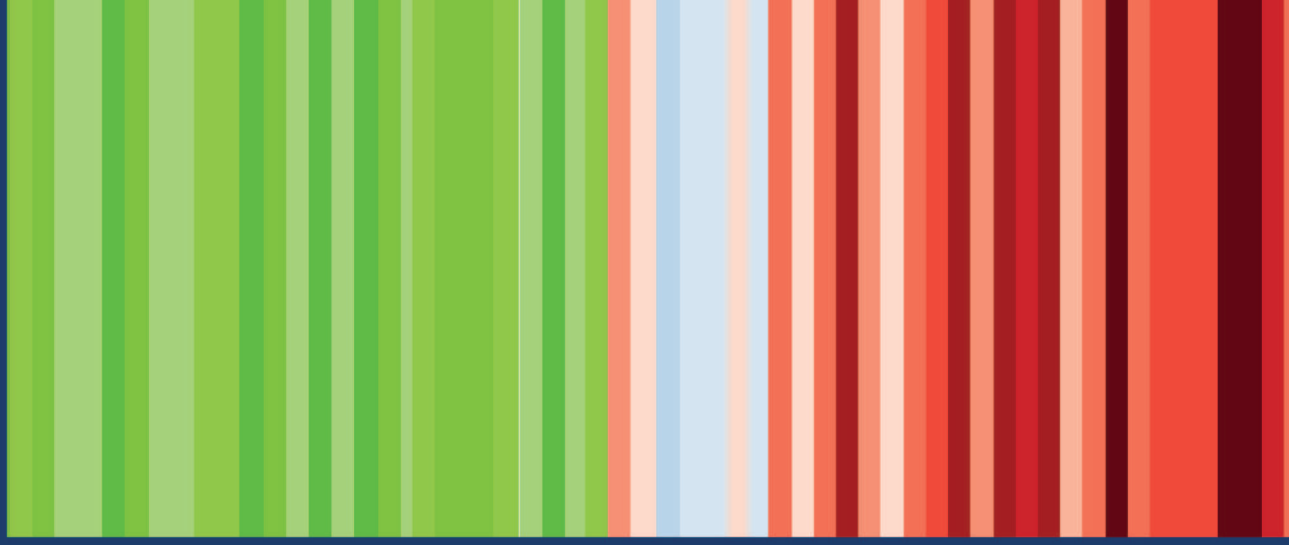
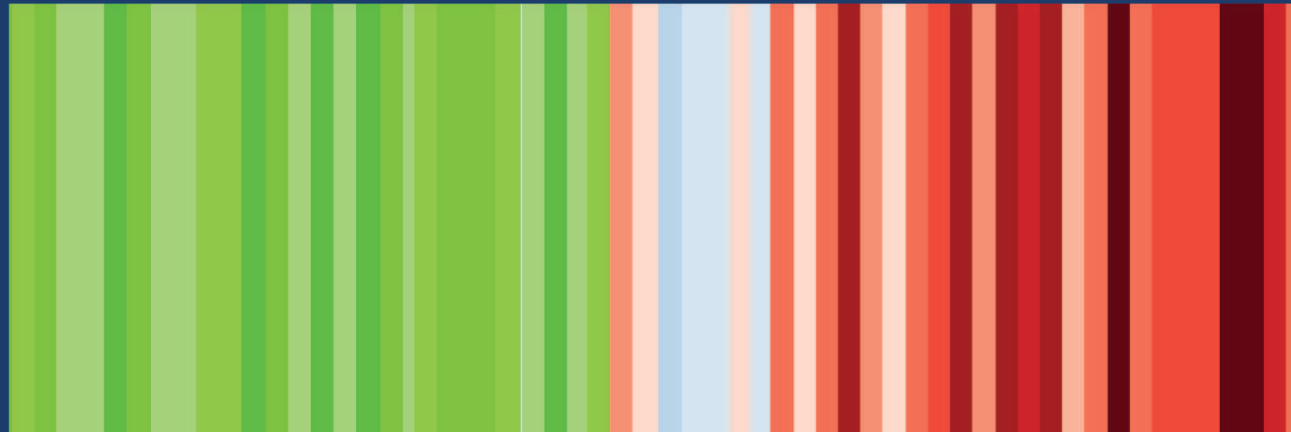


OPENING THE "BLACK BOX"

of decision-making for climate change adaptation at the local level

Luis Diego Segura Ramírez



Opening the “black box” of decision-making for climate change adaptation at the local level

Luis Diego Segura Ramírez

Cover Design: Jania Umaña

Layout: Jania Umaña

ISBN: 978-94-6534-066-1

Opening the “black box” of decision-making for climate change adaptation at the local level

Dissertation

To obtain the degree of Doctor at Maastricht University, on the authority of the Rector Magnificus, Prof. Dr. Pamela Habibović, in accordance with the decision of the Board of Deans, to be defended in public on Wednesday December 10th at 09:45 hours

by
Luis Diego Segura Ramírez

SUPERVISOR

Prof. Dr. Pim Martens, Maastricht University

CO-SUPERVISOR

Dr. Annemarie van Zeijl-Rozema, Maastricht University

ASSESSMENT COMMITTEE

Prof. Dr.Frank Boons (chair), Maastricht University

Prof. Dr. Robbert Biesbroek (Wageningen University & Research)

Dr. Maud Huynen (Maastricht University)

Prof. Dr. Chris Thomas (Lincoln University, UK)

Organizations that contributed to the doctoral research

Universidad Nacional de Costa Rica

CONTENTS

List of Figures

List of Tables

PART 1:
Context and Framework for Analysis

CHAPTER 1: INTRODUCTION AND RESEARCH OVERVIEW

Climate Change (CC) is one of the main global challenges of the 21st century. "Climate change is now affecting every country on every continent" (United Nations, 2019). From permafrost melting and heavy precipitation to droughts, floods, and wildfires, damage to infrastructure, human migration and displacement, among others (Begum et al, 2022). These are just a few of the numerous consequences already being felt around the world and that will continue to worsen in the years to come (Pietrapertosa, Khokhlov, Salvia, & Cosmi, 2018).

The international agenda has made significant progress since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC). The international community has recognized that the mitigation agenda alone will not be sufficient to address the problems associated with CC, and the latest international instruments have incorporated adaptation as a central issue in responding to it.

Until the beginning of the XXI century, adaptation measures were marginalized as there existed strong confidence in achieving mitigation targets that would reduce the concentrations of Greenhouse Gases (GHG) (Carvalho, Schmidt, Santos, & Delicado, 2014). However, nowadays, it is recognized that, even with unprecedented mitigation efforts, the impacts of CC would still be unavoidable. (Biesbroek et al., 2010) As our planet would still need time to recover from the GHG already trapped in our atmosphere (Commission of the European Communities, 2009). This explains the growing attention given to CC Adaptation in recent years, shifting from what could be considered a fatalistic strategy to a necessary response to address CC. (Biesbroek et al., 2010).

Since avoiding climate change is no longer an option, the Intergovernmental Panel on Climate Change (IPCC) emphasizes the urgency of adaptation action, recognizing that precautionary and anticipatory measures are more effective and less costly than last-minute emergency solutions (Maslin, 2014). The Sixth Assessment Report of the IPCC documented an increase in adaptation responses from governments, businesses, and civil society (Begum et al., 2022).

States have been approving Nationally Determined Contributions within the framework of the Paris Agreement. In these contributions, the generation of public policy to promote adaptation at the national level has been established as a central element. However, a fundamental challenge of adaptation is that it must be studied and developed locally; therefore, national and international instruments can stimulate and promote these processes. Nevertheless, it will be the local authorities and actors who will determine the progress of these processes.

When conducting CC Adaptation and risk management processes, decision-makers must answer questions such as whether to adapt, what to adapt to, when to do so, how

to do it, who should adapt, and who should bear the costs of adaptation. These and other questions that arise during the process are laden with normativity, in which the participating actors interact to guide answers to these questions according to their respective frames of reference.

1. What is adaptation?

CC Adaptation, since its first definition by the IPCC (2001), has been contested and framed in various ways. Dupuis and Biesbroek argued that two authoritative discourses on adaptation to climate change have evolved in scientific literature. First is the CC Adaptation perspective, centered on the definitions framed in the UNFCCC and the IPCC, in which "adaptation is perceived as a process that should aim to reduce harm provoked by actual or expected climatic stimuli or their effects". (IPCC, 2001, p. 365). The second discourse is represented by the Vulnerability Centered Adaptation perspective (VCA), "accordingly with this, vulnerability and adaptation are placed in wider debates about conflicts over resources, poverty, insecurity, equity, justice, and fairness." (Dupuis & Biesbroek, 2013, p. 1479)

Within the framing and definition of possible pathways to adaptation, two major orientations have emerged in policy. First, the need to create a domain whose main objective is to address the adverse effects of climate change. This implies that there are resources, objectives, and a formal distribution of responsibilities for climate adaptation (the direct approach). The other orientation suggests integrating climate change adaptation into other policy domains, a process known as mainstreaming climate change adaptation (Uittenbroek, Janssen-Jansen, & Runhaar, 2013).

2. Barriers to CC Adaptation and Framing

Practically every case study and global study on adaptation to climate change has identified numerous barriers across all phases of the adaptation process. (Adger et al., 2007; Aylett, 2014, 2015; Moser & Ekstrom, 2010; Schaller, Jean-Baptiste, & Lehmann, 2016) Barriers are defined as "obstacles that can be overcome with concerted effort, creative management, change of thinking, prioritization, and related shifts in resources, land uses, institutions, etc. (…) barriers are simple impediments that can stop, delay, or divert the adaptation process." (Moser and Ekstrom, 2010)

Barriers are shaped by the values, meanings, and importance that the actors involved in the adaptation process assign to them. "Actors' values as barriers depend on their roles, values, interests, and ideas; actors interpret and give meaning to events in different ways and therefore can have conflicting ideas about what the real barriers to adaptation are and which barriers should be given priority." (Biesbroek, Klostermann, Termeer, & Kabat, 2013. P. 1124)

Therefore, many aspects of the decision-making process for climate change adaptation will be contested by different stakeholders, who will have conflicting views on the

problem at hand and possible solutions. These should be addressed to advance and reach agreements, thereby moving to the implementation phase. Consequently, different authors have called for the need to "open the black box of decision making" to understand better why, in every policy process related to climate change adaptation, barriers occur, more than just trying to solve the barriers; what is necessary is to understand why they appear within the decision-making process.

The way decision makers frame adaptation matters because it will emphasize specific pathways that could bring good adaptation, in line with the sustainable development goals and more inclusion, or, instead, create maladaptation, increasing vulnerability or higher risk of suffering negative climate impacts or even diminishing welfare, especially for those already more vulnerable (Dodman et al, 2022). For example, when adaptation plans and actions are primarily assessed, focusing on financial or economic viability, the interventions can result in detriment to already more vulnerable areas or reinforce exclusion of particular sectors, as the latest IPCC report presented plenty of examples of this (Dodman et al, 2022; Anguelovski et al, 2016).

By revealing which frames are at play and how they influence CC Adaptation policies, we can better understand why certain problems arise in drafting and implementing these policies. Further analysis can help us understand why some cities, municipalities, or even communities can advance in the adaptation process, creating better outcomes. In contrast, others fail even to initiate any adaptation, or worse, end up producing maldaptation, because institutional frames limit and sometimes obstruct adaptation measures (Bosomworth, 2015).

By making competing frames clear and taking them into account, policies and action plans could be designed that resonate with all actors, promoting better integration of different perspectives, possibly leading to better policy outcomes and reducing intractable opposition (Fünfgeld et al., 2012; Radhakrishnan et al., 2017). In Cultural Theory (CT), this is called "clumsy solutions", in other words, interventions that include actions for each intervening frame (Verweij et al, 2006). We recognize, however, that other elements also play a role in CC Adaptation policy and implementation, such as power relations (Vink, 2013; Woroniecki et al, 2019.), financial resources (Bouwers & Aerts, 2006; Moser et al, 2019), human capital (Paul et al, 2016; Kerry et al, 2012), etc. Frames, however, are often invisible and are neither explicitly mentioned nor addressed in policy processes. This thesis contributes to society by proposing a framework in support of local policy adaptation processes.

Frame analysis and especially CT have already been applied in climate change science. Authors such as de Boer, Wardekker, & van der Sluijs (2010); M. D. Jones (2014); M. Thompson (2003); M. Verweij et al. (2006); and Xue, Hine, Marks, Phillips, & Zhao (2016) have used Cultural Theory in discussions of climate change. Most of these works have been conducted in the context of mitigation strategies, but little has been directed toward CC Adaptation. The work of McNeeley and Lazrus (2014), Figge, L. (2017), Jones (2011), Xue, et al (2016), and Beumer, et al (2018) provides a starting point to understand how the four cultural perspectives of CT relate to CC adaptation, but this

was limited. Also, conceptual approaches to CC adaptation have been researched in the framing literature (Eakin et al., 2009; McEvoy et al., 2013; Fünfgeld et al., 2012), but in this thesis, we propose a framework to connect both CTs' perspectives to these conceptual approaches.

3. CC adaptation research in Central America and case selection

As a tropical developing region, Central America is one of the areas most vulnerable to current climate variability and future climate change, which is why the Fifth Assessment Report (AR5) of the IPCC concludes that Central America has already been severely affected by changes in climate variability and extreme events (Magrin et al., 2014). Food insecurity, human and economic losses are among the impacts of CC in this region (Castellanos et al, 2022). Furthermore, the United Nations Economic Commission on Latin America and the Caribbean (ECLAC, 2011) and Programa Estado de la Nación (2016) have reached the same verdict, acknowledging that in a highly vulnerable region, there is a grave potential for an increase in the risk of disasters and therefore multiple losses due to climate change.

Despite the importance of CC for this vulnerable region, little research has been conducted on the development of adaptation policies. In fact, it turned out that there was a complete absence of information on how the adaptation process was unfolding (if so) in this region, from both direct and mainstream approaches at the national and local levels. A key element of frame analysis is understanding the extent to which national-level policy influences the framing of adaptation at the local level (Dewulf, 2013; Radhakrishnan et al., 2017). A good understanding of the development of direct and mainstream CC adaptation at the national level was needed first. Given the area's vulnerability to climate change, this thesis focuses on Central America, devoting chapters two and three to systematizing and analyzing the development of direct and mainstream CC adaptation at the national level in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama.

After this basis was laid, the policy process for CC Adaptation from a local perspective, as well as its relation to national-level policies, was studied in chapters four, five, and six. To achieve this goal, this thesis analysed several case studies: two from Central America with similar contextual conditions (Honduras and Costa Rica), and three more in Europe (Italy, Portugal, and Spain) to achieve a diversity of regions and development stages. The two Central American cases are the first of their kind and are situated in a vulnerable region that is relatively new to CC adaptation policy development. The scientific literature has extensively documented the process of CC Adaptation policy development at the national level in Europe, which is one of the most advanced regions in the world in this regard (Biesbroek et al., 2010; Pietrapertosa et al., 2018; Bednar-Friedl et al., 2022). The chosen cases in Europe concern cities that had already approved local CC Adaptation strategies and have comparable contextual conditions. The link that this thesis makes between national-level policy-making on CC adaptation

and the local-level developments, with a focus on framing, contributes to a novel and growing body of scientific work.

In summary, this thesis examines how framing at various levels influences the process of CC Adaptation policy development, particularly at the local level, and the impact of framing on the policy process' outputs and outcomes, with the help of a framework that was implemented in five case studies conducted in Upala, Costa Rica; San Francisco del Valle de Ocotepeque, Honduras; Porto, Portugal; Bologna, Italy; and Zaragoza, Spain.

4. Research questions

When actors face a situation with completely different and even opposing frames, intractable controversies may arise (Schön & Rein, 1994); these are conceived by Hisschemoller and Hoppe (1995) as unstructured problems, or moderately structured problems, based on the (un) certainty of relevant knowledge and the agreement (or lack of it) on norms and values. Actors who frame the problem with opposing viewpoints generally disagree on the relevant knowledge or the norms and values associated with it, often turning the policymaking process into an unstructured problem.

In this sense, adaptation processes have been shown to encounter a growing number of barriers, many of which are especially focused on the social and institutional dimensions of adaptation. These barriers have been defined as the arrangement of climatic and non-climatic factors that emerge from the actors, the governance system, or the system under study (Biesbroek et al., 2013, P. 1119). Thus, studying framing CC Adaptation could give us clues into how they affect the relationship between actors and the governance system that facilitates or hampers the implementation of CC Adaptation measures and strategies, which leads to the following research questions.

As mentioned in the previous sections, there was very little information on the advancement of CCAdaptation policies in Central American countries. Therefore, the first main question was:

> *What is the progress of the Central American countries developing CC Adaptation policies, both from the dedicated and the mainstream approach to adaptation and how does this progress relate to the local level of government?*

Related sub-questions that are addressed are:

1. What similarities and differences characterize the strategies developed among the countries in Central America, and how can they be explained?
2. What components of developing these strategies in Central America could be useful to help other regions with contextual similarities?
3. Is climate change adaptation being integrated into the policy sectors of general development, disaster risk-management, and land-use planning in Central America, and if so, how?

4. How is the vertical interaction between national and local levels of government in Central America for mainstreaming present in the drafting process and the arrangements included in these to support implementation, monitoring, and funding of the policy outputs

The second main research question focuses on the relation between CC Adaptation frames used and resulting policies:

> *Why do some municipalities advance in the CC Adaptation policy process while others don´t, and how would the inclusion of different and sometimes competing frames make advancement more likely?*

Related sub-questions that are addressed are:

5. How did national CC Adaptation policies influence municipal adaptation policies?
6. How did the worldviews of the municipal actors that were part of the decision-making processes influence the way municipal CC Adaptation policies were framed?
7. How did the design and conduction of the planning processes at the municipal level deal with different CC Adaptation frames?

5. Methodology and Outline

For the first main research question, this thesis developed a framework to assess the progress and quality of the adaptation policies approved in Central America, using both the direct and the mainstream approaches. For the direct approach, the framework looked at five key elements: first, identify the drivers motivating climate policy development; second, classify the objectives pursued by the policies; third, investigate the influence that such policies had on the subsequent process of policy integration (mainstreaming); fourth, review the vertical interactions among the national and local governments, and fifth, analyze the arrangements for implementation, evaluation and funding integrated into the policies. This framework was based on previous research conducted in European cases and developing countries (Biesbroek et al., 2010; Kehew et al., 2013; Massey & Bergsma, 2008; Pietrapertosa et al., 2018). (See chapter two)

For the mainstream approach, the framework first classifies the policy outputs between the strategic, tactical, and operational levels of policies for the sectors of General Development Planning, Risk Management, and Land-use Planning. Secondly, it uses the criteria developed by Brouwer et al. (2013) and Mickwitz et al. (2009) to assess the levels of inclusion, consistency, and weighting of CC Adaptation into the sectoral policies. Third, as in the direct approach, it looks at the vertical interactions between the national and local levels of government, by identifying the level of participation of the latter in the national policy development, and later classifying the role assigned to municipalities for implementation, funding, and monitoring. (See chapter three)

For the second main research question, this thesis developed a framework to study frames about CC Adaptation by focusing on the framing process in three distinct levels. First, at the meta-level frames consisting of the core values and beliefs of people (Fünfgeld & McEvoy, 2011) by using Cultural Theory, a relevant typology to understanding the different perspectives of a population by organizing them into a small set of groups accordingly to their worldviews toward different trends (Beumer et al, 2018; Figge, 2017; Offermans, 2012a; Thompson, 1990). Based on a division between *group* and *grid,* four worldviews are distinguished: Hierarchism, Egalitarianism, Individualism, and Fatalism (Offermans, 2012). Each way of life has a specific approach to issues such as natural resources and human nature, even for CC and CC Adaptation. Second, the conceptual level, which is influenced by the meta-level, is linked with the creation of theories and definitions, in this case, related to CC Adaptation (McEvoy et al., 2013). On the conceptual level, the main frames in policy approaches distinguished by CC Adaptation literature are risk management (the most influential and original approach suggested by the IPCC), the vulnerability approach (more connected to development studies for developing countries), and the resilience approach (one of the most recent, highly influential on developed countries) which don't necessarily cancel each other and can influence the outcomes of the policy process. Third, at the operational level, it identified links between the different Cultural Theory perspectives and the adaptation approaches; these connections between frames that exist at the meta and conceptual levels can be used to understand the decisions taken at the operative level.

This thesis is composed of 7 chapters in total; Figure 1.1 presents an overview of the structure. Chapters 2 and 3 are devoted to addressing the knowledge gap regarding the CC Adaptation policy progress in Central America. Chapter 2 developed a framework to analyze the adaptation policies (direct approach) in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The chapter addressed this by creating a dataset of all documented policies in each country and their main characteristics. A total of 18 policies were documented and studied.

Chapter 3 is devoted to studying the progress of integrating CC Adaptation into three key policy sectors in Central America (mainstream approach): general development, disaster risk management, and land-use planning. The chapter implemented a framework to assess the levels of inclusion, consistency, and adaptation weighting across the three sectors for 44 policy outputs.

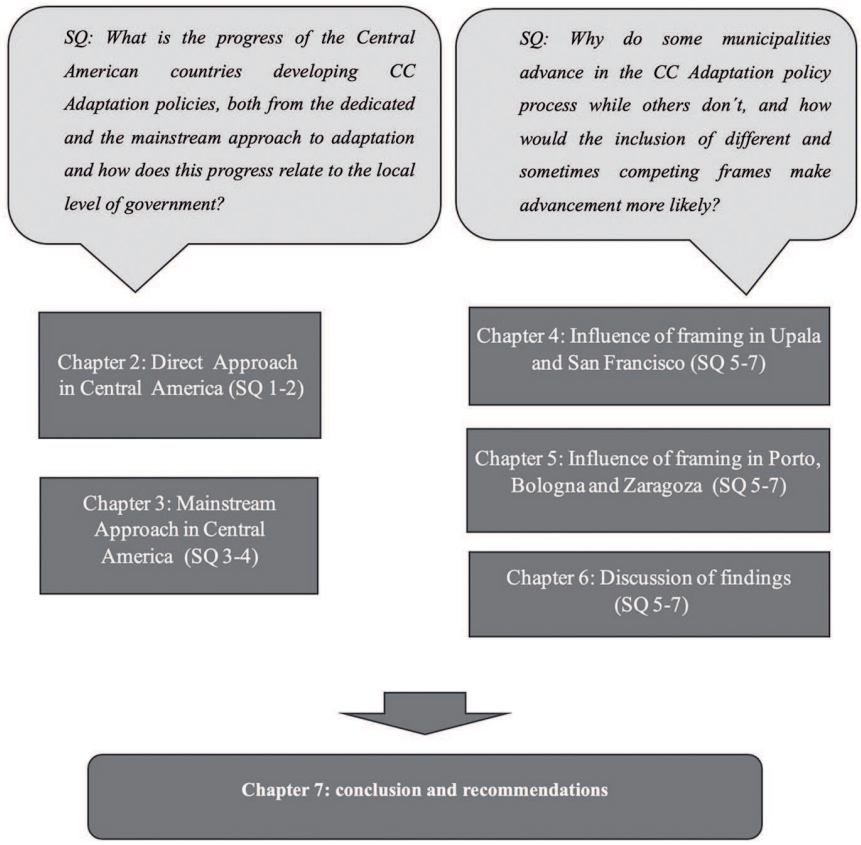
Chapter 4 developed the theoretical framework for frame analysis for CC Adaptation. Framing occurs at three levels. At the meta-level, the framework uses Cultural Theory, a robust typology that can be applied across countries and societies. The conceptual level of framing centers on three main approaches to adaptation documented in the scientific literature: risk management, the vulnerability approach, and the resilience approach. At the operational level, the connections between the Cultural Theory worldviews and the conceptual approaches were explored and determined. This chapter also documents and analyzes the results for Upala (Honduras) and San Francisco (Costa Rica), including 22 interviews with key stakeholders of both cases.

Chapter 5 presents a comparative analysis of the results for the three European cases, Bologna, Porto, and Zaragoza. In total, 18 interviews were conducted in these three to assess the existing frames. This was performed with the help of master's students from the Maastricht Sustainability Institute; one was originally from Porto in Portugal, and the other was from Bologna in Italy. They decided to study their home cities, both of which had CC Adaptation local strategies approved. The last student was from Puerto Rico, but, because of language affinity, decided to study the case of Zaragoza, Spain, one of the country's leading cities. These use the same framework and methods developed and applied to the Costa Rican and Honduran cases.

Chapter 6 is a general discussion of the results and findings for all five cases. This chapter allows us to explore the cases' similarities and differences, following the framework developed in Chapter 4.

Finally, Chapter 7 summarizes the partial conclusions of the thesis and addresses the research questions, considering how the inclusion of different, sometimes competing, frames could be balanced. It also makes some recommendations for policymakers and future research.

Figure 1.1 Representation of the outline of the thesis



Source: Own elabotarion

CHAPTER 2: CLIMATE CHANGE ADAPTATION IN CENTRAL AMERICA: A REVIEW OF THE NATIONAL POLICY EFFORTS

Based on Segura, L. D., van Zeijl-Rozema, A., & Martens, P. (2022). Climate change adaptation in Central America: A review of the national policy efforts. Latin American Policy, 13, 276– 327. https://doi.org/10.1111/lamp.12277

Abstract

The latest comparative studies of climate policies reinforce the fundamental importance of employing adaptation planning alongside national development strategies. While these studies are necessary to document and share the knowledge on the practices and experiences undertaken at the national level, documents are still scarce on regions of interest such as Central America. This article scrutinizes the state of adaptation planning through an exhaustive investigation of adaptation policy documents, consisting of National Adaptation Strategies, National Climate Legislation, and National Adaptation Action Plans, which are common in all six Central American countries. The findings reveal a region with an intricate yet progressive trend toward adaptation policies, with each country showing different speeds and qualities of adoption. An increasing learning curve has allowed for the emergence of two generations of adaptation policies with several improved features, including horizontal and vertical coordination, monitoring systems, and the inclusion of heterogeneous instruments to implement these systems. Yet, institutional challenges outside the adaptation realm could hinder the progress attained, due to factors such as political and economic crisis and institutional fragility. Further research into the broader political and governance landscape is needed, focusing on if and how climate policies should address political instability and institutional fragility as vulnerability stressors.

Resumen

Estudios recientes de políticas climáticas refuerzan la importancia de atender la adaptación al cambio climático en paralelo con la implementación de las estrategias nacionales de desarrollo. Si bien estos estudios son necesarios para documentar y compartir el conocimiento sobre las prácticas y experiencias realizadas a nivel nacional, aún existe una escasez de investigación en regiones de interés como Centroamérica. Este artículo analiza el estado de la planificación para la adaptación en América Central a través de una investigación exhaustiva de los documentos de políticas de adaptación. Estas consisten en Estrategias Nacionales de Adaptación, Legislación Climática Nacional y Planes Nacionales de Acción de Adaptación, que son comunes en los seis países de Centroamérica. Los hallazgos revelan una región con una tendencia intrincada pero progresiva en el desarrollo de dichas políticas. Detectamos una curva de aprendiza-

je creciente, lo cual ha permitido el surgimiento de dos generaciones de políticas de adaptación con diversas características mejoradas en la segunda, que incluyen coordinación horizontal y vertical, integración de sistemas de monitoreo e instrumentos heterogéneos de implementación como la creación de Fondos Nacionales para el Clima. Sin embargo, desafíos institucionales fuera del ámbito de la adaptación podrían obstaculizar los avances logrados, debido a factores como crisis políticas y la fragilidad institucional. Se requiere más investigación sobre el panorama político y de gobernanza; es importante cuestionar si las políticas climáticas deberían abordar la inestabilidad política y la fragilidad institucional como factores que incrementan la vulnerabilidad, y cómo deberían hacerlo.

Keywords: Central America, climate change adaptation, national adaptation strategies, governance; mainstreaming; drivers of climate adaptation

1. Introduction

As a tropical developing region, Central America is one of the areas most vulnerable to current climate variability and future climate change, which is why the Fifth Assessment Report (AR5) of the International Panel on Climate Change (IPCC) concludes that CA had already been severely affected by changes in climate variability and extreme events (Magrin et al., 2014). Furthermore, the United Nations Economic Commission on Latin America and the Caribbean (ECLAC, 2011) and Programa Estado de la Nación (2016) have reached the same verdict, acknowledging that in a highly vulnerable region there is a grave potential for an increase in the risk of disasters and therefore multiple losses due to climate change.

The first step for adaptation planning in Central America is the reduction of vulnerability toward the current climate and its variability (Magrin et al., 2014). The region has a combination of social, economic, and governance factors that exacerbate its exposition to risk, which is why Brooks, Adger, and Kelly (2005) emphasize the need for general indicators of vulnerability at the national level. These indicators in Central America reveal a region that is not only vulnerable but also has substantial differences regarding general vulnerability in various countries (see Appendix 1). For example, Guatemala, Honduras, and Nicaragua present more vulnerabillty compared to Costa Rica and Panama, where governance, health, and income indicators point to better conditions to face current climate variability and sustain adaptation to climate change. The vulnerability of these northern countries is also highlighted in the climate risk index (Eckstein, Künzel, & Schäfer, 2017), which ranks Honduras and Nicaragua as the first and fourth most affected in the world for the past 20 years.

The AR5 report documents a worldwide paradigm shift in the planning process for CC Adaptation, which has steered away from awareness of the construction of plans and strategies (Mimura et al., 2014). In this sense, some studies from different regions started to document the advancement of a new approach (Biesbroek et al., 2010; Ford, Berrang-Ford, & Paterson, 2011; Forino et al., 2014; Greiving & Fleischhauer, 2012;

Heinrichs & Krellenberg, 2011; Massey & Bergsma, 2008; Pietrapertosa et al., 2018; Preston et al., 2009; Robinson, 2018; Termeer, Biesbroek, & van den Brink, 2012). Yet, the scientific literature is still penurious regarding national efforts in Central America. Rivera and Wamsler's (2014) studies have recorded some initial progress on policies and strategies at the regional and national levels. In addition, the global studies conducted by Nachmany et al. (2014), and Dubash et al. (2013) have created a worldwide systematization of laws and policies relating to mitigation and adaptation.

Although initial national efforts towards CC Adaptation started in 2007, when Panama and Costa Rica approved their first national strategies that were followed by a profusion of policies, plans, and laws in these and other countries, a systematic comparative analysis of the adaptation responses at the national level in Central America does not yet exist. This article contributes by conducting this comparative analysis and answering the following overarching questions.

- What progress have Central American countries achieved in developing strategies to address climate change adaptation?
- What similarities and differences characterize the strategies developed among the countries in this region, and how can they be explained?
- What components of developing these strategies in Central America could be useful to help other regions with contextual similarities?

This article is structured in three sections; the first one explains the data collection, framework, and methodology. Section two presents the results of the analysis following the structure of the framework, subdivided into 5 subsections. Finally, the third section is the discussion of the results in light of the literature and future areas of research.

2. Data Collection and Methodology

2.1 When to Consider a Document as a CC Adaptation Policy

Multiple countries in different regions have approved several policy instruments purposed to guide the climate-adaptation process at the national level. These instruments include legislation, strategies and policies, and plans and are known as a dedicated approach. They have initiated processes of policy integration into other policy domains including land-use planning, risk management, and health and development, among others. Comparative studies on CC Adaptation demonstrates difficulties in discerning whether a policy is addressing adaptation or merely creating co-benefits. Dupuis and Biesbroek (2013) define this situation as the dependent variable problem, due to conceptual indistinctness of what an adaptation policy is. We must consider two essential components to characterize something as an adaptation policy. First, the policy document should have intentionality—what it is understood as the purposeful design of a policy dealing with climate change effects, e.g., adaptation. Second, the policy should contribute either to reduce climate change vulnerability or to benefit from climate-change opportunities, otherwise known as substantial adaptation policy.

This article uses the aforementioned components to ascertain whether a document can be considered a CC Adaptation policy. If one of the analyzed countries did not demonstrate policies that can be interpreted as tangential to adaptation, the research would have considered that, for these respective countries, CC Adaptation is out of scope for policy decisions. At the start of this research, we intended to find a limited number of documents per country, but in the end a total of 29 policy documents were registerd, expanding from national overarching strategies to documents specific to sectors such as agriculture.

The policy documents were classified using Pietrapertosa et al.'s (2018) definitions based on the European Environmental Agency (EEA, 2013), as well as those of Dubash et al. (2013), and Haselip, Narkevičiūtė, and Rogat (2015). Four different kinds of policy documents are recorded, and in three cases, a sub-classification was necessary to demonstrate specific connotations for the region.

National Adaptation Strategy (NAS): "A broad policy document that outlines the direction of action in which a country intends to move in order to adapt to climate change." (EEA, 2013, p. 68). For CA, a new trend is the adoption of these strategies or policies in sector-specific domains; we call them "Sectorial NAS."

National Action Plan (NAP): "A more detailed document providing a roadmap for the implementation of specific adaptation actions that are being planned." (EEA, 2013, p. 68). For Central America, a new trend is the adoption of adaptation plans in sector-specific domains; we call them "Sectorial NAP."

National Climate Legislation (NCL): "An act that has been passed by a national parliament, that is in force, and that includes in its title, in its statement of objectives, or chapters about mitigation and adaptation measures" (Dubash et al., 2013, p. 655). In Central America, the reform of General Environment Law to integrate chapters or sections on CC Adaptation is common; we call these actions "NCL law reform."

This research documents 29 policies, eight NAS (including the regional strategy), seven NAP, five NCL, and 10 sectorial policies. Eight more policy documents under development were recorded but not analyzed. We conducted a thorough analysis of the general NASs, NCLs, and NAPs at the national level that governments had approved leading up to August 2018. In total, we considered 18 policy documents. All sectoral policies and the policy documents under development are excluded from the analysis due to time constraints; we decided to focus on the most overarching policy documents dedicated to adaptation (see Table 1 and Appendix 2).

Table 1. Overview of the national adaptation policy and legal framework in Central America (as of August 2018)

Country	NAS	NAP	NCL	Sectorial NAS and NAP	Web Portal
Costa Rica	· First NAS 2007 (Both CCA-CCM) · Second NAS 2017 (Policy on CCA)	· Yes 2014 (both CCA-CCM) · NAP on CCA under development	NCL under development	· NAP (2011) for agriculture and food sector (both CCA-CCM) · NAS (2015) for biodiversity sector (CCA only) · NAP (2015) for biodiversity sector (CCA only) · NAPs (2018) a plan for all 8 regions of the country for agriculture and stockbreeding	Yes, Spanish
El Salvador	Yes, 2013 (Both CCA-CCM)	Yes, 2017 (Both CCA-CCM)	· Yes, 2012 (law reform) · NCL under development	· NAS (2015) Strategy for agriculture, food, and forestry (both CCA-CCM) · NAS (2017) Policy for agriculture, food, and forestry (both CCA-CCM) · NAP (2017) for agriculture, food, and forestry (CCA only) · NAS for public works, transport, housing and urban development under development	Yes, Spanish
Guatemala	Yes, 2009 (both CCA-CCM)	Yes, 2016 (both CCA-CCM)	Yes, 2013	NAP for agriculture and stockbreeding under development	Yes, Spanish
Honduras	· First NAS 2010 (both CCA-CCM) · Second NAS under development	Yes, 2018 (CCA only)	Yes, 2013	NAS (2014) for agriculture and food (CCA only)	Yes, Spanish

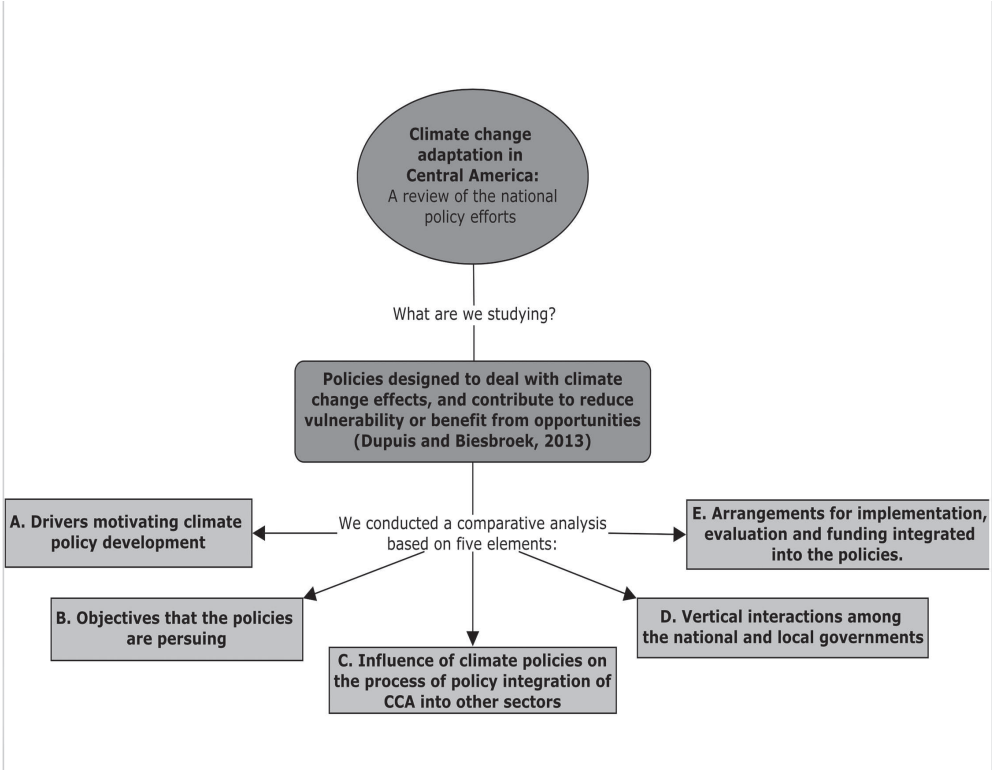
Nicaragua	· First NAS 2010 (both CCA-CCM) · Second NAS under development	Yes, 2010 (both CCA-CCM)	Yes, 2008 (law reform)	NAP (2013) for agriculture, food, and forestry (CCA only)	Yes, Spanish
Panama	Yes, 2007 (both CCA-CCM)	Yes, 2007 (both CCA-CCM)	Yes, 2015 (law reform)	NAP (2018) for agriculture and stockbreeding (both CCA-CCM)	Yes, Spanish
SICA	· Yes, 2010 (both CCA-CCM) · Second Regional Strategy under development	No	1993 treaty on CC (CCM only)	No	Yes, Spanish

Source: Authors' elaboration.

2.2 Framework for a Comparative Analysis

Studies conducted in Europe and other countries (Biesbroek et al., 2010; Kehew et al., 2013; Massey & Bergsma, 2008; Pietrapertosa et al., 2018), have created the basis for a comparative analysis of the policy developments for CC Adaptation. In the literature, five components have been the center of study—(1) research on the drivers behind policy development; (2) adaptation objectives in the policies, where in many cases it is possible to find links between the drivers and the objectives of these policies and how the situation could change with new climate policies; (3) the process of policy integration in other sectors, where we reviewed the sectors that were prioritized and how they changed in importance with new climate policies; (4) the governance interactions among different levels of government behind the policy process, especially how local governments were included (or not) in the development and implementation of the policies; and (5) the arrangements made for policy implementation, evaluation, and funding, and how these instruments evolved with newer policies (see Figure 2.1). These five factors allow for a complete analysis of the process and the outputs behind policy development. They could also allow for future research regarding how this process is unfolding across regions, and the common advances and challenges behind adaptation efforts.

Figure 2.1 Research framework followed



Source: Authors' elaboration, based on Biesbroek et al. (2010); Kehew et al. (2013); Massey & Bergsma (2008); Pietrapertosa et al. (2018)

2.2.1 Drivers of Policy Development

Swart et al. (2009) developed a classification of drivers that motivated adaptation policy developments in the European countries, following a thorough process that combined literature review with interviews with policymakers and experts, Biesbroek et al. (2010) summarize the work, reporting as drivers (1) European Union policies; (2) economic costs of inaction; (3) scientific research; (4) non-governmental organization (NGO) advocacy; (5) media; (6) private-sector interests; (7) examples from other countries; (8) the recognition of opportunities; (9) the United Nations Framework Convention on Climate Change (UNFCC).

The work conducted in Europe set a base for studying whether the drivers of policy development had similarities across different regions. In the context of Central America, some initial modifications were necessary. First, the driver on the effect of European Union policies was modified to reflect possible influences from policies coming from the Central American System of Integration (SICA) (CCAD, & SICA. 2010), a process of regional integration formed by all the countries studied in this article. Second, a new

driver was included—the influence of international cooperation on the policy development through technical or financial assistance; previous research justifies its inclusion as a possible driver of policy development in the region (Segura, Crespo, & Hernández, 2015). The driver 'European Union policies' from the original was modified to "SICA policies"; and a new driver was added called "Influence of international cooperation."

2.2.2 Objectives of CCA Policies

Massey and Bergsma (2008. P. 19) built a classification while assessing objectives of CC Adaptation policies, applying the model to 29 European countries to classify climate policies. In their study, they question what the policy is trying to accomplish, based on previous research including the AR4 (IPCC, 2007). The authors classify the objectives into four categories (Massey & Bergsma, 2008, p. 19).

1. Building adaptation capacity: "relates directly towards a measure that builds or enhances government or societal awareness about adaptation, builds capacity to enable action and also prompts for some form of action to be undertaken."
2. Increased coping capacity during extreme or damaging events (response to extreme events): "closely related to reduction of risk, this objective focuses on extreme events and their impacts on people, property and nature inter and post factum."
3. Reduction of risk and sensitivity: "Actions can be undertaken to reduce the risk of damage and disruption, and reduce sensitivity of people, property, natural resources, and ecology to changed climatic conditions implying pre-emptive action be taken that will lessen potentially damaging impacts."
4. Capitalization on changed climatic conditions: "some benefit might arise from any changed climatic condition. In this case an action might be undertaken to capitalize on such change."

McGray et al. (2007) comes to a similar classification when studying developing countries. Their study adds an objective linked to policies or actions in the realm of development that were producing co-benefits for adaptation, and they do not integrate any objective related to taking adventages from CC. Following the work of Massey and Bergsma (2008) this research focuses directly on adaptation policies rather than policies that create benefits of adaptation indirectly. So our research classifies the objectives of the policies in Central America following the four options covered.

2.2.3 The Influence of CCA Policy on Policy Integration in Other Sectors

The scientific community has extensively studied the integration of climate-change adaptation policy into other policy sectors, i.e., mainstreaming CC Adaptation (Adger et al., 2003; Huq & Reid, 2004; Huq et al., 2004; IPCC, 2014; Runhaar et al., 2018; Uittenbroek, Janssen-Jansen, & Runhaar, 2013). Unlike the dedicated approach1, main-

1 The dedicated approach is when autorithies draft and approved policies or plans directly focused on CCA, rather than seeking integrating CCA into sectorial policies or plans as secondaries objectives or activities, this second approach is named polity integration or mainstreaming.

streaming seeks to disseminate the adaptation goals (including mitigation) into traditional policy sectors, especially those that could render more co-benefits, such as development planning, risk management, urban or land-use planning, public works, and infrastructure, among others (Huq & Reid, 2004; Mimura et al., 2014). This research does not study the process of mainstreaming CC Adaptation in the region, but it analyzes if and how the climate policies are creating favorable conditions for the mainstream approach to take place.

