. Interim and final reports were sent to all participants, providing an accessible synthesis of the information and knowledge that had been produced over the previous research period. However, from the point of view of the researchers involved, the future of this engagement is dependent on the acceptance of new scientific proposals by national and international R&D financial mechanisms. However, central to sustaining the PAR cycles initiated through the case studies, is the integration of these approaches in local, regional and national governance structures for a long-term CC adaptation, involving multiple social actors, from civil society to market and state-based programs. University-based action-researchers may become initiators of processes of change, but would find it difficult to play the role of practitioners after a grant period is completed. However, if a genuine participatory process has been implemented, (see Paper 1's description of PAR), processes of change are likely to continue to move forward through a multitude of alternative future pathways, even after the research period ends. Thus, by implementing action-research approaches, universities may play an important role in promoting the mainstreaming of these research practices, and influencing regime changes in the dominant methodological frameworks prevailing in Portuguese institutional organizational and management structures. The Cascais municipality illustrates these findings. Following more than two years of sustained involvement in an action-research study led by the BASE project, municipal representatives claimed in feedback interviews that they were committed to continue developing the adaptation process, by taking stock of the lessons learned through the PAR experiences. Specifically, these stakeholders state that future activities should continue following an PAR approach and promote the inclusion of other stakeholder representatives. They also emphasized an interest in replicating and applying the participatory methodologies learned to the municipality's mode of planning. The general goal referred to by these interviewees was to continue pushing for the implementation of integrated and cross-sectoral adaptation measures. A clear policy achievement for these planners and specialists was the inclusion of the

Cascais Strategic Plan for Climate Change as an annex to the municipality's Land Use Plan, in 2015 (see Paper 2).

Another challenge for PAR is the question of comparability and replicability. Since PAR emerges from the meeting of varied interests and motivations (those of the researchers and of adaptation practitioners), and research questions, methodologies and results are continuously re-thought and re-designed, it may be difficult to replicate PAR processes and results in different learning cases. Yet, particular methodological approaches that support adaptation planning and implementation in similar regions can be replicable and comparable. SWAP, for instance, shows significant potential for being successfully replicated in other regions in Portugal. Conversely, if comparison is difficult, this may pose an opportunity for observing how adaptation processes develop in different socio-political and economic contexts engaging in CC adaptation; and possibly identify deeper patterns that characterize different contexts.

Time has also been a challenging factor for transdisciplinary PAR implementation. Among other aspects, projects are framed in their use of time and material resources by financial mechanisms. Yet, action-research demands time to engage in a continuous dialogue. This dilemma has been referred to by Badham and Sense (2006) as a «spinning out»:

«This issue of 'spinning out' to honour either industry or academic commitments to an action research project is therefore a significant methodological dilemma faced by action researchers and a desirable area for further investigative research. » (Badham and Sense, 2006:373)

When developing a project together, it is not always easy to coordinate the availability of individuals, groups, organizations, and research colleagues to engage in needed discussions and meetings, nor to harmonize various desired outcomes. PAR experiences have revealed spatial limitations too, which are closely related to time constraints. Since the research team engaged directly with individuals, communities or organizations, with the purpose of establishing a continuous dialogue, it would be difficult to cover large territories. In the Vagos and Ílhavo case study, for instance, the initial purpose was to cover other municipalities too, namely Mira to the South of Ílhavo which is equally affected by similar problems. But it was concluded that, during the time period available, it would be difficult to create the climate of mutual trust necessary for a genuine

involvement and to fully integrate representatives of the diverse actor groups from the three municipalities (i.e. Mira in addition to Ílhavo and Vagos). Nevertheless, maybe because of its challenges, the PAR experiences encouraged continuous innovation in the research frameworks, methods and approaches developed. From the beginning there has been a need to surpass spatial and temporal limitations, but also an effort to produce results that would satisfy academics and practitioners, and could add to existing knowledge.

One strategy to mitigate the limitations of time is for research projects to collaborate more intrinsically and to pass on their work to other funded proposals. This has been the case with the coast of Ílhavo and Vagos case study, which was inherited from another project, previously implemented. An internal articulation of the diverse projects between scientists and research institutions is often difficult to put into practice, particularly when different universities are involved and fiercely competing with one another. Nevertheless, this strategy presupposes a highly collaborative framework among scientists from various disciplines and at times from different research institutions. Internal collaborations may bring added benefits to the scientists involved, such as a continued participation in the collaborative writing and publishing of papers produced by the partner teams that respectively initiated and inherited a case study. Collaborations may grow and take the form of new scientific consortia developing funding proposals backed by strong interdisciplinary and transdisciplinary competences, knowledge and experiences. Arguably these issues point to more fundamental challenges posed by the current scientific research regime, and one could argue that a transition is also needed in the dominant structures and institutions that currently upkeep scientific research. More collaborative research ultimately may mean a new paradigm in the making of science. Climate Change may be triggering this new paradigm.

A governance for transformation?

On approaching the end of this research journey an intriguing question emerges – what type of governance is needed for promoting long-term climate change adaptation? Or rather, if ultimately currently development pathways need to be changed as argued by Pelling and colleagues (Pelling, 2014), should we speak of transformation rather than adaptation? And if so, what type of governance is needed?

Ultimately, governance can be understood as being carried out by a group of people deciding together on their shared futures. Individuals are able to organize themselves in order to pursue a shared, common political project (Vob *et al*., 2006; Dryzek, 2010). Given the challenges posed by anthropogenic CC (Mimura *et al*., 2014), but equally considering other sustainability challenges driving the Earth's system to dangerous thresholds (Rockstöm *et al*. 2009), it seems adequate to claim that a governance that supports a societal transformation is needed (Westley *et al*, 2011). Thus, studies from the sustainable transitions and social-ecological research fields argue for the need of facilitating and promoting a societal transformation. New modes of governance such as Transition Management and Adaptive Co-management have been proposed with the aim of steering sustainable change of large scale socio-technical and social-ecological systems. Sustainability and CC scholars seem to be increasingly playing a socially active role by not only studying and understanding global challenges, but also by proposing solutions (Rockstöm *et al*., 2011; Loorbach, 2010) and suggesting that society at large deliberatively engages in alternative developmental pathways (Pelling *et al.*, 2014). Considering the Resilience Framework, for instance (Folke *et al.*, 2010), social resilience refers both to the quality of maintaining fundamental structures and functioning when faced with external pressures, as well as to the capacity for "renewal, re-organization and development" (Folke, 2006:253). It is the latter that should be at the core of our attention. Global societal systems should be able to deliberatively push forward more sustainable developmental pathways that consider the state of both present and future generations. Eventually, an ecological collapse could mean a breakdown of the human condition and species, not necessarily of the natural world, which would transform itself into an alternate system state, regardless of the wellbeing of human societies. This awareness was recalled by the political philosopher Hannah Arendt who argued that to be alive means «to live in a world that has preceded our own arrival and will survive our departure» (Arendt, 1961:31). She calls attention to distinguishing the objective time of the natural world and human subjective time (Ibid, 1961). Similarly, while elaborating on social practices, T. Schatzki's analysis of time and space, distinguishes between objective time and space (which exist independently of human activity) and social timespace (Schatzki, 2009). Concurrently, as social groups at different and interdependent levels of governance decide together on more sustainable developmental pathways, it is central to take into account the natural worlds' *objective time*. As scientific evidence increasingly shows, current development pathways are moving us towards dangerous tipping-points

(Rockstöm *et al.* 2009; Westley et al., 2011), and a governance for sustainability should be integrating as a core principle a more *objective* sense of time.

Moreover, in the CC discourse, the idea of transformation as an object for global development traverses adaptation and mitigation actions (Pelling, 2010). Political processes that uphold genuinely sustainable developmental pathways, and new social learning arrangements that translate into alternative forms of governance focusing on the long-term, should perhaps go beyond the adaptation and mitigation distinction. If adaptation may mean a societal transformation, and if it is desirable that such a transformation is sustainable, then transformational adaptation would mean a more resilient and sustainable socio-technical and ecological system. Thus, transformational adaptation, if it is to mean a sustainable transition, should imply as well the reduction of greenhouse gas emissions. Not surprisingly, IPCC reports began integrating these ideas by proposing «climate-resilient pathways» (Denton *et al*., 2014). These pathways are described as «new approaches to sustainable development that take into account complex interactions between climate and social and ecological systems» and as «development strategies that combine adaptation and mitigation. » (Ibid, 2014:1102).