Biesbroek et al. (2010) used the Organization for Economic Co-operation and Development (OECD, 2002) framework for policy integration of sustainable development to assess if the prerequesites for policy integrarion were taking place in selected European countries. These prerequesites are

- the leadership of an institution or department is vital for developing and sustaining the action of the NAS;
- the establishment of units of adaptation in vulnerable sector departments;
- interdepartmental units that manage the integration of adaptation into sectoral policies; and
- how the bottom-up approach is present (or not) for coherence among policy levels" (participation of municipalities in the drafting process and relevance for implementation is studied) (OECD, 2022).

This research assesses if the climate policies (direct approach) creates the conditions (prerequisites using the OECD framework) to start and sustain processes of policy integration.

The article also lists the sectors prioritized by the climate policies to initiate mainstreaming. Following the research of Biesbroek et al. (2010), Massey and Bergsma (2008), and Pietrapertosa et al. (2018), in total for this research we listed 11 sectors—water resources; agriculture, stockbreeding, and food security; biodiversity and forestry; health and disease management; disaster risk management; coastal and maritime zone; construction, infrastructure, and transport; land-use planning; finance and insurance; energy; and tourism.

2.2.4 Governing Interactions among Different Levels of Government

The trend toward a bottom-up approach to CC Adaptation appears to indicate recognition of the need for governing interactions that allow for comprehensive coordination among different levels of government. Horizontal coordination between departments of the national government is studied as part of the prerequisites for mainstreaming in the previous point. Vertical interactions among national governments and municipalities are studied in this article in detail by using the framework of Kehew et al. (2013), based on the work of Kern and Alber (2008). The authors developed four categories when studying the cases of Philippines, Mexico, and South Africa. Their classifications are

- Governing by regulation: When national- or state-level legislation policies require local governments to address climate change in the local policies;
- Governing through enabling: When national- or state-level governments only encourage and support local-level action (e.g., through non-mandatory guidelines, capacity building, or the dissemination of information and best practices);
- Governing by provision: shaping practice through the delivery of infrastructure and services;
- Governing with representation and consultation: The local government becomes involved in or influences the ongoing development at the national level of policies and strategies in an evolving and dynamic policy, legal and regulatory environment (Kern & Alber, 2008, p. 726)

As this classification has been studied, improved, and tested in developing countries, the decision was made to use it in this research as a valuable classification for the study of the vertical interactions between the national and the local level of governments in Central America.

2.2.5 Policy Implementation, Monitoring, and Funding

Finally, this article studies the arrangements for implementation, monitoring, and funding included in the policy documents. For the first two, it uses the same components as studied by Biesbroek et al. (2010), classifying the instruments for implementation and compliance following five categories, (1) incentives or voluntary agreements, (2) financial instruments, (3) regulatory measures, (4) compensations and governmental support, and (5) planning obligations and instruments.

When studying the arrangements for monitoring, the authors focus on two questions, as does the research in Europe, (1) what has to be monitored?, and (2) who should monitor? One final aspect was assessed, the funding arrangements of the policies, first by asking if there were any arrangements for funding and second, if present, what the source of the funding was. The article classifies the sources as local, national, and international cooperation funds, or a mix of these. All these classifications are considered valuable to test in the region to contrast the applicability in developing countries and to facilitate comparability with the results achieved in European countries.

The latest National Communications on Climate Change (NC) is the primary source of information; each government details the policies, strategies, plans, and legislative actions in those reports. Subsequently, a thorough investigation was made of all official websites for each country's Ministry of Environment, documenting any other policy documents that were not mentioned in the reports. In addition, the lead author contacted government staff to obtain documents that could not be accessed online. All information was carefully registered and systematized for analysis purposes, according to the components of the framework for the comparative analysis. The next step is to perform the systematization of these components, for which we develop a coding

document to explain each concept, scores, and how to register the information for each policy (see Appendices C and D) The product is a valuable Excel database containing all available information collected on all investigated countries.

The following section describes the general results of the systematization of all policy instruments on climate change for the region.

3. Results

3.1 Drivers of Adaptation Policy in Central America

The development of adaptation policy in Central America is driven mostly by the conjunction of three drivers that are mentioned most often— 'UNFCCC and ongoing international negotiations'; 'influence of international cooperation'; and 'extreme weather events and impacts'. It is evident that international drivers have a greater effect on policy development in the region than local or national ones. Internal actors, such as the 'media,' the 'private sector,' and 'NGOs' are absent from the policy documents (see Table 2).

Table 2. Drivers motivating the development of climate policies in Central America

Driver of adaptation policy	Costa Rica			El Salvador		Guatemala		Honduras		Nicaragua	Panama
	NAS 2007	NAP 2015	NAS 2017	NAS 2013	NAP 2017	NAS 2009	NAP 2016	NAS 2010	NAP 2018	2010 (NAS-NAP)	2007 (NAS-NAP)
UNFCCC	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓
International cooperation	✓	✓	✓	-	✓	-	✓	✓	✓	-	✓
Extreme weather events/effects	-	-	✓	✓	✓	✓	✓	✓	✓	✓	-
Scientific research	✓	-	✓	-	-	-	✓	-	✓	-	✓
Recognition of opportunities	✓	-	✓	-	-	-	-	-	-	-	-
Economic costs of inaction	-	-	✓	-	-	-	-	-	-	-	-
SICA policies	-	-	-	-	-	-	-	-	-	-	-
NGO-civil society advocacy	-	-	-	-	-	-	-	-	-	-	-
Media	-	-	-	-	-	-	-	-	-	-	-
Private-sector interests	-	-	-	-	-	-	-	-	-	-	-
Examples from other countries	-	-	-	-	-	-	-	-	-	-	-

Source: Authors' elaboration

The 'international negotiations under the UNFCCC' have recently placed more attention on adaptation, and especially in the least-developed countries, they have created financial conditions to support adaptation. The Paris Agreement has also generated more conditions for adaptation commitments from state actors (Adger et al., 2003; Lesnikowski et al., 2017).

The 'influence of international cooperation' is associated with increases in capital committed to adaptation; in Central America, this trend is clearly visible, with more policies

being developed with the support (technical, financial, or both) of international actors such as the United Nations Development Program and individual state development agencies. In addition, over the last 30 years, the region has suffered more frequently from 'extreme weather events.' Some are mentioned as motivators of climate policies, such as droughts associated with El Niño Southern Oscillation (ENSO), hurricanes, and tropical storms. Across all documents, the governments are making connections among increased recurrence, intensity, and damage related to extreme weather, climate change, and climate variability. Nicaragua's documents mentioned only 'extreme weather' as a driver of policy development. Other drivers are acquiring importance, such as "scientific research" and 'economic costs of inaction, ' which gained more attention in the most recent approved policies.

All these drivers influence the objectives of such policies. The following section explores the aims of the reviewed policies, and linkages between aims and drivers.

3.2 Adaptation Objectives in CA's Climate Policies

Central America perceived climate change almost soley as a threat, only Costa Rica perceives opportunities. The most common objectives in all policy documents are first to 'build adaptive capacity,' and second to 'reduce risk and sensitivity.' Almost all countries center their objectives on improving adaptive capacity. Only El Salvador did not mention *risk and sensitivity reduction*. An additional objective in Guatemala's and Honduras' NAS is *increasing coping capacity during extreme or damaging events.*

There are certain differences between countries. Guatemala and Honduras could be described as closer to more traditional risk management, due to the emphasis of certain policies on 'extreme events.' Still, both countries have such an emphasis within their first generation of policies, but not in the second. El Salvador, Nicaragua, and Panama are situated at the interception between creating the conditions to deal with CC and managing climate risk and vulnerability. Finally, Costa Rica is moving toward 'reducing vulnerability' and 'seizing opportunities arising from CC' (see Table 3).

Table 3. Objectives of the climate policies approved in Central America

Objectives wof adaptation policy	Costa Rica			El Salvador		Guatemala		Honduras		Nicaragua	Panama
	NAS 2007	NAP 2015	NAS 2017	NAS 2013	NAP 2017	NAS 2009	NAP 2016	NAS 2010	NAP 2018	2010 (NAS-NAP)	2007 (NAS-NAP)
Building adaptation capacity	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓
Reduction of risk and sensitivity	✓	✓	✓	-	-	✓	✓	✓	✓	✓	✓
Increase coping capacity during extreme or damaging events (response to extreme events)	-	-	-	-	-	✓	✓	✓	-	-	-
Capitalization on opportunities	✓		✓	-	-	-	-	-	-	-	-

Source: Authors' elaboration

The main drivers for policy development could be patent in the aims that such documents target. For instance, the link between the driver 'extreme events' and the aim 'increase coping capacity' in such events is clear. New scientific research (the climate scenarios of national communications, and IPCC reports) could change awareness of new climate threats. For instance, the UNFCCC process is promoting both awareness and public response toward climate change, further indicating the need for adaptive capacity.

The central focus for building capacity in the region is a recognition of the need for more awareness and preparedness from government and society to understand the implications of climate change and necessary adaptations. Therefore, it is also important to reduce sensitivity and vulnerability. Policy integration is a common answer to address these issues, by delegating responsibilities to institutions in different sectors and levels of government. Central America has made important efforts toward that process, as the following section shows.

3.3 CCA Policy Integration in Central America

The region has advanced in approving climate legislation in almost all countries; these regulations have mandated advancements in CC Adaptation policy integration. The mandates came in multiple forms; in some cases (Nicaragua and El Salvador) the law requires that the strategies and plans mainstream climate change into other policy sectors, while in Guatemala and Honduras the law requires all land-use planning to integrate climate-change concerns. These mandates take form when they are implemented in conjunction with actions to sustain the integration process. These are the set of pre-requisites that help align and bring together all the key institutions and actors that are stakeholders in the policy sector.

3.3.1 Pre-requisites for Policy Integration

The institutional arrangements for sustaining policy integration are becoming a reality in most countries in the region, and the NCL or by executive decrees have introduced most of these arrangements The general results are that (1) the leadership of the Ministries of the Environment has been clearly established, in practice and legally, something also evident with the interdepartmental committees. (2) in all countries these types of committees have been created with a large representation of other ministries and specialized institutions (in some cases with participation of the non-public sector); it is common for the Ministries of Environment either to preside over or be the secretariat of such bodies; (3) the participation of the local tier of government is somehow present in all countries, either as part of the committee, in the drafting process of policies, or with responsibilities to implement adaptation actions; and (4) the last prerequisite of specialized units within vulnerable sectors is recently being implemented, but not in all countries; Costa Rica and Panama are behind the other four countries in this regard.

In the Ministries of the Environment a distinct department for climate change has been created. Ig has influence on designing policies, programs, and projects and through receiving and allocating various resources from the national government and international donors. These ministries have accumulated experience through managing the national communications of climate change, assisting ongoing international negotiations of the UNFCCC, and facilitating drafting processes for the NASs, and more so for the NAPs in the second policy generation (some of these units were created or reinforced after the NAS). See Table 4.

Table 4. Progress reported in Central America regarding the prerequisites for policy integration

Country	Leadership of an institution in the NAS-NAP development	Units on adaptation in vulnerable sector departments	Interdepartmental units to support the integration target sectors	Participation of other scales of government (municipalities or their association)
Costa Rica	Ministry of Environment, Directorate of CC	None	Two specialized committees (ministerial and technical)	Participation in the latest NAS but no seat on the committee. Implementer of actions in the NAS.
El Salvador	Ministry of Environment, Unit of CC	Several ministries and institutions	Two committees with functions on CC (ministerial and consultative)	Participation in the NAP and a seat on the committee.
Guatemala	Ministry of Environment, Directorate of CC	Several ministries and institutions	One committee on CC with broad participation	Participation in the NAP and a seat on the committee. Implementer of actions in the NAP.
Honduras	Ministry of Environment, Directorate of CC	Several ministries and institutions	Two specialized committees (ministerial and technical)	Participation in the NAP and a seat on the committees.
Nicaragua	Ministry of Environment, Directorate of CC	One ministry	One committee on CC with broad participation	No participation, no seat on the committee, but considered co-implementer of actions in the NAS.
Panama	Ministry of Environment, Unit of CC	None	One committee on CC with broad participation	No participation, no seat on the committee, but considered co-implementer of actions in the NAS.

Source: Authors' elaboration based on the National Communications on Climate Change and oficial web pages of the countries (full list is integrated in the references section).

In some ministries or public institutions, in sectors such as agriculture, public works, and forestry, these types of climate change units have been recently created. For instance, El Salvador reported the creation of these units within institutions related to public works and transport, agriculture, local development, treasury, and foreign affairs. In Guatemala, the Ministry of Agriculture, as well as the National Council for Protected Areas, now have CC units. In Honduras, the Secretary of State for Finance has a Unit of Economic and Financial Management of climate change, mandated by the NCL. Furthermore, the Institute of Forestry has a climate change unit. The Nicaraguan Ministry of Agriculture now has a unit for climate and disasters.

Interdepartmental coordination is happening within special committees for climate change. Sometimes the committees have two levels of participation—one at the ministerial-level, and the other being a technical committee. The first country to create these coordination spaces was Nicaragua (1999); Panama created a committee to support the Ministry of Environment in 2009. Costa Rica (2010) created a high-level and a technical committee, and El Salvador delegated two committees to coordinate for climate change, the first being the Cabinet of Environmental Sustainability Vulnerability (2014) with high level representation, and the second being a National Council (2016) for dialogue with civil society, the private sector, academia, and the finance sector, among other stakeholders.

Bottom-up approaches to participation in the drafting and implementation processes show positive trends in most countries in the region. All six countries considered the inclusion of municipalities to be necessary for successful implementation. Yet, in most cases, municipalities did not have the necessary resources or expertise. All countried noted the need to build adaptive capacity and to strengthen institutional capacity at the local level. In most policies it is essential for the process of adaptation to begin at the local level. In this sense, the most recent NAPs integrate multiple actions in relation to building adaptive capacity and transferring knowledge and resources to the local tiers of government.

3.3.2 Prioritized Sectors for Policy Integration

At least in one policy document mentioned the 11 sectors listed. Considering how many policy documents mentioned each sector as a priority, three groups of sectors were identified by number of mentions. The first and most mentioned domains are common for all six countries as the most vulnerable and prioritized. In all six countries, (1) water resource management, (2) agriculture and food security, and (3) biodiversity and forestry management were the most important; practically all NASs and NAPs include the first two. These points are evident in the increasing number of sectoral policies in agriculture, followed by biodiversity and forestry, the first one with policies approved in five countries and one under development. Biodiversity and forestry is a sector with co-benefits, linked to an ecosystem-based adaptation approach (Magrin et al., 2014) as well as Reducing Emissions from Deforestation and forest Degradation (REDD+) for mitigation, which has been detected as adaptation and mitigation interactions (Hijioka et al., 2014). See Table 5.

Table 5. Targeted sectors for adaptation in Central American countries

Policy sectors considered vulnerable and prioritized	Costa Rica			El Salvador		Guatemala		Honduras		Nicaragua	Panama
	NAS 2007	NAP 2015	NAS 2017	NAS 2013	NAP 2017	NAS 2009	NAP 2014	NAS 2010	NAP 2018	NAS-NAP 2010	NAS-NAP 2007
Water resource	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Agriculture, stockbreeding, and food security	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Biodiversity and forestry	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓
Health and disease management	✓	-	✓	✓	-	✓	✓	✓	✓	-	✓
Risk management	-		✓	✓	✓	✓	-	✓	✓	✓	-
Coastal and maritime zone	✓	-	✓	✓	✓	-	✓	✓	-	-	✓
Construction, infrastructure, and transport	✓	-	✓	✓	-	✓	✓	-	✓	-	-
Land-use planning	-	-	✓	✓	✓	✓	-	-	✓	✓	-
Energy	✓				✓			✓			
Finance and insurance	-		✓	✓	-	-	-	-	-	-	-
Tourism	-		✓	-	-	-	-	-	-	-	-

Source: Authors' elaboration

The second level of priority is shared by five sectors with a similar number of mentions in five countries' policy documents. These sectors are gaining importance, especially in the second generation of policies where an increased number of documents are integrating them as priority. Within this level, some are gaining importance more rapidly, for instance, infrastructure—not only for the number of mentions but also because El Salvador is developing a policy specifically for this sector that other countries could emulate.

Three sectors share the third and lowest level of priority, two of which are only included in policies found in the second generation. They are energy, finance or insurance, and tourism, all closely related to industries in the private sector, which could be an indicator of an increasing influence of the private sector in the climate policy domain; further research is necessary to consider this sector as a driver for action. The process

of policy integration into other sectors requires horizontal coordination among the institutions leading each sector. Vertical coordination among different levels of government (e.g., from the national level down to municipalities) is of relevance to ensure the success of the process. The next section explores governance interactions for vertical coordination in Central America.

3.4 Governing Interactions among Different Levels of Government

Governing interactions to coordinate between different levels of government are a vital feature of the mitigation and adaptation of climate policies (Betsill & Bulkeley, 2006; Kehew et al., 2013; Kern & Alber, 2008). Adaptation is context-dependent, local governments being better positioned to address and lead the process. Still, initiatives from national governments to support or guide local governments are fundamental to steer, facilitate, and sustain action at the local level (Mimura et al., 2014). The most common mode in the region is governing through enabling, which all six countries include. This situation confirms Klein et al.'s (2014) conclustion that the local tier of government is considered institutionally weak, with limited knowledge and conditions to begin leading the adaptation process, so they require national government guidance and knowledge transfer.

Governing by provision is the second-most-common approach of governance in Central America. Two primary actions defined in the policy documents are the creation of early warning systems allowing preparedness and responsiveness for climate stressors, and delivering infrastructure and public services, especially in rural areas. A combination of modes of governing is widely used in Central America, especially within the most recent policies whereby national authorities give more attention to governing with representation and consultation. This point reinforces the results in previous sections that the local tiers of government are gaining more presence in the development and implementation of adaptation policies, at least in four of the six countries. This mode began as an exception in Honduras; now in all countries with a new NAP, the elaboration process was conducted with consultation and representation.

The region also denotes increasing attention toward regulation, mostly centered on land-use planning and risk management at the local level, whereby local authorities must integrate climate adaptation in such tasks. Here is evidence that the region is transitioning from narrow and more traditional modes of governing toward models that allow local authorities to become active in drafting and implementing policy. The following subsection focuses on specific components included in the policies that constitute instruments for implementation, monitoring, and funds for adaptation.

3.5 Implementation, Evaluation, and Funding

Arrangements for implementation, funding, and monitoring in the policies display a trend toward integrating a variety of kindred instruments; the first policies approved in the region were very limited in terms of arrangements, especially for monitoring. The following subsections convey the results in detail.

3.5.1 Implementation

In terms of instruments for implementation, there is a progressive trend toward mixing and integrating different types. The most recent policies use up to four different types of tools, the most important being "planning obligations" and "regulatory measures." All six nations integrate planning obligations (Nicaragua and Panama depend exclusively on this type). The most-mentioned planning instrument is the integration of tasks of the NAP in the annual operative plans and budgets of the mandated institutions. In some countries, it is prescribed by law (Honduras and Guatemala), and Honduras goes further, mandating the Ministry of Environment to create a National Adaptation Program that helps implement its different components. 'Regulatory measures' are included in the NAPs of four countries, in areas including building code reforms (Guatemala and Honduras), a new law for water and climate change (El Salvador), reform of technical mandatory forms for sewage water services, and land-use planning (Costa Rica).

Two other implementation tools are also becoming important in the newest policies—'financial instruments' and 'compensations and governmental support.' National climate change funds are the principal 'financial instruments' for implementation mentioned in Guatemala (created by the NCL operative with the NAP), El Salvador, and Costa Rica; the use of these funds must now be determined. These funds could be crucial drivers for creating incentives for the local level of government to address CC Adaptation. Still, this trend remains dependent on international cooperation as primary source of funding. The second tool is 'compensations and government support', especially in agriculture, health, and infrastructure. Both could reinforce the mode of governance by provision (see Table 6).

Table 6. Instruments for implementation integrated in the climate policies of Central America

Instruments for Implementation	Costa Rica			El Salvador		Guatemala		Honduras		Nicaragua	Panama
	NAS 2007	NAP 2015	NAS 2017	NAS 2013	NAP 2017	NAS 2009	NAP 2016	NAS 2010	NAP 2018	2010 (NAS-NAP)	2007 (NAS-NAP)
Financial instruments	-	✓	✓	✓	✓	-	✓	-	-	-	-
Incentives or voluntary agreements	-	✓	-	-	-	-	-	-	-	-	-
Regulatory measures	-	✓	✓	✓	✓	-	✓	✓	✓	-	-
Compensations and government support	-	✓	-	-	✓	-	✓	-	✓	-	-
Planning obligations and instruments	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: Authors' elaboration

3.5.2 Funding

Public policies require financial commitments from the state to address problems and funding solutions. In this regard, a critical question is whether adaptation measures integrate a cost analysis, or at least an evaluation of them. In the case of Central America, only two instruments estimated the costs of adaptation measures; the NAPs of El Salvador and Costa Rica assessed the cost of different activities in all adaptation programs. Yet, cost evaluation does not preclude that a state is planning to fund the totality of them. Most instruments identified international cooperation as an important source of funds, as well as national and local sources. All countries stress that receiving funds from international mechanisms and commitments under the UNFCCC and carbon markets is essential for ensuring implementation. As referenced in the point above, countries with national climate funds created them to manage additional funds from international cooperation. Public funding for policy implementation is now becoming a mandate since all second-generation NAPs required relevant institutions to dedicate resources within their budgets to implement their assigned responsibilities.

3.5.3 Monitoring

Monitoring is critical for evaluating and learning for climate change adaptation (Noble et al., 2014). In Central America, monitoring for adaptation is present the strongest in the most recently approved NAP. Only two NASs integrate monitoring systems; for instance, Costa Rica and El Salvador mandated the creation of a national monitoring system. Still, these systems are exclusively for mitigation of greenhouse gases, with some provisions for capacity building.

The NAPs in the region are the primary tools for implementing strategies and policies on climate change; in this regard, the NAPs of El Salvador, Honduras, and Guatemala integrated monitoring and evaluation for CC Adaptation within the contents and mandates of these documents. Two aims are at the core of the monitoring, first to allow the update and improvement of the NAP. Second, the NAPs of Honduras and Guatemala aim for monitoring to feed into the drafting process of the NC, as well as into commitments made as part of the UNFCCC. In some NAPs there is no clear responsibility to monitor, but there are indicators to evaluate the progress of implementation. In this sense, the newest policies are where mandates for monitoring have been created, with more clear indications in the NAP on how to proceed, but the reports on implementation are not yet accessible.

4. Discussion and Conclusions

Like many other developing regions, Central America is facing critical challenges related to climate variability and climate change. High vulnerability and limited adaptive capacity hinder its sustainable development, and extreme weather events threaten its progress. The authorities of the region have responded to this challenge with a combination of measures integrated into laws, strategies, and plans. The same response in

other regions is at the center of an increasing number of scientific studies on climate change. A growing number of scientific publications are studying how adaptation planning is unfolding worldwide. This article is the first to register and study the national policies of climate change adaptation in Central America.

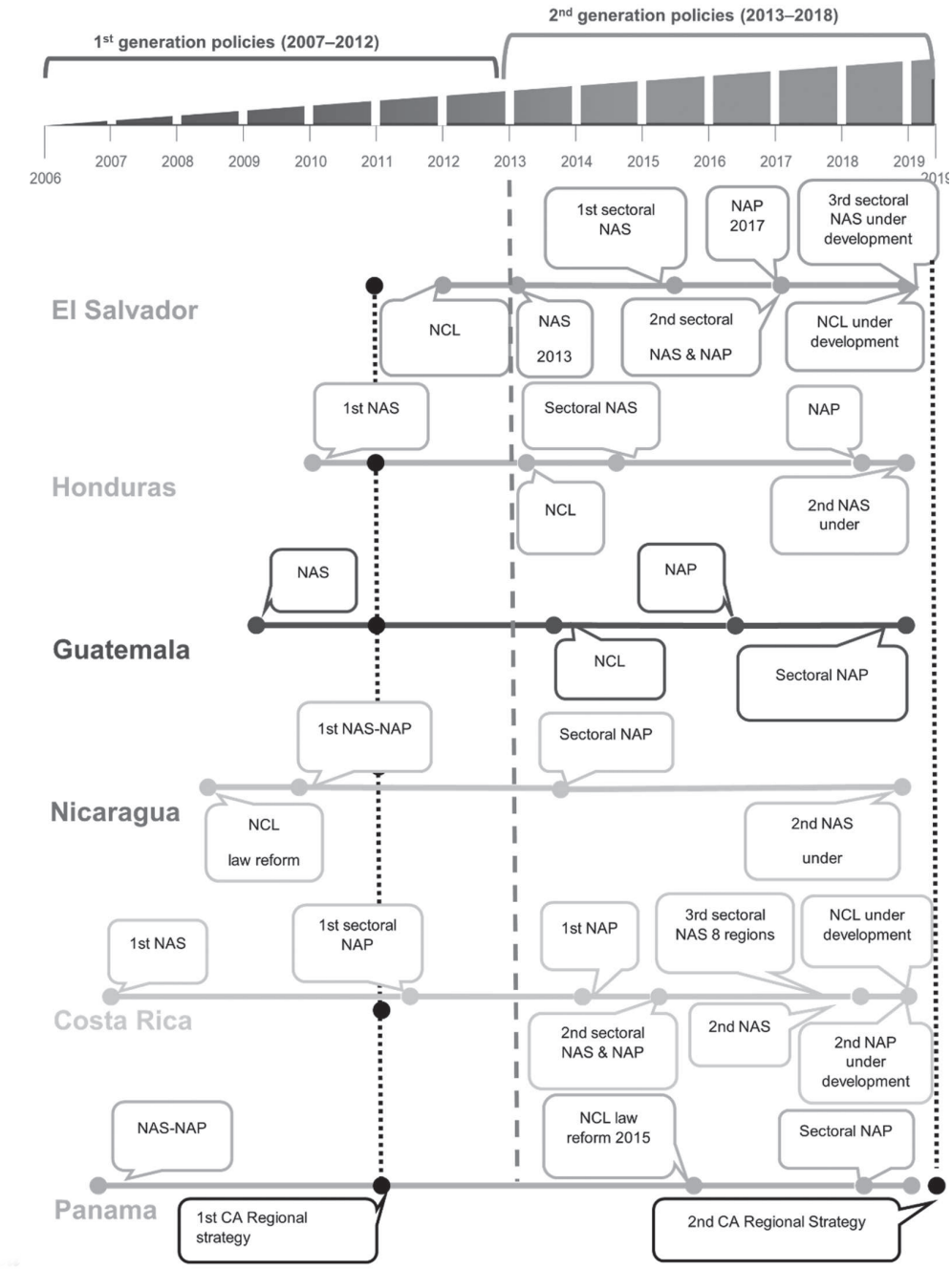
The UNFCCC negotiations and commitments, together with international cooperation, have created momentum for policy development in the region, leading to an increasing number of policies addressing adaptation goals in all countries. This article studies how Central America is responding to the challenge, using a framework for comparative analysis based on previous research mostly conducted for European countries.

Answering the first research question, this study has documented that this process has gained increasing importance, to the point that it has transited through two distinct generations of adaptation planning, each with specific characteristics. The number and quality of policy outputs addressing CC Adaptation have increased. In terms of quantity, as Table 1 and Figure 2.2 summarize, from 2006 to 2012, nine documents were approved; from 2013 to 2018, 16 new policies were adopted, and 9 more are in different stages of elaboration.

Answering research question two, the research distinguishes an improvement in the policy outputs, especially in terms of arrangements for implementation and monitoring, and in terms of new forms of vertical interactions. These two generations present distinct characteristics, showing a learning curve for adaptation planning. The overarching characteristics of the first generation of policies are:

1. All national strategies (except for the second one in Costa Rica) are part of a first generation of policies. NASs in all countries address both mitigation and adaptation actions.
2. The most critical sectors in which adaptation and vulnerability reduction are considered priority are agriculture, stockbreeding, health, and water.
3. The policies show a top-down design with no direct participation of local tier of governments.
4. The NASs of this generation have limitations in monitoring elements; for example, only two integrate monitoring, but they are centered on mitigation. The others lack any reference to this aspect.
5. The implementation mechanism of preference is planning obligations they mandate to advance policy integration, and to design and implement future national adaptation plans.
6. In terms of funding, none integrates a cost analysis of the adaptation measures and all rely on national and international funds for implementation. Two documents mandate that public institutions must integrate funds in their institutional budgets to implement the measures.

Figure 2.2 Timelines of CC Adaptation policy development in each country in Central America



Source: Authors' elaboration

The second generation of NASs is underway; countries such as Costa Rica, Honduras, and Nicaragua have recently approved new policies or are in the process of drafting them. Even SICA has started the process of drafting a new regional strategy. The NCL introduced most of the institutional changes that allow for new features, responsibilities, and conditions for policy improvement. Climate legislation, together with the process of elaborating the third communications on climate change and the increased influence from international cooperation, seem to have created the conditions for the second generation of policies.

Except for Nicaragua and Panama, this article considers the NAP to be a second generation of climate policies in Central America, due to differences in terms of the drafting process; participative approaches; and improvements in implementation, monitoring, and funding arrangements. The interinstitutional committees designed to allow for horizontal coordination, and the units of climate change in various ministries are two of the new features . Additionally, consultative and broad participative drafting processes are now the norm in the region, representing in some cases a clear trend toward "governance with representation and consultation", as Figure 2 shows.

The NAPs of the second generation follow some common aspects.

1. *International cooperation supported the process* (technically and financially).
2. Albeit the NAPs *integrate both CC Mitigation and CC Adaptation, a new trend for exclusive adaptation policies is starting;* Honduras's and Costa Rica's new NAP and NAS are examples.
3. The drafting process was conducted with the *participation of multiple institutions* from the national government and with the inclusion *of local governments, research agencies, and academia.*
4. *Disaster risk management and land-use planning* were recurrent components of the NAPs, often integrating mandates to these policy areas.
5. All NAP documents indicate the responsibility of the public institutions to address their CC Adaptation tasks by *integrating into their budget funds for implementation*. Yet, all NAPs consider that national funds are not enough to face the challenge. Therefore, they call for *financial and technical assistance from the international community* as a critical driver for successful implementation.
6. An *emphasis on specific sectors is increasing in all countries,* agriculture, food, and forestry being the most common across the region. In other sectors, these documents are under construction.

Honduras and Guatemala are advancing the creation of legislation and new plans with higher quality; the former is updating its NAS, and both are creating sector-specific strategies. The issue would appear to be gaining momentum in both countries. El Salvador, Honduras, and Guatemala have also considerably increased their efforts to address CC, but they has been mostly driven by extreme weather events causing terrible and persistent loss. In this regard, a network of international donors have also supported

the efforts, not simply promoting reconstruction but building adaptive capacity; technical and financial support is key to understand the improvement in the policy efforts.

Costa Rica has elevated the environment and climate change as an important agenda point, not only in internal affairs but also as part of the foreign policy (the objective of seizing opportunities related to CC is clear evidence). It has multiple policy efforts not only as an internal policy issue but also as an international display to be promoted in the country to attract more investments and funding.

Nicaragua and Panama are at the bottom in updating or creating more policy instruments in region. Their NAS and NAP are more than 10 years old, and both presented serious limitations as planning instruments, which is evidence that the issue if of less importance in these two countries. In Nicaragua, despite terrible losses due to extreme weather, the government has been more centered on political stability and increasing control over public institutions, which could have hindered the process of climate adaptation and policy development. The nation has become increasingly isolated due to its authoritarian nature, reducing access to funding and technical support, which has been key for the other countries. In Panama, the lower level of risk associated with extreme weather events and better economic results during the last decade can explain the decreased urgency in drafting CC Adaptation policies.

Some of the features discussed for the first and second generations, including their limitations, are common to other countries and regions where policy developments are first taking place (Biesbroek et al., 2010; Kehew et al., 2013).

Regarding research question three, the characteristics reported in terms of the speed and increasing quality of the most-recent policy outputs describe a region that is learning how to plan for adaptation. Most scientific literature remarks on the importance of addressing adaptation as a learning process (Collins & Ison, 2009; Fisher et al., 2018; Mimura et al., 2014).

Notwithstanding the progress reported in this article, recent developments are hampering and even converting into regressions the advancements in adaptation policy discussed here. Among the destabilizing situations of the economic and political fabric, which reduce progress, we could mention the uprisings and repression in Nicaragua; conflict and threats among the executive and judiciary powers in Guatemala; challenged electoral results, corruption scandals, and social unrest in Honduras; and the increasing fiscal deficit and political deadlock in Costa Rica to advance state reforms. This situation supports the AR5 conclusions on corruption as a threat to adaptation efforts, and the vital role of institutions for advancement adaptation (Klein et al., 2014).

These negative developments, together with phenomena linked to climate change and climate variability, are considered among the drivers that increase the flow of migrants from Honduras, Guatemala, and El Salvador, causing a humanitarian crisis on the U.S.–Mexico and Mexico–Guatemala borders (Holpuch & Lakhani, 2019; Lakhani, 2019a, 2019b, 2019c; Semple, 2019). The World Bank (2018) estimates that by 2050, the region together with Mexico could face up to 3.5 million new migrants due to climate change effects. These issues, along with other problems and constraints, threaten the progress documented here.

Limitations and Suggestions for further Research

The main source of information for this research was the mentioned policy documents, other official information found in the NC, and several official web pages. In some countries we were able to contact and exchange information on policy development with national authorities, but such was not the case for all countries and all policies documented due to limited time or lack of response from authorities. Some information was limited, especially regarding drivers of policy development. Still, this research is novel for the region and for developing countries in general, which is why we believe that further research should be conducted in areas, including (1) research on the implementation of policies, assessing whether they are generating the intended results, and which areas require improvement; (2) studies on the entwinement between national and local branches of government, civil society, academia, and private sectors in the climate policy arena; (3) research on if and how climate policies should address the political instability and institutional fragility as vulnerability stressors in developing countries; (4) analysis of if and how climate change is integrated into the development strategies and programs in different sectors of the region; and (5) analysis of whether the region is receiving the additional climate funds, and how they are used in relation to the implementation of climate policies.

In terms of the conceptual framework used here, several modifications were necessary during the research process to adapt it to the contextual characteristics of the region, for instance, the sub-classifications and modifications of the drivers. The framework applied here makes an important contribution toward expanding the research frontier into policy development for CC Adaptation. The different elements of the framework were not necessarily used together in previous research, but when applied as conducted in this article, are of remarkable value for understanding the policy process, the common and different characteristics of it, and elements for improving the policy delivery in the region and possibly other countries and regions. Improvements could be made, for example, in the integration of interviews, to clarify, contrast, and dig deeper into the policy process, which could benefit future research.

This article documents and analyzes the process of developing adaptation policies in six countries of Central America, a region that is characterized as one of the most vulnerable to the negative effects of climate change. Except for Nicaragua and Panama, the process of planning for CC Adaptation is speeding up in terms of updating or creating new policy outputs. These recent documents are evidence of a learning curve in the planning process, especially evident in terms of new modes of governance between different levels of government and more instruments for implementation and monitoring. Still, this progress is fragile and easily disrupted. The implementation gap is an aspect that is not analyzed here but is of outmost importance as a step following this research. More policy outputs do not necessarily translate into more adaptation readiness in a region such as Central America.

CHAPTER 3: POLICY INTEGRATION OF CLIMATE CHANGE ADAPTATION IN CENTRAL AMERICA: A REVIEW FOR DEVELOPMENT, LAND-USE, AND RISK MANAGEMENT PLANNING

Based on Segura R, L.D., van Zeijl-Rozema, A., & Martens, P. (2023). Policy integration of climate change adaptation in Central America: A review for development, land-use planning, and risk management. Latin American Policy, 14, 534–567. https://doi.org/10.1111/lamp.12314

Abstract

Central American countries have been described as highly exposed to the negative effects of climate change. Policies dedicated to climate change and climate policy integration (mainstreaming) into sectoral policies have been considered key strategies to face climate change. Policy integration eases the adaptation process to take place across different sectors, creating opportunities for co-benefits, and tackling possible contradictions or conflicts by addressing adaptation while implementing sectorial goals. Previous research has documented the progress made in this region regarding dedicated policies. However, regarding policy integration, the information is limited or nonexistent. This article aims to address this gap by studying the level of integration of climate change adaptation considerations into three prioritized sectors, general development planning, risk management, and land-use planning, by applying three criteria for policy integration: inclusion, consistency, and weighing. The results show a progressive trend to integrate adaptation into the policy outputs of the three sectors in all countries. Nevertheless, the operational level of instruments in some cases is failing to fulfill the mandates to mainstream climate adaptation, consistency is limited. These failures are indicators of lower levels of organizational maturity. This has also been detected in other developing countries, and this is connected with conflict and trade-off avoidance behaviors as a filtering strategy to ensure progress at the cost of leaving key issues outside of the mainstreaming process.

Resumen

Los países centroamericanos han sido descritos como altamente expuestos a los efectos negativos del cambio climático. Las políticas dedicadas a atender el cambio climático y los procesos de integración (mainstreaming) de objetivos de adaptación al cambio climático en políticas sectoriales han sido consideradas estrategias clave para enfrentar el cambio climático.

La integración la adaptación a políticas sectoriales facilita que el proceso de adaptación se lleve a cabo en diferentes sectores, creando oportunidades de beneficios colaterales y abordando posibles contradicciones o conflictos cuando se están implementando objetivos sectoriales y se consideran objetivos de adaptación. Investigaciones recientes han documentado los avances realizados en esta región en materia de políticas dedicadas. Sin embargo, en cuanto a la integración de políticas, la información es limitada o inexistente. Este artículo tiene como objetivo abordar esta brecha estudiando el nivel de integración de las consideraciones de adaptación al cambio climático en tres sectores priorizados: planificación general del desarrollo, gestión de riesgos y ordenamiento territorial, aplicando tres criterios para la integración de políticas: inclusión, coherencia y ponderación. Los resultados muestran una tendencia progresiva a integrar la adaptación al cambio climático en las políticas de los tres sectores en todos los países. Sin embargo, el nivel operativo de los instrumentos de política pública en algunos casos no cumple con los mandatos de incorporar la adaptación climática y la coherencia es limitada. Estas fallas son indicadores de niveles más bajos de madurez organizacional. Esto también se ha detectado en otros países en desarrollo, y está relacionado con comportamientos de aminorar potenciales conflictos y sacrificios como estrategia de filtrado para asegurar el progreso a costa de dejar cuestiones clave fuera del proceso de integración.

Keywords Central America; Mainstreaming; Climate Change; Adaptation; Policy Outputs

1. Introduction

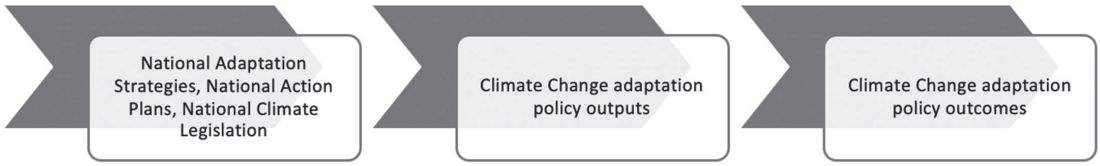
The combination of current climate variability, with high exposure to climate hazards and vulnerability, is making Central America exceedingly susceptible to climate change's negative effects (ECLAC, CCAD, & SICA, 2011; Giorgi, 2006; Magrin et al., 2014; Programa Estado de la Nación, 2016). Various studies have reported deficient public institutions, weak economies, corruption, and violence have been common drivers of migration out of the region. Nowadays recent droughts in the northern countries (Honduras, El Salvador, and Guatemala) together with the expansion of the coffee rust disease and volatile international prices, have created the perfect storm for the increasing number of migrants going to the United States (Holpuch & Lakhani, 2019; Lakhani, 2019a, 2019b, 2019c; Milman, Holden, & David, 2018). A policy note by the World Bank (2018) on future scenarios of migration induced by climate change estimated that under a pessimistic scenario, migration out of México and Central America could reach even up to 3.9 million by 2050. This study of climate policy advancement in this region is of great importance to understand how the governments have responded so far, but more importantly, to identify the gaps in the policy development to confront climate change's negative effects to know where action is needed.

National Adaptation Strategies (NAS), National Action Plans (NAP), and National Climate Legislation (NCL) are policy outputs specifically designed to address climate change consequences. These three combined are usually known as the "dedicated approach", see figure 3.1. (Runhaar, Wilk, Persson, Uittenbroek, & Wamsler, 2018). In this regard, Segura, Van Zeijl-Rozema, and Martens (2022) inquired about an important

advancement in the process of dedicated adaptation policies in Central America. They documented that all six countries have approved new legislation, policies, and plans dedicated to mitigation and adaptation to climate change. As early as 2006 the first strategies on climate change were approved. The authors identified a total of 29 dedicated policy outputs also recognizing a learning curv on the quality of the policies in terms of drafting process, instruments for implementation, funding, and monitoring. But most importantly, these documents required the integration of climate change objectives into sectorial policies.

This requirement of policy integration is usually termed "mainstreaming", which is a form of Environmental Policy Integration (EPI). This is defined as the process by which external environmental objectives are integrated into policy outputs to produce outcomes that will allow more efficiency and effectiveness in achieving adaptation goals and reducing or solving possible contradictions to those of different domains, see figure 3.2. (Brouwer, Rayner, & Huitema, 2013; Mickwitz et al., 2009; Runhaar et al., 2018; C. Uittenbroek, 2014) Scientific literature has considered both, the dedicated as well as the mainstream approach key strategies to face climate change (Dupuis & Biesbroek, 2013; Mimura, 2014; Runhaar et al., 2018; C. J. Uittenbroek, Janssen-Jansen, & Runhaar, 2013).

Figure 3.1 The dedicated approach



Source: Own elaboration adapted from Runhaar, Wilk, Persson, Uittenbroek, & Wamsler, 2018

The OECD (2002) established four key prerequisites for policy integration for sustainability. These are the need for a strong leading department, the creation of specialized units in departments or ministries selected, the involvement or creating of interdepartmental committees, and finally, the bottom-up input from lower levels of government. These have been researched for CC Adaptation with interesting results in Europe (Biesbroek et al., 2010) and also in Central America. Segura et al. (2022) detected a certain level of progress on the prerequisites for mainstreaming in all countries, namely delegating responsibility to a leading institution to guide the process, creating institutional arrangements such as the inter-institutional committees for CC Adaptation and units specialized in climate change in several sectoral ministries, and vertical coordination with lower tiers of government. The existence of these prerequisites refers to the process of institutionalization of CC Adaptation within departments and ministries otherwise foreign to the topic.

Figure 3.2 Mainstream approach

Source: Own elaboration adapted from Brouwer, Rayner, & Huitema, 2013; Mickwitz et al., 2009; Runhaar et al., 2018; C. Uittenbroek, 2014.

This process of institutionalization has also been studied by Montesano, Biermann, Kalfagianni, and Vijge (2023), who developed a framework to track for nine years the process of sustainability policy integration within the International Labor Organization (ILO). Their framework reflects how the process of institutionalization is preceded by the development of norms and ideas. Norms in their case are characterized by breadth (how many actors have adopted the idea) and consistency (relating to how uniform the norm is understood). Norms usually have been formally adopted by all members of ILO. In the case of ideas, they considered them as "subjective systems of representation and representation-producing practices" (Montesano et al., 2023, p. 3) under this framework, for the norms to be institutionalized and aggregated it requires that the ideas behind them to be more developed diffused among participants.

This process is characterized by a cycle in which ideas form, spread, and aid the creation of norms, and these in time can evolve into institutions that can also be used for CC Adaptation. Of course, this framework has been created to study the process within an international organization (ILO) and not a state, but the cycle itself can be evident in certain aspects or CC Adaptation policy development. For example, in Central America, the first strategies integrated broad ideas and visions of the need to address CC Adaptation but little effort on how to do it, these can be translated as the main ideas regarding the need to address adaptation; nevertheless, a second wave of policy outcomes created direct mandates to address the issue as part of different departments, as well as in certain countries evolved even in climate laws (Guatemala and Honduras, for example) or law reforms (El Salvador and Nicaragua) (Segura et al., 2022), which represent the norms as the example of ILO,

These legislation efforts created the institutions needed to help the policy integration efforts such as specialized units of CC in different departments, the creation of interdepartmental committees and even creating spaces for the participation of the local level of government. (Segura et al., 2022) Nevertheless, the research on the advancement of CC Adaptation into the sectorial policies is still scarce in this region, however, the initial stages that can sustain the mainstreaming process suggest there are key foundations to advance in the integration process.

Mainstreaming is striving to disseminate the adaptation goals (mitigation as well) into traditional policy sectors, especially into those that could render more co-benefits. An example of those is the disaster risk management sector, a sector that "fails to include times and spatial scales needed to address the root causes of climate change vulnerability" (Mimura, 2014, p. 881). Mainstreaming CC Adaptation in this sector can supplement this shortcoming and avoid duplication of efforts. The IPCC also documented that those adaptation actions that offer development benefits in the short term and vulnerability reduction in the long term are the most popular, therefore, mainstreaming adaptation in development planning creates greater opportunities for more efficiency and benefits (Huq & Reid, 2004; Mimura, 2014). As early as 2004 literature has made a clear case for the importance of this sector for addressing climate change's negative effects and especially to address vulnerability and reducing high-risk investments (Huq & Reid, 2004; Huq et al., 2004; Klein, Schipper, & Dessai, 2005; Sietz, Boschütz, & Klein, 2011) Other sectors in which scientific literature calls for mainstreaming are spatial or land-use planning (Albers & Deppisch, 2013; Hurlimann & March, 2012), public works, and infrastructure (NCCARF, 2013), water (Bergsma et al., 2018), among many others. Mainstreaming as well as the dedicated approach are essential strategies for the advancement of CC Adaptation. Usually, dedicated policies tend to create conditions for the mainstream approach to takeoff. For example, Biesbroek et al. (2010) delineated how the NAS in European countries are creating the conditions for mainstreaming adaptation into other policy domains.

The study of mainstreaming for CC Adaptation has seen increased attention from the scientific community. Runhaar et al. (2018) documented 597 scientific articles on mainstreaming, of which they studied 87 articles centered solely on empirical cases of climate adaptation or in combination with mitigation. According to their results, 98% of these articles have reported that mainstreaming had led to policy outputs, however, these outputs only lead to outcomes in only 50% of the cases (Ibid). In 86% of the cases, the authors identified that regulatory mainstreaming is the most common strategy, including CC Adaptation as part of the objectives in sectoral policies and "changes in strategic planning and legislative tools" (Ibid, p. 1205) The authors also concluded that the results "show that mainstreaming has been more successful in producing effective policy outputs than effective outcomes", suggesting that there is an implementation gap between the CC Adaptation goals of sectoral policies and the adaptation measures that have been implemented (Ibid, p. 1206) A combination of mainstreaming strategies is considered the key to success in the aforementioned study; it is understood that when managerial, intra-inter organizational and regulatory strategies are implemented these lead to effective mainstreaming (Ibid).

Of these 87 articles, only three Latin American countries are studied, Ecuador, Uruguay, and Nicaragua. We see that there is a knowledge gap in how the planning for adaptation is progressing in the whole of Central America. The present article will fill this knowledge gap in planning for adaptation with a thorough analysis of the process of mainstreaming in Central America, through a comprehensive comparative study of six countries at the national level.

Concerning mainstreaming a noteworthy article is the one about Nicaragua by Rivera and Wamsler (2014) in which they assess whether mainstreaming was taking place in risk management, environmental management, and urban planning sectors. They concluded that some degree of advancement was noticed, especially regarding new environmental plans and regulations undertaken. Other authors have researched the dedicated approach, especially the construction of CC Adaptation strategies, plans, and even laws (Dubash, Hagemann, Höhne, & Upadhyaya, 2013; ECLAC et al., 2011; Nachmany et al., 2014; Programa Estado de la Nación, 2016).

The current article aims to further continue this work with an evaluation of the mainstreaming process across three key sectors, risk management, land-use planning, and development planning. With this paper we aim to gain a better insight on how this vulnerable developing region is addressing CC Adaptation in key sectors, which can also allow for further comparative research with other developing regions. This research can also inform policymakers on the progress and challenges ahead in this process.

The article is divided into three sections starting with a general description of the region, the framework used to assess mainstreaming, and the data collection. The second section will lay out the results based on the three main elements of the analysis which are a) the classification of the policy outputs assessed in each sector; b) the criteria for assessing the mainstreaming process; and c) the vertical interaction between national and local level of government for mainstreaming present in the drafting process and the arrangements included in these to support implementation, monitoring, and funding of the policy outputs. The third section is a discussion of the results, conclusions, and suggestions for further research.

2. Study region, analytical framework, and material collection

Central America is formed by six countries, namely Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. They all are members of the SICA. In terms of CC vulnerability, by 2022 German Watch classified Honduras and Nicaragua among the top 5 more vulnerable countries of the world, and Guatemala and El Salvador among the 20. These four countries also share similar gdp of lower than $4.500 and a human development index between 0.625 to 0.685. Costa Rica and Panama both have better indicators in terms of vulnerability (between 50 to 100 most vulnerable countries), GDP (over $12.000 and $15.000 respectively), and human development index of over 0.776 (Segura et al., 2022). On top of that, these two have the highest level of democracy according to The Economist Democracy Index (full and flawed democracy respectively), the other four countries have seen their respective scored reduced in the latest years, Nicaragua today considered an authoritarian regime is the lowest of the region, the other three are classified as hybrid regimes (Unit, 2022). Recent events such as higher concentration of power and abuses of authority against opposition leaders, journalists, and civil society have affected the perception of the stability of these countries (Abi-Habib, 2023; Grant, 2022; OHCHR, 2023; Quintanilla, 2023)

This research addresses the question of whether and how climate change adaptation is being integrated into three policy sectors of the six countries. Runhaar et al (2018) documented that four sectors are the most commonly studied by the literature on mainstreaming, the first being environmental and natural resources (including agriculture), closely followed by urban and land-use planning, water and flood risk management, crisis management and disaster risk management. Among the sectors with the lowest attention is development. For developing countries, especially Central America, the development sector has the potential to render greater benefits for adaptation when tackling some of the determinants of poverty and exclusion in the most vulnerable population. It is for this reason that in this article we included general development planning as a key sector of analysis. The other two sectors, risk management (RM)[2] and land-use planning (LUP) were selected due to their relevance for this specific region, Segura et al (2022) found these to be increasing in importance as sectors to mainstream climate change adaptation. Additionally, outputs of these three sectors usually intersect with the agendas of the local governments, which creates opportunities to assess the role of these in the policy process at the national level.

Even though there is no agreement in the scientific community regarding the definition of climate mainstreaming, multiple articles agree on certain elements such as that it requires to integrate, incorporate or align of CC Adaptation considerations, concerns, objectives, responses or measures into other policy domains (Brouwer et al., 2013; Mickwitz et al., 2009; Pasquini, Ziervogel, Cowling, & Shearing, 2015; Saito, 2013; Uittenbroek Caroline, Janssen-Jansen Leonie, & Runhaar Hens, 2016; Wamsler & Pauleit, 2016) One common definition referred by multiple articles studied by Runhaar et al. (2018) is the definition presented by Mickwitz et al. (2009, p. 19) "the incorporation of the aims of climate change mitigation and adaptation into all stages of policy-making in other policy sectors (non-environmental as well as environmental); complemented by an attempt to aggregate expected consequences for climate mitigation and adaptation into an overall evaluation of policy, and commitment to minimise contradictions between climate policies and other policies".

Numerous scientific sources have been dedicated to assessing mainstreaming (Runhaar et al., 2018). Kivimaa and Mickwitz (2006) created a framework, later complemented by Mickwitz et al. (2009) in which mainstreaming is further developed into five criteria to assess policy integration. **The first** is the inclusion of climate change aims as the basis from which the rest of the criteria can be applied. Concerning inclusion, the aim of addressing adaptation is key to separating a policy with unintended co-benefits and a policy with clear goals of addressing adaptation as part of the sector's objectives. **The second** is consistency which centers its attention on how the policy is minimising possible contradictions between the sectorial and the adaptation objectives. **The third** following the need to solve the possible contradictions is the weighting given to the integrated climate change aspects concerning other sectoral aspects. **The fourth** is the recognition of the importance of feedback for implementation, in this regard reporting

2 In other latitudes the term is disaster risk management.

is considered ex-ante in terms of how climate change goals will be implemented and recorded as well as ex-post evaluations of the policy instruments implemented. Finally, **the fifth** criteria centers is attention on the means necessary for implementation, especially the know-how and resources provided. Uittenbroek et al. (2013) used this framework while applying a model to two Dutch cities conducting urban planning. Also, Brouwer et al (2013, p. 136) modified and applied this framework to the European Union water policy, the authors decided to exclude the last two criteria because:

- reporting is "a potential explanation for the degree of mainstreaming" achieved not a measuring criteria.
- resources are "a tool to achieve mainstreaming but not an indicator of its extent"

Brouwer et al (2013, p. 136) also developed scores to measure the results of the level of mainstreaming in each of the three criteria. Bauer and Steurer (2015) applied this latest version of the framework to Dutch and German cases for water management with interesting results on how different approaches towards mainstreaming render results and especially how a combination of a dedicated approach together with sectorial strategies could be a robust strategy for adaptation. This latest version of the framework proved to be of great value in assessing mainstreaming in European cases.

This research follows the works of Brouwer et al (2013) applying the three criteria focused on the policy outputs in the Central American countries for three specific sectors, intending to not only measure progress in this region but also to assess the value of the framework in a developing region. Solely policy outputs are evaluated in each sector understanding these as legislation, policies/strategies, regulations, action plans, and technical guides.

Even though Runhaar et al. (2018) documented a need for more studies on the outcomes, for this region we first need to understand until which point policy integration is taking place among the most important policy instruments (policy outputs) before we can move to assess what adaptation outcomes these policy instruments are achieving in these sectors. To classify the policy outputs, borrowing from planning theory, the outputs were classified into three planning categories:

i. strategic planning is the level at which general long-term goals and guidelines of the sector are described.

ii. tactical level where the specifications on how to attain the goals are decided which usually are outputs to be implemented between short to medium term.

iii. operational level where specific instructions on how to proceed in the short term are provided.

All policy outputs which were approved and under implementation from 1996 until August 2018 were included in the analysis. We have excluded documents preceding 1996 or those that are no longer under implementation. The rationale of this time ex-

panse was to include policy outputs approved up to 10 years previous from the NAS drafting process that was initiated in 2006, so we can be able to distinguish the effect that such instruments could have had in the process of mainstreaming CC Adaptation into these policy domains. After classifying all policy outputs, they were assessed with the help of the three criteria for mainstreaming – inclusion, consistency, and weight- to determine the extent of mainstreaming currently present in Central America.

Finally, mainstreaming is due to be conducted horizontally across sectors, but also vertically at different levels of government (Bauer & Steurer, 2015). To study the advance of climate change adaptation policy outputs at various levels of government, we examined the participation of municipalities in the drafting process and the role (if any) in the implementation, funding, and monitoring phases of the policies documented in the sectors of analysis. We scored the level of involvement as:

i. absent: no mention of municipalities

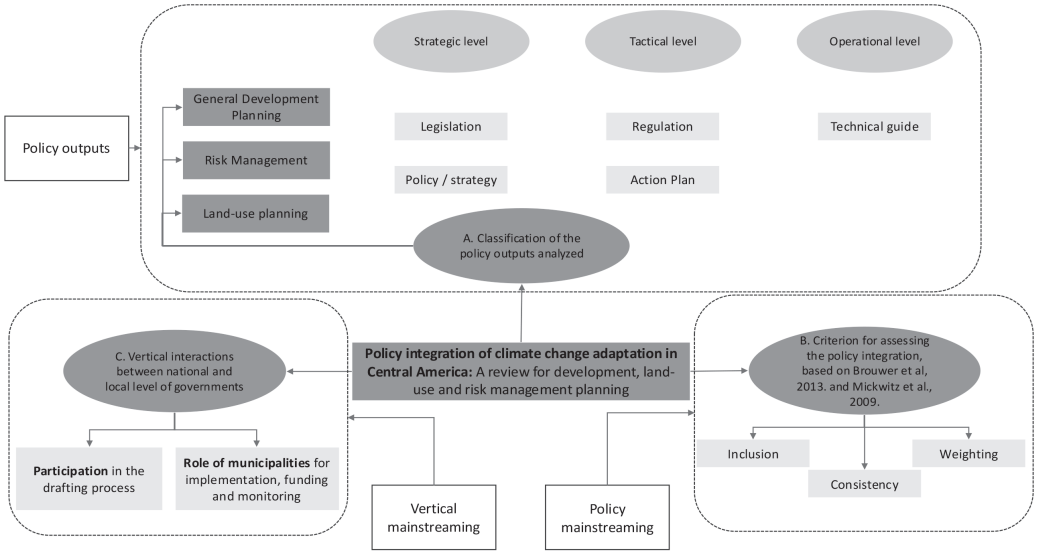
ii. passive: municipalities mentioned but as beneficiaries

iii. partners: municipalities are included as a key actor

We consider that vertical interactions are strong when different levels of government (in this case municipalities) participate in policy design, implementation, and monitoring. See figure 3.3 for the synthesis of all elements discussed into a framework of analysis.

The main source for the policy outputs is the official websites of the ministries and/or public institutions leading the policy sector. The documents were collected as of August 2018 the latest approved, in total 44 policy instruments. Of the total policy outputs, 10 are for general development planning, 20 for land-use planning, and 14 for risk management. Table 1 gives a summary of the documents studied. To facilitate and maintain coherence in the analysis process, this research developed a coding document describing the elements of the framework which were identified and registered after scrutiny of all policies (see supplement material). The results of the research are summarized in the following section.

Figure 3.3: Summary of the research framework



Source: Author´s elaboration.

3. Results

This section presents the results by first introducing the landscape of the policy outputs, a total of 44 documents from 1996 until 2018 (See appendix 1). As mentioned in the section before, we have collected the documents from three policy sectors with certain distant characteristics and classified the outputs into three categories, strategic, tactical, and operational. We also documented whether the institution (s) leading the sector is (are) a member of the national inter-institutional committee of climate change and if it has (has) created a unit of climate change within the internal structure. The subsequent section addresses the results of the policy integration criterion. The final subsection answers if and how vertical integration is occurring by studying the level of participation of municipalities in the drafting process and the role assigned to them as part of the implementation, funding, and monitoring arrangements.

3.1 The landscape of policy outputs analyzed

Central American countries share unique similarities, which allows for a broad comparative analysis. All six countries have a presidential political system, are unitary states with low levels of decentralization, and have legal systems based on civil law (Fonseca, 2001). These characteristics facilitate the conditions to compare how different states with similar political and legal systems responded to climate change by integrating it into the policy outputs within three distinctive sectors. The studied sectors have several differences that are important to understand beforehand.

General Development (GD) planning has been traditionally a task of the Presidency assisted either by a Ministry or by a special office that delineates the plan for the term of government. For our purpose, we documented the latest plan for each country. However, some countries have started to create long-term development policies or strategies aiming to generate national development objectives and guidelines. These encompass all the institutions of the state and should pursue the objectives through the short-term plans of the governments elected during the implementation period. For instance, Honduras approved in 2010 a long-term development policy that all subsequent governments should follow and implement through action plans by 2038. The other countries followed the example except for Costa Rica and Nicaragua.

The sector of Risk Management (RM) planning in Central America became very important after Hurricane Mitch in 1998 which caused large economic and human losses in the region. Practically, all countries in the region adopted new legislation renovating the institutions in charge of prevention, preparation, and response to national emergencies. Governments have also approved policies and action plans in most countries as part of the new responsibilities designated by these legislations. These instruments also have created important interactions with the local level of government either by assigning new responsibilities such as the creation of municipal committees for risk management or by requesting the incorporation of risk-related actions into local development plans.

Finally, Land Use Planning (LUP) is the most active sector in the period under study. Firstly, because up to 1996 several of these countries transitioned to peace and democratic systems, from civil war and dictatorial forms of government. This meant that land-use planning had been a task relegated for decades or just confined to the main cities. This is why the governments have adopted new legislation and regulations, creating or modernizing the basic requirements for conducting it mostly related to the awareness aspect, incorporating elements concerning risk management and environmental protection as already mentioned. Secondly, the institutions at the national level have also approved or updated technical guides and toolboxes to assist and transmit knowledge to the local administrations, therefore facilitating the process of drafting and approving land-use plans.

These operative instruments are a key feature of LUP, which is not present in the other two. For example, Honduras approved two technical guides; the first one is for municipal development plans with an emphasis on land use and the second guide is specific for the land-use planning process with all basic formalities and studies usually requested in such a process. (See table 7)

Table 7. Summary of policy outputs documented in each country by sector and category (from 1996 until August 2018)

Country	General Development		Risk management		Land-use planning		
	Strategic	Tactical	Strategic	Tactical	Strategic	Tactical	Operational
Costa Rica	No documents	Plan (2015)	Law (2006) Policy (2015)	Plan (2016)	2 Policies (2013 & 2018)	2 Plans (2013 & 2018) Regulation (2017)	No documents*
El Salvador	Policy (2018)	Plan (2015)	Law (2005)	Plan (2016)	Policy (2002) Law (2011)	Plan (2004)	Guide (2016)
Guatemala	Policy (2015)	Plan (2016)	Law (1996) 2 Policies (2011 & 2016)	No documents	Law (1996)	No documents	Guide (2018)
Honduras	Policy (2010)	Plan (2015)	Law (2009) Policy (2013)	Plan (2014)	Law (2003)	Regulation (2013)	2 Guides (2010 & 2015)
Nicaragua	No documents	Plan (2017)	Law (2000)	No documents	Policy (2001)	Regulation (2002)	Guide (2009)
Panama	Policy (2017)	Plan (2014)	Law (2005) Policy (2010)	No documents	Legislation (2009)	Regulation (2015)	No documents*
Total policy outputs	4 documents	6 documents	11 documents	3 documents	8 documents	7 documents	5 documents

*: The regulation approved contents or is a technical guide that is mandatory to follow.

Source: Author´s elaboration.

Segura et al. (2022) documented the creation of inter-institutional committees on climate change in all countries, the first one being created in 1999 (Nicaragua) and the latest in 2016 (El Salvador). In the present article, we found that the institutions leading the sectors of GD and RM are members of these committees (the exception is Nicaragua). For LUP, Guatemala, Panama, and Nicaragua have included the institution leading the sector as a member of such committees. The other three countries are either not a member or just one of the institutions which coordinate the sector participates in the committee. We also reviewed whether these institutions have created units specialized on climate change, this has been regarded as a prerequisite for mainstreaming (Biesbroek et al, 2010). Only in two countries, we have found such units had been created in some institutions, for instance, in Nicaragua where for the land-use sector both institutions coordinating the sector reported the creation of these units; in the case of El Salvador, the LUP sector is coordinated by two institutions, a national council for land use planning and territorial development, the second being the Ministry of Environment, in the last, there is a unit dedicated to climate change. In the other sectors, such units are absent. (See appendix 2)

In the following subsections, the research framework (fig. 03) will be used to systematically analyze the findings. The next subsections will explore the results for:

- Policy integration, including a classification of the policy outputs (sections A and B of the Research Framework) to understand how much progress the region has achieved.
- Vertical integration, (section C of the Research Framework) to understand if and how municipalities are included in the process.

3.2 Policy integration in Central America

As described in the research framework, our analysis is focused on three aspects: inclusion, consistency, and weighting of CC Adaptation within the documents of the three sectors under study. The classification of the documents into three categories (strategic, tactical, and operational) is conducted to assess the level of alignment between policy outputs. The next sub-point describes the results of inclusion for all 44 documents, as well as the results for consistency and weighting for the policy outputs which have integrated CC Adaptation either extensively or partially (in total 27 documents).

Inclusion of CC Adaptation in the policy outputs

The policies exhibit a progressive trend toward the inclusion of adaptation as part of the concerns for policy development and goals that those documents are addressing in these sectors. This trend is influenced by the advancement of the dedicated approach in each country, which require initiating the mainstreaming process in several sectors (Segura et al, 2022). With the only exception of one policy in Honduras, all Central American countries started including CC Adaptation as part of sectoral policies just after the approval of the dedicated policy requesting mainstreaming. (See table 8)

However, there were exceptions in which national authorities approved policies without considering CC Adaptation. For example, in El Salvador, the sectors of LUP and RM approved documents that did not include adaptation even after five years of law requesting mainstreaming into plans and regulations of all institutions. Another example is two technical guides for the LUP sector in Honduras and Nicaragua that failed to include CC Adaptation. In all these cases, the authorities did not fulfill the legal requirement to mainstream climate change.

GD is one sector across all countries where we find the inclusion of CC Adaptation to be recurrent across all analyzed documents, as they were all drafted after the approval of CC Adaptation policies. However, in some cases CC Adaptation was partially considered, for example, both documents from Honduras integrate the goals or measures for adaptation as activities without any indicators or clear determinants merely calling for the continued implementation of the climate policy.

Worthy of attention is the systematic decrease in the number of policies failing to integrate CC Adaptation after the dedicated policy has requested this integration. For instance, for RM only one policy failed to integrate it, but before the dedicated policies were developed, more than 83% of the documents did not include it. For LUP the change is even more dramatic, as all documents ignored CC Adaptation impacts before the materialization of dedicated policies, but after, only 25% continue not to integrate it (two technical guides).

When looking at the planning categories the tactical level is the one that presents the highest level of inclusion (see table 9); up to 50% of the documents extensively consider CC Adaptation impacts, and 19% fail to include it at all at this level. At the strategic level, almost half of all policy outputs fail to include adaptation, with only 35% doing so in an extensive manner. Finally, the most concerning result is at the operative level (only studied in the LUP sector) where up to 60% of the documents did not integrate CC Adaptation; even more worrying is that the respective authorities approved all operational documents ignoring the mandates from the dedicated policies. This is problematic as the operative level is where detailed information on how to proceed to implement the policies and plans is given. If this fails to integrate adaptation this could hinder the advancement of the implementation of CC Adaptation.

In summary, the region under study has made progress in integrating climate change into sectorial policies, this is documented especially after the approval of the dedicated CC Adaptation policy in each country. This is a clear demonstration of how the dedicated approach can support the advancement of the mainstream approach toward addressing climate change effects in Central America. In terms of kinds of policy outputs, the documents of the strategic level present higher levels of inclusion compared with the tactical or operational level. This could hinder mainstreaming progress because these two levels are the ones that guide most of the activities implemented on the field, if these fail to integrate climate change goals, this could result in greater exposure to risk or even maladaptation practices.

Table 8. Inclusion of CC Adaptation into policies in Central American countries in the sectors of General Development, Risk Management, and Land-Use Planning from 1996 until August 2018 using the framework of Brouwer et al. (2013).

Country and sector		**Level of inclusion**		
Climate change impacts ignored		*Climate change impacts partially considered*	*Climate change impacts extensively considered*	
Costa Rica	General Development			✓Plan (2015)
	Risk management	✓Law (2006)		✓Policy (2015) ✓Plan (2016)
	Land-use planning		✓Regulation (2017)	✓Policy (2013) ✓Plan (2013) ✓Policy (2018) ✓Plan (2018)
El Salvador	General Development			✓Plan (2015) ✓Policy (2018)
	Risk management	✓Law (2005) ✓Plan (2016)		
	Land-use planning	✓Policy (2002) ✓Plan (2004) ✓Law (2011) ✓Guide (2016)		
Guatemala	General Development		✓Plan (2016)	✓Policy (2015)
	Risk management	✓Law (1996)	✓Policy (2011)	✓Policy (2016)
	Land-use planning	✓Law (1996)		✓Guide (2018)
Honduras	General Development		✓Policy (2011) ✓Plan (2015)	
	Risk management		✓Policy (2013) ✓Plan (2014)	✓Law (2009)
	Land-use planning	✓Law (2003) ✓Guide (2010)	✓Regulation (2013)	✓Guide (2015)

Nicaragua	General Development			✓Plan (2017)
	Risk management	✓Law (2000)		
	Land-use planning	✓Policy (2001) ✓ Regulation (2002) ✓Guide (2009)		
Panama	General Development			✓Plan (2014) ✓Policy (2017)
	Risk management	✓Law (2005)	✓Policy (2010)	
	Land-use planning	✓Law (2006) ✓ Regulation (2002) ✓Guide (2009)		✓ Regulation (2015)

Source: Author's elaboration.

Table 9. Inclusion of CC Adaptation according to the policy output classification in Central American countries from 1996 until August 2018 using the framework of Brouwer et al. (2013).

Levels of inclusion	**Classification of outputs**			
	Operational	**Tactical**	**StrategicW**	**Total**
Total number of policies under each classification	5	16	23	44
Climate change impacts extensively considered	2	8	8	18
Climate change impacts partially considered		5	4	9
Climate change impacts ignored	3	3	11	17

Source: Author's elaboration.

Consistency regarding CCA in policy outputs

Consistency refers to the efforts made to assess possible contradictions among sectorial and CCA goals, and the efforts made to minimize them within the policy documents (Brouwer et al., 2013). In general, the results indicate high levels of consistency, 60% of

all policy outputs with the inclusion of CC Adaptation either considered or addressed contradictions across the board. Honduras is the only country where the results are less favorable across the three sectors, all five documents are failing to consider contradictions among sectorial and CC Adaptation goals even though in some cases adaptation was mentioned as a goal but any further indication regarding how to assess it or incorporate it is missing (See table 10) This is a sign of a low level of integration of climate concerns when addressing sectoral goals. This could reflect a low commitment from sectorial authorities to address climate change goals and therefore reduce the conditions for the sector to adapt, or even worse, could be creating pathways in which the actions taken could increase exposition to risk or even increase the carbon footprint of this sector.

When studied by sector, LUP is better positioned regarding consistency with up to 78% of all documents taking this into account. This was especially the case for Costa Rica, in which new policies and plans have recently been approved and are demanding greater efforts from authorities across different scales to address contradictions and give indications for it. In addition to this, technical guides and regulations from Honduras, Guatemala, and Panama also gave more details on how to conduct land-use planning integrating CC Adaptation in all aspects, and how to assess the contradictions and attend to them. For LUP, the contradictions between sectorial and adaptation goals are more evident. The outputs in this sector are guidelines and even specific tools and measurements directed for planners at the local level to make contradictions evident, discuss them with broader audiences, and address them. However, special attention should be given to the operational level, where, for example in Costa Rica, the regulation that gives specific details on how to conduct the planning process failed to orientate on how contradictions regarding CC Adaptation goals should be evaluated and addressed.

RM is not surprisingly the sector in which most outputs considered CC Adaptation as an integral part of the agenda. The policies in Costa Rica (and the action plan), Guatemala, and the law in Honduras did so. As regards Honduras, the policy and the plan were approved after the law had incorporated the adaptation goals, but they stop there, as they have not developed any further guidelines on how to operationalize them. Both the policies as well as the law, assume that there is no contradiction and therefore there are no considerations of this assumption or even indicators to follow and assess potential contradictions. In the case of Panama, the policy requested that further instruments should harmonize sectorial instruments with CC Adaptation but they have failed to give any further detail on how to assess or how to address possible contradictions.

For the GD sector, the results were mixed, as certain countries displayed important higher positions in our chart regarding consistency. For example, in 2018 El Salvador approved a long-term development policy aligned with the sustainable development goals integrating CC Adaptation in every aspect, including measures and indicators. Therefore, this document considered adaptation as an integral part of the development agenda. Similar policies in Panama and Guatemala also conducted an overall consideration of CC Adaptation aims and demanded a balanced approach that takes action

to minimize the contradictions among different goals, all these at the strategic level. However, at the tactical level, the action plans of Panama and Guatemala failed to be consistent, thus these will show strategic levels have higher consistency while the tactical level is failing to follow.

Honduras, in both the long-term policy as well as the plan, fails to assess the contradictions between the development agenda and the CC Adaptation goals. In the case of Nicaragua, we could only assess the development plan, which indeed is addressing adaptation goals, but only in specific areas, and not consistent with other goals from the development agenda, and therefore we considered that just in certain instances the contradictions are assessed.

When analyzed by output category, the operational and strategic level of policies have better results with higher levels of consistency, both documents at the operational level as well as 75% of strategic level ones present higher levels of inclusion. On the contrary, at the tactical level, 46% of the policies ignored the possible contradictions between sectorial and CC Adaptation goals (see table 11). This shows a limited alignment between the strategic and the tactical level and could result in a limited or even lack of implementation of high-level adaptation goals when sectorial plans are implemented.

When the results are analyzed by category, is clear that the tactical level is a challenge because of the lack of consistency, in GD and RM sectors, the strategic level is addressing in higher levels the contradictions, but the tactical level that guides implementation is not addressing it in the same proportion. This was especially true for Panama and Guatemala. Honduras is a country with less consistency in all policy outputs.

In terms of consistency, the results show that when a policy output has a high level of inclusion, consistency will follow up. The only exception was the GD plan of Nicaragua. This is relevant because confirms that if a policy output is drafted from the beginning with higher levels of inclusion, the contradictions between sectorial and adaptation goals could be identified and addressed at a higher level. As in the previous section, the challenge to this specific region is the consistency not in the single policy outputs but between different categories of outputs; the Costa Rican LUP regulation of 2017 is an example of an operative level output failing to follow the level of consistency of the strategic and tactical level documents. This could create contradictions on the implementation level, especially among different levels of public administration units, being the operative level the one that public administrations in the field most likely will be directly following.

Table 10. Degree to which contradictions between the aims of CC Adaptation and other policy goals have been assessed and efforts to minimize them (consistency) in policies in Central American countries on the sectors of General Development, Risk Management, and Land-Use Planning using the framework of Brouwer et al. (2013).

Country / sector		Level of consistency			
Contradictions are ignored		Contradictions are considered and addressed in certain instances	Contradictions are considered and addressed across the board	After careful consideration, no contradictions are found; climate change is seen as an integral part of the agenda.	
Costa Rica	GD			✓Plan (2015)	
	RM				✓Policy (2015) ✓Plan (2016)
	LUP	✓Regulation (2017)		✓Policy (2013) ✓Plan (2013) ✓Policy (2018) ✓Plan (2018)	
El Salvador	GD			✓Plan (2015)	✓Policy (2018)
	RM				
	LUP				
Guatemala	GD	✓Plan (2016)		✓Policy (2015)	
	RM	✓Policy (2011)			✓Policy (2016)
	LUP			✓Guide (2018)	
Honduras	GD	✓Policy (2010) ✓Plan (2015)			
	RM	✓Policy (2013) ✓Plan (2014)			✓Law (2009)
	LUP	✓Regulation (2013)		✓Guide (2015)	
Nicaragua	GD		✓Plan (2017)		
	RM				
	LUP				
Panama	GD	✓Plan (2014)		✓Policy (2017)	
	RM		✓Policy (2010)		
	LUP			✓Regulation (2015)	

Source: Author's elaboration

Table 11. Degree of consistency regarding CC Adaptation in the policy output classification in Central American countries from 1996 until August 2018 using the framework of Brouwer et al. (2013).

Levels of Consistency	Classification of outputs			
	Operational	**Tactical**	**Strategic**	*Total*
Total number of policies under each classification	2	13	12	27
After careful consideration, no contradictions are found; climate change is seen as an integral part of the agenda.		1	4	5
Contradictions are considered and addressed across the board	2	5	4	11
Contradictions are considered and addressed in certain instances		1	1	2
Contradictions are ignored		6	3	9

Source: Author's elaboration

Weighting

Weighting represents the degree to which relative priorities of CC Adaptation compared to other policy goals have been decided (Brouwer et al., 2013). Our analysis revealed a percentage of 63% of the policy outputs to be ranked at a limited level of weighting. When CC Adaptation goals overlap with other sectorial goals we found that it does not take priority over sectorial goals in any of the analyzed documents. In 37% of the policy outputs, other sectorial goals have priority over CC Adaptation, or the priorities have not been yet decided. At the country level, we can see even lower levels of weighting. In Honduras only 29% of the documents take into consideration adaptation goals when overlapping with sectorial ones; in Panama only 50%, and in Guatemala 60%. An example of this is the Guatemalan Action Plan for GD, in which the president explicitly decided the top priorities excluding any mention of CC Adaptation. Nicaragua and El Salvador (even though have fewer documents), along with Costa Rica show higher levels of weighting (See table 12).

When looking at the results by sector, LUP is the one with a higher level of weighting, up to 78% of the documents are taking into consideration CC Adaptation goals together with sectorial ones. For LUP, all documents at the three levels (strategic, tactical, and

operational) present the same level of weighting, and only two regulations fail to do so in Honduras and Costa Rica. The reason for these two failures is that in the Honduran case, non-climate considerations are more important and in the Costa Rican case the relative priorities had not yet been decided. The case of Costa Rica is even more interesting because the regulation itself contains a guide for land-use planning which is making it mandatory to be followed by local authorities. For Honduras, the situation on the paper looks better because the guide was approved in 2015 and has higher inclusion, consistency, and weighting, but in practice, the national authorities have prioritized and made it compulsory for all local authorities to follow the 2010 guide, which fails to include CC Adaptation.

For the sector of GD, 60% of the policy outputs are demanding the consideration of CCAdaptation together with other sectorial goals. In Honduras, both the policy and plan are prioritizing the non-climate goals. In the case of Panama and Guatemala, we can see a contradiction between the strategic and the tactical level, in the sense that the first one presents a higher level of weighting than the latter. In other words, the short-term plans are failing to address CC Adaptation at the same level as requested by the long-term policies because other considerations take precedence.

For the RM sector, 50% of the documents consider CC Adaptation as equally important as sectorial goals. Nevertheless, there are differences at the country level, for example, neither Nicaragua nor El Salvador has policy outputs for the RM sector. In Honduras, the law presents higher levels of inclusion, consistency, and weighting, but the policy and the plan have both failed to address this in detail. For example, even though the Honduran law considered CC Adaptation to be an integral part of the agenda, the policy and the plan approved subsequently have not elaborated further nor evaluated the possible contradictions, or even decided on the priorities. In this case, we see no alignment between instruments at the same level (strategic) and lower level (tactical). The case of Costa Rica represents an alignment between the strategic and tactical levels, both documents consider CC Adaptation goals when overlapping with sectorial ones. In the case of Guatemala, there is improvement within the strategic level, the 2016 policy increased the level of weighting compared to the 2011 one, by considering adaptation goals when overlapping with sectorial ones. (See table 13)

When analyzing all the data collected is clear that when a policy scored a high level of inclusion of CC Adaptation, the results for consistency and weighting are considerably better. This was true for all three sectors and across policy levels (strategic, tactical, and operational), there was only one instance in which this was not the case, a GD plan of Panama with a high level of inclusion had the lowest level for consistency and weighting. By sectors, LUP showed the lowest results, only three countries are integrating CC Adaptation, Costa Rica is the one with the highest inclusion, consistency, and weighting in all policies but with lower scores at the tactical level, the others being Panama and Honduras.

A problematic feature is the lack of alignment between policy levels, in many instances, a strategic document had high inclusion, consistency, and weighting but the tactical

level failed at it, that was the case for the GD sector in Guatemala and Panama. In other instances, is just the operational level the one that is advancing the integration process while the strategic and tactical levels ignore CC Adaptation, such was the case for the LUP sector in Honduras and Panama. This was not expected, it could be the result of certain factors influencing the drafting process of these documents, such as the involvement of international donors, such was the case of Honduras, or the advancement of adaptation-dedicated policies creating momentum for mainstreaming, it seems to be the case in most policy sectors.

Table 12. Degree to which relative priorities of CCA compared to other policy goals have been decided (weighting) into policies in Central American countries on the sectors of General Development, Risk Management, and Land-Use Planning using the framework of Brouwer et al. (2013)

Country / sector		Level of weighting			
		Relative priorities are decided, non-climate considerations are most important	Relative priorities are not decided	Relative priorities are decided, climate change considerations are taken on board when they overlap with other goals	Relative priorities are decided, climate change considerations take precedence
Costa Rica	GD			✓Plan (2015)	
	RM			✓Policy (2015) ✓Plan (2016)	
	LUP		✓Regulation (2017)	✓Policy (2013) ✓Plan (2013) ✓Policy (2018) ✓Plan (2018)	
El Salvador	GD			✓Plan (2015) ✓Policy (2018)	
	RM				
	LUP				
Guatemala	GD	✓Plan (2016)		✓Policy (2015)	
	RM	✓Policy (2011)		✓Policy (2016)	
	LUP			✓Guide (2018)	

Honduras	GD	✓Policy (2010) ✓Plan (2015)		
	RM		✓Policy (2013) ✓Plan (2014)	✓Law (2009)
	LUP	✓Regulation (2013)		✓Guide (2015)
Nicaragua	GD			✓Plan (2017)
	RM			
	LUP			
Panama	GD	✓Plan (2014)		✓Policy (2017)
	RM	✓Policy (2010)		
	LUP			✓Regulation (2015)

Source: Author's elaboration

Table 13. Degree of weighting to CC Adaptation according to the policy output classification in Central American countries from 1996 until August 2018 using the framework of Brouwer et al. (2013).

Levels of weighting	Classification of outputs			
	Operational	Tactical	Strategic	*Total*
Total number of policies under each classification	2	13	12	27
Relative priorities are decided, climate change considerations take precedence				
Relative priorities are decided, climate change considerations are taken on board when they overlap with other goals	2	7	8	*17*
Relative priorities are decided, non-climate considerations are most important		4	3	7
Relative priorities are not decided		2	1	*3*

Source: Author's elaboration

3.3 Vertical interactions between the national and local levels of government

The vertical interactions between national and local authorities are important for mainstreaming, as the quality of the linkages between these two levels determines the success in achieving the expected results (Bauer & Steurer, 2015). In this research, we separate the analysis into two perspectives on the involvement of municipalities: involvement during the phase of drafting the national policies; and, how the national authorities consider them for the implementation phase. It is worth mentioning that the analysis of the implementation phase is subdivided into the role of municipalities for implementation, funding arrangements, and monitoring tasks.

Involvement of municipalities in the drafting process

A common practice in Central America has been to include a subsection within the policy document to describe the drafting process which often includes the stakeholders of the process. In most of the cases, this was sufficient to establish whether or not the municipalities were part of the process. The only shortcoming has been when analyzing the legislation and regulations, as in these documents, the text does not describe which stakeholders are consulted, which is why we were compelled to study the overall results with and without these instruments. Unsurprisingly, the results show that the municipalities have limited involvement in the drafting process in all six countries and the three sectors. The exception is only in two countries, Costa Rica and El Salvador, where we registered a relatively high percentage of active participation of municipalities in half the documents (56% and 50% respectively). In Honduras, we found direct and indirect participation, throughout the national association of municipalities. Panama and Nicaragua only allowed indirect participation in just 20% of the policy outputs. When it comes to analyzing the results from the sectors, the situation is similar for GD and RM but dramatically worse for LUP, which has only 28% of the documents registered with either direct or indirect participation.

When excluding the laws and regulations, in which no register of any participation process was accessible, we saw that the situation improved significantly for some countries but was still persistent in others. For instance, in Costa Rica and El Salvador, direct participation increased to 71% and 67% respectively. Honduras has an important increase in both direct and indirect participation reaching up to 83% (50% is direct and 33% indirect participation). For the other three countries, the situation improved but only marginally, with up to 60% of the documents being drafted without any participation from local governments. (See table 14)

Table 14. Degree of inclusion of municipalities in the drafting process of national policies.

Level of participation in all 44 policy documents assessed			
Country	**Direct participation**	**Indirect participation**	**No evidence of participation**
Costa Rica	56%		44%
El Salvador	50%		50%
Guatemala	29%		71%
Honduras	33%	22%	44%
Nicaragua		20%	80%
Panama		17%	83%
Central America	32%	9%	59%
Level of participation excluding laws and regulations			
Costa Rica	71%		29%
El Salvador	67%		33%
Guatemala	40%		60%
Honduras	50%	33%	17%
Nicaragua		33%	67%
Panama		33%	67%
Central America	47%	13%	40%

Source: Author's elaboration

Role of municipalities for implementation, funding, and monitoring

In contrast with the results of the drafting process, in general, 77% of all documents show that the national authorities consistently considered municipalities as a partner in the implementation of the policy outcomes. El Salvador is the country in which the results show lower levels of this type of consideration, but still close to the regional average (63%); in contrast, Nicaragua did consider municipalities in all their documents. Worthy to be noted is the passive recipient role of municipalities, 20% of all the documents considered municipalities as beneficiaries or must comply with mandates from the national level (passive role). Finally, only in one policy municipalities are absent, this was the case of the law of risk management of Panama.

In terms of sectors, both RM and LUP policy outputs recognize municipalities in the role of partners in up to 85% of the cases. This is not the case for the GD sector in which both the passive and the partner roles are equally divided. When studied by classification of the document in most instances is the tactic level where municipalities have a passive role in this sector. This is not surprising, because the tactical level is a typical top-down kind of policy for this sector. For LUP we have only three instances where municipalities are

considered passive actors: this was the case for two plans (Costa Rica National Urban Plan and El Salvador National Land-use Plan) and the national land-use strategy of El Salvador. We can also distinguish in these that the national authorities mention municipalities, without giving them a clear role, or the municipalities are just mentioned as beneficiaries of different actions that national authorities should undertake.