This way of combining adaptation and mitigation takes into account both the dynamics of future CC and planetary boundaries [20] (Rockstöm *et al.* 2009; Steffen *et al*, 2014). The idea of *threshold* or *tipping points* is increasingly embedded in environmental science, and integrated in the use of the term *Anthropocene*, coined by Nobel laureate Paul Crutzen and Eugene Stoermer. The Anthropocene refers to the current era in the history of the Earth's system dominated by human activity (Lövbrand *et al*., 2015). This era is characterized by being a volatile period, as human activity is pushing the planets' life support systems to dangerous limits.

A more expansive concept of CC adaptation may mean a new turn in CC adaptation discourses, policy and action, as the dangers posed by the Anthropocene become the starting point for adaptive action. As Lövbrand *et al.* argue there is still a fundamental role for the social sciences in re-constructing the global narrative of the Anthropocene, into a narrative centered on the sustainability, adaptability and resilience of those living today, as much as of future generations (Lövbrand *et al*., 2015).

---

[20] Environmental science scholars increasingly refer to planetary boundaries and tipping points (Rockstöm *et al.* 2009; Steffen *et al,* 2014). These are moments when the external pressures on the environmental system, caused by human activity (e.g. increases in Greenhouse Gas emissions) may radically disrupt the stability of human and natural systems.

In line with these approaches and reflections, this thesis proposes from the point of view of research and policymaking that in aiming towards the long-term, more than distinguishing between mitigation and adaptation, modes of governance should be centred on the sustainability and resilience of present and future generations. Governance should equally be characterized by a cyclical and active engagement between science, policy and society at large, at multiple societal levels. The continuous involvement of multi-level and multi-scales of governance may support consistently and proactively new pathways for development guided by desirable long-term changes, as well as clear discourses and understandings that account for the *objective time* of CC. The goal of such collective action should be perhaps to re-construct the Anthropocene into an era of desirable societal transformation.

Thus, following the previous responses to the five research questions addressed through the CC adaptation case study experiences, this thesis proposes that a research and political agenda for sustainable development (that includes CC adaptation) should be characterized as a governance for transformation. Bearing in mind the long-term challenges towards more sustainable, adaptive and resilient social and ecological systems, it seems less useful to distinguish between mitigation and adaptation, when responses to CC are deliberated over the long-term (i.e. 50 years or more), and a sustainable transformation is needed and desirable (Folke *et al*., 2010; Pelling, 2010). Therefore, this work proposes that a governance for transformation should abandon the mitigation and adaptation frontiers, particularly when considering long-term developmental pathways. Further research could support this proposal, by exploring more thoroughly, at the empirical level, how useful it is to approach CC policy and action as adaptation and mitigation strategies, and if these two interdependent domains for action are separable in practice. The agenda of a governance for transformation should equally result from a more extensive study of climate change adaptation case studies, at diverse stages of the adaptation process in Portugal and elsewhere. Yet, the intention to promote transformation rather than adaptation could be the starting point for building an agenda for transformation.

Closing remarks

The previous meta-discussion attempted to provide a clear picture of how the four research papers have together delivered responses to the questions of this thesis. None of

the responses are exhaustive, nor could they be since the five questions refer to vast issues, such as the complementarity between different literatures and their conceptual and methodological frameworks, in the context of CC adaptation research, besides the impacts of PAR experiences in societal action. These are extensive topics that need to be continually investigated through case studies and experimentation, in diverse governance contexts. Furthermore, PAR is an extremely flexible and dynamic approach to research that opens immense possibilities for complementing these findings with additional empirical observations and experiences.

Based on the case studies analysed, the main hypothesis of this thesis is found to be partially confirmed, yet a number of doubts remain on the long-term outputs of PAR. PAR has been able to build up local adaptive capacity and promote a number of outputs. PAR is able to set a fertile ground for promoting a political and social reflection on the issue of CC adaptation, and sustainable long-term changes (i.e. response to question E). PAR facilitated the co-production of adaptation outputs that may promote a more sustainable direction in the context of long-term CC adaptation processes. The approach equally allowed for the involvement of different actor-worlds, at diverse levels and scales of governance.

Yet, PAR is a cyclical and incremental approach that can be initiated by researchers (as was the case with the coast of Ílhavo and Vagos), but needs to continue being implemented by local communities and other stakeholders involved. Thus, the question of whether or not PAR leads to more sustainable developmental pathways, in the context of CC adaptation, can only be addressed after observing how PAR processes develop in the coming years. Among the cases studied, the Amoreiras Village Convergence Centre (ACC) is the only study providing evidence that the concrete outputs co-produced by the ACC[21] and local villagers have resulted in incremental changes, which, over the years, appear to have increased local adaptability and resilience (as argued in Paper 3). This incremental changes may eventually result in a transformed village system. The story of how other action-research processes (i.e. Ílhavo and Vagos and Cascais case studies, which were respectively coordinated and observed by me) will continue to be promoted and implemented by local stakeholders can only be told in the future.

---

[21]   The ACC implemented a PAR approach over a period of eight years, which subsequently was assessed through the Systematization of Experiences, in the context of the PAR study led by me.

Methodological approaches seem to be of central importance for inspiring and motivating participants to continue developing research cycles and experimentation in other decision-making and planning arenas. While taking up the role of frontrunners in implementing PAR, universities can promote the approach in other governance contexts. For instance, by working with local and national stakeholders in the Ílhavo and Vagos study, the university has demonstrated to those participating, another mode of decision-making and planning, which participants may reproduce in their institutions. Finally, integrating the different bodies of literature studied and their methodological approaches in the context of PAR studies, may contribute to promoting a more structured organization of PAR that is better equipped to address the challenges of the approach, such as the questions of comparability and replicability.

This chapter ends with the proposal for a governance for transformation, which would provide a broader umbrella to explore complementarities between diverse research fields and their particular insights and contributions, in a multidisciplinary and transdisciplinary PAR context.

.

Chapter VI
Conclusion

The point of departure for this thesis was based on the principle that while responding to perceived and future climate change (CC) impacts, as well as other sustainability, environmental and societal challenges that may be intertwined with CC adaptation, society should take into account the resilience and sustainability of those living today, as well as of future generations. However, initial explorations into the subject of sustainable CC adaptation in Portugal led to acknowledging that there is a short supply of long-term perspectives directing CC adaptation planning in the country. Planning regimes have been characterized in previous studies as typically proposing unarticulated solutions and not delivering concerted action strategies to deal with adaptation (O'Riordan *et al.*, 2014). It seemed unclear how public policy, civil society and/or market driven initiatives in Portugal are being or can be further directed by shared future visions and long-term sustainable goals (Carvalho-Ribeiro *et al.*, 2010). Moreover, an empirically based reflection on the role of social scientists working in transdisciplinary sustainability and CC research, led to investigating the role of scientific research in promoting modes of governance that may support more sustainable, adaptable and resilient societies.

These initial explorations resulted in posing five questions that informed the design of the main hypothesis, investigated through empirical case study research, including participatory action-research (PAR) case studies. In order to establish an empirical framework that would deliver answers to the research questions, three research objectives were set out as part of the analytical framework:

(i) To characterize adaptation case studies at different governance levels and scales, responding to distinct types of CC related impacts in Portugal;

(ii) To test, experiment and co-create participatory methodologies and approaches with local communities and stakeholders;

(iii) To produce and evaluate adaptation outputs: visions, strategies, actions and plans in Portugal.

The multidisciplinary case study research that I coordinated and/or was involved in as a collaborator and participant observer, was able to address these objectives. Altogether the four case studies provided a multi-level and multi-scale characterization of adaptation processes in Portugal. The PAR cases offered a field for experimentation

and co-creation of participatory methodologies with local stakeholders. Finally, adaptation outputs were co-produced and evaluated.