All policies in all countries and sectors rely on "planning obligations and instruments" as the most important tool for implementation, followed in importance but with fewer mentions by "regulatory measures" and further distant "compensations and governmental support" and "financial instruments". RM is the sector in which the authorities rely on a higher diversity of tools for implementation.

A sound policy output identifies the actors responsible for the actions but also responsible for funding the activities and deliverables. In the case of Central America, we found that almost a third of all documents fail to identify the sources of funding. At the country level, we identified several differences: Nicaragua, up to 80% of all documents, does not clarify the sources for implementation or the possible costs while El Salvador does so in half of its policy outputs. Costa Rica is the only country in which all documents identified the sources of funding for implementation. When studied by sector, RM is the one in which all documents identify the sources of funding. In contrast, up to half of all LUP documents fail to identify the sources. This is especially critical for operational documents where 80% of them did not clarify who should assume the costs of implementation. For GD the situation is similar with 40% of the documents not clarifying the sources of funding. The tactical level of outputs is the second one failing to identify sources with 38% of all documents doing so.

We can consider an indicator of increasing ownership of policy implementation the fact that national and/or local authorities are responsible for the funding and there is not a single document that exclusively requires international cooperation funds.

Local funding from municipalities is recognized in up to 66% of all documents which integrated funding arrangements. Especially for the LUP sector up to 80% of the documents did so, this sector is expected to see a major involvement of municipalities implementing outputs and therefore assuming a part of those costs. The percentages vary across countries for example in Panama the municipalities are only being cited in one document and for the other three only national funds are mentioned. In Nicaragua, the only document that clarifies funding included both local and national funds. In Honduras, all six documents are including local funds as well. El Salvador is the country in which international cooperation funds are identified as sources in most of the policies (75% of them).

Evaluating and reporting advancement on the implementation of policies is a key task, but in Central America up to 39% of all outputs fail to establish any kind of monitoring task, goals, or even the responsible bodies for conducting it. The situation among the countries differs. For instance, while Honduras is the only country in which monitoring is included in all documents (33% of them are a limited monitoring system); in Costa Rica, only one output failed to include monitoring systems. In contrast, in Panama and

Nicaragua, over 80% of policies fail to include monitoring systems or at least delegate such responsibility. Even if in some instances the authorities have established general indications or responsibility to create such systems, we decided to characterize those as limited, as the only countries in which this practice is more common are Costa Rica and Honduras.

By sector, GD is the one with better results, up to 60% of the documents established monitoring systems with clear scope, indicators, and responsibilities. LUP and RM have failed to establish these in up to 40% of their outcomes. In the LUP sector, we found limited systems in up to 30% of the documents. The operational level shows better results with 80% of documents including clear monitoring systems for LUP. The strategic level does not include monitoring tasks in almost 40% of all documents and 35% of the cases just give general indications or mandates to do so, usually delegating in the action plans the task of creating monitoring systems. The problem is that the action plans that belong to the tactical level are failing to comply with this mandate, 44% of all tactical documents failed.

The municipalities are constantly absent when the outcomes create a monitoring system. Only 30% of the documents were included as a partner for monitoring. In the other 11%, municipalities are the subject of evaluation and monitoring by national authorities. At the country level, Panama and Nicaragua never include municipalities, in Costa Rica, 25% of the policies in which municipalities are included are only the subject of the monitoring process. El Salvador is where municipalities are more included as partners for monitoring tasks (60%), followed by Honduras (44%) and Guatemala (33%).

Central America is still in the early stages of mobilizing the public sector to address climate change adaptation. This is particularly true regarding the local level of government where a low level of involvement is portrayed in most policy outputs. This is a key limitation when addressing adaptation because it is place-based, and local authorities are located in the strategic spot for decision-making regarding adaptation, but in Central America, this process is just starting. Outcomes at the local level will be highly dependent on local authorities being able to understand and incorporate (mainstream) adaptation into the local agenda regarding land-use planning, general development planning, and risk management.

4. Discussion and conclusions

This article aimed to fill the knowledge gap on how Central American countries are taking steps to adapt to climate change by mainstreaming it into key sectors, General Development (GD), Land-Use Planning (LUP), and Risk Management (RM). Our research collected information on policy outputs produced for over 20 years: a total of 44 documents were assessed.

The region shows a progressive trend of **inclusion** of CC Adaptation into the sectorial policy outputs. This trend is especially visible after the approval in each country of a dedicated policy on adaptation instructing mainstreaming. With the approval of the

first dedicated policy, 26 out of 30 sectorial outputs in total had considered CC Adaptation either partially or extensively.

Nevertheless, even after the mandate to mainstream CC Adaptation, some authorities approved policy outputs that did not consider climate change impacts and goals. This was the case for El Salvador but also Nicaragua and Honduras in one policy each. In several cases, the new policies integrated CC Adaptation concerns only in a limited manner, as is the case for Honduras and Guatemala, where considerations regarding impacts of climate change or even goals on adaptation are partially addressed, or just mentioned but any further description or even inclusion of actions, activities or indicators are absent. Panama and Costa Rica both show better results.

This eclectic combination of results is also evident among the sectors. While it is clear that the GD sector is leading the way in terms of the inclusion of CC Adaptation, the other two sectors are still approving new policy outputs which are failing to address adaptation as mandated. This is particularly concerning in the case of LUP as this sector is the key to addressing vulnerability and especially limiting new urban development in risk-prone areas and this sector was as well prioritized in the dedicated policies as a key to mainstream CC Adaptation (Segura, 2022).

Regarding **consistency**, one of the other criteria for assessing mainstreaming is when the policy output has extensively considered CC Adaptation it usually addresses the contradictions across the board. In several cases, adaptation is even seen as an integral part of the agenda, which is particularly true for RM. For the LUP sector, it is more common to find mandates for all authorities within the sector to assess and address the possible contradictions of every intervention, balancing both sectoral as well as CC Adaptation goals. Policy outputs assessed as just partially considering adaptation, this usually means that said policy is ignoring the contradictions between sectoral and adaptation goals, therefore when contradictions arise CC Adaptation goals may be ignored in favor of sectorial ones. Both GD and RM are the sectors in which this was particularly evident. By country, El Salvador and Costa Rica are better positioned with higher consistency. Guatemala and Panama can be considered in the middle, while, Honduras and Nicaragua are at a lower level of consistency.

Weighting represents the degree to which relative priorities of CC Adaptation compared to other policy goals have been decided (Brouwer et al., 2013). The results for **weighting** followed the same pattern: when inclusion and consistency are higher the results for weighting are better as well. A total of 16 cases were registered with higher inclusion and consistency, in which climate change considerations are taken on board only when they overlap with other goals (relatively high weighting). However, we did not identify any document in which climate change considerations take precedence over sectorial ones. The LUP sector presented better weighting compared to others, but just in one case non-climate considerations took precedence.

In general terms, mainstreaming is advancing in the region and the degree of advancement is linked with the approval of NAS and climate legislation in every country through which mainstreaming was instructed. Brouwer et al (2013) analyzed a simi-

lar situation in Scotland, where new legislation on climate change and environmental assessment influenced the advancement of mainstreaming. This conclusion also supports what Biesbroek et al. (2010) documented for other European countries.

The creation of specialized units of climate change in institutions or ministries in vulnerable sectors is considered a prerequisite for successful mainstreaming (Biesbroek et al., 2010), as part of this research, no such units were identified in the sectors studied, except for LUP in Nicaragua which did not translate into any progress for mainstreaming. The only document in this sector for Nicaragua approved after the CC Adaptation legislation did not integrate the goals or impacts of climate change into consideration. The creation of said units could support better consistency and weighting results, but from the example of Nicaragua, there is no guarantee that its creation could achieve better results.

As other literature on sustainability policy integration has pointed out, this process usually occurs on a cycle in which certain ideas could form a group of norms. These can aggregate and constitute institutions that will continuously integrate the new policy goals (CC Adaptation) within the mandates and strategy of organizations (Montesano et al., 2023). In the case of the sectors studied here, the process of mainstreaming is moving from ideas to norms but has not yet reached a higher level of institutionalization within the key departments. This could potentially limit achieving the outcomes expected from the mainstreaming process.

Another key aspect of mainstreaming is the fact that 11 policy outputs have poor results in consistency criteria. Consistency relates to contradictions between the CC Adaptation and sectorial goals, if it's assessed and efforts are taken to minimize them, possible conflicts and trade-offs could be attended achieving better adaptation results. Wong and van der Heijden (2019) studied how bureaucracies avoided conflict and trade-offs while conducting sustainability policy integration. This behavior of conflict avoidance was studied in three countries (Finland, Germany, and the Czech Republic), leading to the identification filtering (avoiding) issues in which the actors know too much or too little about them, the issues are too political, the deliberation is too abstract or the bar for consensus is too high. When such issues were encountered they were discarded, focusing on those promising less resistance, therefore resulting in just minor improvements.

For Central America, the fact that so many policy outputs that did include CC Adaptation failed to address consistency, may be an indication of avoidance behavior. This is highlighted by the fact that 10 of these outputs have poor results regarding weighting, either prioritizing nonclimate considerations or not deciding on priorities. This resulted in limited efforts of policy integration, backing some of the ideas of Wong and van der Heijden (2019)

Alignment between policy outputs of different categories is a key determinant for mainstreaming to work in the field. The documents in this research were categorized into **strategic, tactical, and operational levels**. Only the first two levels were documented for the GD and RM sectors, LUP is the only sector that provides operative-level

outputs. Only in the case of Honduras for the RM sector, did we notice alignment problems between the law (high inclusion moderately high consistency, and weighting) and the policy and action plan in which CC Adaptation was partially considered but did poorly on consistency and weighting. In the case of the LUP sector, we identified more cases with contradictions, both Honduras and Costa Rica approved operational and tactical instruments that either failed to include CC Adaptation or partially did it, failing on consistency and weighting. Hernantes, Gimenez, Sarriegi, and Labaka (2019) have developed and applied a model for analyzing the level of organizational maturity to implement resilience. In their model, failing to sustain adaptation action in different categories of policy outputs is a reflection of a lower level of organizational maturity. In this sense, the results documented for Central America's countries are a reflection of a low level of maturity in integrating climate change into the three sectors under study.

Vertical integration is considered key to improving coherence among different levels of government, in the case of Central America the analysis reflects mixed results. There is not a clear connection between policies integrating CC Adaptation and more participative drafting processes. In all countries, policy outputs drafted in participative processes, including municipalities, have failed to integrate climate change. Subsequently, outputs integrating climate change were approved without the participation of municipalities. What is clear is that in almost all countries and all outputs, the municipalities are considered either a partner for implementation or passive recipients of the actions planned at the national level. These policies show that a top-down approach tends to be more common in the mainstreaming process in Central America.

The OECD (2002) prerequisites were key in studying the institutionalization of CC Adaptation both in Europe and Central America (Biesbroek et al., 2010; Segura et al., 2022). The study by Montesano et al. (2023) commented previously also allows for a greater understanding of how the advancement of the prerequisites can be a signaling of advancement from ideas and norms to reach institutionalization. Nevertheless, this process has yet to reach maturity in the three sectors here studied.

Central America is progressing in the process of mainstreaming climate change adaptation. Nevertheless, this progress is still in the early stages and shows important gaps that require attention to ensure not just better outputs but long-term outcomes conducted to improve the adaptation levels of the region. Two key aspects are the main gaps, first; the levels of consistency need to be improved, especially between different categories of outputs, in other words, alignment between strategic, tactical, and operational levels. Otherwise, the progress will be hindered by inconsistency.

Second, adaptation is place-based, it requires an understanding of the local contexts, in this sense, local authorities play the most important role to ensure progress in the field, but in CA this level of government is still absent or dormant. Increasing the consistency of the operative level requires an important transfer of knowledge, resources, and instruments to the local administrations, but is at the operative level where results are still more fragile.

The level of centralization of Central America countries could be an important limitation to overcome. Countries such as Nicaragua and El Salvador are transiting toward more authoritative regimes. It will be important to assess if this could limit adaptation progress at the local level of government. In the case of Guatemala and Honduras, problems are related to corruption, impunity, and governance. This is also a key limitation to ensure the implementation of the policy outputs. Costa Rica and Panama are better positioned in that sense, nevertheless, the economic limitations from the effects of the covid-19 pandemic and the current oil and food prices, are relegating environmental and adaptation goals from national authorities. All these aspects were not part of our framework but we recognized them as real threats that could affect the implementation of the adaptation agenda built in recent years. Subsequent research should assess the outcomes achieved so far.

Runhaar et al. (2018) in their study of mainstreaming detected that developing countries share as a common element limited or partly effective mainstreaming outputs. They connected this result with the need for more robust mainstreaming strategies and difficulties to sustain adaptation practices. Consistency was also mentioned as a limitation for mainstreaming CC Adaptation in the least developed countries in South and Southeast Asia. Saito (2013) detected that Bangladesh had achieved better results thanks to enhanced coordination among key ministries with an active enrolment of the highest authorities, recognition of mainstreaming work, and the use of previous experience for gathering lessons.

Adaptation is recognized as a learning process, that requires constantly assessing progress, tracking lessons learned, and planning again. This process in Central America seems to be gathering momentum, but it will be very important to assess the level of implementation of the policy outputs here analyzed. The knowledge of what did work and what not should be put to use in the following wave of policy development. These possible areas of future research can contribute to expanding the knowledge on how stakeholders at the local level "unpack" these outputs coming from higher governmental levels and integrate them into the local planning processes and development. This could also be complemented by using maturity models to support the self-assessment process and guiding local authorities toward understanding the limitations and possibilities ahead to keep adapting to climate change.

However, we recognize that our research and its results do not come without limitations such as the fact that we chose an approach centered around the official policy outputs rather than direct interviews with informants from the public institutions and experts in the field. In some cases, we discussed it with representatives of the Ministry of Environment and the units of climate change but in most cases, this option was very scarce. We acknowledge the fact that we limited our research on policy outputs and not on outcomes, but for reasons such as time constraints and for keeping our goal we actively decided that the research on the outcomes should come as part of upcoming research. Such future research could contribute to comparing specific cases in the field with how these outputs are being implemented, what projects have been derived from these, and how local authorities are incorporating climate adaptation into the land-use plans.

PART 2:

Framework of analysis and results of the local cases

OVERVIEW AND CASES DESCRIPTION

This thesis has studied five cases, using the framework developed in Chapter 4. The two original cases were Upala in Costa Rica and San Francisco del Valle de Ocotepeque in Honduras; the results of these two cases are analyzed in depth as part of that chapter. These cases belong to the same region (Central America) and are two rural municipalities located in border areas.

The other three cases are all located in Western Europe; these are Porto in Portugal, Bologna in Italy, and Zaragoza in Spain. The results for these three cases are compared in Chapter 5. Chapter 6 brings a comparative analysis of all five cases with a discussion regarding the overall findings and results.

CHAPTER 4: THE INFLUENCE OF FRAMING ON THE GOVERNANCE OF CLIMATE CHANGE ADAPTATION AND RISK MANAGEMENT AT THE LOCAL LEVEL: THE CASES OF UPALA IN COSTA RICA AND SAN FRANCISCO DEL VALLE DE OCOTEPEQUE, HONDURAS.

Based on Segura, L., & Bonilla, A. (2023). The Influence of Framing on the Governance of Climate Change Adaptation and Risk Management at the local level: The Cases of Upala in Costa Rica and San Francisco del Valle de Ocotepeque, Honduras. Relaciones Internacionales, 96(1), 191-227. https://doi.org/10.15359/ri.96-1.10

Abstract

Climate change is one of the main global challenges of the 21st century. The international agenda has come a long way since the approval of the United Nations Framework Convention on Climate Change. The international community has understood that the mitigation agenda will not be enough to address the problems associated with climate change and the latest international instruments have incorporated adaptation as a central issue in the response to it. States have been approving Nationally Determined Contributions within the framework of the Paris Agreement. In these contributions, the generation of public policy to promote adaptation at the national level has been established as a central element. However, a fundamental challenge of adaptation is that it must be studied and developed locally; therefore, national, and international instruments can stimulate and promote these processes. Nevertheless, it will be the local authorities and actors who will determine the progress of these processes.

This article focuses on analyzing the influence of actors and their frames of reference in local planning processes and the integration of adaptation to climate change. We studied the cases of Upala, Alajuela in Costa Rica, and San Francisco del Valle de Ocotepeque in Honduras, to understand how these frameworks influenced the development of local public policies that integrated risk management and climate change adaptation measures.

The results show that the referential frameworks of the actors influence how risk and climate change are understood and the assessment of the measures that were included in the local plan. Thus, using comparative case studies applied to countries is a key tool for analyzing international phenomena. Although adaptation is a locally led process, its study, practice, and instruments that facilitate its progress demand research processes that allow the different practices and associated problems to be compared internationally. From the international relations agenda, the study of these adaptation practices of different countries is a key tool in the study of the international agendas for adaptation and response to climate change.

Keywords: Climate Change Adaptation, Honduras, Costa Rica, framing theory, territorial planning.

Resumen

El cambio climático es uno de los principales retos globales del siglo XXI. La agenda internacional ha avanzado mucho desde la aprobación de la Convención Marco de las Naciones Unidas sobre el Cambio Climático. La comunidad internacional ha entendido que la agenda de mitigación no será suficiente para atender la problemática asociada al cambio climático y los últimos instrumentos internacionales han incorporado la adaptación como un tema central en la respuesta a este. Los Estados han aprobado Contribuciones Nacionalmente Determinadas en el marco del Acuerdo de París. En estas contribuciones se han establecido como elementos centrales la generación de política pública para favorecer la adaptación a nivel nacional. Sin embargo, un reto fundamental de la adaptación es que esta debe ser localmente estudiada y desarrollada, por ende, los instrumentos nacionales e internacionales pueden estimular e impulsar dichos procesos, no obstante, serán las autoridades y actores locales los que determinarán el avance de estos.

Este artículo se centra en analizar la influencia de los actores y sus marcos de referencia en procesos de planificación local y la integración de la adaptación al cambio climático, estudiando los casos de Upala de Alajuela en Costa Rica y San Francisco del Valle en Honduras, con el objetivo de comprender cómo estos marcos influyeron en el desarrollo de políticas públicas locales que integraron medidas de gestión del riesgo y adaptación al cambio climático.

Los resultados demuestran que los marcos referenciales de los actores influyen en la forma en que se entiende el riesgo y el cambio climático y en la valoración de las medidas que se incluyeron en el plan local. En Upala los actores más críticos demostraron tener una influencia primaria "individualista" que incidió en una baja percepción del riesgo y una mayor aceptabilidad del "status quo". Ello contrastó con la perspectiva "jerarquista" del gobierno local, esto derivó en un bloqueo al proceso. En el caso de San Francisco del Valle la combinación de un proceso altamente participativo, sin características normativas de regulación, y con un balance casi perfecto entre las perspectivas "jerarquista" y la "igualitaria" entre todos los actores favorecieron un proceso sin gran conflictividad que derivó en la adopción del Plan de Desarrollo Municipal. La inclusión del cambio climático surgió de las personas participantes del proceso como un tema de gran relevancia ambiental y económica para el cantón.

Palabras clave: Adaptación al Cambio Climático, Honduras, Costa Rica, teoría de marcos de referencia, ordenamiento territorial

1. Introduction

"Climate change is currently affecting all countries on all continents" (United Nations, 2019). From melting permafrost and heavy precipitation to droughts, floods and wildfires, these are just a few of the plethora of consequences that have already begun to be experienced around the world and will continue to worsen in the impending future (Pietrapertosa et al., 2018). Since it is no longer about avoiding CC at this point, the IPCC emphasizes the urgency of adaptation, recognizing that precautionary and anticipatory measures are more efficient and cost-effective than last-minute emergency solutions (Maslin, 2014).

Taking this into account, CC Adaptation policies that aim to guide response to the risks and impacts caused by CC (McNeeley & Lazrus, 2014) have become particularly popular (Pietrapertosa et al., 2018). Notwithstanding, only recently has adaptation gained momentum and become important in national public policies (Pietrapertosa et al., 2018). This trend has also reached Central American countries with a growing number of approved policies (Segura, Van Zeijl-Rozema, & Martens, 2022).

When conducting CC Adaptation and risk management processes, decision-makers must answer questions such as whether to adapt, what to adapt to, when, how, who should adapt, and who should pay for the costs of adaptation. These and other questions that appear in the process are laden with normativity, where the participating actors in these processes interact to guide the answer to these questions according to their own frames of reference.

Schön and Rein (1994, p. 23) define frames of reference as "structures of belief, perception, and appreciation"; McEvoy et al., (2013, p. 281) conceptualize them as a process where "people with different knowledge, experiences, and personal backgrounds consider a common challenge and try to *understand* it from their individual or organizational viewpoint." "Framing" or constructing a frame of reference is connected with how an actor comprehends a situation, process, or even a problem. *Understanding* is directly related to prior knowledge, values, and the perspective of the actor himself. Two actors are perfectly capab le of understanding the same situation very differently, even with the same information available, because of different backgrounds, values, or perspectives.

When actors face a situation in which they approach it with completely different and even opposing frames, intractable controversies arise (Schön & Rein, 1994); these are conceived by Hisschemoller and Hoppe (1995) as unstructured problems, or moderately structured problems, based on the (un)certainty of relevant knowledge and the agreement (or lack of it) on norms and values. Actors who frame the problem with opposing viewpoints generally disagree on the relevant knowledge or the norms and values associated with it, often turning the policymaking process into an unstructured problem.

In this sense, adaptation processes have been shown to encounter a growing number of barriers, many of which are especially focused on the social and institutional dimensions of adaptation. These barriers have been defined as the arrangement of climatic

and non-climatic factors that emerge from the actors, the governance system, or the system under study (Biesbroek et al., 2013. P. 1119). Thus, studying frames of reference could give us clues into how they affect the relationship between actors and the governance system that facilitates or hampers the implementation of CCA measures and strategies.

This article intends to study the frames that actors bring to the decision-making processes, where the inclusion of risk management and adaptation to climate change measures is assessed. That is to say, the present article analyzes the management of a variety of actors and their frames as well as their influence on the adoption of said measures.

To achieve this objective, the article consists of two case studies. First and foremost is the adoption process of a land-use plan in Upala, Alajuela, Costa Rica, and the second one is the adoption process of the Municipal Development Plan of San Francisco del Valle de Ocotepeque, Honduras. In both cases, local actors deliberated and valued aspects of risk management and adaptation to climate change. In the first case, various social groups pressured local authorities to reject the implementation of the plan, whereas in the second case, the interest of social actors aided in the incorporation of risk management and adaptation elements, which in turn caused the approval and implementation of the plan.

In this way, both processes show how frames devised by the actors determined the process of constructing public policy with different results. The adaptation processes are determined and constructed locally. Even if States and the international community influence said adaptation processes via national policies, international agreements, or through international cooperation (as it was reported in both cases), it is still the local actors and their local governance processes that will most influence their success or failure (Nalau, J. et al., 2015).

Adaptation case studies allow an understanding of how these processes are developed, and by making use of theoretical instruments, it is possible to understand trends and patterns that can be used to guide future adaptation processes more effectively by integrating them into international cooperation processes, which is a hallmark element of the study of international relationships.

2. Methodology

According to Schön and Rein (1994), there are three different levels of action frames. First is the macro level, which comprises the metacultural frames based on a system of values or beliefs (McEvoy et al., 2013). This framing level refers to values and beliefs often seen through media. These influence research, policies, and decision-making (Fünfgeld & McEvoy, 2011).

The second framing level is political or conceptual, where actors "construct the problem", that is to say, they define the problem, concepts, and theories on how to approach and solve said problem (McEvoy et al., 2013; Schön & Rein, 1994). This level is re-

lated to different communities or institutional networks that share values, concepts, and methods, among other elements that allow them to evaluate a topic, define the problem, and construct a solution. Public domains like climate change adaptation and public planning are vast enough that different communities or institutional networks compete to lead the process with their own concepts, theories, and methods.

The third level is defined as institutional or operational framing. Schön and Rein (1994) describe it as "naturally complex and hybrid" because of the lack of a general framework; practically different related frames interact at this level, they are the "local expression of metacultural frames". For McEvoy et al. (2013), this is the practical level where "decisions and actions are taken". This framing level is directly related to the design of the planning process, the strategies and tools chosen to implement it, the products and results of the process, as well as the definitions of the actions to be taken subsequently. Table 15 summarizes the theoretical framework, followed by its application to the case studies.

Table 15. Summary of the theoretical framework applied

Levels of framing	Determinants of the level	Research orientation
MACRO	System of values and beliefs	Cultural Theory was used to arrange key actors based on four classifications: egalitarian, individualistic, hierarchical, and fatalist (Thompson, 1990; Verweij et al., 2006).
CONCEPTUAL	Conceptual theorizing applied to CC Adaptation	National and local policies were systematized into three conceptual orientations of CC Adaptation: resilience, vulnerability, and risk (Eakin et al., 2009; McEvoy et al., 2013).
OPERATIONAL	Decision-making and operationalization of the process	Cultural Theory and conceptual orientations were both studied in the construction and discussion process of the local plans. Source: Adapted from McEvoy et al., 2013.

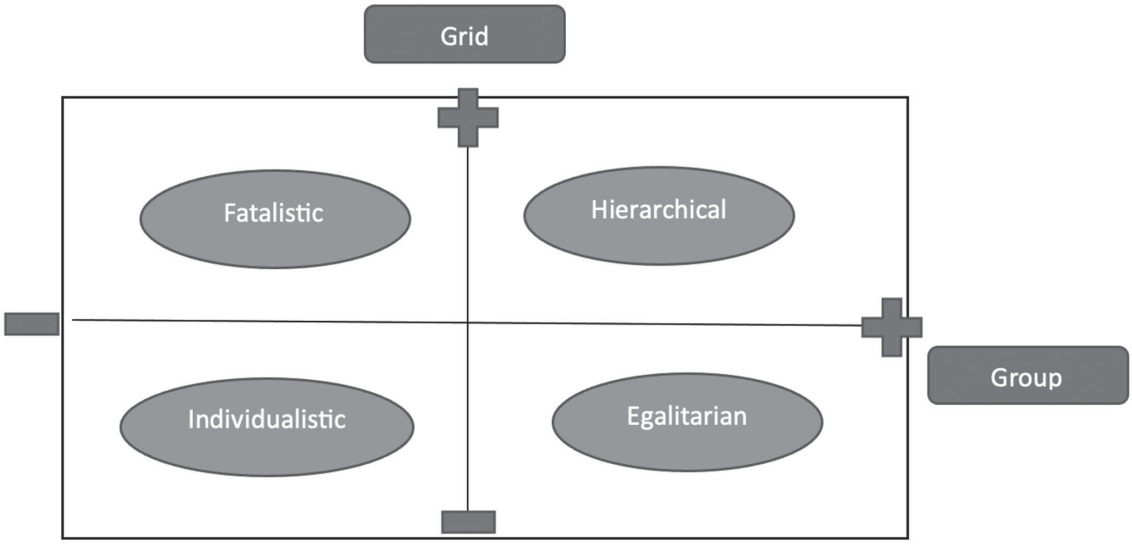
Source: Own elaboration

To apply a frame analysis to the case studies, it was determined that the macro level would be analyzed through *Cultural Theory* which sees culture as essential for explaining social life (Mamadouh, 1999) while it is also perceived as an effective tool for classifying, analyzing, and interpreting people's behavior based on their ways of life (Offermans, 2012). Culture can be defined as "the range of learned ideas and behavior patterns that people acquire, share, and modify as members of a society" (McNeeley & Lazrus, 2014, p. 506).

Cultural Theory presents two different dimensions of social life called group and grid. Group and grid analysis is relevant to understanding how various types of cultures perceive CC at the meta-level of framing. Group dimension analyzes "the extent to which a primary commitment to a social unit restricts individuals' thought and action" (Douglas, Thompson, and Verweij, 2003, p. 100). See Figure 5.1.

Conversely, the grid is related to the "level of restrictive prescriptions; life is less open to individual negotiation the more restrictive the prescriptions are" (Offermans, 2012, p.37). In other words, the group analyzes how people are integrated into a wider social environment while the grid studies how people are classified and regulated (Verweij et al., 2011). After understanding if these dimensions are registered as high or low, it is possible to draw four perspectives to understand society and its cultural diversity representation (Mamadouh, 1999). Precisely, one of the statements of Cultural Theory is that the four possible combinations of the two dimensions are both universal and representative of the nature of a social being (Mamadouh, 1999).

Figure 4.1: The Grid-Group Analysis of Cultural Theory



Source: Adapted from Thompson (1990)

Figure 4.1 is comprised of four quadrants, each representing four ways of living discerned according to the strength of the group and the grid: hierarchism, egalitarianism, individualism, and fatalism (Offermans, 2012). Each way of living has a specific topic approach, such as natural resources and human nature, even for CC and adaptation. Group and grid analysis, employment, along with the myths of nature, are key for exploring how different types of cultures understand climate change on the meta-level of the frame. Table 16 summarizes the aforementioned information.

Table 16. Representation of the four perspectives -or ways of life- of Cultural Theory and their view on nature and CC.

Fatalistic: It encompasses the most isolated, vulnerable, and displeased members of society and institutions. They see nature as capricious while also being distrustful of others. This perspective can't be prepared or learned while only reacting to external effects. Religious perspectives that detect adverse events as the will of God belong to the Fatalistic way of life. This group is seen as inactive, vulnerable, and generally absent in decision-making. They don't provide solutions regarding CC.	**Hierarchical**: They have faith in believing CC will be solved by leaving it in the hands of experts belonging to special institutions. They consider CC to be a problem, but not an urgent problem. They see nature as tolerant within certain limits. Control and regulation are considered important tools, meaning they require adroit knowledge to determine the limits to apply. Members of this group often prefer solutions based on regulations and technology.
Individualistic: To some degree, members of this group are skeptical about CC and its longer-term consequences. They believe in the human capacity as a limitless source to find technological solutions to issues. They tend to see nature as benign, and they have an attitude that invites and accepts risk. CC is seen as a technical affair; for that reason, they prefer solutions derived from the market. Other factors related to the market, such as resource prices and innovation, are believed to create good conditions to solve CC.	**Egalitarian**: They recognize CC as an urgent matter created for the most part by an overconsumption society, such as the one seen in industrialized countries, which are known for exploiting natural resources. Because of the urgency and dangers of Climate Change, they believe the only solution is to make changes in society by significantly curbing CO_2 emissions and by making essential changes in human behavior. They perceive nature as fragile while also rejecting the idea that CC can be corrected through technology or the driving force of the market.

Source: Adapted from Figge, L. (2017); Jones (2011); Pendergraft, C. (1998); O'Riordan and Jordan (1999); Thompson (2003); Xue et al (2016); van Asselt, M. (2000).

The works of Eakin et al (2009), Fünfgeld and McEvoy (2001), and McEvoy et al. (2013) were instrumental in the effort of approaching the conceptual level. Their work allowed the classification and portrayal of the main conceptual frames of reference, which are used to drive the development of policies and adaptation procedures. Table 17 summarizes and compares all three conceptual frames of reference. The first, and most dominant, is the adaptation based on risk management; the second is the adaptation established on vulnerability linked to the school of studies for development; and the third conceptual frame is the adaptation based on resilience.

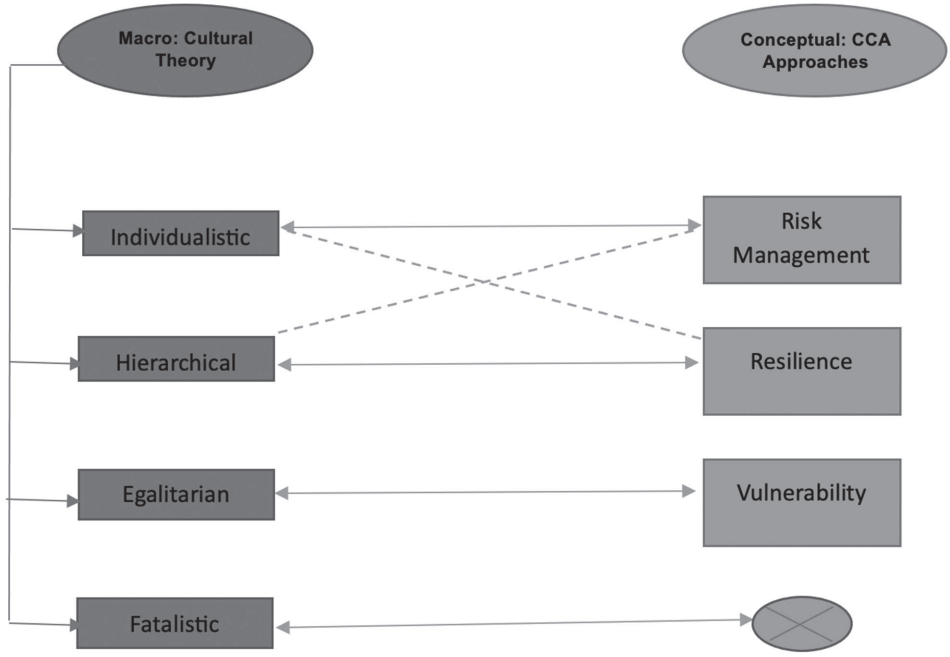
Table 17. Implicit exchanges in the development of climate policies using risk management, resilience, and vulnerability approaches.

Criteria of the process	Theoretical-conceptual approach to CC Adaptation		
	Risk-based adaptation approach	**Vulnerability-based adaptation approach**	**Resilience-based adaptation approach**
Special scale of implementation	Sector-focused (e.g., water, agriculture, etc.)	Places, communities, groups, ecosystems, etc.	Large-scale coupled socio-ecological systems (e.g., populated watersheds).
Timeframe of implementation	Short or medium-term future risks.	Past and present vulnerabilities.	Long-term future.
Actors	Public-private partnerships	Public sector and vulnerable groups	Civil society and the public sector.
Policy objective	Address known and evolving risks.	Protect populations most exposed to experiencing harm.	Improve system capacity for recovery and renewal.
Expected outcome	Maximize loss reduction at the lowest possible cost.	Minimize social inequity and maximize the capacities of disadvantaged groups.	Minimize the probability of rapid, unwanted, and irreversible changes.

Source: Own elaboration based on Eakin et al. (2009)

In practice, the combination of Cultural Theory with conceptual framing allows the establishment of relationships between them by uniting different macro-level perspectives with conceptual levels based on their main elements. In this way, the following relationships emerge: a) individualistic, it has strong ties with the adaptation approach relying on risk management, preferring tools and solutions connected with incentives or risk reduction strategies as well as the possibility to transfer adaptation; b) hierarchy, is strongly linked to resilience adaptation methods by focusing on regulation and control processes; c) egalitarian, connected with an emphasis grounded on vulnerability, as such, it will promote transformation that specifically serves vulnerable groups and nature; d) fatalistic, it doesn't associate with any approach in particular since it does not believe that is worth acting; e) Individualistic, it couples lightly with adaptation based on resilience, giving great emphasis to public-private alliances, self-regulation, and incentives for innovation; f) hierarchical, lightly tied with adaptation established on risk while emphasizing zoning instruments, construction codes among other regulations, and actions regarding risk reduction. Figure 4.2 depicts these relationships.

Figure 4.2: Relationships between Cultural Theory perspectives and CC Adaptation approaches.



Source: Own elaboration

An analytical framework was created using the previous elements. This framework explores the influence of the three levels of analysis present in the frames (meta, conceptual, and operational) in public policy and the inclusion of CC Adaptation. Qualitative data were gathered by studying national policies regarding adaptation, risk management, and land-use planning of Costa Rica and Honduras, including those of the municipalities of Upala and San Francisco. The selection of these cases followed several criteria. First, it was decided to select a case with a successful approach (San Francisco) and one with a failed approach (Upala). This would allow for comparing the results using the previously formulated conceptual theoretical instrument. Plus, both Upala and San Francisco are rural municipalities near the border with a proportionally similar territory size in terms of population and levels of economic growth. Moreover, both planning and processes were supported by international cooperation institutions, including Japan's International Cooperation Agency (JICA) in the case of Honduras. Costa Rica received aid from the Spanish Agency for International Development Cooperation (AECID).

Interviews with relevant actors were performed throughout the research project. To be more precise, 11 actors were interviewed for each municipality, including local authorities such as mayors, municipal committee members, district advisors, community representatives, municipal technicians, national-level authorities, and local leaders. In-

terviews followed a semi-structured process using a shared guide across all interviews, in which questions about the planning process, the chosen approach, participative processes, and results and limitations of the process were integrated. Moreover, direct questions regarding the actors' CC perception were added to provide a clear identification of the Cultural Theory perspective on the topic. A survey to discern the relationship between distinct frames and environmental topics was included, which has been developed and applied in multiple environmental study cases (Meader, 2002).

Regarding the interview analysis, all interview transcriptions were first encoded based on the four aforementioned Cultural Theory perspectives using the last section as a descriptor. Each researcher recognized in the transcriptions the references that are linked with a particular perspective (to exemplify, the egalitarian perspective). These references were then copied and incorporated into a chart that also had the associated perspective and a researcher's comment explaining why that perspective was assigned. To accomplish validation of this method, a randomly chosen transcription was processed by a different researcher, ensuring the researcher followed the same analysis method. The results of the analyses were then contrasted to identify differences that could hamper the study.

The interviews with each actor could show references related to several perspectives. Thus, it was imperative to discern if the interviewee had a preference for a specific perspective (to illustrate, the interviewee's answers could be more related to the hierarchical perspective than to the other perspectives). Based on the work of Beumer et al (2018), the percentage that each perspective received in all transcriptions was calculated, and then it was considered that each world vision could have 25% of the reference total, attaining a perfect balance. For this reason, in the present study, a perspective will be considered dominant when it obtains a score over 37.5% and secondary if the score is lower than 12.5% (12.5 ± [25*0.5]).

Secondly, the present analysis was based on Meader's work (2002), who applied questionnaires in his research on environmental worldviews using Cultural Theory. Every interviewee answered the survey, consisting of four items for each perspective (16 in total). The interviewees had to mark each item on a five-point Likert scale with the following categories: completely disagree, disagree, neither agree nor disagree, agree, and completely agree. The percentage of each cosmovision was determined, and then the same grading values previously described were applied in hopes of identifying which perspective was dominant and which perspectives were secondary. Then, to test the trustworthiness of the Cultural Theory analysis made on each interviewee, the results of both research instruments were compared.

3. Results for each case

3.1 Upala's Case, Costa Rica

Upala is the thirteenth municipality of the province of Alajuela, Costa Rica. It borders Nicaragua. It has an extension of 1580 square meters and an estimated population of 43.653 people (Municipalidad de Upala, 2012a). This municipality has a strong agricultural calling. In 2019, Upala presented a Municipal Human Development Index of 0.635, reaching, in fact, one of the lowest indexes in the country. Regarding climate risk, 11% of its territory is at flood risk, including 1,2% of its land being prone to lahars. Authorities also discovered drought damage in the area (similar to the drought damage caused in 1998) (Municipalidad de Upala, 2012b). This municipality is highly vulnerable due to its low social development. Its high agricultural calling makes its economy susceptible to extreme external hydrometeorological events, including its high exposure to floods. Plus, Hurricane Otto affected Upala directly in 2016, highlighting the risk exposure of the municipality.

Upala's case is related to the construction and approval process of the Upala Regulatory Plan (land-use planning) between 2010 and 2014. This process, headed by the Municipality of Upala, counted on the financial support of the Spanish Cooperation AECID, in tandem with the Geography Department of the Universidad Nacional de Costa Rica as the technical institution responsible for the studies of the area.

The construction process of this plan needed the recognition of a series of risk management-related factors, to be more precise, the locally coined term "Índices de Fragilidad Ambiental (IFAS), translated to Environmental Vulnerability Index (EVI) for this study. Not only were risk management factors grounded on the EVI needed, but also CC information was required to continue the plan.

Aiming to study the context of applicable public laws and policies, it is necessary to present the following laws and policies approved during this period:

I. Ley Nacional de Emergencias y Prevención de Riesgo (National Emergency and Risk Prevention Law) No.8488, dating 22/11/2005.

II. Estrategia Nacional de Cambio Climático (Climate Change National Strategy) approved in 2007.

III. Manual de Instrumentos Técnicos para el Proceso de Evaluación del Impacto Ambiental (Manual de EIA) (Technical Instrument Guidelines for the Assessment of Environmental Impact) - Part III Executive Order 32967 20/02/2006.

Documents related to Upala's Land/Use Plan proposal

The National Emergency and Risk Prevention Law didn't include adaptation to CC in its objectives or the actions mandated. Notwithstanding, it does include, as a competency of the National Emergency Commission, to assist municipalities with information regarding risk management conditions for land-use planning procedures (Article 14, point h).

Regarding the Climate Change Strategy, which was established in 2007, although it included actions related to CC Adaptation, it was more focused on curbing CC to achieve the goal of becoming carbon neutral in 2021. Despite conveying more interest in carbon neutrality, the information in this document does show concern about the growing necessity to adapt several sectors as a priority, without considering land-use planning. In other words, there was no mandate to integrate CC into the laws and regulations for land-use planning.

The only document that entails the duty to tackle CC in tandem with land-use planning was the Technical Instrument Guidelines for the Assessment of Environmental Impact. In Appendix 1, point 5.9.4 section d, it is declared that:

> *"d) Life zones, including the most recent climatic and bioclimatic data available for the study area. To the extent that data is available, the climate change factor will be taken into account as part of the evaluation, and in particular, the vulnerability of water bodies and the life they support to said condition linked to the situation of the planetary atmosphere.*
>
> *In consideration of the characteristics of these variables, they will not be integrated with the IFA qualification. They will be included as part of the map and the table of limitations and technical potentialities as information for decision-making" (P.16).*

Point 5.13.2 of this same document refers to soil use and overuse as well as environmental carrying capacity. Section a), authorizes that a CC variable must be included when approaching topics related to water as explained below: "a) Source of water, with particular emphasis on the water for human consumption (taking into account climatic factors -including vulnerability to climate change-, both for surface and groundwater) (P.19).

It is essential to understand that although CC variables are now part of environmental studies, their inclusion is limited by normative limits, provided that there is existing information or studies in the area where land-use planning will take place. Interviews with the technical team that conducted the research reveal that they didn't have local or regional CC scenarios available to inform the process. Even so, they added risk analysis tools that ordained that normative at that moment, which took into consideration the hydrological variable (point 5.5), slope stability analysis (point 5.6), natural threat factor (point 5.7), and the inclusion of more factors (point 5.8) until finally adding anthropological, biological, and edaphological elements.

Continuing with the documents related to the Upala Land-use Plan, the following texts were checked:

- Regulation on Sustainable Development
- Environmental scope
- Zoning regulation

None of these texts incorporated any aspect connected with CC, as several interviewees already stated. On the other hand, concrete actions in risk management were integrated. It is also necessary to highlight how much this sector has greatly influenced the creation of conceptual frames and adaptation tools, as well as actions for risk management that bring forth co-benefits related to the subject matter of adaptability. Risk management actions added to the documents are detailed in the table below.

Table 18. Inclusion of risk management elements found inside the texts of Upala's Land/Use Plan proposal.

Plan Document	Incorporated Risk Management Elements
Regulation on Sustainable Development, Article 19	It conveys general directives that the municipality ought to follow to address risk management effectively. These directives include discerning, limiting, restricting, and prohibiting infrastructure construction in risk zones prone to suffering from floods, landslides, and other pertinent dangers. It also restricts anthropogenic activities related to lahars while also implementing risk management plans in communities likely to suffer from weather inclemency and environmental risks. It establishes an infrastructure maintenance plan focused on mitigation in the event of natural disasters.
Regulation on Sustainable development, article 29	It includes a risk prevention strategy to encourage urban growth in Upala. P.74-75.
Regulation on Sustainable Development, article 47	It has remedial environmental directives according to the level of environmental frailty of the territory, especially focused on flood probability in the most important rivers, as well as volcanic threat, and landslide and avalanches. P.97-98.
Environmental scope document	It entails the results of the diagnostic previously applied. More specifically, the latest results in terms of impacted environmental factors about threat vulnerability, including both natural and anthropogenic threats. In this section, it is recognized that 11.7% of Upala's territory is under flood risk while also having 1.2% of its land susceptible to lahars. P.25-28
Environmental scope document	Section 1.4.5 about natural disasters and risk management lists the concrete zones with the risk of suffering floods and lahars. P.43.
Zoning regulation article 10	Corrective ordinances are created according to the results of the diagnostic in terms of territorial frailty. Flood, avalanche, and landslide guidelines stand out more than the rest. P15-17

Zoning regulation chapter XXVI	Locates areas susceptible to lahars. It also limits the zones with this type of risk while giving plans of action and labeling territory based on conforming and non-conforming soil use.
Zoning regulation chapter XXVII	Pinpoint's locations with a high flood chance. Moreover, it determines the extension of the risk area as well as conforming and non-conforming soil use and the respective mitigation procedures.

Source: Own elaboration based on the documents of the Upala Land-use Plan (Municipalidad de Upala, 2012b, 2012c, and 2012d)

As can be seen in the previous chart, the studies duly determined the latent risks in the municipality. Risk zones were determined, and management guidelines were listed by identifying common natural disasters in the area. Authorities developed their local normative draft containing valuable information on how to contain and curb future risks. Notwithstanding, the possibility of new risks and future risk levels heightened by CC was not considered in said draft.

Analysis of the results of the actors interviewed by type of actor, profile according to the interview, and the survey

Based on the results of the interviews and the questionnaires, the actors showed different perspectives on the issue. This information is detailed in the table below:

Table 19. Interview and survey analyses results to determine the actors' dominant and secondary perspectives in the Upala case.

Actor	Interview	Interview Result	Survey Result
Academia	CR-01	Hierarchical 83% (dominant) Fatalistic 17% (secondary)	Hierarchical 38% (dominant) Egalitarian 33% (secondary)
	CR-07	Hierarchical 63% (dominant) Egalitarian 21% (secondary)	Hierarchical 32% (dominant) Egalitarian 32% (secondary)
Municipality personnel	CR-02	Fatalistic 47% (dominant) Hierarchical 33% (secondary)	Hierarchical 35% (dominant) Egalitarian 33% (secondary)
	CR-04	Hierarchical 67% (dominant) Egalitarian 17% (secondary)	Hierarchical 38% (dominant) Egalitarian 31% (secondary)
Private sector	CR-03	Individualistic 39% (dominant) Egalitarian 35% (secondary)	Egalitarian 34% (dominant) Hierarchical 29% (secondary)

Political leaders	CR-05	Egalitarian 54% (dominant) Hierarchical 38% (secondary)	Hierarchical 37% (dominant) Egalitarian 29% (secondary)
	CR-06	Hierarchical 85% (dominant) Egalitarian 15% (secondary)	Hierarchical 32% (balanced) Egalitarian 32% (balanced)
	CR-08	Hierarchical 60% (dominant) Egalitarian 13% (secondary)	Hierarchical 32% (balanced) Egalitarian 32% (balanced)
	CR-09	Hierarchical 40% (dominant) Individualistic 30% (secondary)	Hierarchical 30% (balanced) Egalitarian 28% (balanced)
	CR-10	Hierarchical 60% (dominant) Egalitarian 20% (secondary)	Hierarchical 31% (balanced) Egalitarian 31% (balanced)
Social sector	CR-11	Hierarchical 62% (dominant) Egalitarian 23% (secondary)	Hierarchical 32% (balanced) Egalitarian 32% (balanced)

Source: Own elaboration.

Based on the previous chart, the following analysis relates the type of actor and worldview documented with interviews and surveys, which is based on cultural theory. The base question to apply is: *What was the role fulfilled by the different perspectives of key actors during decision-making in the Municipalidad de Upala regarding the process of drafting and delivering on the approval of the land-use plan?*

Regarding the distribution among the perspectives according to their representativeness in the results, the following can be observed: the hierarchical perspective was majoritarian among a total of eight actors in both instruments. This perspective was also majoritarian among the two consulted actors, in one of the instruments, which was the survey. The second perspective represented as dominant was egalitarian; a total of two stakeholders, one in the interview and the other in the survey, presented this perspective as dominant. Egalitarian and hierarchical were also the most common secondary perspectives among all the actors. The individualist and the fatalist were the least represented perspectives among the dominant and secondary in both instruments, with just one as dominant and one as secondary. The former was identified in the actor CR 02, a city official; the second one was identified in the actor CR 03, from the private sector.

The percentage differences between perspectives based on the answers provided by the consulted people were stretched by the application of the survey regarding the interview, where it was less clear the dominant position, as the minority of the criteria was above 37,5% which defines the dominance between perspectives. For that reason,

it can be affirmed that there is a more marked distance in the positions of the consulted person when their answers are provided in the context of an interview.

Of the eleven consulted people, in eight of them the dominant perspective coincides in both instruments, consistently evidencing the Hierarchical perspective as their dominant influence. Based on this, it follows that for this case study, 72% of the consulted people have a perspective influenced by a hierarchical frame of reference.

It can be observed that, according to the percentages regarding the answers provided in both cases, the actors have a secondary position very similar or identical to their percentual value regarding the dominant perspective. This makes it possible to assume that both perspectives are very close to each other in their understanding and definition of the aspects that concern the substantive issue, namely the elaboration process of the Land-Use Plan of Upala, from the perspective of CC Adaptation and risk management, from which the design of the survey originated.

Based on the same chart, it can be interpreted that the egalitarian perspective is common to seven of the consulted people as a secondary position, in a percentage of 64% in the interview's case. In the survey, the same perspective was shared by ten of the consulted people, for a rate of 91%. That is to say that by combining both instruments (22 instruments applied, two for each person), the egalitarian perspective adds 17 positions and 77,2% as the secondary perspective among the consulted people.

This allows us to propose that this percentage of the total number of people consulted shares, even a variable range, a similar understanding, and definition of the problem presented concerning the Land-Use Plan, from the approach of risk management and adaptation to climate change.

Three of the analyzed cases deviate from the trend of the leading group, which presents as dominant the hierarchical perspective. This group stands out in the following aspects:

1. They are the only ones that do not present the hierarchical perspective as dominant in both categories.
2. They are the only ones in which the dominant perspective does not coincide in both instruments.
3. They are the only ones that evidenced a frame that incorporates the fatalist perspective and the individualist perspective, with one case each.
4. Additionally, it can be observed how in three cases the hierarchical and egalitarian perspectives are present as secondary perspectives. In the third of them, there is an exchange of positions. However, it always remains within the combined scope of the hierarchical and dominant perspective, which proved to be predominant in the global results among all the consulted actors.

Discussion about the results of Upala's case

It is essential to review in general terms the temporal context of the case. In 2010, the process of construction of the Land-Use Plan of Upala was initiated with the support of Spanish cooperation. The Universidad Nacional is hired as a technical entity for the elaboration of the studies and technical design. The municipality (mayor's office and Council) had an important role at the beginning and the end of the process, but it had little involvement during the process. In 2014, the process finishes with the indecision of the Council to elevate the plan to the national authorities, for its validity because of the strong social pressure produced by a group that opposed the plan, composed mainly of representatives from the private sector from the urban center that with their resources mobilize people from different communities, alleging among other aspects that the studies overestimated the risks and that it would generate a significant loss in the economic activity in the municipality.

In 2016, Hurricane Otto had a significant impact in Upala, which resulted in the loss of human lives and public and productive infrastructure due to floods and landslides. Based on the performed study, it can be concluded that for this case:

1. Since its beginning, the process has had a significant component of external management. This contributed to the supporting and management of the process, but at the same time, it implied a considerable influence of outside actors alien to the local sphere, which, in a certain manner, was exploited by the opposition.
2. The latter made it easier to implant the perception that the project of reference for this analysis (land-use plan) was essentially "elaborated at a desk in San Jose" (the capital city).
3. The process seeks to achieve high participation of local actors. Indeed, it had a participative component that can be considered between moderate and high at the local scale. However, it didn't permeate enough to counter the perception of what was indicated in point 2.
4. There were institutional actors with particular interests that acted to form an opposition to the initiative because they considered that such interests would be prejudiced by the adoption of the plan, regardless of its quality.
5. This individualistic group had a low perception of the risk and, for that reason, affirmed that the technical instruments overestimated such risk, which was refuted by the effects of Hurricane Otto.
6. The fact that the land-use plan, different from other plans, has a binding character in management and decision-making in the municipal territory, favored the formation of such opposition.

7. The instrument was developed and approved by the Municipal Council, but it was not presented to the competent national authorities because of the local conflict that was generated around it.
8. It was evidenced that the underlying political background, in this kind of process, can be more significant than the quality and performance of the process from a technical aspect. From this characteristic, using frame analysis as developed in this article, gives explanations for these kinds of phenomena.
9. In the Costa Rican context, the high centralism of the state structure is a signal of a high influence of the image and hierarchical position. It can also be taken as an example of the first strategy for climate change that originated directly from the Presidency of the Republic in 2007.
10. It has been sought to increase citizen participation over time. However, it continues to be a challenge for these processes, ranging from operational aspects, such as schedules, to the political and comprehension of the cultural weight of these processes.

3.2 Case San Francisco del Valle de Ocotepeque, Honduras

The municipality of San Francisco del Valle has a population of 7,999 inhabitants and a 12.124 square meter territory. It is a municipality with a strong agricultural vocation where coffee farming is the main activity. It possesses an important population in poverty, with estimations of 58% of the population with a daily income lower than one American dollar, and only 52,5% of the kids of school age are enrolled in school (Municipalidad de San Francisco del Valle, 2018). In environmental matters, the Plan for Municipal Development also identified the occurrence of a series of negative aspects related to global warming, including abrupt changes in the average temperature, long periods of droughts, shorter rainy seasons, and forest fires, among others. (Municipalidad de San Francisco del Valle, 2018)

The case of the municipality of San Francisco del Valle de Ocotepeque centers on the process of elaboration and approval of its Municipal Development Plan (PDM in Spanish) with a focus on Territorial Planning. In the case of San Francisco, the process was supported by the project Strengthening Local Capacities Project for the Republic of Honduras (FOCAL II in Spanish) executed by the Secretary of Governance, Justice, and Decentralization (SGJD in Spanish) from the Government of Honduras, with the sponsor of the International Cooperation Agency of Japan (JICA). This process was initiated in 2010 and 2011 with the formation of technical teams. It then advanced with the establishment of a baseline and continued with the discussion process from the community level, zone areas, and finally to the municipal level. This process resulted in the approval of the PDM of San Francisco 2018-2023, which the SGJD certified.

To study the context of the applicable public policies, the following policies were documented for Honduras which were approved during the 2010-2017 period:

I. Land-Use Planning Law, Decree No. 180-2003.

II. National Risk Management System Law (SINAGER), Decree No. 151-2009.

III. Climate Change Law, Decree No. 297-2013.

IV. National Climate Change Strategy of 2010.

V. State Policy for the Comprehensive Management of Risk in Honduras of 2013.

VI. Regulations for the formulation of municipal development plans with a territorial planning approach, Agreement No. 00132 of 2013.

VII. Methodological Guide: Elaboration of Municipal Development Plans (PDM) with a territorial planning approach.

VIII. Municipal Development Plan with a territorial planning approach for San Francisco del Valle.

Documents related to San Francisco's Development Plan proposal

Initiating with the Land-Use Planning Law, this law does not integrate climate change among its objectives and norms. However, this legislation does directly address risk management as part of the processes of territorial planning, incorporating it as a critical aspect of the process—for example, articles 31, 44, 47, 88, 89, and 100. The law SINAGER integrates decisively climate change as a critical element that must be part of risk management in Honduras. This legislation even establishes in its principle III, the responsibility of municipalities to implement actions in prevention and risk reduction, preventing and mitigating disasters, adapting to climate change, and answering emergencies, including rehabilitation and reconstruction of affected areas.

One interesting aspect of the Honduran case is the existence of the Climate Change law, whose purpose is that state institutions and the general population adopt practices to reduce environmental vulnerability and to improve the capacity of adaptation (Article 2). Among the law's objectives, it is established to contribute to internalizing all the projects and development plans of the public and private sectors, including the environmental variable. This takes into consideration climate change and adaptation (Article 6, Clause 2). The law demands that Municipalities and Councils of Municipal Development take into consideration the results of the National Climate Change Strategy, the National Action Plan on Adaptation and Mitigation of Climate Change, and the Honduras National Communications on Climate Change, when elaborating their local land-use plans. Hence, this instrument integrates adaptation and mitigation (article 24).

The Honduran legal framework is clear, demanding that the process of planning and land-use planning integrate aspects of risk management and adaptation. In this case, municipalities had been delegated to steer the integration of both topics within their local planning processes. Regarding public policies, the National Strategy of Climate Change makes special emphasis on the need to advance the integration of the assess-

ment of CC Adaptation within the local planning instruments, such as the PDM or Land-Use Plans (LUP). These instruments are particularly highlighted as measures of adaptation in the water resources area (P. 82-83) and risk management (P. 94-95).

The risk management policy, integrated elements related to climate change, the main one is the inclusion of this variable in the instruments of risk management. One of the principles of this policy (principle b) calls for addressing LUP as a critical element of risk management to provide human security. Specific objective 2 articulates this principle by incorporating it into the instructions, guidelines, and methodologies in the management of a territory. Strategic guideline 3 develops the actions that should be implemented in this area, even by proposing the need to integrate variability and climate change in the zonings of hazards.

The regulation for the drafting of PDM includes a cross-cutting axis for municipal planning, on point 2, the risk management of disasters and territorial planning, which asks that those processes address the risk, implicitly allowing the adaptation to climate change. However, the rest of the document does not address how to value the risk and adapt to climate change. Therefore, it remains unclear how to activate the transversal axis. This becomes even more evident in the methodological guide for the development of the PDM, which fails to integrate climate change and risk management clearly. As part of the diagnostic of the municipality, it is only asked to apply a SWOT analysis, which integrates the variable threats. However, it is not clear about the specific type of threats it refers to, nor does it explicitly require the integration of weather-related threats.

As can be appreciated in the overall reading, Honduras has done an exceptional effort to develop a public policy updated to integrate mandates for addressing climate change, especially in adaptation and risk management. Both legislation and policies demand that these two aspects be approached within the development of plans and projects in the country, including local governments. However, these strategic mandates have little impact on the operational level instrument where decisions on how to address climate change and risk management are taken.

The primary example is the shortcoming in the approach of the methodological guideline and the limited clarity that the PDM normative provides, leaving the local actors to decide whether to address climate change and risk management, and how to do it.

Regarding the PDM in San Francisco it must be emphasized that even though the methodological guideline did not require to assess climate change during the drafting process, the topic was frequently and systematically addressed as an essential threat to the development of the productive sector of the municipality (P. 5 3, 56, 57, 58, 63, 67, 75). In addition, it was considered an opportunity that different institutions are willing to support the development of projects to address climate change (P. 58 and 79). Although the threat posed by climate change is clearly identified, the plan does not develop specific objectives regarding adaptation. However, it structures a series of activities that directly address the protection of natural resources as actions to confront climate

change. These activities are organized by zones (a total of five zones) and involve a series of initiatives that communal organizations, the municipality, and external actors will implement.

For example, in Zone 1, activities are articulated (p. 115) as follows:

1. Environmental care training program.
2. Prohibition of hunting.
3. Certification process for farms.
4. Establishment of forest nurseries.
5. Certification process for forested lands.
6. Organization of a forest firefighting group.

What is interesting about this (PDM) is that in the different zones, an investment plan has been developed that includes activities in all its communities; all five of these plans put together constitute the municipal PDM. There are 178 actions divided into different thematic axes like water, education, health, land-use planning, land, housing, and vulnerable populations, among others. Now, the plan does not integrate direct actions, especially those thought to address risk management or CC Adaptation. However, the community is aware of the problem and approaches it directly by protecting its natural resources (especially forests and water) and reducing vulnerability, especially in the coffee production sector. This was evident in several of the interviews.

Result analysis on the interviews with the actors according to the actor type, interview profile, and the survey application.

In Honduras case there were three group interviews, these were the coded interviews as HON-02 with two technicians from the Municipal Association of Honduras (AMHON in Spanish), HON-05 with four leaders of different organizations from the community of Santa Teresa de San Francisco del Valle, and HON-07 with both local leaders from two different communities from the urban area of San Francisco. According to the performed analysis, the consulted actors manifested their perspectives regarding the problematic according to the next results, see table below.

Table 20. Results of the analysis of interviews and questionnaires to determine the dominant and secondary perspectives of the actors in the case of San Francisco del Valle.

Actor	Interview	Interview results	Survey results
Ministerial Technician	HON-01	Hierarchical 60% (dominant) Egalitarian 20% (secondary)	Hierarchical 34% (dominant) Egalitarian 32% (secondary) Fatalistic 9% (marginal)
Experts of AMHON	HON-02*	Hierarchical 66.6% (dominant) Egalitarian 26.6% (secondary) Individualistic 6.6% (marginal)	Hierarchical 36% (dominant) Egalitarian 31% (secondary) Fatalistic 11% (marginal)
Municipal Personal	HON-03	Egalitarian 46.6% (balanced) Hierarchical 46.6% (balanced) Fatalistic 6.6% (marginal)	Hierarchical 30% (balanced) Egalitarian 30% (balanced)
Political leaders	HON-04	Hierarchical 54.5% (dominant) Egalitarian 45.4% (secondary)	Hierarchical 35% (dominant) Egalitarian 29% (secondary) Fatalistic 12% (marginal)
Social Sector	HON-05*	Hierarchical 60% (dominant) Egalitarian 40% (secondary)	Hierarchical 43% (dominant) Egalitarian 34% (secondary) Fatalistic 11% (marginal)
Municipality personal	HON-06	Egalitarian 55% (dominant) Hierarchical 45% (secondary)	Hierarchical 35% (dominant) Egalitarian 29% (secondary)
Social Sector	HON-07*	Egalitarian 66% (dominant) Hierarchical 26% (secondary)	Hierarchical 32% (dominant) Egalitarian 29% (secondary)
Municipality personal	HON-08	Egalitarian 69% (dominant) Hierarchical 23% (secondary)	Hierarchical 39% (balanced) Egalitarian 39% (balanced)
Municipality technician	HON-09	Egalitarian 42% (balanced) Individualistic 42% (balanced)	Hierarchical 35% (balanced) Egalitarian 35% (balanced) Fatalistic 10% (marginal)
Municipal Federation Technician	HON-10	Egalitarian 83% (majority) Hierarchical 16% (secondary)	Egalitarian 36% (dominant) Hierarchical 33% (secondary)
Social Sector	HON-11	Egalitarian 73% (majority) Hierarchical 27% (secondary)	Egalitarian 43% (dominant) Hierarchical 40% (secondary)
***: The profile of one of the participants is analyzed in the interview, not all of them.**			

Source: Own elaboration

Based on the table, the following analysis of the interview is presented regarding the kind of actor and profile that emerges from the interview and the survey completed by each of them, according to cultural theory.

Regarding the distribution between perspectives according to their representativeness in the results, the following was found. The hierarchical and Egalitarian perspectives are very balanced, with four interviews where each is respectively dominant, with unanimous results between the interview and the questionnaire. Even in the two cases, both perspectives are completely balanced on the questionnaire and the analysis of the interview. A third interview shows the hierarchical perspective as dominant in the questionnaire, but the analysis of the interview catalogs it as egalitarian.

This reflects an important balance between both perspectives, which could explain certain stability in the design process, approval, and execution of the PDM. The least represented perspectives were the fatalist and the individualist. In this case, the latter succeeded in representing the secondary perspective. Regarding the contrasting results between the dominant perspectives identified for the same actor, only in one case was a variation between both instruments detected, which shows a high level of trust in the identification of the dominant perspectives and a lesser measure of the secondary ones.

The fact that the group focused on two perspectives with an almost perfect balance, including being this in many cases interchanged between dominant and secondary, suggests that the consulted people share an understanding and similar definitions in the process of construction and approval of the PDM in San Francisco, from the perspective of risk management and climate change adaptation.

There are many coincidences between the interviews, among a broad acceptance of the participation of different stakeholders in the process, the need to create local normative or public policy, and finally, the importance assigned to the problem of climate change and its necessary addressing where the actions of conservation and protection of natural resources and ecosystems are the most signaled.

Discussion about the results from the San Francisco del Valle case.

It is essential to clarify that the PDM is, by national norm, necessary for the municipalities to receive funds from the national government, which enables them to develop projects, activities, and investments through budget transfers. This favors that the local actors, far from stopping the process, look forward to advancing it as its successful approval depends on the financial resources.

In addition, if it is true that the PDM has a land-use planning focus, it is not a land-use plan per se, as it lacks the normative faculties of zoning and regulation of land use. In concrete, the PDM works as the bank of prioritized projects for each municipal zone, with each respective area of influence, relevant actors, and identification of the necessary resources. With this plan, the municipalities establish their operative plans and annual investment budgets over which they are held accountable.

Based on the performed analysis, the following can be concluded about this case:

1. The process counted on the crucial support of third actors and a clear and solid methodological framework with concrete tools. Still, these did not address the topics of risk management or CC Adaptation deeply. The process from its beginning is highly participatory of the organizations and local leadership in all the communities of the municipality.
2. There was a strong process of appropriation that cause the actors to identify autonomously climate change as a fundamental threat to the development of the municipality and for that reason there were identified actions that could support the preparation to face adverse effects, overall in environmental and natural resources, such as water, sanitation, land-use planning, and economy.
3. The presence in the territory of NGOs and international cooperation projects regarding climate change prepared the path for local organizations and leaders to integrate that previous knowledge into the PDM process, but this was not requested by the methodology.
4. The absolute convergence of an almost perfect balance between the hierarchical and egalitarian perspectives favored a conjunction of measures that were acceptable for all the actors, leaving little space for resistance to the opposition of third parties. Actually, in almost all the interviews, it was clear that there were no identified opponents to the process, but people who did not believe in the importance of it (fatalist perspective), others who were motivated to participate, and those who simply abstained completely.
5. It is clear that the nature of the instrument (PDM) did not generate competence for the instruments that could be affected (as it occurs in land-use planning processes), but the discussion for prioritizing actions that all actors considered important. This, together with the participative nature of the process, avoided significant confrontations that could lead to obstacles for the approval and implementation of the instrument.

4. Conclusions

It is relevant to delve into how different people frame a problem. This is a tool to comprehend better the development of policies and how different frames of reference influence their design (Dupuis & Knoepfel, 2013). Therefore, frame theory allows a better comprehension of how people define what is CC Adaptation and its effect on local agendas (McEvoy et al., 2013).

In this article, it was possible to appreciate how the perspectives of the actors influence the design processes and approval of the public policy where they seek to integrate elements of CC Adaptation and risk management. It is essential to take into account some of the differentiating particularities in both cases. Even if the instruments in both cases comprehend elements of land-use planning, it is clear that in the case of San Francisco,

this was not the typical regulatory instrument; that is why we think it had a lower possibility of creating conflict or opposition among stakeholders.

In Upala's case, a process of drafting and approving a land-use plan affected the interests of different economic groups. These initially did not pay a lot of attention to the process until they identified that the new zoning, due to the risk of flooding, could have a direct impact on the value of properties and economic activities (for example, increased insurance costs, loss of property value, etc.).

In both cases, a strong hierarchical tradition can be noted in both countries in establishing norms and national policies, which influences the local processes of design and approval of the local public policy. An example of that was the development of the strategy of CC in Costa Rica, which is directly managed by the presidency with a strong emphasis on CC Mitigation. In Honduras' case, this is reflected in the national normative, which obligates the municipalities to have a PDM using the national methodology if they want to opt for receiving the economic transfers from the central government.

A critical aspect is that in both cases the national policies identified the management and drafting of land-use plans as critical for the process of risk management and CC Adaptation, in both cases the operative instrument (the normative and technical guidelines) are very ambiguous and therefore it is up to the local actors to decide how to board the CC Adaptation or if addressing it at all.

Regarding the analysis of the perspectives of the stakeholders, a strong representation of the hierarchical perspective (this was expected) is followed closely by the egalitarian perspective (which is usually a mobilizing actor and actively participates in the processes). In both cases, the great majority of actors concentrate on both perspectives. However, it is important to note that when the instruments are mainly regulative (as in Upala's case), it is expected that the reaction of stakeholders with an individualist perspective, who may feel their interests are being affected.

In this sense, it is possible to discern a thoroughly narrow approach to these processes with an emphasis on hierarchical measures such as rules, taxes, and regulations. This emphasis is prone to cause conflict with other perspectives that do not include more favorable solutions. To illustrate, San Francisco's case sheds light on this situation by giving an array of measures beyond solely relying on hierarchical approaches, which contributed to the success of public policy instruments.

Both processes had a participative design. Although in Upala's case, an external actor – the technical team hired (Universidad Nacional) in unison with the municipality of Upala conducted the process design. Whereas in the San Francisco case, the task required local leaders to manage local implementation with ample community participation, assuring a more effective representation of contrasting perspectives in the approval of research instruments, contrary to Upala's case, where the quality of the participative processes was strongly criticized.

In Upala's case, the emphasis of the approach was greatly influenced by the conceptual level of risk management, which was clearly linked to the hierarchical perspective. On the other hand, in San Francisco's case, elements connected with the conceptual approach of vulnerability were identified, such as ample references to CC as a threat and its impact on diverse areas of the municipality were included in the PDM. This shows a marked influence of the egalitarian perspective.

By using frame theory, it was possible to discern operative elements of great interest that could aid local adaptation procedures. Firstly, it allows recognition of different perspectives competing and or cooperating as a means to lead the process of creation and approval of public laws and policies. Secondly, starting from a macro level, these perspectives show essential preferences necessary to approach the issue at a conceptual and operational level; in other words, if these processes of public policy drafting are highly focused on stakeholders with the same perspective, their frame will greatly influence which operational and conceptual instruments will be used. To exemplify, Upala's predilection to accept risk management instruments started at a national level and finished at a local level without further questioning. Conversely, by permitting a plethora of perspectives, a more inclusive design can be created, as seen in San Francisco's case, where the process was highly participative, allowing for the assessment of vulnerability, risk management, and development aspects.

Third, making visible the different perspectives present in the various actors that participate in these processes, and attending to the differentiated orientations on how to approach them and from which measures to integrate, could lead to the construction of more comprehensive policies that allow further progress and results. San Francisco's case is a quintessential example of how a wide range of actions to satisfy a larger number of participants proved beneficial for the project. This is widely known as "clumsy solutions", answers to problems that require a high level of skill and planning (Beumer, 2014; Verweij et al.,2006).

These three aspects are key to understanding how to guide the creation of adaptation policies. As mentioned in the introduction, our current climate crisis bounds every country in the world to make advancements in the formulation of effective adaptation policies. Aspects such as resources, regulations, and investment priorities demand important decisions at a local level, while negative effects of CC cause a rise in damage and losses. Thus, the edification of well-made and feasible plans based on socially acceptable adaptation instruments is critical at a local scale.

The research instruments used in this analysis allowed a clear understanding of the good practices and the constraints these adaptation procedures are facing. For international studies, it is critical to understand how governance processes related to adaptation policies are developed in several countries by making use of theoretical and conceptual research instruments that give room to better compare and comprehend them. Frame theory proves to be a useful tool for the cases presented in this research,

which could be applied, in the future, to cases with bigger differences between them, such as comparing developed and developing countries, simple and complex municipalities, and urban and rural municipalities.

Adaptation, as previously discussed, requires a strong local involvement; however, it is not developed in isolation. It is influenced by an international agenda of regimes that are ever-growing in complexity and stakeholders that gain influence through technical and financial cooperation (as documented in the cases of Upala and San Francisco). The national governments also shape parameters and conditions to develop local planning through the creation of policies and legislation. For this reason, seen from the perspective of international studies, it is vital to deepen the study of adaptation processes in several countries, and do so through new and diverse methods. Frame theory is valued as an interesting alternative.

However, this theory, like others, brings forth a range of limitations, such as not studying the power relations between the stakeholders. This was evident in Upala's case, where private sector actors used their economic capacity to mobilize a sector of the population and to pressure decision-makers, paralyzing the approval of the land-use plan as a consequence. Additionally, this research intended to study both the macro and conceptual perspectives in the acting of authorities, leaving aside the power and the capacity of the actors. Other research instruments, such as actor analysis viewed from the MACTOR method, could be complementary to this study.

CHAPTER 5: THE INFLUENCE OF FRAMING ON THE GOVERNANCE OF CLIMATE CHANGE ADAPTATION AND RISK MANAGEMENT AT THE LOCAL LEVEL: THE CASES ZARAGOZA IN SPAIN, BOLOGNA IN ITALY, PORTO IN PORTUGAL.

Abstract

In this chapter, we put into practice a framework developed by Segura et al. (2023) to examine how the framing process behind policy development for climate change adaptation should be made visible and accounted for to ensure that adaptation measures are not only technically feasible but also socially and politically viable. By integrating cultural theory with risk management, resilience, and vulnerability approaches, the framework facilitated an in-depth understanding of how different perspectives influence CC Adaptation strategies in three European cases: Porto, Portugal; Bologna, Italy; and Zaragoza, Spain.

Keywords: Climate Change Adaptation; Frame theory; Cultural theory; Bologna, Italy; Porto, Portugal; Zaragoza, Spain.

Resumen

En este artículo, aplicamos un marco analítico desarrollado por Segura et al. (2024) para analizar cómo los marcos de referencia de los actores influyen en el proceso de formulación de políticas de adaptación al cambio climático. Este plantea la necesidad de que estos deben ser visibles y tenidos en cuenta para garantizar que las medidas de adaptación no solo sean técnicamente viables sino también socialmente y políticamente viable. Al integrar la teoría cultural con los enfoques de gestión de riesgos, resiliencia y vulnerabilidad, el marco facilitó una comprensión profunda de cómo las diferentes perspectivas inciden en las estrategias de ACC en tres casos europeos: Oporto, Portugal; Bolonia, Italia; y Zaragoza, España.

Palabras clave: Adaptación al Cambio Climático; Teoría de Marcos de Referencia; Teoría Cultural, Bologna, Italia; Oporto, Portugal; Zaragoza, España.

1. Introduction

"Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850-1900 in 2011-2020" (IPCC, 2023). This means climate change is already impacting our planet with consequences that are projected to have a negative impact on "health, livelihoods, food security, water supply, human security, and economic growth"(Pachauri et al., 2014, p. 9), meaning that anthropogenic climate change will have profound im-

pacts not only on natural ecosystems but also socially and, in turn, affecting human wellbeing (Bosello, Carraro, & De Cian, 2010; Gonah et al, 2025; Brubacher et al, 2025).

The increasing number of climate change-related risks and their direct and indirect impacts threaten societies' capacity to develop along sustainable paths (Denton et al., 2015)vulnerabilities, and prospects for adaptation (Chapter 18. Aiming at minimizing impacts, governments around the world are facing climate change following two approaches: mitigation and adaptation. The former refers to the human effort to reduce climate change. This is achievable by limiting greenhouse gas (GHG) emissions and by reinforcing activities that remove GHG from the atmosphere (IPCC, 2014). The latter relates to the need to adapt to life in a changing climate, preparing societies to cope with the effects of climate change. Mitigation implies actively targeting the causes of climate change, whereas adaptation is an adjustment in response to climate change effects (Adamo, 2015). Mitigation and adaptation are complementary approaches to tackling climate change, and according to the IPCC, they are both required in the development of effective climate change-related policies (IPCC, 2014).

For many years, CC Adaptation measures were marginalized, as there existed strong confidence in the effectiveness of mitigation options (Carvalho, Schmidt, Santos, & Delicado, 2014). However, nowadays it is recognized that even if unprecedented mitigation efforts were to be made, the impacts of climate change would still be unavoidable. (Biesbroek et al., 2010) As our planet would still need time to recover from the GHG already trapped in our atmosphere (Commission of the European Communities, 2009). This explains the growing attention given to adaptation in recent years, moving from what could be considered 'a fatalistic strategy' to a necessary response to deal with climate change (Biesbroek et al., 2010).

Dealing with climate change is a significant objective of the European Union (EU). The EU has been officially committed to mitigation policies since 1998, when it signed the Kyoto Protocol, which set short- and long-term emission-reduction targets (Reckien et al., 2018). Adaptation was addressed in a second moment when the need to adjust to climate change consequences became clearer, and providing regions and cities with tools to respond to related hazards became a key issue. First, in 2007, the EU signed the Green Paper "Adapting to Climate Change", followed by the White Paper "Adapting to Climate Change: Towards a European Framework for Action" published two years later. In 2013, the EU Strategy on Adaptation to Climate Change was approved; finally, in 2024, the latest EU Strategy on Adaptation to Climate Change was approved. These four documents provided EU decision-makers with the guidance needed to create and implement adaptation policies. In fact, most of the EU Member States have developed national adaptation strategies (Pietrapertosa et al., 2017)a stimulating role is played by EU projects as well as by international climate networks such as the Covenant of Mayors Initiative on Climate Change Adaptation (Mayors Adapt.

A large body of scientific literature has documented the progress of national-level CC Adaptation policies, and Europe has been a leading region. Biesbroek et al. (2010) analyzed the strategies of 10 countries, and Pietrapertosa et al. (2018) documented policy

development across 33 European countries, revealing an important trend in this region. The lastest IPCC report presented the most updated picture regarding the adoption of adaptation strategies across the continent, in Northern Europe only Iceland had not adopted one; in Western and Central Europe four countries were measing an adaptation strategy these been Belarus, Moldova, Monaco and Ukraine; finally in Southern Europe six countries did not have such documents approved: Albania, Andorra, Bosnia & Herzegovina, North Macedonia, San Marino and Serbia. By 2022, 34 countries had approved such documents (Bednar-Friedl et al. 2022).

Local governments have followed this rapid increase at the national level. To illustrate this rapid increase, data from 2016 (Araos et al.) showed that of 401 cities with over 1 million inhabitants, 61 had implemented adaptation initiatives, and 73 were planning adaptation policies. Furthermore, in 2019, Reckien et al. documented that 26 out of 28 EU countries (at that time) had cities with local climate policies, representing 75% of the 885 cities surveyed. Although new data were not available, it is assumed this trend has continued to date.

When developing CC Adaptation policies, decision-makers must answer questions such as whether to adapt, what to adapt to, when, how, who should adapt, and who should pay for the costs of adaptation. These and other questions that arise in the process are laden with normativity, in which the participating actors interact to guide the answers to these questions according to their own frames of reference.

When actors face a situation in which they approach it with entirely different and even opposing frames, intractable controversies arise (Schön & Rein, 1994); these are conceived by Hisschemoller and Hoppe (1995) as unstructured problems, or moderately structured problems, based on the (un) uncertainty of relevant knowledge and the agreement (or lack of it) on norms and values. Actors who frame the problem with opposing viewpoints generally disagree on the appropriate knowledge or the norms and values associated with it, often turning the policymaking process into an unstructured problem.

In this sense, adaptation processes have been shown to encounter a growing number of barriers, many of which are primarily focused on the social and institutional dimensions of adaptation. These barriers have been defined as “the arrangement of climatic and non-climatic factors that emerge from the actors, the governance system, or the system under study” (Biesbroek et al., 2013, P. 1119). Thus, studying framing adaptation could give us clues into how they affect the relationship between actors and the governance system that facilitates or hampers the implementation of CC Adaptation measures and strategies.

Segura & Bonilla (2023) developed a framework to study frames about CC Adaptation by focusing on the framing process in three distinct levels. First, at the meta-level frames consisting of the core values and beliefs of people (Fünfgeld & McEvoy, 2011) by using Cultural Theory, a relevant typology to understanding the different perspectives of a population by organizing them into a small set of groups accordingly to their worldviews

toward different trends (Beumer et al, 2018; Figge, 2017; Offermans, 2012a; Thompson, 1990). Based on a division between *group* and *grid,* four worldviews are distinguished: Hierarchism, Egalitarianism, Individualism, and Fatalism (Offermans, 2012). Each way of life has a specific approach to issues such as natural resources and human nature, even for CC and CC Adaptation. This can be seen as a meta-level of framing.

Second, the conceptual level, which is influenced by the meta-level, is linked with the creation of theories and definitions, in this case, related to adaptation (McEvoy et al., 2013). On the conceptual level, the authors proposed using the main frames in policy approaches identified in the CC Adaptation literature —risk management, resilience, and vulnerability —none of which necessarily cancel each other out, and which can influence the outcomes of the policy process. Third, at the operational level, the authors identified links between the different Cultural Theory perspectives and the CC Adaptation approaches. These connections between frames that exist at the meta and conceptual levels can be used to understand the decisions taken at the operative level.

In this article, we test this framework to analyze three cases of CC Adaptation policy development in European cities: Porto, Portugal; Zaragoza, Spain; and Bologna, Italy. The goal was to examine how these three European cities dealt with climate change adaptation policies and the different frames involved in the drafting process. These three cases were selected because the cities represented strong examples of local CC Adaptation policy development. Also, the three countries have been negatively impacted by climate change effects in recent years, making it more important to develop such policies.

This article examines the frames that actors bring to decision-making processes. That is to say, the present article analyzes the management of a variety of actors, their frames, and their influence on the adoption of these measures. All three municipalities have developed local adaptation plans, which were the focus of this article. Nevertheless, local policy development does not occur in a vacuum; national and even regional-level policies affect and sometimes steer the direction and tools used at the local level. Therefore, sometimes the frames that influence the local level may come from national-level stakeholders and policy choices. In this regard, the chapter also analyzes if and how the national level influences the local one.

All three cases answer the following questions:

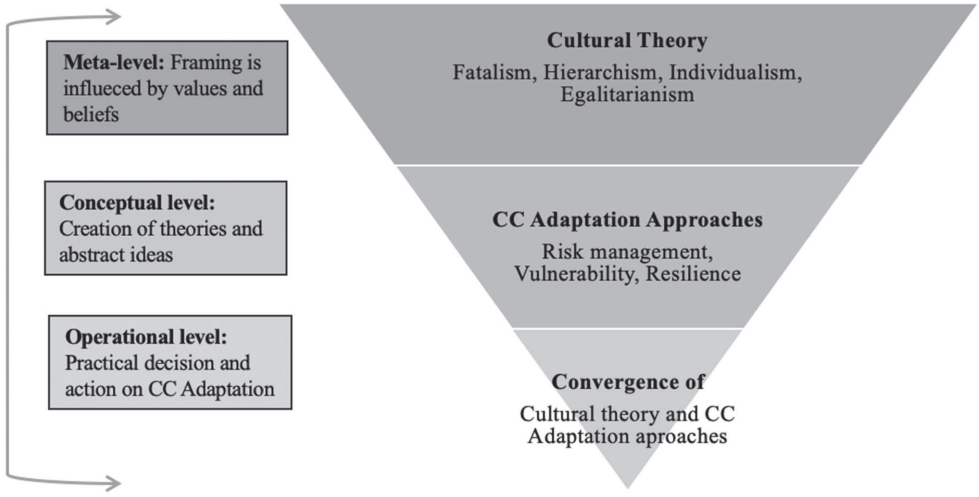
1. How did the national and regional CC Adaptation policies influence municipal adaptation policies?
2. How did the worldviews of the municipal actors that were part of the decision-making processes influence the way municipal CC Adaptation policies were framed?
3. How did the design and conduction of the planning processes at the municipal level deal with different CC Adaptation frames?
4. How has the city implemented the planning process outputs?

2. Methodology

This research investigates the role framing played in the development of adaptation policies in the Municipalities of Bologna, Porto, and Zaragoza. The cases were conducted by Toni (2020) for Bologna, Bentley (2020) for Porto, and Viana (2020) for Zaragoza. As mentioned in the previous section, the research framework was developed by Segura & Bonilla (2023). It focuses on the process of framing, which occurs at three levels: the meta-level, the conceptual level, and the operational level.

Figure 5.1 illustrates how framing evolves in the CC Adaptation decision-making process. It arises from personal values and beliefs, takes a theoretical form through the creation of adaptation concepts, and finally gains concreteness at the operational level, where adaptation policies are developed. Following the figure, the meta-level was analyzed through Cultural Theory. The four worldviews this theory presents were useful to investigate the values and beliefs of the decision-makers interviewed related to the environment. The conceptual level, characterized by a definition of the issue and concepts and theories for addressing it, was analyzed through the three approaches to CC Adaptation: resilience, vulnerability, and risk management. This is because the three approaches towards adaptation offer insights to study the conceptual paths decision-makers decide to follow for addressing adaptation. Finally, for the operational level, in which CC Adaptation strategies, tools for implementation, and practical actions are defined, a convergence of Cultural Theory and approaches towards adaptation was applied.

Figure 5.1. Analytical Framework



Source: Own elabotarion

To answer the research questions, this study collected qualitative data adopting a strategy that combined document analysis, literature review, and in-depth semi-structured interviews that included a short questionnaire. The table below explains the aim of each research sub-question. Based on these aims, specific sources and methods were chosen to approach each research sub-question.