The Systematization of Experiences (SE) of Amoreiras Village Convergence Centre (ACC) responded to objective (ii), since the SE was specially developed and applied to the ACC context with local partners. It also became an evaluation of adaptation outputs resulting from the ACC's work, and from the SE, thus responding to objective (iii). The Ílhavo and Vagos study responded to objective (ii) by implementing a new combination of methodologies to support a reflexive participatory decision-making process. This process led to objective (iii), with the co-production of a long-term adaptation action-plan for the coastal region.

Two analytical studies were also included in this research. The Cascais study was an analytical appraisal of a PAR study implemented by my colleagues at the BASE project. The Portuguese National Adaptation Strategy [PNAS] is an analytical appraisal of an ongoing governmental adaptation planning process. The PNAS progress reports represent the first stage of the national strategy. Thus, these two case studies contribute to objective (i), but do not fulfil the other two research objectives.

Throughout almost three years of empirical research, four papers have been written drawing from the case studies and research experiences. The papers are therefore the heart of this thesis. The leading research questions acknowledge that climate change, although a problem on its own, is symptomatic of a globally unsustainable developmental pathway. Thus, moving beyond an understanding of adaptation as a set of technical and rationalistic solutions aimed at solving perceived or expected problems caused by CC, this thesis has sought to contribute to understanding how society at large can be involved and own a transformational, adaptation process.

The hypothesis posed is that in CC adaptation research PAR promotes outputs that may influence more sustainable development pathways through the reflexive involvement of diverse social actors, at different scales and levels of governance.

Moving towards responding to the main hypothesis, the four papers and case study experiences provide responses to questions A to E. However, these responses are not exhaustive and require long-term observations to deliver additional insights.

First, in response to question A, it was concluded that the three research fields, which informed the theoretical underpinnings for the case study research and the four papers – Sustainable Transitions, Social-Ecological Systems Resilience Framework and Social Practice Theory –, have a few points of intersection that can be explored

empirically. Thus, it was found that these bodies of literature provide complementary approaches to the study of incremental and transformational long-term CC adaptation processes.

Second, in response to question B, it was found that two paradigmatic interpretations of CC adaptation co-exist in the Portuguese landscape of multi-actor and multi-level CC adaptation policies, plans and actions. These interpretations are:

> a. «Climate change adaptation policies refer to a set of technical and scientific options to resolve perceived and expected CC impacts, such as rising sea levels and heat waves. »

> b. «Climate change adaptation policies should contemplate medium and long-term action-plans to address perceived and expected CC impacts, while promoting a transition to a more resilient and sustainable society. »

Third, in response to question C, it was found that these two paradigmatic interpretations relate to two types of future visions that are depicted in the case studies' analyses: (i) adaptation will result in incremental changes and the societal system maintains its current developmental pathway; (ii) adaptation should be transformative and new developmental pathways emerge.

The first vision guided the actors involved in the adaptation planning experience in the coast of Ílhavo and Vagos, which was reported in detail in Paper 4 and further discussed throughout Chapter V. The second vision guided the actions led by the grassroots innovation studied – the Amoreiras Village Convergence Centre – described and discussed in Paper 3, as well as in Chapter V. We are not able to know whether these two visions will result in incremental or transformative adaptation processes, and if the results may eventually oppose the collective visions that have kindled the PAR adaptation cycles. However, since PAR is an incremental research approach based on cycles of diagnosis, planning, implementation and evaluation (as explained in Paper 1), it is likely that if the PAR process continues being led by local stakeholders, the adaptation process will equally continue to move forward.

Fourth, in response to question D, it is concluded that new governance arrangements are emerging and developing in the country as responses to CC and/or to environmental pressures that are perceived as being intensified by CC. These new

arrangements are entering regime policies, such as the Portuguese National Adaptation Strategy, as well as niche developments within the dominant environmental planning regime in Portugal (e.g. the coast of Ílhavo and Vagos; Cascais municipality), and niche experiments (e.g. Amoreiras Village Convergence Centre). These new governance arrangements appear to be influencing both the processes of policy integration and mainstreaming of adaptation.

Fifth, in response to question E, the empirical studies illustrate that action-research led by scientists and other social actors, including innovators (e.g. the Convergence Centre), and regime actors (e.g. Cascais; Ílhavo and Vagos) is playing a role in initiating adaptation processes in Portugal. PAR encourages a political and societal reflection on the possibility for influencing more sustainable developmental pathways, in the context of CC adaptation. Nevertheless, the results do not provide any certainties of whether the momentum for adaptation will be sustained over the medium or longer term. Specifically, there is no guarantee that CC adaptation strategies (e.g. the Cascais Strategic Plan or the Portuguese National Adaptation strategy), action-plans (e.g. the plan for the coast of Ílhavo and Vagos), or sources of adaptability (e.g. the Amoreiras Convergence Centre) will continue the process, upscaling at the regional or national levels, and eventually be mainstreamed in other political discourses, strategies or civil society initiatives. There is equally no assurance that the processes related represent the commencement of an incremental or transformational adaptation process in the country.

Nevertheless, the retrospective analysis of the Amoreiras Convergence Centre (Paper 3), indicates that when PAR was implemented by local stakeholders, who were guided by a collective, long-term, sustainable vision of the future, the result led towards a more sustainable, adapted and resilient community. Aside from this micro level innovation, at a macro level, CC policy and adaptation processes, as well as PAR approaches in academic and policy contexts, are still fairly new developments in the Portuguese landscape. More studies are needed to provide empirical evidence that these processes contribute to leading Portugal in a transition to a more sustainable, adaptive and resilient society.

Therefore, I find the hypothesis guiding this research to be partially true, since more research would be needed, including an extensive observation of a wider number of PAR case studies across longer periods of time, to fully confirm the influence of PAR in promoting sustainable development pathways. Yet, PAR does seem to go beyond a collective reflection, to encourage the co-production of adaptation outputs. In all PAR

case studies this was evident. Yet, how those processes will develop in the future is still not known.

In the Amoreiras Village Convergence Centre (ACC), the analytical process was twofold. The Systematization of Experiences (SE) of the ACC initiated a PAR cycle and produced a participatory retrospective assessment of the innovation. Consequently, the SE produced an evaluation of the PAR cycles developed by the group in the previous years. Thus, the SE equally represented the end of a previous set of PAR cycles implemented by the ACC, and the beginning of new cycles based on the lessons learned throughout the SE. These cyclical process resulted in a set of adaptation outputs. By providing a clear understanding of the achievements of the project, but also of the challenges and collective goals of the group, the SE offers a useful outcome in the form of the systematization of results reported to the group. From the point of view of the researchers, the lessons learned through the SE can be summed up as a realization of the value of grassroots innovations in contributing to more adaptable and resilient rural communities in isolated regions, with problems of land abandonment and land degradation. Conversely, the SE similarly highlighted the outputs co-produced by the ACC and village residents, such as the sustainable village design.

The coast of Ílhavo and Vagos PAR study resulted in the first long-term CC adaptation action-plan for the region. Both the ACC and the coast of Ílhavo and Vagos case studies have delivered new methodological approaches which were co-developed with local stakeholders. The SE method was adapted to integrate the ACC's mode of working. The SWAP – Scenario Workshop and Adaptation Pathways – resulted from the combination of the two methods for aiding decision-making in the context of long-term CC adaptation planning. Thus, it is concluded that PAR is able to integrate adequate methodologies and approaches that provide outputs and frameworks for steering a collective decision-making process towards more sustainable development pathways.

Finally, in the Cascais municipality, the CC adaptation case study developed by my colleagues at the BASE project, and evaluated by me through participant observation and feedback interviews, gained from: a participatory cross-sectoral assessment and reprioritization of adaptation measures; a cost-effectiveness analysis of the prioritized measures; awareness raising and learning on the issues of CC; experimentation with participatory methodologies, resulting in a revised Strategic Plan for Climate Change now included as an annex to the city's Land Use Plan.