Table 22. Research Questions

Research questions	Explanation	Sources & Methods
1. How did national CC Adaptation policies influence municipal adaptation policies?	The aim was to understand the vertical interactions, namely the degree of freedom the decision-makers of the cities had in designing policies	• National, regional, and municipal policy analysis: - Direct Approach - Mainstreaming Approach • Interview analysis
2. How did the worldviews of the municipal actors that were part of the decision-making processes influence the way municipal CC Adaptation policies were framed?	The aim is: • to identify interviewees' worldviews (Cultural Theory) • to link a CC Adaptation frame for each policy analyzed (Frame Theory) • to compare interviewees' worldviews and the CC Adaptation frames of the policies they developed	• Interview and survey analysis • Local policy analysis • Comparative analysis
3. How did the design and conduction of the planning processes at the municipal level deal with different CC Adaptation frames?	The aim is to gain insights into the policy planning processes and their participative characters	• Policy Analysis • Grey literature • Interview analysis
4. How has the city implemented the planning process outputs?	The aim is assess the level of advancement on the implementation of the policy outputs	• Interview analysis

Source: Own elaboration.

A total of 40 policies were studied in all three cases, including national, regional, and local policies, comprising CC Adaptation policies and sectorial policies in the risk-management and spatial planning sectors (to assess the mainstreaming of CC Adaptation). 19 interviews were conducted with stakeholders who directly participated in the drafting process or national-level experts who could inform about the national-level policies and their influence on the local level. The interviewees came from different sectors: some were local government staff, others were from civil society and academia; it was not possible to conduct interviews with the private sector. The interviews were conducted in the local language by a native speaker. The original number of interviews had to be reduced because of the effects of COVID-19 during 2020 (the year in which all interviews were conducted). The interview guide followed a semi-structured process, with open questions related to the drafting policy process in general, followed by open questions regarding personal opinions on climate change, to match their answers to those typically associated with the four Cultural Theory worldviews. Lastly, a questionnaire was included, especially designed to relate the answers to the different Cultural Theory worldviews (see Appendix).

3. Results

The analysis is presented in three steps: first, the Meta Level with the Cultural Theory results. Second, the conceptual level of framing using the approaches towards CC Adaptation. Third, the operational level.

3.1 Meta-level of framing using Cultural Theory

A total of 18 interviews were conducted with local stakeholders involved in the local planning process (one of the interviews in the Porto case was only used to inform on the national level of policy; therefore, it was not included regarding framing), five for Portugal´s case, five for Italy´s case, and a total of eight for Spain. In all three cases, the subjects had either been directly involved or an influential actor in the decision-making processes for local CC Adaptation policies as participants, coordinators, or collaborators. Whether it was in the planning or participatory processes. Most of the group is composed of municipal staff, followed by academic and NGO participants involved in the process. It was not possible to identify or contact private-sector participants involved in the planning process.

The most relevant findings from the analysis of the Cultural Theory worldviews are as follows (see Table 23):

1. Sixteen out of the eighteen subjects, the worldview detected with the open questions about CC Adaptation, coincided with the main worldview detected with the questionnaire. This is relevant because it gives us great confidence in the results of the Cultural Theory perspectives. In the two subjects that presented changes, B0-02 (from Italy) and Sub3 (from Spain), in both cases, in the questionnaire, the main worldview does match with the second one detected in the interview.

2. In all three cases, the main worldview detected was **hierarchist,** followed by **egalitarian.** This finding was somewhat expected due to the higher concentration of subjects belonging to the municipalities' staff. Usually, these tend to present hierarchist perspectives due to the nature of the public administration. The same can be said for academia and NGO members, for whom it is common to find egalitarian perspectives.

3. Most hierarchist subjects had a secondary egalitarian worldview, and most egalitarians also had a hierarchist second worldview. This reflects a significant concentration on both worldviews.

4. We detected six subjects in which the **individualist** worldview was detected as second, but in most cases, a second place shared with egalitarian or hierarchist. There was only one subject with individualism as the only second worldview for the interview, but that was not the case with the questionnaire; this subject works in the business sector. This is a clear result of the difficulty in finding private-sector participants to interview, or of their absence from the planning process. It is essential to remember that, for this worldview, CC is not a priority, or, for some, there is still skepticism, or CC Adaptation is considered a technical affair that will be fixed with technological improvements; therefore, no need to take action. Thus, this attitude could eventually be related to limited participation due to a lack of interest or clear incentives for the private sector to engage in the policy process.

5. Only one subject from the Porto case (PO-04) recorded the fatalist as a secondary worldview. The **fatalist** worldview is absent in the other two cases. Not even as a secondary one was it detected. It is important to remember that this perspective tends to self-exclude from participating in this process. Or they are not invited or even excluded.

6. Overall, the results recorded for all these three cases coincide with similar results obtained in two case studies conducted in developing countries, the municipalities of Upala in Costa Rica and the municipality of San Francisco del Valle de Ocotepeque in Honduras (Segura & Bonilla, 2023). In both cases, applying the same methodology as in this study, they detected a high concentration of both hierarchist and egalitarians in that particular order, with minor representations of the individualists and very limited fatalists.

Table 23. Analysis of the worldviews of the local stakeholders involved in the local planning process using both the interview's open questions and the Cultural Theory questionnaire.

Country / Interviewee		Worldview results based on the INTERVIEW analysis				Worldview results based on the QUESTIONNAIRE analysis			
Dominant worldview		%	Second worldview	%	Dominant worldview	%	Second worldview	%	
Portugal	PO-01	Hierarchist	85	Egalitarian	15	Hierarchist,	42	Individualist	36
	PO-02	Egalitarian	45	Hierarchist, individualist	27	Egalitarian	47	Hierarchist	33
	PO-03	Hierarchist	58	Individualist	25	Hierarchist	34	Egalitarian	29
	PO-04	Hierarchist	57	Fatalist	29	Hierarchist	42	Egalitarian	36
	PO-05	Egalitarian	62	Hierarchist	38	Egalitarian	33	Hierarchist	28
Italy	BO-01	Hierarchist	50	Egalitarian	41.5	Hierarchist	32.1	Egalitarian	30.2
	BO-02	Egalitarian	62.5	Hierarchist	37.5	Hierarchist	44.5	Egalitarian	33.3
	BO-03	Hierarchist	50	Egalitarian	50	Hierarchist	33.1	Egalitarian	31.2
	BO-05	Egalitarian	42.8	Hierarchist	42.8	Egalitarian	38	Hierarchist	31
	BO-06	Hierarchist	60	Individualist (20), Egalitarian (20)	40	Hierarchist	40.6	Egalitarian	26.2

Country / Interviewee Dominant worldview		Worldview results based on the INTERVIEW analysis				Worldview results based on the QUESTIONNAIRE analysis			
		%	Second worldview	%	Dominant worldview	%	Second worldview	%	
Spain	Sub1	Hierarchist	80	Egalitarian	20	Hierarchist	38	Egalitarian	35
	Sub2	Hierarchist	80	Egalitarian	20	Hierarchist	37	Egalitarian	37
	Sub3	Egalitarian	60	Individualist (20), Hierarchist (20)	40	Hierarchist	38	Egalitarian	36
	Sub4	Hierarchist	60	Individualist (20), Egalitarian (20)	40	Hierarchist	36	Egalitarian	33
	Sub5	Hierarchist	60	Individualist (20), Egalitarian (20)	40	Hierarchist	39	Egalitarian	33
	Sub6	Hierarchist	60	Individualist (20), Egalitarian (20)	40	Hierarchist	39	Egalitarian	33
	Sub7	Hierarchist	60	Egalitarian	40	Hierarchist	41	Egalitarian	38
	Sub8	Egalitarian	66.7	Hierarchist	33.3	Egalitarian	37	Hierarchist	34

Source: Own elaboration

3.2 Conceptual level of framing using the approaches towards CC Adaptation

National Adaptation Strategies (NAS), National Action Plans (NAP), and National Climate Legislation (NCL) are policy outputs specifically designed to address climate change consequences. These three combined are usually known as the "dedicated approach". (Runhaar, Wilk, Persson, Uittenbroek, & Wamsler, 2018)

Policy integration is usually referred to as "mainstreaming," a form of Environmental Policy Integration (EPI). EPI is defined as the process by which external environmental objectives are integrated into policy outputs to produce outcomes that enhance efficiency and effectiveness in achieving adaptation goals and in reducing or resolving potential contradictions across different domains. (Brouwer, Rayner, & Huitema, 2013; Mickwitz et al., 2009; Runhaar et al., 2018; C. Uittenbroek, 2014) Scientific literature has considered both the dedicated and the mainstream approaches as key strategies to face climate change (Dupuis & Biesbroek, 2013; Mimura, 2014; Runhaar et al., 2018; C. J. Uittenbroek, Janssen-Jansen, & Runhaar, 2013).

In the following section, we will discuss the results obtained across the three cases for both the direct and the mainstream approaches in national policies.

National-level policies Direct

From the national-level analysis (which also includes the regional level), it is clear that the center stage lies in both risk management and resilience conceptual frames. The vulnerability conceptual frame was not found to be dominant in any policy document; in two of Portugal´s policy documents, references could be linked to this frame. All three countries possess regional direct CC Adaptation policy documents. In five CC Adaptation policies risk management conceptual frame is dominant, in four others is resilience the conceptual frame that comes as dominant. (see table 2)

In Portugal, all three CC Adaptation policies directly connect to a risk management frame, while Italy and Spain show the resilience frame as dominant. This is especially important to confront the results at the local level. National and regional level policies have a larger influence on the development of local level policies; therefore, it is important to consider whether the local level policies present the same conceptual frame as the dominant.

The only two sectoral policies that did not include CC Adaptation among their goals or considerations were from Portugal, both of which are laws, one for the risk management sector and the other for spatial planning. In Spain and Italy, all policies in both sectors integrate CC Adaptation into their goals. When it comes to frames, sectorial policies also exclude any references to the vulnerability conceptual frame. The sectorial policies also heavily reflect the risk-management conceptual frame; all except four policies present this frame as dominant.

Both risk-management and resilience frames are connected to individualistic and hierarchist worldviews in Cultural Theory. Depending on the instruments or adaptation measures chosen, it could lean more toward one or the other. This reflects an absence of egalitarian perspectives in the policies approved in these countries. (See table 24)

Table 24. National and regional level of policy analysis

Document	Country	Type	CCA/ sectoral	Conceptual frame
National Climate Change Adaptation Strategy (ENAAC)	Portugal	National Adaptation Strategy (NAS)	CC Adaptation	Risk management as dominant.
Methodological Guide for the Elaboration of CCA Municipal Strategies	Portugal	National Adaptation Plan (NAP)	CC Adaptation	Risk management as dominant.
Action Program for Climate Change Adaptation (P3AC)	Portugal	National Adaptation Plan (NAP)	CC Adaptation	Risk as management dominant, but quite some emphasis on both resilience and vulnerability approaches.
Metropolitan Plan For Adaptation to Climate Change in Porto's Metropolitan Area	Portugal	Regional Adaptation Plan (NAP)	CC Adaptation	Risk as management dominant, but quite some emphasis on both resilience and vulnerability approaches.
Basic Law of Public Policy of Soils, Spatial Planning and Urbanism	Portugal	National Legislation	Sectoral	No inclusion of CC Adaptation
National Program for Land-use Planning (PNOPT)	Portugal	National Policy/ Strategy	Sectoral	Risk management and resilience as dominant approaches.
Basic Law on Civil Protection	Portugal	National Legislation	Sectoral	No inclusion of CC Adaptation
National Strategy for a Preventive Civil Protection	Portugal	National Strategy	Sectoral	Risk management as dominant.
National Plan for Emergency and Civil Protection	Portugal	National Action Plan	Sectoral	Risk management as dominant.

Strategia Nazionale di Adattamento Ai Cambiamenti Climatici (SNAC)	Italy	National Adaptation Strategy (NAS)	CC Adaptation	Risk Management as dominant
Piano Nazionale di Adattamento ai Cambiamenti Climatici (PNAC)	Italy	National Adaptation Plan (NAP)	CC Adaptation	Resilience as dominant
Strategia di Mitigazione e adattamento per i Cambiamenti Climatici della Regione Emilia-Romagna	Italy	Regional Adaptation Strategy (RAS)	CC Adaptation	Resilience as dominant
Piano Comunale di Protezione Civile	Italy	National Action Plan	Sectoral	Risk Management as dominant
Piano Terittoriale Regionale Emilia Romagna	Italy	Regional Action Plan	Sectoral	Resilience as dominant
Legge Regionale 24/2017	Italy	Regional Legislation	Sectoral	No frame identified
National Plan for Climate Change Adaptation (PNACC)	Spain	National Adaptation Plan (NAP)	CC Adaptation	Resilience as dominant
Aragonese Strategy for Climate Change (EACC)	Spain	Regional Adaptation Strategy (RAS)	CC Adaptation	Resilience as dominant
Aragonese Strategy for Sustainable Development	Spain	Regional Strategy	Sectorial	Resilience as dominant
The Agenda For Change: Towards an inclusive and sustainable economy	Spain	National technical guide	Sectorial	Risk Management as dominant
National Strategy For Civil Protection	Spain	National Strategy	Sectoral	Risk Management as dominant
Aragonese Spatial Planning Strategy	Spain	National Strategy	Sectoral	Risk Management as dominant
Orientation Guide of the Law for Prevention and Environmental Protection for Aragon	Spain	Regional Technical Guide	Sectoral	Risk Management as dominant
Law for Prevention and Environmental Protection for Aragon	Spain	Regional Legislation	Sectoral	Risk Management as dominant

Source: own elaboration

Local level policies

Of the four local policies documented, two are from Zaragoza: one Local Adaptation Strategy (LAS) with a resilience conceptual frame and a Local Adaptation Policy (LAP) with a risk management conceptual frame. Porto has a LAS with a risk management frame, and Bologna has a LAP with a resilience-dominant frame.

At the local level, we can see that the vulnerability conceptual frame is also missing, meaning that the egalitarian perspective is absent or has very little influence on policy development and on the kinds of adaptation actions and initiatives included. (See Table 31)

In the case of Porto, it follows the same conceptual frame as the national level of policies; the same can be said for Bologna. In the case of Zaragoza, one policy does reflect the same dominant conceptual frame as the national-level policies. Thus, this shows that, at the local level, policy choices closely follow decisions made at the national level. A good example is Portugal, where the national guidelines for drafting LAPs were strictly followed by the government of Porto, which had a dominant risk-management conceptual framework.

In total, five sectoral policies fail to integrate CC Adaptation; this was especially the case in Porto across all sectoral policies and in Bologna, in two policies in the spatial planning sector. In Zaragoza, all sectoral policies integrated CC Adaptation. This is particularly concerning given the importance of spatial planning and risk management policies to help cities and communities adapt to CC's adverse effects, especially in avoiding risk-prone areas.

The risk management conceptual frame was dominant in three local policies, while the resilience conceptual frame was dominant in two policies. As with national-level policies, the local level shows the same concentration in those two conceptual frames. (See Table 25)

Table 25. Local level of policy analysis

Document	Country	Type	CC Adaptation / sectoral	Conceptual frame
Municipal Strategy for Climate Change Adaptation (EMAAC)	Portugal	Local Adaptation Strategy (LAS)	CC Adaptation	Risk management as dominant.
Municipal Director Plan (PDM)	Portugal	Local Regulation	Sectoral	No inclusion of CC Adaptation
Porto's District Civil Protection and Emergency Plan	Portugal	District Action Plan	Sectoral	No inclusion of CC Adaptation

Municipal Civil Protection and Emergency Plan	Portugal	Local Action Plan	Sectoral	No inclusion of CC Adaptation
Piano di Adattamento Citta dii Bologna (LAP)	Italy	Local Adaptation Plan (LAP)	CC Adaptation	Resilience as dominant
Piano Urbanistico Generale (PUG)	Italy	Local Action Plan	Sectoral	Resilience as dominant
Piano structural Comunale.	Italy	Local Action Plan	Sectoral	No inclusion of CC Adaptation
Regolamento Urbanistico Edilizio (RUE)	Italy	Local Regulation	Sectoral	No inclusion of CC Adaptation
Piano Comunale di Protezione Civile	Italy	Local Action Plan	Sectoral	Risk management as dominant.
Climate Change, Air Quality, and Health Strategy for Zaragoza (ECAZ 3.0)	Spain	Local Adaptation Strategy (LAS)	CC Adaptation	Resilience as dominant
Climate Change Adaptation Strategy for the City of Zaragoza	Spain	Local Adaptation Plan (LAP)	CC Adaptation	Risk management as dominant.
Strategy for Integrated Sustainable Urban Development in Zaragoza (EDUSI)	Spain	Local Action Plan	Sectoral	Risk management as dominant.
Ebrópolis Strategy Zaragoza +20	Spain	Local Strategy	Sectoral	Resilience as dominant
Zaragoza and Sustainable Development	Spain	Local Action Plan	Sectoral	Risk management as dominant.

Source: own elaboration

3.3 Operational level

The policy process in all three cases presents a set of different motivations for their development. In the case of Porto, it is important to remember that it was a project from the national government that developed the guide and created the conditions for the local municipalities to kickstart their planning process. Therefore, there is a significant influence from the national level in this case. In other words, the national level determined the operational conditions for the development of the local plan.

In the case of Bologna, it was a project, funded by the EU, that supported the conditions for the Municipality to launch and sustain the planning process at the local level. Here,

the local government had more freedom to design and conduct it within the conditions agreed with the EU.

Finally, in the case of Zaragoza, both documents are the result of the municipality´s efforts to address climate change as an issue of importance; in both cases, it was not part of a national government or EU initiative, therefore, the level of freedom to design and conduct the process was greater compared to the other two.

In the case of Porto, the conditions set by the national government put forward the risk management conceptual frame as the basis for policy development, in both the national and the local policy on CC Adaptation, which was dominant (see Table 32). At the local level, the stakeholders were in the majority, hierarchist (four subjects and just one egalitarian). It is important to keep in mind the fact that Portugal has been a very centralized and vertical country due to its authoritarian past. Thus, these conditions limited greatly the possibility of bringing other worldviews or conceptual frames to the table. The participation process at the local level was also conducted with greater limitations, only focused on presenting the document when it was almost completed to a set of stakeholders, but there was little interaction during the planning process.

In Spain, the transition from authoritarian rule to a democratic government was accompanied by greater decentralization at the regional and municipal levels. Zaragoza conducted the planning process on its own interest and resources. In this case, both the national and local levels of government choose the resilience conceptual frame as dominant, just leaving the LAP with higher influence from risk management. Here, hierarchies were also the dominant meta-frame (6-2). For Zaragoza, the first document was a broad strategy but limited regarding the description of goals or indicators to achieve. In general, both policy planning processes were described as very participative, and these included the use of learning spaces, the sharing of knowledge, the outsourcing of sectoral experts, and the inclusion of information developed by research groups. These processes involved multiple workshops with people from different sectors, moderated to maintain consensus and ensure everyone was heard. In the end, all subjects seemed pleased with the participatory processes and their highly inclusive nature.

As mentioned before, the Italy case was part of a project funded by the EU. In this regard, the Municipality of Bologna was the primary stakeholder leading the planning process. The interviewees noted that, even though the municipality tried to invite various stakeholders to participate at different stages, this participation was considered limited because all decisions and choices were municipality-centered. In the case of Bologna LAP, the potential challenge of dealing with divergent interpretations of goals and the meaning of adaptation was faced by restricting the number of stakeholders, who were hand-picked by the municipality. Conversely, the Bologna PUG planning process was more open to citizens, and participation had an impact on the final policy. As previously mentioned, the municipality, supported by selected experts, took the lead on the project and controlled the process. This occurred since the beginning of the planning process. In fact, the participants' ways to frame adaptation were steered from the very beginning towards the direction the municipality wanted to go. Moreover, it

is important to note that PUG was elaborated to operationalize Regional Law 24/2017, which mandated municipalities in Emilia-Romagna with clear, specific instructions on how to design their urban general plans. Thus, Regional Law 24/2017 played a significant role in the way PUG was framed from its inception.

The conceptual frames used by the national level presented two different frames; the national strategy showed a risk management conceptual frame, and the national adaptation plan showed a resilience conceptual frame. At the local level, the local adaptation plan shows a resilience-dominant conceptual frame; the stakeholders also presented a dominance of the hierarchist meta-frame at a ratio of 3:2. (See table below)

Table 26. Summary of the results of the frame analysis for the main national and local policies on CCA, as well as for the stakeholders' worldview.

Case	National CC Adaptation conceptual frame	Local CC Adaptation conceptual frame	Stakeholder meta frame
Porto, Portugal	National Climate Change Adaptation Strategy (ENAAC) **Risk management as dominant.**	Municipal Strategy for Climate Change Adaptation (EMAAC) **Risk management as dominant.**	**Hierarchist** was the main meta frame (4-1)
	Methodological Guide for the Elaboration of CCA Municipal Strategies **Risk management as dominant.**		
	Action Program for Climate Change Adaptation (P3AC) **Risk management as dominant.**		
Bologna, Italy	Strategia Nazionale di Adattamento Ai Cambiamenti Climatici (SNAC) **Risk management as dominant.**	Piano di Adattamento Città di Bologna Resilience as dominant	**Hierarchist** was the main meta frame (3-2)
	Piano Nazionale di Adattamento ai Cambiamenti Climatici (PNAC) **Resilience as dominant**		

Zaragoza, Spain	National Plan for Climate Change Adaptation (PNACC) **Resilience as dominant**	Climate Change Adaptation Strategy for the City of Zaragoza Resilience as dominant	**Hierarchist** was the main meta frame (6-2)
		Local Adaptation Plan (LAP) **Risk management as dominant.**	

Source: Own elaboration

Results on the implementation of policies

In the case of Porto, since there was not much information available on implementation, it is relevant to understand the different interviewees' views on the options and their implementation. PO-05 did not have a positive impression, stating that "40 measures are garbage, as they are the same everywhere" adding that "they are good intentions" and "they aren't big discoveries" suggesting that to tackle climate change would be preferential to have fewer, more targeted options (PO-05, personal communication, July 15, 2020). Along these lines, PO-02 admitted that bolder measures with a low likelihood of being achieved were not pursued because it was "better to have these because they are going to infect (other options)" (PO-02, personal communication, July 3, 2020).

Moreover, according to PO-02, measures "could have gone further had there been an ability to convince decision-makers," as they did not want to condition the successive political cycles (PO-02, personal communication, July 3, 2020). Additionally, the funding available was considered limited. In contrast, PO-03 recognized that the latest CC Adaptation developments made in Porto were due to current political will and that without it, it wouldn't have been possible to accomplish EMAAC (PO-03, personal communication, July 7, 2020).

Bologna LAP was developed around three main themes: drought and water scarcity; heat waves in urban areas; extreme rainfall events; and hydrogeological risk. Each theme was addressed with general long-term objectives (Comune Di Bologna, 2015). These broad objectives were translated into specific, concrete actions. The responsibility for the implementation of each action was distributed between the municipality and public and private stakeholders that participated in the LAP planning process, e.g., University of Bologna, Kyoto Club NGO, Emilia-Romagna Region (Comune Di Bologna, 2015).

For the area of drought and water scarcity, 18 actions were identified. Among them, five have been completed, nine are in progress, and four are pending. Regarding heat waves in urban areas, 20 actions were designed. Eight of them have been completed, ten are in progress, one is pending, and one was cancelled. Finally, 17 actions were planned to adapt to extreme rainfall events and hydrogeological risks. Seven of them have been completed, six are in progress, and four are pending (Comune Di Bologna, 2020a).

According to the monitoring document, a few examples of actions completed include reducing water consumption in the industry sector, increasing common urban vegetable gardens, constructing permeable parking areas, and monitoring waterways critical to hydrogeologic risk (Comune Di Bologna, 2020a). According to the municipality, the actions that require the application of spatial planning instruments are those that are pending. These actions will be reconsidered and reviewed during the elaboration of the "Action Plan for Sustainable Energy and Climate", which started in June 2020 (Iperbole. Rete civica, 2020a). The urban instrument that will be applied to address these actions will be the PUG (Comune Di Bologna, 2020a).

When it comes to interviewees' opinions regarding the implementation of LAP outputs, BO-02 expressed satisfaction and called the planning process and its implementation a "success story" (BO-02, personal communication, August 21, 2020). On the other hand, Interviewee BO-06 focused more on the difficulties of implementing the adaptation measures elaborated in the LAP. Following BO-06, these challenges stem from two main reasons. The first regards the fact that adaptation involves a wide range of stakeholders. This means that implementation does not depend solely on the municipality's will, but also on other public and private organisations. The second reason concerns the interconnection of LAP with other policy instruments. On the one hand, this is particularly important for achieving sound and comprehensive adaptation measures. However, it makes LAP implementation harder and slower (BO-06, personal communication, October 5, 2020).

In the case of Zaragoza, the policy analyses show that many documents are promoting CC Adaptation that enable stakeholder involvement and participation across different sectors. Many have detailed action plans and strategies for implementing CC Adaptation across a multi-sector, transversal platform, expanding its interdisciplinarity. However, most are non-binding documents that lack regulations and demands. These documents all have a very encouraging tone, but some even lack a precise distribution of responsibilities among stakeholders or the inclusion of other governmental entities. The interview subjects also confirm this to be a challenge, as SUB1 and SUB2 state that, even though there have been many CC Adaptation projects and initiatives, these strategies sometimes fall short in terms of implementation, given their explanatory nature without demands. SUB1 goes so far as to say that, without proper governmental implementation, these strategies can be useless without appropriate enforcement.

Enforcement mechanisms are of high importance, but what is mentioned as well is the importance of funding. SUB4 talks about the distribution of funds at a governmental level and how economic relief funds should include green economy projects. Nonetheless, this can be seen as a positive attribution as SUB3 states that this means that there is no complicated bureaucratic process and allows stakeholders to feel more welcomed to engage in CC Adaptation in their own way without the fear of facing negative consequences.

4. Conclusion

In this article, we analyzed three European cases of municipalities advancing local adaptation planning for climate change. The cases were selected because they were considered leading municipalities in climate change adaptation planning in each country: Italy, Spain, and Portugal.

The goal was to analyze how these three European cities dealt with climate change adaptation policies and the different frames involved in the drafting process. The first research question was how did the national CC Adaptation policies influence municipal adaptation policies? When drafting its local adaptation plan, the Municipality of Bologna was not influenced by the national government or the regional government. First of all, this is due to chronological overlapping since both the SNAC and Bologna LAP started being elaborated in 2012 and were approved in 2015, whereas the regional mitigation and adaptation strategy of Emilia-Romagna was approved in 2018. Second, it was determined that SNAC took a risk management approach, whereas Bologna LAP focused on resilience. Third, two interviewees reinforced the absence of an influence from the national level to the municipal one (BO-01, personal communication, August 21, 2020; BO-03, personal communication, August 28, 2020).

In the case of Zaragoza, the first local strategy shows higher levels of influence from the national adaptation plan, both share the resilience conceptual frame, and the latter was approved in 2006, while the local one was approved in 2010. The second local strategy shows lower levels of influence from the national level. First, because the dominant conceptual frame changed to risk-management, but also due to the lack of a recent national policy on CC Adaptation, the one from 2006 is considered outdated; also, the planning process was entirely driven by the local initiative and resources.

Regarding the results for Porto, the research shows that it was a very centralized process, where (non-mandatory) guidelines were created. As is the case with the Methodological Guide for the development of CC Adaptation strategies at the local level, which aims to build municipalities' adaptive capacity through a very detailed set of manuals that 27 municipalities, including Porto, followed in 2015. This being the case, this research points towards adaptation in Portugal as a top-down process in which municipalities rely on guidance and directions from the national level, which seems to be the case for at least the 27 municipalities that followed the Methodological Guide.

As a consequence of this influence, EMAAC follows the same lines as all the national adaptation policies and the Methodological Guide, namely, a risk management approach to CC Adaptation. Even though EMAAC had a significant influence from the national level when it comes to the conceptual frames followed, freedom was given to municipalities when developing the operational level of adaptation options, as the Methodological Guide presented various types of adaptation options that municipalities could go for in a way that did not condition the local level to a specific frame. Nevertheless, since the conceptual frame of risk management influenced the entire planning process, it was very present throughout the EMAAC.

The second research question was: how did the worldviews of the municipal actors involved in the decision-making processes influence the way municipal CC Adaptation policies were framed? In the case of Porto, even though only a portion of the actors involved in the process were interviewed, there was a significant influence from the hierarchist worldview, which can explain two things: why the process was less reliant on stakeholder engagement. It also reinforced risk management as the dominant conceptual frame in the document, as the hierarchist worldview tends to favor policy measures aligned with risk management. Nonetheless, according to this research's results, the primary influence emanated from vertical interactions with the national level.

In the case of Zaragoza, this analysis suggests that hierarchist influences shaped the planning process, especially in the second local adaptation plan, where the dominant conceptual frame was risk management. This supports a relationship of influence from individual stakeholder worldviews into the local CC Adaptation policy framing of the hierarchist stakeholder perspective, to a mostly risk-management conceptual frame in local policies. However, it also confirmed a relation to influencing a resilience conceptual framing, as a hierarchist favorite to both (McNeeley & Lazrus, 2014), and both resulted in the local policy analysis.

For Bologna, within the limits of this study, a profound influence of decision-makers' worldviews was identified in both the way they designed CC Adaptation policies and in the practical actions those policies developed. Therefore, decision-makers' meta-frames strongly influenced the conceptual and operational levels of framing in Bologna LAP. Additionally, the link hierarchist worldview-resilience approach was observed in the Bologna LAP.

The third question was how the design and conduct of the planning processes at the municipal level dealt with different CC Adaptation frames. In Bologna, the municipality took the lead and played a central role in elaborating both documents. As for Bologna LAP, stakeholders were handpicked by the municipality in one policy, and in the other, they steered citizens toward the direction they chose. This minimized the challenge of dealing with divergent interpretations of goals and the meaning of adaptation (the same can be said for Porto). The municipality, supported by selected experts, led the project and process from the beginning. By doing so, the municipality gave the policy its first imprint. Goals and courses of action were set, which could be considered an effective, though not fully participatory, way to address potential issues of divergent frames.

In the case of Zaragoza, there was a consensus among all subjects that the local government heavily values the participation process and the inclusion of multiple sectors in it. Policy development always seems to involve stakeholders from different sectors and aims to create transversal, large-scale goals. The spaces and methodologies provided for the participatory process were considered key during planning to address different frames.

Lastly, for Porto, the different frames included throughout the process were mainly from the municipality's inner scope, which shows that there wasn't a significant effort made in trying to include various and possibly chasing perspectives in the process,

which is precisely a trait hierarchist tends to go to as they prefer to rely on expert knowledge. The only time a wider range of perspectives was included (in the workshop), the EMAAC team ensured the stakeholders chosen would not be an opposing force to the process. Therefore, it can be said that the process mainly failed to include different frames.

Finally, regarding the last question, how has the city implemented the planning process outputs?, this was hard to asses for the municipality of Porto, nevertheless, the interviewees expressed the limited ambition of the local administration towards the final adaptation measures included, especial concern was on the fact that a following political cicle could negatively affect the advancements if they plan was to ambisitous. The case of Zaragoza also presented limitations, mainly due to limited funds and the character of recommendations for some measures, rather than regulations or enforcement capacity. In the case of Bologna, more progress was noted in the implementation of the local strategy; a municipal report showed a high level of progress in all but those related to land-use planning.

It seems that the case with less autonomy from national government influence showed the least advancement in the policy process and implementation outcomes (Porto). The other two cases (Bologna and Zaragoza) had less influence, and the preliminary results, whether self-assessed in advancement reports or reported by stakeholders in interviews, indicated advancements in activities where local authorities had allocated resources and did not depend on changes in local regulations. Changes to such regulations require lengthy political and legal processes at the local level and may be hampered by opposition from third parties (different frames).

The three cases here studied allowed us to put into practice a framework for framing climate change adaptation. The results showed that the hierarchist perspective is the most prevalent, influencing the conceptual level of framing, centering the risk-management approach as the most important in these three countries, with specific policies also being influenced by the resilience approach. But both, with significant emphasis on measures privileged by the hierarchist perspective.

These two levels influenced the operative level by conducting a participation process with a certain degree of control over who could participate (especially in Porto), emphasizing the role of experts over other stakeholders. Interestingly, the private sector had limited participation, to the point that it was impossible to contact any representative from this sector who had participated in the processes; no individualist perspective was detected as the main one among stakeholders. Bologna and Zaragoza presented a more participative process, not just a consultation on the final draft; nevertheless, when we analyzed the interviewees' Cultural Theory perspectives, there was little representation of the egalitarian perspective. In other words, the bulk of the stakeholders were hierarchist.

Cultural Theory has been used to analyze policy and develop climate change strategies. This approach helps understand the perspectives of the various stakeholders involved

in the decision-making process (Bentley, 2020). Authors such as Verweij et al. (2006) and McNeeley and Lazrus (2014) have used Cultural Theory to examine the framing of climate change, and argue that the need to create policy options that resonate with different perspectives, in the balance of the various options, is where resistance to policy development and implementation is reduced.

For example, in Burkina Faso, differences in cultural values among groups led to the adoption or rejection of new livelihood strategies to reduce climate change vulnerability (Nielsen & Reenberg, 2009). Similarly, a study of community-level climate adaptation in the Netherlands found that diverse cultural perspectives influenced whether different adaptation strategies were appropriate or effective (Heimann & Mallick, 2016). Ead (2022) conducted research with university personnel in Egypt, who reached similar conclusions about the role of culture in shaping policy preferences, rejection, and acceptance decisions. These studies demonstrate how Cultural Theory can help diagnose barriers and facilitate dialogue and cooperation around climate change adaptation planning.

The three cases analyzed in this article did not integrate much balance between the different perspectives or the conceptual approaches. Hierarchist was dominant, and in all cases, either a risk-management or the resilience approach was favored. Nevertheless, the measures approved did not create significant changes, especially not in the local land-use regulations. It seems that the local authorities decided to avoid decisions that could ignite a certain degree of opposition; in the case of Porto, this was an actual decision.

We can argue that these results indicate strategies favored easy decisions or incremental changes that help the adaptation process, but actively avoided tackling areas or measures that would require a lengthy political, legal, and, more broadly, participatory process, such as reforming land-use planning. This is what Wong and van der Heijden (2019) have identified filtering, a strategy used to avoid conflict and trade-offs. When issues present such situations, they are discarded in favor of those promising less resistance. The problem with this strategy is that adaptation needs may not be met at the required level, and the measures finally adopted may not be sufficient when facing climate extremes, causing greater economic and societal losses.

More research is needed to assess the extent of filtering in local adaptation strategies and the potential long-term costs of adopting such measures, especially given that GHGs are still increasing in the atmosphere (IPCC, 2023), thereby increasing near-term adaptation needs.

CHAPTER 6: CASE STUDIES DISCUSSION OF FINDINGS

1. Contextualization of the five cases

Selecting the five cases allows us to present a range of characteristics to compare. Both Costa Rica and Honduras are developing countries, but with different levels of income: Costa Rica is a middle-income country, while Honduras is a low-income country. Nevertheless, both cases are municipalities with similar characteristics: rural and located in the border areas of their respective countries. The European cases were similar: developed countries with high income and municipalities at the heart of large metropolitan areas. (See table 27)

The policy development process studied for Upala was a land-use plan that, from the national level, requested the inclusion of risk management and climate change adaptation measures. This policy process was conducted between 2010 and 2014 but was ultimately rejected by local authorities due to pressure from the private sector and the mobilization of particular communities. This policy process received funding from the Spanish International Cooperation Agency.

Table 27. The five cases studied

Country	Country development level	Municipality	Main characteristic of the Municipality	Policy process studied	Policy status
Costa Rica	Developing, Middle-income	Upala	Small rural municipality in the border area of the country.	Land-use plan	Rejected
Honduras	Developing, low-income	San Francisco del Valle	Small rural municipality in the border area of the country.	Development plan with land-use elements	Approved
Portugal	Developed, high-income	Porto	Large metropolitan municipality	CC Adaptation policy	Approved
Italy	Developed, high-income	Bologna	Large metropolitan municipality	CC Adaptation policy	Approved
Spain	Developed, high-income	Zaragoza	Large metropolitan municipality	CC Adaptation policy	Approved

Source: Own elaboration

The San Francisco case in Honduras was a development plan that included elements of a land-use plan, following a national-level guide that mentioned risk management integration but, in practice, failed to provide guidance on how to integrate it and did not mention CC Adaptation at all. This policy process was conducted between 2010 and 2017, and after some delays, it was finally approved for implementation in 2018-2023. This policy process received funding and technical support from a project of the Japanese International Cooperation Agency.

All three European cases refer to the development of local CC Adaptation policy processes. The Porto case in Portugal followed a national-level guide and was part of a project to support the development of local adaptation strategies in several municipalities countrywide. The local plan was approved in 2016. The Bologna case in Italy was handled directly by local authorities, without any intervention from the national government. However, the policy development received funding from the European Union and was developed between 2014 and 2015, when it was finally approved. Finally, the Zaragoza case in Spain is the continuation of a local initiative. Zaragoza had a local adaptation strategy from 2009 to 2015; a new strategy was necessary, and the authorities, with the participation of local stakeholders, developed the new policy that was approved in 2019.

2. Comparison of the results for the national and regional levels of policy

All five countries have national-level CC Adaptation policies that, at different levels, have guided or influenced the local development of policies. Of the five countries, the risk management approach was dominant in two (Costa Rica and Portugal), the resilience approach in two (Italy and Spain), and in Honduras, the vulnerability approach was dominant. Nevertheless, some countries have policies either with an emphasis on other conceptual frames (two policies in Portugal with resilience and vulnerability approaches, the two policies in Honduras with some emphasis on risk management) or a policy with another dominant frame, such as the case in Italy, with one policy with a dominant risk management approach. (See table 28)

For the sectoral policies, seven policies did not include CC Adaptation, so no frame was identified (Spain included adaptation in all six policies studied). In all five countries, the risk management approach was the dominant frame; in Italy, the resilience approach was dominant in one policy, as was the case in Spain.

It is important to note that the concept of adaptation and the initial set of guides issued by the IPCC were strongly influenced by the risk management approach, as discussed in Chapter Four. Therefore, it is expected to have a greater influence than the other two approaches. The resilience approach is present in European cases, and vulnerability is present only in Honduras. The vulnerability approach is more likely to be present in developing countries, whereas resilience is more common in developed countries. The results in this section corroborate those expectations.

Table 28. National-level policies' dominant frames

Country	CC Adaptation policies' conceptual frame	Sectoral policies' conceptual frame
Costa Rica (N:3)	One policy studied, the dominant frame is the risk management approach.	Of the two policies studied, one did not include CC Adaptation and, therefore, has no frame. The other document has a dominant risk management approach.
Honduras (N:7)	Two policies were studied, and in both cases, a dominant vulnerability approach with some emphasis on risk management.	Five policies studied. In three policies, no inclusion of CC Adaptation; therefore, no frame was identified. In two policies, the dominant frame was risk management.
Portugal (N:7)	Four policies with dominant risk management. In two policies, some emphasis is placed on resilience and vulnerability approaches.	Three policies with a dominant risk management approach. Two policies without inclusion of CC Adaptation, therefore, no frame.
Italy (N:6)	Three policies in total, two of which adopt a dominant resilience approach. One policy with a dominant risk management approach.	Three policies were studied, one of which had a dominant risk management approach. One with a dominant resilience approach. For the last one, no frame was identified.
Spain (N:8)	Two policies in total, both of which use a resilience approach as the dominant frame.	Six policies were studied; in five cases, risk management was the dominant frame, and in just 1 case, the resilience approach was dominant.

Source: Own elaboration

3. Comparison of the results for the local level of policy

The only cases with CC Adaptation policies were the European cases; of the four policies documented, two had a dominant resilience approach: Bologna and the most recent CC Adaptation policy of Zaragoza (ECAZ 3.0). The policy of Porto and the first one of Zaragoza (2010) had a dominant risk management approach.

International efforts such as 100 Resilient Cities, which has a significant number of European cities, have been key to advancing the resilience approach in different regions of the world. The case of Porto is essential to remember (as mentioned in Chapter Five), which was highly influenced by the national guide promoting the development of such policy instruments. The first policy of Zaragoza was enacted quite early, when the IPCC framework was highly influential in shaping the first adaptation policies.

Regarding sectorial policies, Porto was the only case in which no single policy integrated CC Adaptation; therefore, we could not detect a conceptual framework. In Bo-

logna, two of the four policies did not integrate adaptation, so no conceptual frame was identified for those. The other two policies presented in one case the dominant risk management approach and in the other, resilience. For Zaragoza, two of the three policies used risk management as their dominant frame, and the other used resilience. Upala in Costa Rica presented a policy with a risk management approach with limited CC Adaptation references. San Francisco in Honduras had a vulnerability approach as the dominant frame. (See table 29)

In general, risk management was more dominant with respect to sectorial policies, followed by resilience, and lastly by the vulnerability approach. As mentioned before, because the IPCC has favored a risk-management approach since the initial development of adaptation concepts and tools, it was highly expected to find such a conceptual approach dominant. In the European context, the resilience approach has been very active, especially since the creation of the Resilient Cities Network in 2013, and has expanded in different regions, including Latin America, Africa, and Asia (Brown et al, 2012; Broto, 2013).

Table 29. Local-level policies' dominant frames

Country, case	CC Adaptation policies' conceptual frame	Sectoral policies' conceptual frame
Costa Rica, Upala (N: 1)	No policies.	1 sectoral policy with a dominant frame of risk management approach.
Honduras, San Francisco (N:1)	No policies.	1 policy studied with a dominant frame of vulnerability approach.
Portugal, Porto (N:4)	1 policy with dominant risk management.	3 policies without the inclusion of CC Adaptation, therefore, no frame.
Italy, Bologna (N:6)	1 policy with a dominant resilience approach.	4 policies were studied, 1 of which had a dominant risk management approach. 1 with a dominant resilience approach. The last two were without the inclusion of CC Adaptation; therefore, no frame was identified.
Spain, Zaragoza (N:5)	2 policies in total, one with the resilience approach as the dominant frame, and the other with the resilience approach as the dominant frame.	3 policies were studied, in 2 cases the risk management approach was the dominant frame, and in 1 case the resilience approach was dominant.

Source: Own elaboration

4. Comparison of the results for the stakeholders' meta-level of frame

In total, 40 interviews were conducted as part of the research process for the five cases. Upala and San Francisco had the most interviews, with 11 each; Bologna and Porto had 5 each; and Zaragoza had 8. In total, 16 interviewees were municipal staff; 6 were political leaders or heads of local governments; 8 were from academia; 4 were from civil society; 4 were from regional or national bodies; and three were from the private sector.

The interviews in all three European cases were conducted in 2020, which explains the difficulty reaching more stakeholders; in both Central American cases, the interviews were conducted in 2019. The private sector was the hardest to reach in most cases due to a combination of factors, including limited participation in the planning process, a lack of contacts with sector representatives, and limited participation from this group.

Usually, when conducting Cultural Theory analysis, some researchers classify stakeholders, assuming that government representatives will be hierarchist, academia and civil society will be egalitarians, and the private sector will be individualists, with fatalists absent. In this research, we decided to apply both open-ended questions on climate change and adaptation in a semi-structured interview and a questionnaire designed to assess the relative weight of different worldviews within a person.