Universities may play an important role in promoting the mainstreaming of these research practices, influencing regime changes in the dominant methodological frameworks for planning and decision-making processes, which currently prevail in Portuguese institutional organizational and management structures. I have also found that there is a symbiosis between multidisciplinary PAR approaches and experimenting with new modes of governance. On one hand PAR offers a testing ground for new modes of governance in context-specific approaches, by setting the conditions for a collective discussion, connecting social groups and individuals who were previously disengaged, and providing a safe space for mutual understanding, supported by a genuinely participatory process. The PAR experiences of the ACC and the coast of Ílhavo and Vagos provide examples of this conclusion, at two distinct levels and scales of governance in Portugal. On the other hand, PAR in the CC adaptation context is multidisciplinary (i.e. involving researchers from multiple disciplinary backgrounds) and transdisciplinary (i.e. resulting from the involvement of scientists, policymakers, and practitioners). Therefore, governance frameworks and analytical approaches from different research fields (e.g. Transition Management; Adaptive Co-management), concerned with systemic long-term transformative changes, may be easier to integrate and may even be used comparatively to analyse the same empirical findings. The new analytical approaches developed in a PAR context may produce a comprehensive understanding of CC adaptation processes, and simultaneously promote adaptation outputs that incrementally lead to long-term sustainable changes.

In the Portuguese context, CC adaptation may need to broaden its discourse and integrate concepts such as resilience and transformation, which could contribute to promoting the mainstreaming of CC adaptation at multiple levels of governance.

Moreover, while action-research approaches can tap into the societal process of change, and infuse CC adaptation processes with a long-term perspective, at least over the period of time that action-involvement lasts, how the process continues in the future remains a blank and unpredictable page. One option for creating a structure that supports the continuation of the adaptation process seems to be the establishment of an inclusive and genuine engagement process throughout the investigation. This is not always the case in participatory research. As the papers have shown, there are different types of engagement and diverse levels of participation. Involving practitioners as mere consultants may not be sufficient to create a cohesive and motivated action-group that will at least attempt to lead the adaptation process forward.

Another option for scientists to continue engaging with the case study partners, would be for a research project to be financially supported over the longer-term (e.g. 10 years or more). Nevertheless, in Portugal this is highly unlikely, given the dominant structures that manage and finance scientific research. In the scientific community, the majority of researchers need to abide by financial mechanisms which cover short-term projects (typically 1 to 4 years), rendering research teams unable to engage in longer term action-involvement programs, and thus becoming active practitioners in a transition process. Moreover, the professional time researchers allocate to their work is often likely to be divided into the implementation of different projects and applications for new funding mechanisms. Thus, PAR approaches are not easily accommodated by the current structures and institutions that support scientific research.

Nevertheless, ultimately researchers should play the role of frontrunners, who experiment with PAR, and who afterwards deliver the process to the hands of those participants involved. It will be up to stakeholders to continue leading the PAR process and replicate the experiences in their institutions or communities. Thus, PAR in CC adaptation research is merely the tip of an iceberg of changes that should involve alternative modes of collective decision making, from state, to market to civil society based projects, dealing with long term uncertainties and the need to provide for more adaptable and resilient futures.

In synthesis, PAR participants (e.g. policy makers, socially innovative initiatives) may be promoting long-term CC adaptation processes and attempt to move beyond the role of initiators of transformative changes, towards enduring practitioners in societal transformation. In this scenario, the social sciences may contribute to producing new knowledge and understanding regarding how to better engage, motivate and inspire society to act collectively towards more sustainable and adaptable futures. At the opposite end of this spectrum, social sciences researchers may choose not to integrate a participatory action-engagement in their empirical research. Ultimately, each researcher has a fundamental role to play in the complex mosaic of sustainability and CC science. Nevertheless, CC and sustainability researchers seem to be increasingly leaning towards supporting todays' global societal challenges. In this context PAR becomes highly relevant for sustainability researchers who wish for their work to benefit, and equally to be benefited by, society at large.

Finally, taking stock of an expanded view of CC adaptation as a process and outcome potentially leading to a societal transformation, this thesis proposes framing CC adaptation as part of a governance for transformation.

Future research

This thesis encompassed a literature review on approaches to transition and transformation studies, which offered conceptual and methodological contributions in sustainability research, both from different theoretical perspectives. The literatures reviewed were: Sustainable Transitions (ST); Social Practice Theory (SPT) and the Social-Ecological Systems (SES) Resilience Framework. A reflexive meta-discussion of these different research fields and their applications to CC adaptation studies sheds some light over research topics that may contribute with solutions for today's societal challenges.

One possibility seems to be a tighter articulation between SPT and contributions from ST and the SES Resilience Framework. The latter two bodies of knowledge are complex system approaches, which recognize that command-and-control and deterministic governance strategies are more than likely either to fail or even aggravate sustainability problems (Voß *et al*., 2006). Nevertheless, the modes of governance proposed by these bodies of literature may benefit from looking in greater depth to non-linear, context-specific processes of change that are embedded in particular spatial and material arenas. SPT does not propose a particular mode of governance, but holds a well-fitted analytical lens to uncover these particularities. Thus, exploring complementarities between the three research fields may provide further insights for promoting CC adaptation processes, by illuminating how social practices can complement Transition and SES studies, or be integrated in proposals for new modes of governance, such as Transition Management (Loorbach, 2010) and Adaptive Co-Management (Folke *et al*., 2005; Armitage *et al*., 2008). Particularly, studies may aim at uncovering potential lock-in situations and path dependencies, which may be hindering transformational adaptation processes. Identifying and understanding lock-in situations could contribute to supporting a continued sustainable adaptation process, which is as much the outcome of everyday life developments, as of macro level structural changes that arguably may be steered by multi-level policies and action-plans.

Moreover, each of the literatures reviewed has developed varied analytical frameworks, which are not usually used together or in the context of CC Adaptation research. For instance, ST is largely influenced by the Multi-level Perspective, but includes other interpretations of the dynamics of socio-technical systems, such as Arenas of Development (Lachman, 2013). Nevertheless, both interpretations of multi-level dynamics of socio-technical systems could be applied in the context of CC adaptation research, especially to support an understanding of the relations between incremental and transformative changes of socio-technical systems in adaptation processes.

Therefore, future research - in Portugal and elsewhere - could focus on investigating how different research fields, in addition to different conceptual frameworks developed by the same research field, provide complementary understandings of empirical and observable developments in CC adaptation.

Concerning multidisciplinary and transdisciplinary PAR experiences, it would be central for social scientists to continue improving research practices that are able to firmly establish action-groups who potentially continue to lead forward the governance process. Likewise, it would be important for Portuguese policymakers, planners and civil society projects to experiment with PAR as an approach to long-term decision-making and planning processes, not only in the CC adaptation context but also regarding other sustainability topics, such as resource scarcity or sustainable land use. Thus, social actors and groups involved in sustainable development policies should consider the benefits of integrating PAR at the core of institutional and organizational modes of planning and policymaking.

From the National Adaptation Strategy to the Amoreiras Village Convergence Centre, case studies offered a first picture of Portuguese CC adaptation process, yet this picture is still incomplete. Many other initiatives are emerging, from local cooperatives to non-governmental organizations and market based initiatives. The list is quite vast, as had been shown by project BASE that identified about 40 potential bottom-up case studies related to CC adaptation in Portugal (detailed in the introductory chapter). Taking stock of the two participatory methodologies applied by this thesis and presented in Papers 3 and 4, future empirical studies could equally explore combining the Systematization of Experiences, as well as the Scenario Workshop and Adaptation Pathways (SWAP), for respectively assessing adaptation experiences and promoting future action at multi-level, multi-scale and multi-actor governance initiatives.

Moreover, future research should focus on continuing an in-depth analysis of multi-actor, multi-scale and multi-level adaptation case studies in Portugal, while also attempting to identify indicators of adaptation processes that are geared towards long-term sustainable changes, as well as the most appropriate methodological approaches for promoting long-term and sustainable processes. Thereafter, further quantitative-based analysis of adaptation case studies could equally provide relevant knowledge, establishing multi-level communicative links, as well as proposing creative methodological approaches and adequate strategies and policies, based on context-specific patterns of change that may support more resilient societies today and in future generations.

Both empirical and theoretical advances in CC adaptation in Portugal and elsewhere could equally account for the possibility of promoting a governance for transformation, or a collective decision-making process that deliberatively influences sustainable development pathways, regardless of how the CC problem evolves over the long-term. In this context, multidisciplinary and transdisciplinary PAR approaches can further develop new applications of the conceptual frameworks developed by the literatures reviewed, as well as promote co-creative processes for designing effective methodological approaches that support a governance for transformation.

Finally, the relevance of a collective effort in a governance for transformation goes beyond Portuguese borders. Of central importance for today's international sustainable development agendas are the Sustainable Development Goals (SDG) approved in 25th September 2015 at the UN headquarters in New York. Following the 2014 Rio+20 conference, the UN Member States agreed on a proposal for the SDG[22] to succeed the UN Millennium Development Goals (MDGs). Unlike the MDG's eight goals targeting mainly developing countries, the SDG comprise 17 goals, with 169 targets until 2030 that are universally applicable to all countries. The SDG integrate the eight MDG, but cover a much wider range of issues, and ultimately represent a proposal for what the world needs to achieve in order to continue on a transition towards sustainable development. Goals such as responsible consumption and production; sustainable cities and communities, climate action and the building of partnerships are included. Multi-

---

[22]   A list of the SDG can be found here: https://sustainabledevelopment.un.org/partnerships (last accessed, September, 2015)

stakeholder partnerships are encouraged worldwide to develop initiatives that meet these goals.

In light of the current sustainable development goals, a governance for transformation is rooted in collaborative thinking, complementarity, and the active convergence of people, ideas and things towards a transformed society. Such ambition is poignantly conveyed by Goal 17 of the SDGs: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Bibliography

Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global environmental change*, *15*(2), 77-86. doi:10.1016/j.gloenvcha.2004.12.005

Adger, W. Neil. (2006). Vulnerability. *Global Environmental Change*, *16*(3), 268–281. doi:10.1016/j.gloenvcha.2006.02.006

Agarwal, A., Perrin, N., Chatre, A., Benson, C. S., & Kononen, M. (2012). Climate policy processes, local institutions, and adaptation actions: mechanisms of translation and influence. *Wiley Interdisciplinary Reviews: Climate Change*, *3*(6), 565–579. doi:10.1002/wcc.193

Alves F.L., Sousa L.P., Esteves T.C., Oliveira E.R., Antunes I.C., Fernandes M.D.,..., Pereira M. (2014). Trend Change(s) in Coastal Management Plans: the integration of short and medium term perspectives in the spatial planning process. *Journal Of Coastal Research*. SI 70, 437-442. doi: 10.2112/SI70-074.1

APA [Agência Portuguesa do Ambiente] (2013). Estratégia Nacional de Adaptação às Alterações Climáticas [National Strategy of Climate Change Adaptation] First Progress Report. Retrieved from: http://sniamb.apambiente.pt/infos/geoportaldocs/Consulta_Publica/DOCS_QEPIC/150515_ENAAC_Consulta_Publica.pdf

Arendt, H (1961) *Between Past and Future. Eight Exercises in Political Thought*. New York: Penguin Books.

Armitage, D. (2005). Adaptive capacity and community-based natural resource management. *Environmental management*, *35*(6), 703–15. doi:10.1007/s00267-004-0076-z

Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global environmental change*, *18*(1), 86-98. Doi:10.1016/j.gloenvcha.2007.07.002

Avelino, F. (2011) Power in Transition: Empowering Discourses on Sustainability Transitions. PhD-Thesis. Erasmus University Rotterdam. (methodology chapter)

Avgitidou, S. (2009). Participation, roles and processes in a collaborative action research project: A reflexive account of the facilitator. *Educational Action Research*, *17*(4), 585-600. doi: 10.1080/09650790903309441

Beck, U. (2002a). The cosmopolitan society and its enemies. *Theory, Culture & Society*, *19*(1-2), 17-44. doi:10.1177/026327640201900101

Beck, U. (2002b). The terrorist threat world risk society revisited. *Theory, Culture & Society*, *19*(4), 39-55. doi: 10.1177/0263276402019004003

Beck, U., Bonss, W., & Lau, C. (2003). The theory of reflexive modernization problematic, hypotheses and research programme. *Theory, culture & society*, *20*(2), 1-33. doi: 10.1177/0263276403020002001

Beck, U., Giddens, A., & Lash, S. (1994). *Reflexive modernization: Politics, tradition and aesthetics in the modern social order*. Stanford: Stanford University Press.

Berkes, F., Colding, J., & Folke, C. (Eds.). (2002). *Navigating social-ecological systems: building resilience for complexity and change*. Cambridge: Cambridge University Press.

Brundtland, GH, & World Commission on Environment and Development [WCED] (1987). *Our common future: Report of the World Commission on Environment and Development*. Oxford University. Retrieved from: http://www.un-documents.net/our-common-future.pdf

Buttel, F. H. (2000). Ecological modernization as social theory. *Geoforum*, *31*(1), 57–65. doi:10.1016/S0016-7185(99)00044-5

Carvalho-Ribeiro, S. M., Lovett, a., & O'Riordan, T. (2010). Multifunctional forest management in Northern Portugal: Moving from scenarios to governance for sustainable development. *Land Use Policy*, *27*(4), 1111–1122. doi:10.1016/j.landusepol.2010.02.008

Cascais (2010). Cascais Strategic Plan for Adaptation to Climate Change. Retrieved from: http://www.cm-cascais.pt/sites/default/files/anexos/gerais/ag21_plano_estrategico_cc_alteracoes_climaticas.pdf

Cash, D. W., Adger, W. N., Berkes, F., Garden, P., Lebel, L., Olsson, P., ... & Young, O. (2006). Scale and cross-scale dynamics: governance and information in a multi-level world. *Ecology and society*, *11*(2), 8. http://www.ecologyandsociety.org/vol11/iss2/art8/

Collins, S. L., Carpenter, S. R., Swinton, S. M., Orenstein, D. E., Childers, D. L., Gragson, T. L., ... & Whitmer, A. C. (2010). An integrated conceptual framework for long-term social-ecological research. *Frontiers in Ecology and the Environment*, *9*(6), 351-357. doi:http://dx.doi.org/10.1890/100068

Crane, T. A. (2010). Of models and meanings: cultural resilience in social-ecological systems. *Ecology and Society*, *15*(4), 19. http://www.ecologyandsociety.org/vol15/iss4/art19

De Haan, J.; & Rotmans, J. (2011). Patterns in transitions: Understanding complex chains of change. *Technological Forecasting and Social Change*, *78*(1), 90–102. doi:10.1016/j.techfore.2010.10.008

Denton, F., T.J. Wilbanks, A.C. Abeysinghe, I. Burton, Q. Gao, M.C. Lemos, T. Masui, K.L. O'Brien, & K. Warner (2014). Climate-resilient pathways: adaptation, mitigation, and sustainable development. In: Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge and New York: Cambridge University Press.

DeWalt, K. M., & DeWalt, B. R. (2010). *Participant observation: A guide for fieldworkers*. London: AltaMira Press.

Dryzek, J. S. (2010). *Foundations and frontiers of deliberative governance*. Cambridge University Press: Cambridge

EEA (2010). The European Environment State and Outlook 2010: Adaptation to Climate Change (SOER No. 2010). Luxembourg: Publications Office of the European Union. Retrieved from: http://www.eea.europa.eu/soer/europe/adapting-to-climate-change

EEA [European Environmental Agency] (2013). *Adaptation in Europe Addressing risks and opportunities from climate change in the context of socio-economic developments* (Report No 3/2013). Retrieved from: http://www.eea.europa.eu/publications/adaptation-in-europe

EEA [European Environmental Agency] (2014). National adaptation policy processes in European countries. Report No 4/2014. Retrieved from: http://www.eea.europa.eu/publications/national-adaptation-policy-processes

Evans, D. (2011). Blaming the consumer – once again: the social and material contexts of everyday food waste practices in some English households. *Critical Public Health*, 21 (4): 429-44. doi: 10.1080/09581596.2011.608797

Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., ... & Zaks, D. P. (2011). Solutions for a cultivated planet. *Nature*, *478*(7369), 337-342. doi: 10.1038/nature10452