The overall results show that hierarchist worldviews dominate among all stakeholders interviewed across the five cases; when the dominant worldview was not hierarchist, it was usually the secondary worldview of the interviewee. The egalitarian worldview was the second most dominant; in fact, only the Upala case presented as dominant other than these two, and the remaining four presented only these. In the Upala case, the hierarchist worldview was strongly dominant, with eight interviewees having it as the main one. However, we registered one individualist, one fatalist, and one egalitarian. Only in the second worldview, in the case of Porto, do we register a single individualist. (See table 30)

This is very important because the adaptation process is highly dominated by hierarchists in all cases, and this aligns with the most common approaches in local policies, risk management, and resilience. For hierarchists, these two approaches are the most preferable in risk management, especially when it relates to measures such as regulations, zoning, education, training, the development of specialized studies, and infrastructure projects (as mentioned in Chapter Four).

The case of San Francisco is quite interesting because it was the only one in which egalitarianism was the dominant frame, and in the local policy, the vulnerability approach was dominant; this approach is the preferred option for egalitarians when dealing with CC Adaptation.

Table 30. Comparison of the Stakeholders' dominant worldviews according to Cultural Theory.

Country	Number of interviews and sectors represented	Stakeholders' dominant worldview*	Stakeholders' second worldview*
Costa Rica	*11 interviews*, 2 from the municipal staff, 5 political leaders, 2 from academia, 1 from civil society, 1 from the private sector	8 hierarchist 1 egalitarian 1 fatalist 1 individualist	2 hierarchist 8 egalitarian 1 individualist
Honduras	*11 interviews*, 4 from the municipal staff, 1 municipality head of government, 3 from regional or national government, 3 from civil society	4 hierarchist 7 egalitarian	7 hierarchist 4 egalitarian
Portugal	*5 interviews*, 4 from the municipal staff, 1 from academia	3 hierarchist 2 egalitarian	1 individualist 2 hierarchist 2 egalitarian
Italy	*5 interviews*, 4 from the municipal staff, 1 from academia	3 hierarchist 2 egalitarian	2 hierarchist 3 egalitarian
Spain	*8 interviews*, 2 from the municipal staff, 3 from academia, 2 from the private sector, 1 from the regional government	6 hierarchist 2 egalitarian	2 hierarchist 6 egalitarian

* To identify the dominant and secondary perspectives between the results of the interview and the questionnaire, the option with the highest score was selected when the results were divergent between both instruments.

Source: Own elaboration

5. Discussion

The five cases analyzed in this chapter clearly illustrate how framing influences the concepts, methodologies, instruments, and participation in the drafting process of CC Adaptation policies. To assess this, we developed a framework that operationalized frame theory by integrating the four perspectives of Cultural Theory (egalitarian, hier-

archist, individualist, and fatalist) as the meta level of framing, together with the three main conceptual approaches to adaptation (vulnerability, resilience, and risk management). Hierarchists had strong links with resilience and risk management (but for the second with a different set of preferences in terms of adaptation actions); egalitarians have a strong connection to the vulnerability approach; individualists a strong connection to risk management (but with adaptation measures with different than those preferred by the hierarchists) and; finally, the fatalist will not plan and probably would actually self exclude from participation.

This was conducted through policy document analysis and interviews with key participants in the local policy processes (some were municipal staff, others from academia, local political leaders, council members, civil society, experts, and the private sector).

When comparing the conceptual framing in policy documents from national and local government, we observe precise alignment. In all five cases, the local policies followed the same conceptual frame as the dominant one in the national CC Adaptation policies. This was the case because either the national government set the framework for local governments to conduct local planning (Portugal and Costa Rica), or local governments chose to follow the same path as the national level (Spain, Honduras, and Italy).

In the case of Australia, a similar trend was found in relation to the weight of influence from the "initial sponsor´s interests and associated institutional arrangements, as well as available resources" (Fünfgetld et al, 2011, p. 291). In this particular case, it was identified as a challenge to conduct framing explicitly and to allow iterative scoping of adaptation projects. A similar conclusion was reached by Olazabal et al. (2024), who suggest that top-down, off-the-shelf initiatives could even increase local vulnerability, undermining locally driven adaptations. Based on the results of this chapter, we noticed similar constraints in the case of Costa Rica, due to the lack of freedom (from the nationally determined proceedings and frame), as well as limited leadership from local authorities to steer the process and create spaces to integrate measures acceptable to other frames (resulting in the abortion of the policy output). The Portuguese case also presented less freedom due to the influence of national-level policy, resulting in a local policy process limited in terms of stakeholders' participation and the inclusion of adaptation measures (considered by some interviewees as "not innovative" or "more of the same"). Even though the Italian and Spanish cases offered greater freedom of action to local authorities, these followed similar patterns of participation, with carefully selected stakeholders choosing a set of initiatives valued by some interviewees as easy options or incremental change, as mentioned in chapter five.

The Honduran case presented better opportunities to explicitly frame local problems and needs among local leaders in all communities, and later at the district and, finally, the municipal level. This resulted in the integration of a multitude of measures tackling adaptation needs from different perspectives (as discussed in Chapter Four). This follows closely the suggestions of Fünfgetld et al. (2011) and Olazabal et al. (2024).

When analyzing the results of the five cases on the policies' dominant conceptual frames and the stakeholders' meta-frames, the connections determined in our research framework were confirmed. For example, in Honduras, the dominant vulnerability approach at the policy level aligns with most participants' metaframe of egalitarianism. The results in Costa Rica and Portugal showed that most interviewees were hierarchist. The policies' dominant conceptual frame was risk management, and the kind of measures matched those preferred by hierarchists. In Spain and Italy, the same was true of resilience: a majority of participants were hierarchists. (See table 31)

Only the Costa Rican case shows a diverse mix of worldviews present; the other four interviewees were hierarchist or egalitarian in minor numbers. However, in terms of the policy process's outcome, all but the Costa Rican case were approved for implementation. In Costa Rica (as discussed in Chapter Four), the private sector heavily opposed the zoning measures included in the policy. They launched a campaign to stop the proposed policy and to exert social and political pressure on local authorities to reject it. The prominent leader of such a movement was the individualist worldview detected in our research. Individuals have a low perception of risk , and the group in Upala shared this perception. For that reason, they affirmed that the technical instruments overestimated flooding and landslide risk in Upala and emphasized that such dispositions will only affect the local economy and their interests. No incentives or supporting measures were included in the plan that could have reduced the opposition from this sector.

In contrast, in the other four cases, the policies were either CC Adaptation policies or development policies that typically do not include regulations, zoning, or limitations that directly affect specific sectors; they often integrate incentives, build adaptation capacities, co-produce knowledge, and foster a long-term vision for future development. Therefore, it is harder to find such intractable opposition as in Costa Rica. Nevertheless, as the adverse effects of climate change intensify, the demand for local CC Adaptation policies that incorporate more restrictive or aggressive measures will also increase (IPCC, 2022).

This will eventually create more conditions for intractable opposition if such policy processes do not account for the preferences of the different frames. Therefore, making frames visible is a powerful tool for identifying how balanced or unbalanced the policy choices are, and how such imbalance can create intractable conflicts around the policy process.

Table 31. Summary of the results of the frame analysis for the national and local policies on CC Adaptation, as well as for the stakeholders' Cultural Theory perspective.

Case	National CC Adaptation Conceptual Frame	Local CC Adaptation Conceptual Frame	Stakeholder meta frame
Upala, Costa Rica	National Strategy of Climate Change **Risk management as dominant**	Land-use plan and regulations **Risk management as dominant**	**Hierarchist** was the main meta frame (8 out of 11)
San Francisco, Honduras	National Strategy of Climate Change **Vulnerability as dominant**	Municipal Development Plan **Vulnerability as dominant**	**Egalitarian** was the main meta frame (7-4)
	Climate Change Law **Vulnerability as dominant**		
Porto, Portugal	National Climate Change Adaptation Strategy (ENAAC) **Risk management as dominant.**	Municipal Strategy for Climate Change Adaptation (EMAAC) **Risk management as dominant.**	**Hierarchist** was the main meta frame (4-1)
	Methodological Guide for the Elaboration of CC Adaptation Municipal Strategies **Risk management as dominant.**		
	Action Program for Climate Change Adaptation (P3AC) **Risk management as dominant.**		
Bologna, Italy	National Strategy of Climate Change Adaptation (SNAC) **Risk management as dominant.**	Adaptation Plan of the City of Bologna Resilience as dominant	**Hierarchist** was the main meta frame (3-2)
	National Plan of Climate Change Adaptation (PNAC) **Resilience as dominant**		

Zaragoza, Spain	National Plan for Climate Change Adaptation (PNACC) **Resilience as dominant**	Climate Change Adaptation Strategy for the City of Zaragoza Resilience as dominant	**Hierarchist** was the main meta frame (6-2)
		Local Adaptation Plan **Risk management as dominant.**	

Source: Own elaboration

As mentioned in Chapter Five, the measures finally adopted in all three European cases were considered incremental change, safe measures; in other words, these were selected because they will be ease to implement, the resources were already allocated or within the capacity of the municipalities whiout mayor changes to butged allocation or increase in taxation, also, they did not center around changes in essential regulations such as those of zoning or construction. The case of San Francisco was very different; the Honduran national government demanded that all municipalities approve and align their budgets with their development plans. Those who fail to do so would not receive budget allocations from national funds, creating a significant incentive to produce and allocate resources to implement the PDM for San Francisco.

As mentioned in Chapter Five, choosing the easy options for adaptation measures to ensure no opposition is directly connected with filtering strategies (Wong and van der Heijden, 2019). By reducing the risk of conflict and trade-offs, municipalities such as Porto, Bologna, and Zaragoza were able to approve their strategies and move them into implementation.

The case in San Francisco is fascinating because local stakeholders decided to actively integrate climate change and risk management options into a plan that was not initially required. Once integrated, they should be included in the municipality's annual budgets.

Due to its nature (land-use plan) and the requirement to integrate effective risk management measures into the zoning, the Upala case created conditions for strong opposition, which used the limited spaces for participation and the lack of involvement from the local leadership throughout the process to criticize and later block approval.

These five cases support the idea that a more open and participatory process, which allows different frames to interact, has the potential to generate ideas and integrate options that resonate with a broader range of perspectives to address CC Adaptation. This supports the argument for "clumsy solutions" from Verweij et al. (2006) and the idea that policies are more likely to succeed when they reflect the cultural biases of the stakeholders (Cambardella et al., 2020; McNeeley & Lazrus, 2014; Fünfgetld et al., 2011).

Nonetheless, having more perspectives competing to present their solutions to the problem could bring conflict and trade-offs to the negotiation table, making the process more complex. These create incentives for the hierarchist perspective to manage and steer the process in a way that could ensure less confrontation and easier implementation, thereby filtering which stakeholders to invite and providing options for integration.

The problem with such a strategy is that it may result in limited adaptation, which in the short term may seem enough, but with more extreme weather and more adverse stimuli from climate change, could render it ineffective or, even worse, lead to disaster. That is why the latest IPCC report indicates that "managing uncertainty with forward-looking processes needs to be more deliberative and oriented towards building trust in a collaborative process. Building relationships through informal, bottom-up processes enables this to occur." (New et al., 2022, p. 2516)

A common element across studies is the difficulty of identifying the fatalist perspective in policy processes and its connection to, or preferences beyond, simply not planning for CC Adaptation or self-exclusion (sometimes, especially in a developing context, excluded due to poverty, minority status, or other vulnerabilities). This is shared across multiple studies on narratives and worldviews on CC since Verweij et al. (2006), Cambardella et al. (2020), and McNeeley & Lazrus (2014), and some studies choose not to include the perspective (Böhm et al. 2019).

Recent literature on the climate change endgame relates to several elements of the fatalist perspective, such as that climate change is considered a force beyond human agency, an unavoidable collapse (Slothuus, 2024), the futility of mitigation, and the focus on survivalist strategies (Finerti et al., 2025), among others this relates to climate nihilism in whicn no meaningful adaptation is possible (Susienka & Purves, 2024). All these narratives underscore the importance of actively addressing the fatalist perspective.

The framework developed in this thesis for analyzing framing in climate change adaptation is centered on how different perspectives influence decision-making. Because CC Adaptation is a contested field, with various stakeholders advocating different strategies or even rejecting the climate science, the framework aims to make these perspectives explicit to better understand the trade-offs inherent in the chosen actions. Each decision stems from a particular frame and carries trade-offs, potentially creating opposition if not explicitly addressed.

The framework helps assess stakeholder worldviews and how they shape decisions on conceptual elements and operational aspects, such as tools, strategies, knowledge, participation, and adaptation measures. It is helpful to analyze the influence of these different frames on the policy outputs and measures selected within.

Applying this framework to the five cases presented in this thesis, the study found that national-level policies significantly influence (in some cases constrain) local decision-making freedom. A hierarchist worldview dominated the process in all but one case, influencing the local policy to mirror the national risk management approach. This highlights the importance of considering diverse perspectives and the potential

limitations imposed by top-down policy directives. The only case that differed was San Francisco, where an egalitarian majority of stakeholders, along with the vulnerability conceptual frame guiding policy development, enabled the inclusion of CC Adaptation and risk management measures in a policy process that did not require them.

In all but one case, the participation process followed a hierarchist pattern, with limited participation and an emphasis on those with expert knowledge. Thus, limiting opposing frames or suggestions of actions that will escape the preferences of the hierarchist. For example, in the case of Portugal, the only egalitarian interviewee was critical of the policy measures' limited scope and their lack of boldness in addressing Porto's adaptation challenges. These findings show how important the frames are in the adaptation process, both at the local and national levels.

The local level of Government is better positioned to address adaptation (OECD, 2023). Developing adaptation policies and plans at the local level is becoming a necessity as the current climate crisis intensifies. Current pathways of GHG emissions can exacerbate the adverse effects of climate change worldwide, particularly in developing countries. This will increase the demand for adaptation planning and implementation at the local level, requiring more from communities and stakeholders alike.

This increased need also requires a better understanding of how the different elements of society relate to climate change and adaptation, and how they perceive these processes. The future success of local policies may depend on the support they gather from different groups of society. This review of how the adaptation process is framed at different levels aims to address this need by proposing a novel analytical framework to be tested at local levels.

By integrating Cultural Theory with the three conceptual approaches for adaptation (risk management, resilience, and vulnerability), the framework facilitated an in-depth understanding of how different perspectives influence CC Adaptation strategies. Our application of this framework to the cases highlighted its utility in identifying the dominant and marginal perspectives that shape policy decisions and implementation.

The findings underscore the need to balance diverse viewpoints in CC adaptation policymaking to enhance effectiveness and acceptance. This balance ensures that adaptation measures are not only technically feasible but also socially and politically viable. By acknowledging and incorporating multiple frames, policymakers can devise more robust and inclusive adaptation policies that are better suited to address the multifaceted challenges posed by climate change.

The limitations of this framework relate to aspects outside the scope traced in this thesis, for example, the framework does not integrate power relations; someone may argue that the private sector (individualist) could have more capacity to influence the policy process due to its resources and connections (as noted in the Costa Rican case). The same can be said about corruption: decision-makers at different levels could be more open to receiving funding for political campaigns or personal benefit from third parties that would prefer the inclusion or exclusion of specific measures. As mentioned

in Chapter Four, this framework departs from the fact that it centers on democratic societies, where the policy process is more open to the participation of different stakeholders, and opposition can openly criticize governmental decisions at various levels. However, CC adaptation policy processes in more authoritarian or hybrid regimes may not include the same considerations for opposition or for stakeholder participation outside the regime. Therefore, it reduces the need to account for those perspectives.

In terms of reliability, this thesis tested the framework developed using a combination of two methods applied to stakeholders; the first was a questionnaire specifically designed and tested, and the second was Cultural Theory applied to environmental issues. This was first developed by Meader (2002). The second method was discourse analysis of the stakeholders interviews, the integration of a section in the semistructured interview regarding the participants views on climate change departing from problem definition, who should be responsible to tackle it, that role the local government should play and possible actions to addres it, and later requesting specific views on adaptation, following a similar approach as Beumer (2014). We considered that relying on a single method to assess stakeholders' perspectives could be limiting; therefore, using both methods allows us to compare the instruments' results and assess reliability. Overall, regarding stakeholders' frames, the great majority of participants' perspectives align across the interview and questionnaire analyses; when the dominant worldview did not match across methods, it was the second-most dominant perspective. Only 2 participants out of 40, in the case of Costa Rica, showed distant results among methods (2 out of 40 interviews).

PART 3:
Conclusions and Recommendations

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

Adaptation processes have been shown to encounter an increasing number of barriers, many of which are particularly focused on the social and institutional dimensions of adaptation. These barriers have been defined as "the arrangement of climatic and non-climatic factors that emerge from the actors, the governance system, or the system under study" (Biesbroek et al., 2013, P. 1119).

As a tropical developing region, Central America is among the most vulnerable areas to current climate variability and future climate change. This region has already been severely affected by changes in climate variability and extreme events (Magrin et al., 2014; Castellanos et al, 2022). Furthermore, the latest IPCC report identified impacts in relation to extreme weather events, droughts and water scarcity, agricultural impacts, food insecurity, health impacts, economic losses, migration and displacements, biodiversity loss, water availability, and urban vulnerability (Castellanos et al, 2022). Due to the lack of scientific knowledge on the CC Adaptation policy development in Central America, both from the direct and mainstream approaches, the first primary research question of this thesis is:

> *What is the progress of the Central American countries developing CC Adaptation policies, both from the dedicated and the mainstream approach to adaptation, and how does this progress relate to the local level of government?*

Studying how adaptation is framed could give us clues into how it affects the relationship between actors and the governance system that facilitates or hampers the implementation of CC Adaptation measures and strategies. Therefore, the second main question was:

> *Why do some municipalities advance in the CC Adaptation policy process while others don´t, and how would the inclusion of different and sometimes competing frames make advancement more likely?*

The Related sub-questions that are addressed in this thesis are:

1. What similarities and differences characterize the strategies developed among the countries in this region, and how can they be explained?
2. What components of developing these strategies in Central America could be useful to help other regions with contextual similarities?
3. Whether and how climate change adaptation is being integrated into the policy sectors of general development, disaster risk-management, and land-use planning in the six countries?

4. How is the vertical interaction between national and local levels of government for mainstreaming present in the drafting process, and the arrangements included in these to support implementation, monitoring, and funding of the policy outputs
5. How did national CC Adaptation policies influence municipal adaptation policies?
6. How did the worldviews of the municipal actors that were part of the decision-making processes influence the way municipal CC Adaptation policies were framed?
7. How did the design and conduction of the planning processes at the municipal level deal with different CC Adaptation frames?

The following sections present the answers to the main research questions, starting with the first main question and answering each related subquestion in subsection 1. Subsection 2 then addresses the second primary research question and its corresponding subquestions. Lastly, subsection 3 brings a series of recommendations from the author's perspective based on the main results of this thesis. (See table 32)

Table 32. Organization of the Chapter with respect to the research questions

Subsection 1: Main question		**Subsection 2: Main question**	
What is the progress of the Central American countries developing CC Adaptation policies, both from the dedicated and the mainstream approach to adaptation, and how does this progress relate to the local level of government?		Why do some municipalities advance in the CC Adaptation policy process while others don´t, and how would the inclusion of different and sometimes competing frames make advancement more likely?	
Subquestions:		**Subquestions:**	
1) What similarities and differences characterize the strategies developed among the countries in this region, and how can they be explained?	Chapter 2	5) How did national CC Adaptation policies influence municipal adaptation policies?	Chapters 4, 5, & 6
2) What components of developing these strategies in Central America could be useful to help other regions with contextual similarities?	Chapter 2	6) How did the worldviews of the municipal actors that were part of the decision-making processes influence the way municipal CC Adaptation policies were framed?	Chapters 4, 5, & 6
3) Whether and how climate change adaptation is being integrated into the policy sectors of general development, disaster risk-management, and land-use planning in the six countries?	Chapter 3	7) How did the design and conduction of the planning processes at the municipal level deal with different CC Adaptation frames?	Chapters 4, 5, & 6

4)How is the vertical interaction between national and local levels of government for mainstreaming present in the drafting process, and the arrangements included in these to support implementation, monitoring, and funding of the policy outputs?	Chapters 2 and 3	Subsection 3: Recommendations

Source: own elaboration

1. Progress advancing CC Adaptation policy in Central American countries

Like many other developing regions, Central America faces critical challenges related to climate variability and climate change. High vulnerability and limited adaptive capacity hinder its sustainable development, and extreme weather events threaten its progress. The authorities of the region have responded to this challenge with a combination of measures integrated into laws, strategies, and plans. The same response in other regions is at the center of an increasing number of scientific studies on climate change. A growing number of scientific publications are studying how adaptation planning unfolds worldwide. This thesis was among the first to register and study Central America's national climate change adaptation policies.

A set of drivers has created momentum for policy development in the region. The UNFCCC negotiations and commitments, together with international cooperation, have led to an increasing number of policies addressing adaptation goals in all countries. Answering the first sub-question, this study has documented that this process has gained increasing importance to the point that it has transitioned through two distinct generations of adaptation planning, each with specific characteristics. The number and quality of policy outputs addressing CC Adaptation have increased. In terms of quantity, as Chapter 2 described in detail, from 2006 to 2012, nine documents were approved; from 2013 to 2018, sixteen new policies were adopted, and nine more were in different stages of elaboration.

Answering *sub-question one*, this research distinguishes an improvement in policy outputs, especially in terms of implementation and monitoring arrangements, and in new forms of vertical interactions between the national and local levels of government. These two generations exhibit distinct characteristics, indicating a learning curve in adaptation planning.

The second generation of NASs is underway; countries such as Costa Rica, Honduras, and Nicaragua have recently approved new policies or are drafting them. Even the regional intergovernmental body (SICA) has begun drafting a new regional strategy. The NCL introduced most of the institutional changes that allow for new features, responsibilities, and conditions for policy improvement. Climate legislation, the process of elaborating the third communications on climate change, and the increased influence

from international cooperation seem to have created the conditions for the second generation of policies. This explains the trend toward improved adaptation policies in most Central American countries, especially in Costa Rica, El Salvador, Guatemala, and Honduras. Nicaragua and Panama were behind, but new policies are under development, possibly catching up with the rest.

Except for Nicaragua and Panama, this thesis considers the NAP to be a second-generation climate policy in Central America, due to differences in the drafting process, participatory approaches, and improvements in implementation, monitoring, and funding arrangements. Two new features are the interinstitutional committees, designed to enable horizontal coordination, and the climate change units in various ministries. Additionally, consultative and broad participatory drafting processes are now the norm in the region, representing, in some cases, a clear trend toward "governance with representation and consultation".

Regarding *sub-question two*, the characteristics reported for the speed and quality of the most recent policy outputs describe a region learning to plan for adaptation. Most scientific literature emphasizes the importance of treating adaptation as a learning process (Collins & Ison, 2009; Fisher et al., 2018; Mimura et al., 2014; Pham & Saner, 2021; Gonzales et al, 2025). The learning curve described earlier is essential to acknowledge, as other regions likely experience it as well. The quality of the policy output has to improve; this was especially true for budgeting, monitoring, and evaluation. These three components are key to easing the implementation process.

Suppose the policy outputs do not clearly determine the budget commitments and sources of funding (local, regional, national, or international). In that case, the adaptation measures will be promises with little capacity to deliver. The same can be said if there are no clear responsibilities, monitoring and evaluation systems, if the activities have no clear responsibility, indicators, time considerations, reporting, and assessment, their implementation will likely be hampered, delayed, or if any advance is achieved, the quality of the outcome will be fragile at best. These lessons should be noted and, hopefully, learned in other regions and countries at similar stages of developing adaptation policies. Some of the features discussed for the first and second generations, including their limitations, are common to other countries and regions where policy developments are first taking place (Biesbroek et al., 2010; Kehew et al., 2013; Paz-Soldán et al, 2023; Climate Change Committee, 2025).

Answering *subquestion three*, this thesis aimed to fill the knowledge gap on how Central American countries are taking steps to adapt to climate change by mainstreaming it into key sectors: general development, land-use planning, and risk management. This research collected information on policy outputs produced over 20 years: 44 documents were assessed. The region shows a progressive trend toward the inclusion of CC Adaptation in sectorial policy outputs. This trend is evident after each country approves a dedicated policy on CC Adaptation, instructing the mainstreaming. With the approval of the first dedicated policy, 26 of 30 sectorial outputs in total had considered CC Adaptation, either partially or extensively.

Nevertheless, even after the mandate to mainstream CC Adaptation, some authorities approved policy outputs that did not consider climate change impacts and goals. This was the case for each of El Salvador, Nicaragua, and Honduras in one policy. In many instances, the new policies integrated CC Adaptation concerns only in a limited manner, as is the case for Honduras and Guatemala, where considerations regarding impacts of climate change or even goals on adaptation are partially addressed, or just mentioned, but any further description or even inclusion of actions, activities, or indicators are absent. Panama and Costa Rica both show better results.

This varied combination of results is also evident among the sectors. While it is clear that the General Development sector is leading the way in CC Adaptation inclusion, the other two sectors are still approving new policy outputs that fail to address adaptation as mandated. This is particularly concerning in the case of Land-use Planning, as this sector is key to addressing vulnerability, primarily by limiting new urban development in risk-prone areas; this sector was also prioritized in the dedicated policies as a key to mainstream CC Adaptation (Segura, 2022).

In general terms, mainstreaming is advancing in the region, and the degree of advancement is linked to the approval of NAS and climate legislation in every country where mainstreaming was introduced. Brouwer et al (2013) analyzed a similar situation in Scotland, where new legislation on climate change and environmental assessment influenced the advancement of mainstreaming. This conclusion also supports what Biesbroek et al. (2010) documented for other European countries. The same conclusion has been demonstrated more recently in Australia (Bleby & Foerster, 2023).

Another key aspect of the mainstreaming study is that 11 policy outputs fail the consistency criteria. Consistency refers to contradictions between the CC Adaptation and sectorial goals; if they are assessed and efforts are taken to minimize them, possible conflicts and trade-offs can be addressed to achieve better CC Adaptation results. Wong and van der Heijden (2019) examined how bureaucracies avoided conflict and trade-offs when integrating sustainability policies. This behavior of conflict avoidance was studied in three countries (Finland, Germany, and the Czech Republic), leading to the identification of filtering (avoiding) issues in which the actors know too much or too little about them, the issues are too political, the deliberation is too abstract, or the bar for consensus is too high. When such issues were encountered, they were discarded in favor of those offering less resistance, resulting in minor improvements.

In Central America, we consider it an indication of similar avoidance behavior that so many policy outputs that did include CC Adaptation failed to address consistency. This is highlighted by the fact that 10 of these outputs have poor weighting, either prioritizing non-climate considerations or failing to decide on priorities. This resulted in limited efforts of policy integration, backing some of the ideas of Wong and van der Heijden (2019)

Answering *sub-question four*, vertical integration is considered key to improving coherence among different levels of government. In Central America, the analysis yields mixed results. There is no apparent connection between policies integrating CC Adaptation and more participative drafting processes. In all countries, policy outputs from participative processes, including municipalities as stakeholders, have failed to integrate climate change. Subsequently, outputs integrating climate change were approved without municipal participation. What is clear is that, in almost all countries and across all outputs, municipalities are either partners in implementation or passive recipients of actions planned at the national level. These policies show that a top-down approach is more common in the mainstreaming process in Central America. Top-down-only strategies are limited in their ability to mainstream climate change adaptation or even lead to maladaptive outcomes due to a one-size-fits-all approach (Sumari et al., 2024). This same author suggests prioritizing bottom-up approaches by empowering communities and enhancing local agency in decision-making, which is somewhat similar to the experience in San Francisco, where the bottom-up drafting of their local plan enabled CC Adaptation to be included.

Local governments are increasingly active in drafting policies and action plans to address climate change (see chapter five). The IPCC (2022) has documented the importance of this level of government in conducting climate action, but, unfortunately, little transformative change has been observed. That is why, in the same report, the panel has suggested that "governance structures that combine actors working at different levels with a different mix of tools are effective in addressing challenges related to implementation of integrated action, while cross-sectoral coordination is necessary" (2022, p. 6)

Central America is advancing in mainstreaming climate change adaptation. Nevertheless, this progress is still in the early stages. It reveals significant gaps that require attention to ensure not only better outputs but also long-term outcomes, thereby improving adaptation levels in the region. Two key aspects are the main gaps. First, the levels of consistency need to be improved, especially across different categories of outputs —in other words, alignment among the strategic, tactical, and operational levels. Otherwise, the progress will be hindered by inconsistency.

Second, adaptation is place-based; it requires an understanding of the local contexts. In this sense, local authorities play the most critical role in ensuring progress in the field, but in Central America, this level of government is still absent or dormant. Increasing the consistency of the operative level requires a significant transfer of knowledge, resources, and instruments to local administrations; some of these gaps were identified by Kristianssen & Granberg (2021). Still, it is at the operative level where results remain more fragile.

The level of centralization of Central American countries could be a critical limitation to overcome, especially due to more autocratic and centralist governments are inplace in countries such as Nicaragua and El Salvador, both transitioning toward more authoritarian regimes (Economist Intelligence Unit, 2025). It will be essential to assess if this could limit adaptation progress at the local level of government. In Guatemala and Hon-

duras, problems are related to corruption, impunity, and governance. This is also a key limitation to ensure the implementation of the policy outputs. Costa Rica and Panama are better positioned in that sense. Nevertheless, the economic constraints imposed by the COVID-19 pandemic, rising oil and food prices, and the migrant crisis are relegating environmental and adaptation goals to national authorities. These situations support the IPCC conclusions on corruption as a threat to adaptation efforts and on the vital role of institutions in advancing adaptation (Klein et al., 2014). Fragile institutions further exacerbate inequities among vulnerable groups, hindering the effectiveness of adaptation measures (New et al, 2022).

Although these aspects were not part of our framework, we recognized them as real threats that could affect the implementation of the adaptation agenda developed over recent years. Subsequent research should assess the outcomes achieved so far.

In summary, *answering the first main question* of this subsection, Central America presents essential developments in policy outputs for both the direct and the mainstream approaches at the national level. Nicaragua and Panama are behind this trend, but they are currently developing new policy outputs that could help them catch up with the rest. This process of policy development shows a learning curve, with higher-quality policy outputs in the most recent outputs. The local level of government is receiving more attention in the second generation of policies, with opportunities to participate in policy development, but also with additional tasks and responsibilities. However, municipalities in this region require more support and resources to address climate change adaptation at the level needed for this vulnerable region.

2. Framing adaptation at the local level

To conduct this research, we developed a framework that operationalized frame theory by integrating the four perspectives of Cultural Theory (egalitarian, hierarchist, individualist, and fatalist) as the meta level of framing, together with the three main conceptual approaches to adaptation (vulnerability, resilience, and risk management).

It is relevant to delve into how different people frame a problem. This has been proven to be a tool for better understanding the development of policies and how different frames of reference compete to influence their design (Dupuis & Knoepfel, 2013). Therefore, frame theory provides a better understanding of how people define CC Adaptation and how to address it, thereby shaping the local policy development process (Kahan, 2012; McEvoy et al., 2013; McNeeley & Lazrus, 2014). Even if CC Adaptation has been described as a local task, it is not happening in a vacuum. The national level of policy is influencing this process.

Answering *sub-question five,* this thesis documented a direct influence between the conceptual frames used at the national level and the framing of policies at the local level. All five municipalities followed the same conceptual frame at the national level. In some cases, it was demanded as part of national guidelines or projects that bring such frameworks to be followed at the local level (Porto, Upala, and San Francisco). However,

even if the municipalities had the freedom to choose, they followed the same conceptual frame as the national level, such as in the cases of Bologna and Zaragoza. As discussed in Chapter 6, constrains on adaptations options or even maladaptation actions have been detected by limiting the freedom to locally conduct the adaptation processes.

The framework developed in this thesis allowed us to connect Cultural Theory as the meta-level of framing with the three main CC Adaptation approaches: risk management, vulnerability, and resilience. Because of the contested nature of adaptation planning, this framework aims to make explicit the different frames and conceptual approaches at play in the decision-making process for adaptation, allowing for a better understanding of the trade-offs associated with the tools, strategies, and adaptation actions chosen by the stakeholders steering it. Each decision on how to address CC Adaptation stems from a particular frame and entails trade-offs: some actors will benefit more, while others will perceive themselves as left behind or see their interests affected.

Regarding *sub-question six, from the analysis of the perspectives of the stakeholders involved in the CC Adaptation policy planning process, it can be noticed that* a strong representation of the hierarchical perspective (this was expected) followed closely by the egalitarian perspective (which is usually a mobilizing actor and actively participates in the processes). In all cases, the great majority of actors concentrate on both perspectives. However, it is essential to note that when the instruments are mainly regulative (as in Upala's case), stakeholders with an individualist perspective may react, feeling their interests are being affected.

Only the Costa Rican case presented representation from the other two worldviews as dominants, individualists, and fatalists. But in this case, it was the high concentration of measures supported by the hierarchist perspective (the zoning and demarcation of risk-prone areas) that caused active opposition from the private sector (represented by the stakeholder interviewed with the individualistic worldview) and the mobilization of specific communities to push for the rejection of the plan (as finally happened).

How different worldviews perceive the risk associated with CC is key to the discussion of the measures that should be adopted. Therefore, using the framework, we could achieve three key conclusions: Firstly, it allows recognition of different perspectives competing and/or cooperating as a means to lead the process of (co)creation and approval of public laws and policies. Secondly, starting from a macro level, these perspectives show essential preferences necessary to approach the issue at a conceptual and operational level; in other words, if these processes of public policy drafting are highly focused on stakeholders with the same perspective, their frame will greatly influence which operational and conceptual instruments will be used. For example, Upala's predilection to use risk management instruments began at the national level and ended at the local level without further questioning. Conversely, by permitting a plethora of perspectives, a more inclusive design can be created, as seen in San Francisco's case, where the process was highly participative, allowing for the assessment of vulnerability, risk management, and development aspects, even when the national government did not require the first two.

Third, making visible the different perspectives of the various actors participating in these processes and attending to the differentiated orientations for framing the process and for integrating which measures could lead to the construction of more comprehensive policies that enable further progress and results. San Francisco's case is a quintessential example of how a wide range of actions to satisfy a larger number of participants proved beneficial for the project. This is widely known as "clumsy solutions": answers to problems that require a high level of skill and planning (Beumer, 2014; Verweij et al., 2006).

This led us to the answer to sub-*question seven.* In three of the five cases, the participation process was open and included a high diversity of stakeholders in the different stages of the policy drafting. Nevertheless, in four cases, it was noted that the private sector had little to non-participation (in Upala they were invited to participate in the consultation process but only when the zoning and risk-prone areas were determined that they actively engaged but to undermine the process), in Porto the process of participation was highly controlled and only as a consultation of the final draft with a small number of stakeholders, thus limiting the process and not having to account for different worldviews in the process.

In San Francisco, the process was highly participative in all communities. Curiously, this was also the only case in which another worldview (egalitarian) was the dominant among the stakeholders than the hierarchist, which was the dominant in all other cases. A key operational feature of worldviews is how they perceive the participation of different stakeholders or experts. In contrast, hierarchist favor expert participation (as was the case in Bologna and Porto), egalitarians favor indigenous knowledge and open processes for all communities and stakeholders (as was the case in San Francisco).

In summary, *the five cases presented a diverse set of examples for addressing the second main research* question. The three cases in the EU showed different levels of stakeholder participation (from the most restrictive, Porto, to the most open, Bologna), but in all three, hierarchism was the dominant frame, steering the process, and risk management or resilience was the main conceptual approach. These led to a summary of operative decisions from limited or cherry-picked participation, even in Bologna, which was a steered participation process, to several adaptation options that were incremental change and easy to implement (avoiding conflicting decisions such as significant investments, change in taxation, or regulations such as zoning or construction codes). These three municipalities seem to have advanced adaptation planning by avoiding conflict. Still, the tradeoff seems to be limited adaptation measures adopted at the risk of not being enough in a worsening climate crisis.

The case of Upala in Costa Rica presented us with a different example. This was not an adaptation policy but a land-use plan required to address risk management and actively incorporate climate change. The process was fairly participatory, but the municipality lacked leadership; it was paid for and developed by third parties at the municipality's benefit. The nature of the instrument —a regulation on zoning and the demarcation of risk-prone areas in the central urban center —caused the private sec-

tor (individualist perspective) to become actively involved, opposing the process once it reached the final stages (did not participate at the beginning of the process). The combination of these two factors, together with the private sector's low perception of risk (an individualist perspective determined through the interview, which confirmed Cultural Theory´s myths of nature), led to the new land-use plan being aborted at the final stage of approval.

The Upala case demonstrates why, by acknowledging and incorporating multiple frames, policymakers can devise more robust and inclusive adaptation policies that are better suited to address the multifaceted challenges posed by climate change. But ignoring, or even failing to ensure, the inclusion of these different frames could later lead to conflict and, ultimately, failure. The San Francisco case in Honduras is an excellent example of the sound effects of balancing and including different frames, leading to positive results.

In San Francisco, neither the national guide for designing the local development plan nor the studies conducted addressed risk management or climate change. Nevertheless, because of the highly participative process to develop the plan, involving three layers of participation and negotiations (community, district, and municipal levels), the stakeholders included a vast array of risk management and adaptation actions, which were later incorporated into the local plan that guides the municipality's annual budget.

All five of these examples reflect the conditions for advancing the CC adaptation policy process at the local level. Restricted participation and consideration of perspectives could result in adaptation policies adopting only limited adaptation measures. Policy plans that bring substantial changes, such as a new land-use plan, should actively and aggressively consider different frames from the outset, with strenuous efforts to ensure broad stakeholder participation. Failure to secure this is likely to result in intractable conflicts and failure in the process in democratic societies (as mentioned, Nicaragua and El Salvador are rapidly moving to highly autocratic states). Direct control from national authorities could bring significant changes with little opposition; however, more research is needed to analyze the impact of these changes on adaptation policy in the medium and long term.

This thesis did not assess in depth the implementation process or the quality of the outcomes; further research should use, among others, longitudinal methodologies to examine how these measures withstand incremental adverse effects from climate change over more extended periods.

3. Recommendations on how to balance the design of the local adaptation policies

Developing adaptation policies and plans at the local level is becoming a necessity, particularly given the growing impacts of the current climate crisis. Current pathways of GHG emissions can exacerbate the adverse effects of climate change worldwide, but

especially in developing countries. This will increase the demand for adaptation planning and implementation at the local level, asking more from communities and stakeholders alike.

This increased need also requires a better understanding of how the different elements of society relate to climate change and adaptation, and how they perceive these processes. The future success of CC Adaptation's local policies may depend on the support it receives from different groups in society. This review of how the adaptation process is framed at different levels aims to respond to this need and is part of the answer to the second research question.

By integrating Cultural Theory with risk management, resilience, and vulnerability approaches, the framework facilitated an in-depth understanding of how different perspectives influence CC Adaptation strategies. Our application of this framework to the cases of Upala, Costa Rica; San Francisco del Valle, Honduras; Porto, Portugal; Bologna, Italy; and Zaragoza, Spain highlighted its utility for identifying the dominant and marginal perspectives that shape policy decisions and implementation.

The findings underscore the need to balance diverse perspectives in CC Adaptation policymaking to enhance the effectiveness and acceptance of adaptation strategies. This balance ensures that adaptation measures are not only technically feasible but also socially and politically viable. By acknowledging and incorporating multiple frames, policymakers can devise (co-create) more robust and inclusive adaptation policies that are better suited to address the multifaceted challenges posed by climate change in democratic societies.

What does it mean to balance CC Adaptation policies? It means first making explicit the conceptual frames that are guiding the drafting process, for example, if the policy process is using the resilience approach, could be of importance to take into account another set of elements, and posing different questions and emphasis from the other conceptual frames, for example considering some aspects of the vulnerability or the risk management approach (as discussed in Chapter Four)

Second, it means that the steering committees should ensure that all worldviews are represented. As discussed in previous chapters, it is common to find a greater representation of hierarchist and egalitarian perspectives in such processes. Thus, it is key to find voices representing the other two perspectives.

Third, the discussion and selection of adaptation measures should also reflect a combination of preferred options across different perspectives. Even if we are using a risk management approach, the preferred options will differ for individualists, hierarchists, and egalitarians. Therefore, an active effort should be made to ensure that the measures offer options acceptable to all perspectives. The fatalist perspective is an elusive worldview when it comes to participating in such processes. However, this perspective provides a very different viewpoint on policy problems. Therefore, having representation from this worldview should be actively sought and sustained.

A common strategy to avoid conflict and opposition is filtering out those issues that can cause intractable problems. The cases of Porto, Zaragoza, and Bologna appear to show some degree of filtering, not addressing land-use planning and building regulations that could cause opposition, or at least leaving them for later in the implementation stage. The problem with such a strategy is that it delays necessary adaptation measures that could significantly reduce future risk. Persisting with filtering could eventually lead to greater exposure to extreme weather conditions and/or higher costs of adaptation measures and/or losses. Zant et al (2023) have identified several adverse effects of just implementing such strategies, for instance, the risk of adaptation traps (failing to address root causes of vulnerability), increased vulnerability, and limited effectiveness (not sufficient to address the magnitude and speed of CC impacts), and potential maladaptive outcomes.

Addressing climate change adaptation in democratic societies requires openness to diverse groups and stakeholders; some of their perspectives and suggestions may not be deemed acceptable, but it is crucial to account for their participation and consider how to address their concerns and interests. The results presented here could be helpful to cities and stakeholders involved in climate adaptation.

Luis Diego Segura Ramírez

REFERENCES

Abi-Habib, M., & García, J. (2023, January 20). *Guatemala targets Colombia's defense minister in crackdown on anticorruption forces.* New York Times. **https://www.nytimes.com/2023/01/20/world/americas/guatemala-colombia-defense-minister.html?searchResultPosition=7**

Adger, W. N., Agrawala, S., Mirza, M. M. Q., Conde, C., o'Brien, K., Pulhin, J., . . . Takahashi, K. (2007). Assessment of adaptation practices, options, constraints and capacity. In O. F. C. M.L. Parry, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Ed.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 717-743). Cambridge: Cambridge University Press.