Folke, C., Carpenter, S., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2002). Resilience and sustainable development: building adaptive capacity in a world of transformations. *Ambio*, *31*(5), 437–40. http://www.ncbi.nlm.nih.gov/pubmed/12374053

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive Governance of Social-Ecological Systems. *Annual Review of Environment and Resources*, *30*(1), 441–473. doi:10.1146/annurev.energy.30.050504.144511

Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267. doi:10.1016/j.gloenvcha.2006.04.002

Folke, C., S. R. Carpenter, B. Walker, M. Scheffer, T. Chapin, and J. Rockström (2010) Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society* 15(4): 20. http://www.ecologyandsociety.org/vol15/iss4/art20/

Ford, J. D., Berrang-ford, L., Lesnikowski, A., Barrera, M., & Heymann, S. J. (2013). How to Track Adaptation to Climate Change : A Typology of Approaches for National-Level Application. *Ecology and Society*, *18*(3), 40. http://dx.doi.org/10.5751/ES-05732-180340

Frantzeskaki, N., & de Haan, H. (2009). Transitions: Two steps from theory to policy. *Futures*, *41*(9), 593-606. doi:10.1016/j.futures.2009.04.009

Frantzeskaki, N., Loorbach, D., & Meadowcroft, J. (2012). Governing societal transitions to sustainability. *International Journal of Sustainable Development*, *15*(1-2), 19-36. doi: 10.1504/IJSD.2012.044032

Futuyma, D. J., & Moreno, G. (1988). The evolution of ecological specialization. *Annual Review of Ecology and Systematics*, 207-233.

Geels, F. W. (2005) The dynamics of transitions in socio-technical systems: A multi-level analysis of the transition pathway from horse-drawn carriages to automobiles (1860-1930). *Technology Analysis & Strategic Management*, 17(4), 445-476. doi: 10.1080/09537320500357319

Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, *36*(3), 399–417. doi:10.1016/j.respol.2007.01.003

Geels, F. W., Hekkert, M. P., & Jacobsson, S. (2008). The dynamics of sustainable innovation journeys. *Technology Analysis & Strategic Management*, *20*(5), 521–536. doi:10.1080/09537320802292982

Geels, F. W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, *39*(4), 495–510. doi:10.1016/j.respol.2010.01.022

Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, *1*(1), 24–40. doi:10.1016/j.eist.2011.02.002

Gram-Hanssen, K. (2010). Residential heat comfort practices: understanding users. *Building Research & Information*, *38* (2), 175–186. doi:10.1080/09613210903541527

Grin, J., Rotmans, J., Schot, J. (Eds.) (2010). *Transitions to Sustainable Development – New Directions in the study of long term transformative change*. New York: Routledge.

Hajer, M (1995) *The Politics of Environmental Discourse. Ecological Modernization and the Policy Process*. New York, London: Oxford University Press.

Hargreaves, T., Longhurst, N., & Seyfang, G. (2013). Up, down, round and round: connecting regimes and practices in innovation for sustainability. *Environment and Planning A*, *45*(2), 402–420. doi:10.1068/a45124

Hendriks, C. M. (2009). Policy design without democracy? Making democratic sense of transition management, (13), 341–368. doi:10.1007/s11077-009-9095-1

Hickey, S., & Mohan, G. (2004). *Participation--from tyranny to transformation? Exploring new approaches to participation in development*. New York: Zed books.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecological Systems* 4:1–23.

Holling, C. S. (1996). Engineering resilience versus ecological resilience. *In* P. C. Schulze (Ed.) *Engineering within ecological constraints.* National Academy Press: Washington.

 IPCC (2014b). Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge and New York: Cambridge University Press.

IPCC, (2014a) Agard, J., E.L.F. Schipper, J. Birkmann, M. Campos, C. Dubeux, Y. Nojiri, L. Olsson, B. Osman-Elasha, M. Pelling, M.J. Prather, M.G. Rivera-Ferre, O.C. Ruppel, A. Sallenger, K.R. Smith, A.L. St. Clair, K.J. Mach, M.D. Mastrandrea, and T.E. Bilir (Eds.). Annex II: Glossary In: Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.) *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, and New York: Cambridge University Press.

Jørgensen, U. (2012). Mapping and navigating transitions—The multi-level perspective compared with arenas of development. *Research Policy*, *41*(6), 996-1010.doi:10.1016/j.respol.2012.03.001

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. *Technology analysis & strategic management*, *10*(2), 175-198. doi: 10.1080/09537329808524310

Kemp, R., Loorbach, D., & Rotmans, J. (2007). Transition management as a model for managing processes of co-evolution towards sustainable development. *International Journal of Sustainable Development & World Ecology*, *14*(1), 78–91. doi:10.1080/13504500709469709

Kemp, R.; Martens, P. (2007) Sustainable Development: how to manage something that is subjective and that never can be reached? *Sustainability: Science, Practice & Policy.* 3(2) doi:10.1016/j.jclepro.2007.10.019

Kemp, R.; Rotmans, J.; Loorbach, D. (2007) Assessing the Dutch Energy Transition Policy: How Does it Deal with Dilemmas of Managing Transitions? *Journal of Environmental Policy & Planning*, 9, 315 – 331.doi:10.1080/15239080701622816

Kemp, R.; M. Volpi (2008) The Diffusion of Clean Technologies: A Review with Suggestions for Future Diffusion Analysis, *International Journal of Cleaner Production.16 (1) S14-S2.doi:* doi:10.1016/j.jclepro.2007.10.019

Kern, F., & Smith, A. (2008). Restructuring energy systems for sustainability? Energy transition policy in the Netherlands. *Energy policy*, *36*(11), 4093-4103. doi:10.1016/j.enpol.2008.06.018

Kirwan, J., Ilbery, B., Maye, D., & Carey, J. (2013). Grassroots social innovations and food localisation: An investigation of the Local Food programme in England. *Global Environmental Change*, *23*(5), 830-837 doi:10.1016/j.gloenvcha.2012.12.004

Kitano, H. (2002). Systems biology: a brief overview. *Science*, *295*(5560), 1662-1664.

Lachman, D. A. (2013). A survey and review of approaches to study transitions. *Energy Policy*, *58*, 269-276. doi:10.1016/j.enpol.2013.03.013

Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P.... & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability Science*, *7*(1), 25-43. doi: 10.1007/s11625-011-0149-x

Lebel L, Anderies JM, Campbell B, Folke C, Hatfield-Dodds S, Hughes TP, Wilson J. (2006) Governance and the Capacity to Manage Resilience in Regional Social-Ecological Systems. *Ecology and Society*. 11(1), 19. http://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1051&context=sms_facpub

Lenschow, A. (2002). *Environmental policy integration: Greening sectoral policies in Europe*. London: Routledge.

Liverman, D. (2004). Who governs, at what scale and at what price? Geography, environmental governance, and the commodification of nature. *Annals of the Association of American Geographers*, *94*(4), 734-738. doi:10.1111/j.1467-8306.2004.00428.x

Loorbach, D. (2007). Transition management: New mode of governance for sustainable development. PhD thesis. Erasmus University Rotterdam, Utrecht: International Books.

Loorbach, D. (2010). Transition Management for Sustainable Development: A Prescriptive, Complexity-Based Governance Framework. *Governance*, *23*(1), 161–183. doi:10.1111/j.1468-0491.2009.01471.x

Loorbach, D., & Rotmans, J. (2010). The practice of transition management: Examples and lessons from four distinct cases. *Futures*, *42*(3), 237–246. doi:10.1016/j.futures.2009.11.009

Lövbrand, E., Beck, S., Chilvers, J., Forsyth, T., Hedrén, J., Hulme, M., ... & Vasileiadou, E. (2015). Who speaks for the future of Earth? How critical social science can extend the conversation on the Anthropocene. *Global Environmental Change*, *32*, 211-218. doi:10.1016/j.gloenvcha.2015.03.012

Markard, J., & Truffer, B. (2008). Technological innovation systems and the multi-level perspective: Towards an integrated framework. *Research Policy*, *37*(4), 596–615. doi:10.1016/j.respol.2008.01.004

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions : An emerging field of research and its prospects. *Research Policy*, *41*(6), 955–967. doi:10.1016/j.respol.2012.02.013

McMeekin, A., & Southerton, D. (2012). Sustainability transitions and final consumption: practices and socio-technical systems. *Technology Analysis & Strategic Management*, *24*(4), 345-361. DOI:10.1080/09537325.2012.663960

Meadowcroft, J. (2009). Transition management and long term energy transitions, 323–340. doi:10.1007/s11077-009-9097-z

Mimura, N., R.S. Pulwarty, D.M. Duc, I. Elshinnawy, M.H. Redsteer, H.-Q. Huang, … & R.A. Sanchez Rodriguez, (2014) Adaptation planning and implementation. In: Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press.

Mol, A. P. (2000). The environmental movement in an era of ecological modernisation. *Geoforum*, *31*(1), 45–56. doi:10.1016/S0016-7185(99)00043-3

Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to Environmental Change: Contributions of a Resilience Framework. *Annual Review of Environment and Resources*, *32*(1), 395–419. doi:10.1146/annurev.energy.32.051807.090348

Nevens, F. & Roorda, C. (2014). A climate of change: A transition approach for climate neutrality in the city of Ghent (Belgium). *Sustainable Cities and Society*. *10*, 112-121. doi:10.1016/j.scs.2013.06.001

Nevens, F., Frantzeskaki, N., Loorbach, D., Gorissen, L. (2012). Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, 50, 111-122. doi: 10.1016/j.jclepro.2012.12.001

O'Brien, K. (2012). Global environmental change II From adaptation to deliberate transformation. *Progress in Human Geography*, *36*(5), 667-676. doi: 10.1177/0309132511425767

O'Brien, K. O., Hayward, B., & Berkes, F. (2009). Rethinking Social Contracts : Building Resilience in a Changing Climate, *14*(2),12. http://www.ecologyandsociety.org/vol14/

O'Brien, K., & Hochachka, G. (2010). Integral adaptation to climate change. *Journal of Integral Theory and Practice*, *5*(1), 89-102. Retrieved June 20th 2015, from: http://integralwithoutborders.net/sites/default/files/resources/O'Brien_Hochachka_Proof.pdf

O'Riordan, T., Gomes, C., & Schmidt, L. (2014). The Difficulties of Designing Future Coastlines in the Face of Climate Change. *Landscape Research*, *39*(6), 613–630. doi:10.1080/01426397.2014.975108

O'Brien, K., Pelling, M., Patwardhan, A., Hallegatte, S., Maskrey, A., Oki, T., ... & Yanda, P. Z. (2012). Toward a sustainable and resilient future. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC)*, 437-486. Cambridge University Press: Cambridge and New York.

Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006) Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, *11* (1), 18. http://hdl.handle.net/10535/3412

Oppenheimer, M., M. Campos, R. Warren, J. Birkmann, G. Luber, B.C. O'Neill, & K. Takahashi. (2014). Emergent risks and key vulnerabilities. In: Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (Eds.). *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge and New York: Cambridge University Press.

Park, S. E., N. A, Marshall, E. Jakku, A.M. Dowd, S.M. Howden, E. Mendham, & A. Fleming. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22*, 115-126. doi:10.1016/j.gloenvcha.2011.10.003

Pelling, M. (2010). *Adaptation to climate change: from resilience to transformation*. Routledge: London.

Pelling, M., O'Brien, K., & Matyas, D. (2014). Adaptation and transformation. *Climatic Change*, 1-15 doi:10.1007/s10584-014-1303-0

Pohl, C., & Hirsch Hadorn, G. (2008). Methodological challenges of transdisciplinary research. *Natures Sciences Sociétés*, *16*(2), 111-121. Retrieved from: http://www.cairn.info/resume.php?ID_PAPER=NSS_162_0111

Raven, R., Kern, F. Verhees, B. & Smith, A. (2015). Niche construction and empowerment through socio-political work. A meta-analysis of six low-carbon technology cases. *Environmental Innovation and Societal Transitions*. doi:10.1016/j.eist.2015.02.002

Reckwitz, A. (2002) Toward a theory of social practices. A development in culturalist theorizing. *European Journal of Social Theory*, 5, 243–263. doi: 10.1177/13684310222225432

Ridder, D., & Pahl-Wostl, C. (2005). Participatory Integrated Assessment in local level planning. *Regional Environmental Change*, *5*(4), 188–196. doi:10.1007/s10113-004-0089-4

Rip, A., Kemp, R., Rayner, S., & Malone, E. L. (1998). Technological change. *Human choice and climate change. Vol. II, Resources and technology*, 327-399.

Rockström, J., Steffen, W., Noone, K., Persson, Å. , Chapin, F. S., Lambin, E. F.,... & Foley, J. A. (2009). A safe operating space for humanity. *Nature*, *461*(7263), 472-475.

Røpke, I. (2009). Theories of practice — New inspiration for ecological economic studies on consumption. *Ecological Economics*, *68*(10), 2490–2497. doi:10.1016/j.ecolecon.2009.05.015

Røpke, I., & Christensen, T. H. (2012). Energy impacts of ICT – Insights from an everyday life perspective. *Telematics and Informatics*, *29*(4), 348–361. doi:10.1016/j.tele.2012.02.001

Rotmans, J.; Kemp, R.; Asselt, M. (2001). More evolution than revolution: Transition management in public policy. *The Journal of Futures Studies, Strategic Thinking and Policy*, 3(1), 15–32. doi: 10.1108/14636680110803003

Santos, F.D & Miranda, P. (Eds.) (2006). *Climate Change in Portugal. Scenarios, Impacts and Adaptation Measures SIAM II*. Lisbon: Gradiva.

Sayce, K., Shuman, C., Connor, D., Reisewitz, A., Pope, E., Miller-Henson, M.,... & Owens, B. (2013). Beyond traditional stakeholder engagement: public participation roles in California's statewide marine protected area planning process. *Ocean & Coastal Management*, *74*, 57-66. doi:10.1016/j.ocecoaman.2012.06.012

Schatzki, T. (1996). *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge: Cambridge University Press.

Schatzki, T. (2009). Timespace and the Organization of Social Life. In: Shove, E., Trentmann, F.; Wilk, R. (Eds.) *Time Consumption and Everyday Life: Practice, Materiality and Culture*. Oxford: Berg.

Schatzki, T. (2010). *The timespace of human activity: On performance, society, and history as indeterminate teleological events*. London: Lexington Books

Schatzki, T., Knorr-Cetina, K., von Savigny, E. (Eds.) (2001). *The Practice Turn in Contemporary Theory*. London: Routledge

Schmidt, L., Delicado, A., Gomes, C., Granjo P., Guerreiro, S., Horta, A.,… Penha-Lopes, G. (2013a). Change in the way we live and plan the coast: stakeholders discussions on future scenarios and adaptation

strategies. In: Conley, D.C., Masselink, G., Russell, P.E. and O'Hare, T.J. (Eds.) Proceedings 12th International Coastal Symposium (Plymouth, England) *Journal of Coastal Research*, Special Issue No. 65: 1033-1038, ISSN 0749-0208. Retrived, June 15 2015, from: http://ics2013.org/papers/Paper4333_rev.pdf

Schmidt, L., Prista, P., Saraiva, T., O'Riordan, T., & Gomes, C. (2013b). Adapting governance for coastal change in Portugal. *Land Use Policy*, 31, 314-325. doi:10.1016/j.landusepol.2012.07.012

Schmidt, L.; Gomes C., Guerreiro, S., O'Riordan, T. (2014). Are we all on the same boat? The challenge of adaptation facing Portuguese coastal communities: Risk perception, trust-building and genuine participation, *Land Use Policy*, 38, 355-365. doi:10.1016/j.landusepol.2013.11.008

Schot, J., & Geels, F. W. (2008). Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology Analysis & Strategic Management*, *20*(5), 537–554. doi:10.1080/09537320802292651

Seawright, J., Gerring, J. (2008). Case Selection Techniques in Case Study Research – A Menu of Qualitative and Quantitative Options *Political Research, 61*(2), 294–308. doi: 10.1177/1065912907313077

Seyfang, G. & Smith, A. (2007). Grassroots Innovations for Sustainable Development: towards a new research and policy agenda. *Environmental Politics*, 16(4) pp. 584-603. doi: 10.1080/09644010701419121

Seyfang, G. &Haxeltine, A. (2012). Growing Grassroots Innovations: Exploring the role of community-based social movements in sustainable energy transitions. *Environment and Planning C*, 30(3), 381-400. doi: 10.1068/c10222

Seyfang, G., Park, J. J., & Smith, A. (2013). A thousand flowers blooming? An examination of community energy in the UK. *Energy Policy*, *61*, 977-989.

Shove, E. (2003). *Comfort, cleanliness and convenience: The social organization of normality.* Oxford: Berg

Shove, E. (2005). Consumers, Producers and Practices: Understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture*, *5*(1), 43–64. doi:10.1177/1469540505049846

Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A*, *42*(6), 1273–1285. doi:10.1068/a42282.

Shove, E., & Walker, G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy*, *39*(4), 471–476. doi:10.1016/j.respol.2010.01.019

Shove, E., Trentmann, F.; Wilk, R. Eds. (2009). *Time Consumption and Everyday Life: Practice, Materiality and Culture*. Oxford: Berg.

Shove, E.; Pantzar, M; and Watson, M., Eds. (2012). *The dynamics of social practice: everyday life and how it changes*. London: Sage Publications.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change*, *16*(3), 282–292. doi:10.1016/j.gloenvcha.2006.03.008

Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research policy*, *34*(10), 1491-1510. doi:10.1016/j.respol.2005.07.005

Smith, A., & Kern, F. (2009). The transitions storyline in Dutch environmental policy. *Environmental Politics*, *18*(1), 78–98. doi:10.1080/09644010802624835

Smith, A., & Stirling, A. (2010). The politics of social-ecological resilience and sustainable socio-technical transitions. *Ecology and Society*, *15*(1), 11. http://www.ecologyandsociety.org/vol15/iss1/ art11/

Smith, A., Voß, J., Grin, J. (2010) Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges. *Research Policy*. 39 (4), 435-448. doi:10.1016/j.respol.2010.01.023

Smith, A.; Raven, R. (2012) What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy*, *41*(6), 1025–1036. doi:10.1016/j.respol.2011.12.012

Smith, A., Fressoli, A.; Hernán T. (2014) Grassroots innovation movements: challenges and contributions. *Journal of Cleaner Production*, 63; 114-124. doi:10.1016/j.jclepro.2012.12.025

Sondeijker, S., Geurts, J., Rotmans, J., & Tukker, A. (2006). Imagining sustainability: the added value of transition scenarios in transition management. *Foresight-The journal of future studies, strategic thinking and policy*, *8*(5), 15-30. doi:http://dx.doi.org/10.1108/14636680610703063

Spaargaren, G., & Mol, A. P. (1992). Sociology, environment, and modernity: Ecological modernization as a theory of social change. *Society & Natural Resources*, *5*(4), 323-344.doi: 10.1080/08941929209380797

Spaargaren, G., Oosterveer, P. (2010) Citizen-Consumers as Agents of Change in Globalizing Modernity: The Case of Sustainable Consumption. *Sustainability*, *2*(7), 1887–1908. doi:10.3390/su2071887

Spaargaren, G., Oosterveer, P., & Loeber, A. (2013). *Food practices in transition: changing food consumption, retail and production in the age of reflexive modernity*. New York: Routledge.

Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., Bennett, E.M.,…, & Sörlin, S., (2015). Planetary boundaries: Guiding human development on a changing planet. *Science 347*(6223), 1259855.

Stirling, A., (2006). Analysis, participation and power: justification in participatory multi-criteria analysis. *Land Use Policy,* 23, 95–1074 doi:10.1016/j.landusepol.2004.08.010

Stirling, A. (2008). "Opening up" and "closing down" power, participation, and pluralism in the social appraisal of technology. *Science, Technology & Human Values*, *33*(2), 262-294. doi: 10.1177/0162243907311265

Stokols, D. (2006). Toward a science of transdisciplinary action research. *American journal of community psychology*, *38*(1-2), 63-77. doi: 10.1007/s10464-006-9060-5

Swyngedouw, E. (2005). Governance innovation and the citizen: the Janus face of governance-beyond-the-state. *Urban studies*, *42*(11), 1991-2006.

Swyngedouw, E. (2014). Anthropocenic politicization. From the politics of the environment to politicizing environments. In: Bradley, K., Hedrén, J. (eds.), Green Utopianism. Perspectives, Politics and Micro-Practices. London: Routledge.

Truninger, M. (2011). Cooking with Bimby in a moment of recruitment: exploring conventions and practice perspectives. *Journal of Consumer Culture* Vol. 11, 1, 37-59. doi: 10.1177/1469540510391221

Truninger, M. (2013). The historical development of industrial and domestic food technologies. In Murcott, A., Belasco, W., Jackson, P. (Eds.) *The handbook of food research*. London: Bloomsbury

Truninger, M. & Freire, D. (2014). *Unpacking the Mediterranean diet: agriculture, food and health*. In Domingos, N., Sobral, J. M. & West, H. (Eds.) Food between the country and the city: ethnographies of a changing global foodscape (pp. 191-206). London: Bloomsbury.

Tukker, A.; & Butter, M. (2007). Governance of sustainable transitions : about the 4 (0) ways to change the world. *Journal of Cleaner Production*, *15*, 94–103. doi:10.1016/j.jclepro.2005.08.016

Van Der Brugge, R; Rotmans, J; & Loorbach, D. (2005) The transition in Dutch water management *Environment Change*, 5,167-176Adger, W.N. (2001). Scales of governance and environmental justice for adaptation and mitigation of climate change. *Journal of International Development*, *13*(7), 921–931. doi:10.1002/jid.833

Van der Brugge, R.; & Roel van Raak (2007). Facing the adaptive management challenge: insights from transition management. *Ecology and Society*, 12 (2). http://www.ecologyandsociety.org/vol12/ iss2/art33/

Verhees, B., Raven, R., Kern, F., & Smith, A. (2015). The role of policy in shielding, nurturing and enabling offshore wind in The Netherlands (1973–2013). *Renewable and Sustainable Energy Reviews*, *47*, 816-829. doi:10.1016/j.rser.2015.02.036

Voß, J. P., & Kemp, R. (2006). Sustainability and reflexive governance: introduction. Reflexive governance for sustainable development, 3-28. In Voß, Jan-Peter, Dierk Bauknecht, and René Kemp (Eds.) *Reflexive governance for sustainable development*. London: Edward Elgar Publishing.

Voß, J.-P., Smith, A., & Grin, J. (2009). Designing long-term policy: rethinking transition management. *Policy Sciences*, *42*(4), 275–302. doi:10.1007/s11077-009-9103-5

Voß J., & Borneman, B. (2011). The Politics of Reflexive Governance : Challenges for Designing Adaptive Management and Transition Management. *Ecology and Society*, *16*(2), 9. http://hdl.handle.net/10535/7593

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social--ecological systems. *Ecology and society*, *9*(2), 5. http://www.ecologyandsociety.org/vol9/iss2/art5/

Walker, B., Gunderson, L., Kinzig, A., Folke, C., Carpenter, S., & Schultz, L. (2006). A handful of heuristics and some propositions for understanding resilience in social-ecological systems. *Ecology and society*, *11*(1), 13. http://www.ecologyandsociety.org/vol11/iss1/art13/

Warde, a. (2005). Consumption and Theories of Practice. *Journal of Consumer Culture*, *5*(2), 131–153. doi:10.1177/1469540505053090

Warde, A. (2014). After Taste: Culture, Consumption and Theories of Practice. *Journal of Consumer Culture,* 1469540514547828. doi: 10.1177/1469540514547828

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D.,… Leeuw, S. (2011). Tipping Toward Sustainability: Emerging Pathways of Transformation. *Ambio*, *40*(7), 762–780. doi:10.1007/s13280-011-0186-9

Wittmayer, J.M., N. Schäpke, F. van Steenbergen, I. Omann (2014) Making sense of sustainability transitions locally. How action research contributes to addressing societal challenges. *Critical Policy Studies*. 8 (4): 465-485. DOI: 10.1080/19460171.2014.957336