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). *Adaptation to climate change in the developing world. Progress in Development Studies*, **3**(3), 179–195. **https://doi.org/10.1191/1464993403ps060oa**

Agência Portuguesa do Ambiente. (2020b). *A Estratégia Nacional de Adaptação às Alterações Climáticas* 2020. https://apambiente.pt/index.php?ref=16&subref=81&sub2ref=118&sub3ref=955

Agência Portuguesa do Ambiente. (2017). *Relatório sobre Políticas e Medidas no âmbito do artigo 13.o, alínea 1 (a) do Regulamento (UE) n.o 525/2013 do Parlamento Europeu e do Conselho e Regulamento de Implementação da Comissão (UE) n.o 749/2014*. **http://apambiente.pt/_zdata/Alteracoes_Climaticas_Relatorios/Art13MMR/PT2017MMRart13report.pdf**

Agência Portuguesa do Ambiente. (2020c). *Estratégia Nacional de Adaptação às Alterações Climáticas 2020.* **https://apambiente.pt/index.php?ref=16&subref=81&sub2ref=118&sub3ref=955**

Agência Portuguesa do Ambiente. (September 2020a). Adaptação. **https://apambiente.pt/index.php?ref=16&subref=81&sub2ref=118**

Albers, M., & Deppisch, S. (2013*). Resilience in the light of climate change: useful approach or empty phrase for spatial planning? European Planning Studies.* **21**(10), 1598–1610. **https://doi.org/10.1080/09654313.2012.722961**

Anguelovski et al., 2016) Anguelovski, I., et al., 2016: Equity Impacts of Urban Land Use Planning for Climate Adaptation: Critical Perspectives from the Global North and South. J. Plan. Educ. Res., 36(3), 333–348.

Asamblea Legislativa de la República de Costa Rica (2005). *Ley Nacional de Emergencias y Prevención del Riesgo*. N.o 8488 del 22/11/2005.

Asamblea Legislativa de la Republica de El Salvador. (2012). *Decreto No. 233 Ley del Medio Ambiente (y su reforma 158 del 2012)*. **https://www.asamblea.gob.sv/sites/default/files/documents/decretos/D9DB6A20-7489-4C06-81F3-3429BBA35E33.pdf**

Asamblea Nacional de Nicaragua. (2008). *Ley No. 647 de reformas y adiciones a la Ley No. 217 Ley general del Medio Ambiente y los Recursos Naturales.* **https://legislacion.asamblea.gob.ni/Normaweb.nsf/($All)/3931522956B885A30625744E00548B32?OpenDocument**

Asamblea Nacional de Panamá. (2015). *Ley No. 41. Ley General del Ambiente y reformas (18-2003, 44-2006. 65-2010, y 8-2015*. **https://www.gacetaoficial.gob.pa/pdfTemp/28131_A/GacetaNo_28131a_20161004.pdf**

Assemblea Legislativa Regione Emilia-Romagna, (2017) (testimony of Legge Regionale N 24. Disciplina Regionale sulla Tutela e l'Uso del Territorio). https://bur.regione.emilia-romagna.it/bur/area-bollettini/bollettini-in-lavorazione/n-340-del-21-12-2017-parte-prima.2017-12-21.5187908668/disciplina-regionale-sulla-tutela-e-l2019uso-del-territorio/l-r-21-12-2017-n.24

Assembleia da República. (2017). *Estratégia Nacional de Proteção Civil Preventiva.*

Assembleia Municipal do Porto. (2015). *Plano Municipal de Emergência de Proteção Civil do Porto.*

Autoridad Nacional Ambiental de la República de Panamá. (2007). *Política Nacional de Cambio Climático y su Plan de Acción.* **https://www.miambiente.gob.pa/index.php/publicaciones/biblioteca-virtual**

Aylett, A. (2014). *Progress and challenges in the urban governance of climate change: results of a global survey.* Cambridge, MA: Massachusetts Institute of Technology.

Aylett, A. (2015). *Institutionalizing the urban governance of climate change adaptation: Results of an international survey.* Urban Climate, 14, Part 1, 4-16. **https://doi.org/10.1016/j.uclim.2015.06.005**

Ayuntamiento de Zaragoza. (2010) *Estrategia de Cambio Climatico, Calidad del Aire, y Salud de Zaragoza* (ECAZ 3.0). http://www.zaragoza.es/contenidos/medioambiente/agenda21/20190507-ECAZ3_0Documentofinal.pdf

Ayuntamiento de Zaragoza. (2019) *Estrategia de Adaptacion al Cambio Climatico de la Ciudad de Zaragoza*. https://www.zaragoza.es/contenidos/medioambiente/EstrategiaAdaptacion.pdf

Bauer, A., & Steurer, R. (2015). *National adaptation strategies, what else? Comparing adaptation mainstreaming in German and Dutch water management. Regional Environmental Change,* **15**(2), 341–352. **https://doi.org/10.1007/s10113-014-0655-3**

Bednar-Friedl, B., R. Biesbroek, D.N. Schmidt, P. Alexander, K.Y. Børsheim, J. Carnicer, E. Georgopoulou, M. Haasnoot, G. Le Cozannet, P. Lionello, O. Lipka, C. Möllmann, V. Muccione, T. Mustonen, D. Piepenburg, and L. Whitmarsh, 2022: Europe. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1817–1927, **doi:10.1017/9781009325844.015.**

Begum, R.A., R. Lempert, E. Ali, T.A. Benjaminsen, T. Bernauer, W. Cramer, X. Cui, K. Mach, G. Nagy, N.C. Stenseth, R. Sukumar, and P. Wester, 2022: Point of Departure and Key Concepts. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 121–196, **doi:10.1017/9781009325844.003.**

Bentley, Carolina. (2020) The Role of framing in adaptation decision making at the local level: Case study of Porto, Portugal [Master´s thesis, Maastricht University]

Bergsma, E., Van Alphen, H., Bruggeman, A., Giannakis, E., Koti, J., Kristvik, E., & Rocha, F. (2018). *Strengths and weaknesses for climate change: Adaptation in water governance: A comparison across six European regions, In Achievements and challenges of integrated river basin management*, (pp. 223–242). IntechOpen. **https://doi.org/10.5772/intechopen.74401**

Betsill, M. M., & Bulkeley, H. (2006). *Cities and the multilevel governance of global climate change. Global Governance: A Review of Multilateralism and International Organizations,* **12**(2), 141–160. **https://doi.org/10.5555/ggov.2006.12.2.141**

Beumer, C. (2014). *Stepping stone cities?: exploring urban greening and gardening as a viable contribution to global biodiversity conservation*. Universitaire Pers Maastricht, https://cris.maastrichtuniversity.nl/portal/en/publications/stepping-stone-cities--exploring-urban-greening-and-gardening-as-a-viable-contribution-to-global-biodiversity-conservation(5ea45ce5-a4ca-4c84-bafd-c6aff9b239e4).html

Beumer, C., Figge, L., & Elliott, J. (2018). *The sustainability of globalization: Including the 'social robustness criterion'. Journal of Cleaner Production*, 179, 704-715. **https://doi.org/10.1016/j.jclepro.2017.11.003**

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

Bleby, A., & Foerster, A. (2023). A Conceptual Model for Climate Change Mainstreaming in Government. Transnational Environmental Law, 12(3), 623–648. doi:10.1017/S2047102523000158

Bosomworth, K. (2015). Climate change adaptation in public policy: frames, fire management, and frame reflection. Environment and Planning C: Government and Policy, 33(6), 1450-1466. **https://doi.org/10.1177/0263774X15614138**

Brooks, N., Neil Adger, W., & Mick Kelly, P. (2005). *The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation.* Global Environmental Change, **15**(2), 151–163. **https://doi.org/10.1016/j.gloenvcha.2004.12.006**

Broto, V. C., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global environmental change*, *23*(1), 92-102.

Brouwer, S., Rayner, T., & Huitema, D. (2013). *Mainstreaming climate policy: The case of climate adaptation and the implementation of EU water policy. Environment and Planning C: Government and Policy*, **31**(1), 134–153. **https://doi.org/10.1068/c11134**

Brown, A., Dayal, A., & Rumbaitis Del Rio, C. (2012). From practice to theory: emerging lessons from Asia for building urban climate change resilience. *Environment and Urbanization*, *24*(2), 531-556.

Brubacher LJ, Peach L, Chen TT-W, Longboat S, Dodd W, Elliott SJ, et al. (2024) Climate change, biodiversity loss, and Indigenous Peoples' health and wellbeing: A systematic umbrella review. PLOS Glob Public Health 4(3): e0002995. **https://doi.org/10.1371/journal.pgph.0002995**

Bouwer, L.M. and Aerts, J.C.J.H. (2006), *Financing climate change adaptation. Disasters*, 30: 49-63. **https://doi.org/10.1111/j.1467-9523.2006.00306.x**

Böhm, G., Pfister, H.-R., Salway, A., & Flottum, K. (2019). Remembering and communicating climate change narratives: The influence of world views on selective recollection. *Frontiers in Psychology, 10*, 1026.

Cambardella, C., Fath, B. D., Werdenigg, A., Gulas, C., & Katzmair, H. (2020). Assessing the operationalization of cultural theory through surveys investigating the social aspects of climate change policy making. *Weather, Climate, and Society, 12*, 651–665.

Castellanos, E., M.F. Lemos, L. Astigarraga, N. Chacón, N. Cuvi, C. Huggel, L. Miranda, M. Moncassim Vale, J.P. Ometto, P.L. Peri, J.C. Postigo, L. Ramajo, L. Roco, and M. Rusticucci, 2022: Central and South America. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 1689–1816, **doi:10.1017/9781009325844.014.**

Carvalho, A., Schmidt, L., Santos, F. D., & Delicado, A. (2014). *Climate change research and policy in Portugal. Wiley Interdisciplinary Reviews: Climate Change, 5*(2), 199-217.

Centro Euro-Mediterraneo sui Cambiamenti Climatici, (2017) (testimony of Piano Nazionale di Adattamento ai Cambiamenti Climatici). https://www.minambiente.it/sites/default/files/archivio_immagini/adattamenti_climatici/documento_pnacc_luglio_2017.pdf

Change, I. C. (2014). *Synthesis Report. Contribution of working groups I. II and III to the fifth assessment report of the intergovernmental panel on climate change, 151*(10.1017).

Civil, C. N. d. P. (2015). *Plano Distrital de Emergência de Protecao Civil do Porto*.

Clar, C., & Steurer, R. (2019). *Climate change adaptation at different levels of government: Characteristics and conditions of policy change.* Paper presented at the Natural Resources Forum.

Cm-porto. (2018a). *Adaptação às alterações climáticas.* **http://www.cm-porto.pt/alteracoes-climaticas/adaptacao-as-alteracoes-climaticas_2**

Cm-porto. (September 2018). *Plano Diretor Municipal. Main Page*. **http://www.cm-porto.pt/pdm**

Coentrão, A. (2018). *Há uma nova agenda nacional para preparar o Portugal 2030. Público*. **https://pnpot.dgterritorio.gov.pt/sites/default/files/2018-05-02-Publico1.pdf**

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. **https://doi.org/10.1002/eet.523**

Comisión Nacional de Emergencias de Costa Rica. (2015). *Política Nacional de Gestión de Riesgo 2016–2020*. **https://www.cne.go.cr/rectoria/politicangr/PNGR%202016%20-2030.pdf**

Comisión Nacional de Emergencias de Costa Rica. (2016). *Plan Nacional de Gestión de Riesgo 2016–2020*. **https://www.cne.go.cr/rectoria/planngr/PLAN%20NACIONAL%20GESTION%20DEL%20RIESGO%202016-2020.pdf**

Comisión Nacional de Emergencias de Costa Rica. (September 2023). *Official website*. **https://www.cne.go.cr/**

Comisión Permanente de Contingencias de Honduras (2013). *Política de Estado para la Gestión Integral del Riesgo en Honduras*. **https://cenid-gdr.org/?q=content/politica-estado-gir.**

Comisión Permanente de Contingencias de Honduras. (2014). *Plan Nacional de Gestión Integral de Riesgos 2014–2019*. **https://reliefweb.int/report/honduras/plan-nacional-de-gesti-n-integral-de-riesgos-pngirh-periodo-2014-2019**

Comisión Permanente de Contingencias de Honduras. (September 2023). *Official website.* **https://copeco.gob.hn/**

Comité Interinstitucional de Cambio Climático y Secretaría de Estado en los Despachos de Agricultura y Ganadería. (2014). *Estrategia Nacional de adaptación del sector agroalimentario de Honduras (2014–2024)*. **https://icf.gob.hn/wp-content/uploads/2022/02/Estrategia-Nacional-Adaptacion-al-Cambio-Climatico-para-el-sector-Agrolimentario-de-Honduras.pdf**

Commission of the European Communities. (2009). *WHITE PAPER Adapting to climate change: Towards a European framework for action*. Brussels. **https://ec.europa.eu/health/ph_threats/climate/docs/com_2009_147_en.pdf**

Comune di Bologna 197 (2007) (testimony of Piano Strutturale Comunale). **http://www.comune.bologna.it/psc/articoli/83**

Comune di Bologna, (2020) (testimony of Piano d 'Azione per l 'Energia Sostenibile - Monitoraggio Piano di Adattamento). **http://www.comune.bologna.it/media/files/monitoraggio_blueap.pdf**

Comune di Bologna, (2020) *(testimony of Piano Urbanistico Generale).* **http://dru.iperbole.bologna.it/progetti/show?progetto=4728&rev=12555**

Congreso de la Republica de Guatemala. (2014). *Ley Marco para regular la reducción de la vulnerabilidad, la adaptación obligatoria ante los efectos del cambio climático y la mitigación de gases de efecto invernadero: Decreto número 7-2013*. **https://www.marn.gob.gt/viceministro-de-recursos-naturales-y-cambio-climatico/direccion-de-cambio-climatico/**

Congreso Nacional de la Republica de Honduras. (2013). *Ley de Cambio Climático. Decreto No. 297-2013*. **https://www.tsc.gob.hn/biblioteca/index.php/leyes/595-ley-de-cambio-climatico**

Congreso de la República de Costa Rica. (2006). *Ley Nacional de Emergencias y Prevención del Riesgo No.8488*. **http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?nValor1=1&nValor2=56178**

Congreso de la República de El Salvador. (2005). *Decreto Legislativo No. 777 Ley de Protección Civil, Prevención y Mitigación de Desastres*. **https://observatorio-op10.cepal.org/es/instrumentos/ley-proteccion-civil-prevencion-mitigacion-desastres-decreto-no-777#:~:text=Espa%C3%B1ol-,Ley%20de%20Protecci%C3%B3n%20Civil%2C%20Prevenci%C3%B3n%20y%20Mitigaci%C3%B3n%20de%20Desastres%20(Decreto,servicio%20p%C3%BAblico%20de%20protecci%C3%B3n%20civil**

Congreso de la República de El Salvador. (2011). *Decreto No. 644 Ley de Ordenamiento y Desarrollo Territorial*. **https://www.jurisprudencia.gob.sv/Documentos-Boveda/D/2/2010-2019/2011/07/910E6.PDF**

Congreso de la República de Guatemala. (1996a). *Decreto Legislativo 109-96 Ley de la Coordinadora Nacional para la Reducción de Desastres (CONRED)*. **https://www.congreso.gob.gt/detalle_pdf/decretos/912#gsc.tab=0**

Congreso de la República de Guatemala. (1996b). *Ley de Vivienda y Asentamientos humanos Decreto No. 120-196*. **http://transparenciaold.minfin.gob.gt/transparencia/BibliotecaDigital/Documentos%20%20Area%20Econ%C3%B3mico/FOGUAVI.pdf**

Congreso de la República de Honduras. (2003). *Ley de Ordenamiento Territorial Decreto No. 180-2003*. **https://observatorioplanificacion.cepal.org/es/marcos-regulatorios/decreto-ndeg-180-2003-ley-de-ordenamiento-territorial-de-honduras#:~:text=Resumen%3A%20Ley%20establece%20que%20el,de%20pol%C3%ADticas%2C%20estrategias%20y%20planes**

Congreso de la Republica de Honduras. (2009*). Ley del Sistema Nacional de Gestión de Riesgos (SINAGER*). **https://www.preventionweb.net/files/21473_15444leydelsinager0120101.pdf**

Congreso de la República de Honduras. (2010). *República de Honduras Visión de País 2010-2038 y Plan de Nación 2010–2022 Decreto Legislativo No. 286-2009.* **https://observatorioplanificacion.cepal.org/es/planes/vision-de-pais-2010-2038-y-plan-de-nacion-2010-2022-de-honduras#:~:text=La%20Visi%C3%B3n%20de%20pa%C3%ADs%20se,impulsar%C3%A1n%20y%20fomentar%C3%A1n%20su%20desarrollo**

Congreso de la República de Nicaragua. (2000). *Ley No. 337 Ley creadora del Sistema Nacional para la Prevención, Mitigación y Atención de Desastres (y su reforma en la ley 863-2014)*. **https://observatoriop10.cepal.org/es/instrumentos/ley-creadora-sistema-nacional-la-prevencion-mitigacion-atencion-desastres-ley-no-337**

Congreso de la República de Panamá. (2005). *Ley No. 7 del 2005 que Reorganiza el Sistema Nacional de Protección Civil*. **https://www.gacetaoficial.gob.pa/gacetas/25236_2005.pdf**

Congreso de la República de Panamá. (2006). *Ley No. 6 del 2006 que reglamenta el Ordenamiento Territorial para el Desarrollo Urbano y dicta otras disposiciones.* **https://www.gacetaoficial.gob.pa/gacetas/25478_2006.pdf**

Congreso Nacional de la Republica de Honduras (2003). Ley de Ordenamiento Territorial Decreto No. 180-2003. Recuperada de: **http://cidbimena.desastres.hn/RIDH/pdf/doch0063/pdf/doch0063.pdf**

Congreso Nacional de la República de Honduras (2009). Ley del Sistema Nacional de Gestión de Riesgos (SINAGER) Decreto No. 151-2009. Recuperado de: **https://www.poderjudicial.gob.hn/CEDIJ/Leyes/Documents/Ley%20Sistema%20General%20de%20Riegos%20Sinager.pdf**

Congreso Nacional de la Republica de Honduras (2013). Ley de Cambio Climático. Decreto No. 297-2013. **https://www.tsc.gob.hn/biblioteca/index.php/leyes/595-ley-de-cambio-climatico**

Consejo Centro americano de Vivienda y Asentamientos Humanos (2010). *Agenda de Ordenamiento Territorial del Consejo Centroamericano de Vivienda y Asentamientos Humanos (CCVAH) 2010–2015*. Consejo Centroamericano de Vivienda y Asentamientos Humanos. **https://repositorio.csuca.org/30/1/Agenda%20OT.pdf**

Consejo Centroamericano de Vivienda y Asentamientos Humanos. (2017). *Agenda de Ordenamiento Territorial del Consejo Centroamericano de Vivienda y Hacentamientos Humanos 2015–2020. Compilación de Instrumentos Estratégicos del Consejo Centroamericano de Vivienda y Hacentamientos Humanos* (CCVHA). **https://sisca.int/centro-de-documentacion/6-ccvah/2-documentos-estrategicos/197-compilacion-de-instrumentos-estrategicos-del-consejo-centroamericano-de-vivienda-y-asentamientos-humanos-ccvah**

Consejo Consultivo Nacional para el Desarrollo. (2017). *Plan Estratégico Nacional con Visión de Estado Panamá 2030*. **https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/PanamaPlanEstrategicoNacionalconVisiondeEstado.pdf**

Consejo de Comunicación y Ciudadanía. (2017). *Ejes del Programa Nacional de Desarrollo Humano 2018–2021*.**https://www.el19digital.com/app/webroot/tinymce/source/2018/00-Enero/Del22al28Enero/Viernes26Enero/EJES%20DEL%20PROGRAMA%20NACIONAL%20DE%20DESARROLLO%20HUMANO.pdf**

Consejo Nacional de Cambio Climático y Secretaría General de Planificación y Programación de la Presidencia de la República de Guatemala. (2016). Plan de Acción Nacional de Cambio *Climático*. **https://www.marn.gob.gt/viceministro-de-recursos-naturales-y-cambio-climatico/direccion-de-cambio-climatico/**

Consejo Nacional de Desarrollo Urbano y Rural de Guatemala. (2015). K'atun Nuestra Guatemala Política y Plan Nacional de Desarrollo 2032. Serviprensa, S. A. Ciudad de Guatemala. **https://faolex.fao.org/docs/pdf/gua143736.pdf**

Consejo Nacional de Sostenibilidad y Vulnerabilidad Ambiental. (2018). *Plan El Salvador Sustentable "Por el derecho a un desarrollo en armonía con el medio ambiente"*. **http://rcc.marn.gob.sv/xmlui/handle/123456789/7**

Conselho de Ministros. (2013). *Plano Nacional de Emergência de Proteção Civil.*

Conselho de Ministros. (2015a). *Estratégia National de Adaptação às Alterações Climáticas.*

Conselho de Ministros. (2015b). *Plano de Ação Adaptação às Alterações Climáticas*.

Conselho de Ministros. (2019). *Programa Nacional da Política do Ordenamento do Território*.

Coordinación Nacional para la Reducción de Desastres de Guatemala. (2011*). Política Nacional para la Reducción de Riesgo a los Desastres en Guatemala*. **https://faolex.fao.org/docs/pdf/gua145471.pdf**

Coordinación Nacional para la Reducción de Desastres de Guatemala. (2016). Estrategia Nacional de Reducción de Riesgo de Desastres Vinculados al Cambio Climático. **https://conred.gob.gt/documentos/Estrategia_Nacional_Reduccion_de_Desastres_Cambio_Climatico.pdf**

Coordinación Nacional para la Reducción de Desastres de Guatemala. (September 2023). *Official website*. Home page. **https://conred.gob.gt/**

de Boer, J., Wardekker, J. A., & van der Sluijs, J. P. (2010). *Frame-based guide to situated decision-making on climate change. Global Environmental Change*, 20(3), 502-510. https://doi.org/10.1016/j.gloenvcha.2010.03.003

Dewulf, A. (2013). Contrasting frames in policy debates on climate change adaptation. Wiley Interdisciplinary Reviews: Climate Change, 4(4), 321-330. doi:10.1002/wcc.227

Dgterritorio. (2017). *O PNPOT*. https://pnpot.dgterritorio.pt/pnpot

Dijk M, de Kraker J, van Zeijl-Rozema A, van Lente H, Beumer C, Beemsterboer S, Valkering P. *Sustainability assessment as problem structuring: three typical ways. Sustain Sci. 2017*;12(2):305-317. doi:10.1007/s11625-016-0417-x.

Dirección de Cambio Climático del Ministerio de Ambiente de la República de Panamá. (2022). *Official website.* **https://dcc.miambiente.gob.pa/**

Dirección General de Protección Civil de El Salvador. (September 2023). *Official website*. **https://www.proteccioncivil.gob.sv/**

Dirección Nacional de Cambio Climático de la Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente de la República de Honduras. (Octubre 2022*). Official website.* **https://www.miambiente.gob.hn/dncc/quiensomos/**

Dirección Nacional de Cambio Climático del Ministerio de Ambiente y Recursos Naturales de la República de Guatemala. (2022). Official website. **https://www.marn.gob.gt/viceministro-de-recursos-naturales-y-cambio-climatico/direccion-de-cambio-climatico/**

Dodman, D., B. Hayward, M. Pelling, V. Castan Broto, W. Chow, E. Chu, R. Dawson, L. Khirfan, T. McPhearson, A. Prakash, Y. Zheng, and G. Ziervogel, 2022: Cities, Settlements and Key Infrastructure. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M.

Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 907–1040, **doi:10.1017/9781009325844.008.**

Douglas, M., Thompson, M., & Verweij, M. (2003). *Is time running out? The case of global warming*. Daedalus, 132(2), 98-107.

Dubash, N. K., Hagemann, M., Höhne, N., & Upadhyaya, P. (2013). *Developments in national climate change mitigation legislation and strategy. Climate Policy*, **13**(6), 649–664. **https://doi.org/10.1080/14693062.2013.845409**

Dupuis, J., & Biesbroek, R. (2013). Comparing apples and oranges: The dependent variable problem in comparing and evaluating climate change adaptation policies. Global Environmental Change, 23(6), 1476-1487. **https://doi.org/10.1016/j.gloenvcha.2013.07.022**

Dupuis, J., & Knoepfel, P. (2013). The adaptation policy paradox: the implementation deficit of policies framed as climate change adaptation. *Ecology and Society, 18*(4).

Ead, H., Gabre, R., Fahmy, H., & Hassan, H. (2022). Reviewing certain aspects of the cultural theory of risk for climate change adaptation in Egypt. *Journal of the International Academy for Case Studies, 28*(4).

Eakin, H., Tompkins, E. L., Nelson, D. R., & Anderies, J. M. (2009). *Hidden costs and disparate uncertainties: trade-offs in approaches to climate policy.* In I. Lorenzoni, K. L. O'Brien, & W. N. Adger (Eds.), *Adapting to Climate Change: Thresholds, Values, Governance* (pp. 212-226). Cambridge: Cambridge University Press.

Eckstein, D., Künzel, V., & Schäfer, L. (2017). *Risk index 2018. Who suffers most from extreme weather events? Weather-related loss events in 2016 and 1997 to 2016*. **https://www.germanwatch.org/sites/default/files/publication/20432.pdf**

Economic Commission for Latin America and Caribbean Economy (2011). *La economía del cambio climático en Centroamérica. ECLAC, CCAD, & SICA*. Retrieved September 25, 2018, from **https://repositorio.cepal.org/handle/11362/26120**.

Economist Intelligence Unit. (2025). Democracy Index 2024: What's wrong with representative democracy? The Economist Intelligence Unit Limited. **https://www.eiu.com**

European Comission. (2018). *Adaptation preparedness scoreboard: Draft country fiche for Portugal*. https://ec.europa.eu/clima/sites/clima/files/consultations/docs/0035/pt_en.pdf

European Commission. (2020). *BLUE AP - Bologna Local Urban Environment Adaptation Plan for a Resilient City*.https://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4229

European Environment Agency (2013). Adaptation in Europe. Addressing risks and opportunities from climate change in the context of socio-economic developments (EEA Report. N. 3/). **https://www.eea.europa.eu/publications/adaptation-in-europe**

European Environmental Agency. (2014). *National adaptation policy processes across European countries- 2014 - EEA Report* (Issue 4).

Feldman, L. and Hart, P.S. (2018), Is There Any Hope? How Climate Change News Imagery and Text Influence Audience Emotions and Support for Climate Mitigation Policies. Risk Analysis, 38: 585-602. **https://doi.org/10.1111/risa.12868**

Figge, L. S. (2017). Connectedness in times of ecological overshoot: a quantitative analysis of the sustainability of globalization. Maastricht University,

Finnerty, S., Piazza, J., & Levine, M. (2025). Climate futures: Scientists' discourses on collapse versus transformation. *British Journal of Social Psychology, 64*, e12840. **https://doi.org/10.1111/bjso.12840**

Fisher, S., Dodman, D., Van Epp, M., & Garside, B. (2018*). The usability of climate information in sub-national planning in India, Kenya and Uganda: The role of social learning and intermediary organisations*. *Climatic Change,* **151**, 219–245. **https://doi.org/10.1007/s10584-018-2291-2**

Fondazione Innovazione Urbana. (2020). *Piano Urbanistico Generale*. https://www.fondazioneinnovazioneurbana.it/progetto/pianourbanisticogenerale

Food and Agriculture Organization (October 2022). *FAOSTAT* https://www.fao.org/faostat/en/#country

Ford, J. D., Berrang-Ford, L., & Paterson, J. (2011). *A systematic review of observed climate change adaptation in developed nations.* Climatic Change, **106**(2), 327–336. **https://doi.org/10.1007/s10584-011-0045-5**

Forino, G., von Meding, J., Brewer, G., & Gajendran, T. (2014). *Disaster risk reduction and climate change adaptation policy in Australia. Procedia Economics and Finance*, **18**, 473–482. **https://doi.org/10.1016/S2212-5671(14)00965-4**

Fünfgeld, H. & McEvoy, D. (2011). *Framing climate change adaptation in policy and practice. Victorian Centre for Climate Change Adaptation Research*, Melbourne.

Fünfgeld, H., Webb, B., McEvoy, D. (2012). The Significance of Adaptation Framing in Local and Regional Climate Change Adaptation Initiatives in Australia. In: Otto-Zimmermann, K. (eds) Resilient Cities 2. Local Sustainability, vol 2. Springer, Dordrecht. **https://doi.org/10.1007/978-94-007-4223-9_30**

Giorgi, F. (2006). *Climate change hot-spots. Geophysical Research Letters,* **33**(8), L08707. **https://doi.org/10.1029/2006GL025734**

Gobierno de Aragon. (2009) *Estrategia Argonesa de Cambio Climatico y Energias Limpias (EACCEL)* https://www.aragon.es/documents/20127/**674325/EACCEL_energias_limpias.pdf/5d6160f5-664e-a873-79c3-221d23a53e74**

Gobierno de Aragon. (2019) *Estrategia Aragonesa de Cambio Climático (EACC) Horizonte 2030.* **https://www.aragon.es/documents/20127/674325/ESTRATEGIA_ARAGONESA_CAMBIO_CLIMATICO.pdf/f4206c8d-94e0-acdd-9fb3-2e69f9d9b7dd**

Gobierno de El Salvador. (2015). *Plan Quinquenal de Desarrollo 2014–2019: El Salvador productive, educado y seguro*. https://extranet.who.int/mindbank/item/5859

Gobierno de la República de Honduras. (2013). *Política de Estado para la Gestión Integral del Riesgo en Honduras*. **https://portalunico.iaip.gob.hn/portal/ver_documento.php?uid=NDU3ODQ4OTM0NzYzNDg3MTI0NjE5ODcyMzQy**

Gobierno de Nicaragua. (Octuber 2022). *Plataforma Nacional de Información y Conocimientos Sobre Cambio Climático*. **https://cambioclimatico.ineter.gob.ni/**

Governo Italiano Presidenza del Consiglio dei Ministri. (2001). *Art. 117 Costituzione della Repubblica Italiana*. http://www.governo.it/it/costituzione-italiana/parte-seconda-ordinamento-della-repubblica/titolo-v-le-regionile-province-e-i

Gonah, L., Mabunda, S. A., Faleni, M., & Nomatshila, S. C. (2025). Overcoming the coupled climate and biodiversity crises and their societal impacts. Science, 383(6675), 123130. **https://doi.org/10.1126/science.abl4881**

Gonzales-Iwanciw, J., Karlsson-Vinkhuyzen, S. & Dewulf, A. (2025). Multi-level learning in climate change adaptation planning: comparing three experiences from Latin America. Reg Environ Change 25, 108. https://doi.org/10.1007/s10113-025-02443-4

Grant, W. (2022, 21 September). *Honduras: A mother searches for justice in a* **'narco-state'. BBC. https://www.bbc.com/news/av/world-us-canada-62960969**

Greiving, S., & Fleischhauer, M. (2012). *National climate change adaptation strategies of European States from a spatial planning and development perspective. European Planning Studies*, **20**(1), 27–48. **https://doi.org/10.1080/09654313.2011.638493**

Haselip, J., Narkevičiūtė, R., & Rogat, J. (2015). *A step-by-step guide for countries conducting a technology needs assessment*. UNEPCCC. Retrieved September 25, 2018. **https://www.tech-action.org/Publications/TNA-Guidebooks**.

Heinrichs, D., & Krellenberg, K. (2011). *Climate adaptation strategies: Evidence from Latin American city-regions. In K. Otto-Zimmermann (Ed.), Resilient cities: Cities and adaptation to climate change—Proceedings of the Global Forum 2010* (pp. 223–230). Springer.

Hernantes, J., Maraña, P., Gimenez, R., Sarriegi, J. M., & Labaka, L. (2019). *Towards resilient cities: A maturity model for operationalizing resilience. Cities*, **84**, 96–103. **https://doi.org/10.1016/j.cities.2018.07.010**

Hijioka, Y., Lin, E., Pereira, J. J., Corlett, R. T., Cui, X., Insarov, G. E., & Surjan, A. (2014). Asia. In V. R. Barros, 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, E. S. Girma, A. N. Levy, S. MacCracken, P. R. Mastrandrea, & 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* (pp. 1327–1370). Cambridge University.

Hisschemoller, M. & Hoppe, R. (1995). *Coping with Intractable Controversies: the Case for Problem-Structuring in Policy Design. Knowledge for Policy,* 4(8), 40 - 60. urn:nbn:nl:ui:29-12441

Holpuch, A., & Lakhani, N. (2019, 29 March). *Border crisis: US failure to respond to migration surge has created chaos*. The Guardian. **https://www.theguardian.com/us-news/2019/mar/29/us-mexico-border-immigration-chaos**

Hoppe, R. (2011). *The governance of problems: Puzzling, powering and participation. Bristol: Policy Press.*

Howden, S.M., J.-F. Soussana, F.N. Tubiello, N. Chhetri, M. Dunlop, and H. Meinke, 2007*: Adapting agriculture to climate change*. *Proc. Natl. Acad. Sci***., 104,** 19691-19696, **doi:10.1073/pnas.0701890104.**

Huq, S., & Reid, H. (2004). *Mainstreaming adaptation in development. IDS Bulletin,* **35**(3), 15–21. **https://doi.org/10.1111/j.1759-5436.2004.tb00129.x**

Huq, S., Reid, H., Konate, M., Rahman, A., Sokona, Y., & Crick, F. (2004). *Mainstreaming adaptation to climate change in least developed countries (LDCs. Climate Policy*, **4**(1), 25–43. **https://doi.org/10.1080/14693062.2004.9685508**

Hurlimann, A. C., & March, A. P. (2012). *The role of spatial planning in adapting to climate change. WIREs Climate Change*, **3**(5), 477–488. **https://doi.org/10.1002/wcc.183**

Instituto Nacional de Vivienda y Asentamientos Humanos de Costa Rica. (September 2023). *Official website*. Home page. **https://www.invu.go.cr/**

Instituto Nacional de Vivienda y Asentamientos Humanos. (2017). *Reglamento No. 6296 Manual de planes reguladores como instrumento de ordenamiento territorial*. **https://www.invu.go.cr/documents/20181/32857/Manual+de+Planes+Reguladores+como+Instrumento+de+Ordenamiento+Territorial/36c4782a-317f-4e57-8f60-c6f1601c4a8d**

Instituto Nicaragüense de Estudios Territoriales. (2009). *Metodología para la elaboración de los Estudios de Ordenamiento Territorial*. **http://biblioteca.univalle.edu.ni/files/original/3614a2858d1e4d161ef86ae9f6e1cf866bc850fc.pdf**

Instituto Nicaragüense de Estudios Territoriales. (September 2023). Official website. Home page. **https://www.ineter.gob.ni/**

Intergovernmental Panel on Climate Change. (2001). *Climate Change 2001: Synthesis Report*. Cambridge UK:

Intergovernmental Panel on Climate Change (2014). *Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global assessment report of the intergovernmental panel on climate change*. Cambridge University.

Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Impacts, adaptation, and vulnerability. Part A: Global assessment report of the Intergovernmental Panel on Climate Change.* Cambridge University. Ginebra, Suíca.

Intergovernmental Panel on Climate Change (2022). Summary for Policymakers [H.-O. Pörtner, D.C. Roberts, E.S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem (eds.)]. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-33, **doi:10.1017/9781009325844.001.**

Intergovernmental Panel on Climate Change (2023). Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, **doi: 10.59327/IPCC/AR6-9789291691647.001**

Intergovernmental Panel on Climate Change, 2023: Sections. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, **doi:10.59327/IPCC/AR6-9789291691647**

Iperbole. Rete civica. (2015). *Cambiamento climatico: approvata la Strategia locale di adattamento*. **http://www.comune.bologna.it/news/cambiamento-climatico-approvata-la-strategia-locale-di-adattamento**

Iperbole. Rete civica. (2019). *Bologna attrae e cresce ancora: residenti oltre quota 391 mila, 8 nuovi cittadini su 10 arrivano da altri Comuni italiani e le nascite si mantengono elevate*. http://www.comune.bologna.it/news/bologna-popolazione-statistica-tendenze-demografiche

Iperbole. Rete civica. (2020a). *Al via i lavori per* **il Paesc | PAESC - Piano d'azione per l'energia sostenibile e il clima | Rete Civica Iperbole. http://www.comune.bologna.it/paes/notizie/143:47201/**

Iperbole. Rete civica. (2020b). *City networks*. **http://www.comune.bologna.it/internationalrelations/servizi/160:14325/**

Iperbole. Rete civica. (2020c). *Piano Urbanistico Generale. Inizia il percorso verso l'adozione del nuovo strumento di pianificazione della città*. http://www.comune.bologna.it/

ISPRA. (2009). *Adattamento ai cambiamenti climatici: strategie e piani in Europa*. **https://www.isprambiente.gov.it/contentfiles/00003500/3580-rapporto94-2009.pdf/**

Jones, M. D. (2011). *Leading the Way to Compromise? Cultural Theory and Climate Change Opinion. PS: Political Science & Politics*, 44(4), 720-725. **10.1017/S104909651100134X**

Jones, M. D. (2011). *Leading the Way to Compromise? Cultural Theory and Climate Change Opinion. PS: Political Science & Politics,* 44(4), 720-725. **doi:10.1017/S104909651100134X**

Jones, R., Patwardhan, A., Cohen, S., Dessai, S., Lammel, A., Lempert, R., . . . von Storch, H. (2014). *Foundations for decision making.*

Jones, R., Patwardhan, A., Cohen, S., Dessai, S., Lammel, A., Lempert, R., . . . von Storch, H. (2014). Foundations for decision making. 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 University Press.

Kahan, D. M. (2012). Cultural cognition as a conception of the cultural theory of risk. In S. Roeser, R. Hillerbrand, P. Sandin, & M. Peterson (Eds.), *Handbook of Risk Theory* (pp. 726–753). Springer Science+Business Media B.V. **https://doi.org/10.1007/978-94-007-1433-5_28**

Kehew, R. B., Kolisa, M., Rollo, C., Callejas, A., Alber, G., & Ricci, L. (2013). *Formulating and implementing climate change laws and policies in the Philippines, Mexico (Chiapas), and South Africa: A local government perspective. Local Environment,* **18**(6), 723–737. **https://doi.org/10.1080/13549839.2013.818949**

Kern, K., & Alber, G. (2008*). Governing climate change in cities: Modes of urban climate governance in multi-level systems. Proceedings from competitive cities and climate change*, Milan, Italy, 9–10 October 2009. **https://www.oecd.org/cfe/regional-development/50594939.pdf**

Kerry, J., Pruneau, D., Blain, S., Langis, J., Barbier, P. Y., Mallet, M. A., ... & Laroche, A. M. (2012). Human competences that facilitate adaptation to climate change: Research in progress. International Journal of Climate Change Strategies and Management, 4(3), 246-259. **https://doi.org/10.1108/17568691211248711**

Kivimaa, P., & Mickwitz, P. (2006). *The challenge of greening technologies–environmental policy integration in Finnish technology policies*. *Research Policy*, **35**(5), 729–744. **https://doi.org/10.1016/j.respol.2006.03.006**

Klein, R. J. T., Schipper, E. L. F., & Dessai, S. (2005*). Integrating mitigation and adaptation into climate and development policy: Three research questions. Environmental Science & Policy*, **8**(6), 579–588. **https://doi.org/10.1016/j.envsci.2005.06.010**

Klein, R. J., Midgley, G. F., Preston, B. L., Alam, M., Berkhout, F. G., Dow, K., & Shaw, M. (2014). Adaptation opportunities, constraints, and limits. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, & 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* (Vol. **16**, p. 943). Cambridge University.

Kristianssen, A.-C., & Granberg, M. (2021). Transforming local climate adaptation organization: Barriers and progress in 13 Swedish municipalities. Climate, 9(4), 52. **https://doi.org/10.3390/cli9040052**

Lakhani, N. (2019a, 31 July). *'It won't be long': Why a Honduran community will soon be under water*. The Guardian. **https://www.theguardian.com/global-development/2019/jul/31/honduras-community-coastal-towns-rising-sea-le**

Lakhani, N. (2019a, July 31). 'It won't be long': *Why a Honduran community will soon be under water. The Guardian.* Retrieved August 22, 2019. **https://www.theguardian.com/global-development/2019/jul/31/honduras-community-coastal-towns-rising-sea-le**

Lakhani, N. (2019b, 30 July). *Living without water: The crisis pushing people out of El Salvador*. The Guardian. **https://www.theguardian.com/global-development/2019/jul/30/el-salvador-water-crisis-privatization-gangs-corruption**

Lakhani, N. (2019b, July 30). *Living without water: The crisis pushing people out of El Salvador. The Guardian*. Retrieved August 22, 2019. **https://www.theguardian.com/global-development/2019/jul/30/el-salvador-water-crisis-privatization-gangs-corruption**

Lakhani, N. (2019c, 29 July). *'People are dying': How the climate crisis has sparked an exodus to the US.* The Guardian. **https://www.theguardian.com/global-development/2019/jul/29/guatemala-climate-crisis-migration-drought-famine?CMP=series_embed_box**

Lakhani, N. (2019c, July 29). *'People are dying': How the climate crisis has sparked an exodus to the US. The Guardian.* Retrieved August 22, 2019. **https://www.theguardian.com/global-development/2019/jul/29/guatemala-climate-crisis-migration-drought-famine?CMP=series_embed_box**

Lesnikowski, A., Ford, J., Biesbroek, R., Berrang-Ford, L., Maillet, M., Araos, M., & Austin, S. E. (2017). *What does the Paris agreement mean for adaptation. Climate Policy,* **17**(7), 825–831. **https://doi.org/10.1080/14693062.2016.1248889**

Lei de Bases da Proteção Civil, (2006).

Lei de bases gerais da política pública de solos, de ordenamento do território e de urbanismo (2014).

Lorenzoni, K. L. O'Brien, & W. N. Adger (Eds.), Adapting to Climate Change: Thresholds, Values, Governance (pp. 212-226). Cambridge University Press.

Magrin, G. O., Marengo, J. A., Boulanger, J.-P., Buckeridge, M. S., Castellanos, E., Poveda, G., & Vicuña, S. (2014). Central and South America. In V. R. Barros, C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, T. E. Bilir, & L. L. White (Eds.), *Climate change 2014: Impacts, adaptation, and vulnerability* (pp. 1499–1566). WMO, UNEP. **https://www.ipcc.ch/site/assets/uploads/2018/02/ar5_wgII_spm_en.pdf**

Mamadouh, V. (1999). *Grid-group cultural theory: an introduction*. GeoJournal, 47(3), 395-409. **doi:10.1023/A:1007024008646**

Martz, J. D. (1991*). Cultural Theory. By Michael Thompson, Richard Ellis, and Aaron Wildavsky. Boulder: Westview*, 1990. 296p. $16.95 paper. American Political Science Review, 85(3), 1008-1008

Maslin, M. (2014). *Climate change: a very short introduction:* OUP Oxford.

Massey, E. E., & Bergsma, E. J. (2008). *Assessing adaptation in 29 European countries*. Institute for Environmental Studies, Vrije Universiteit, Netherlands. **https://research.vu.nl/en/publications/8724c40f-2187-4d30-b857-29676a7e86ab**

McEvoy, D., Fünfgeld, H., & Bosomworth, K. (2013). *Resilience and Climate Change Adaptation: The Importance of Framing. Planning Practice & Research*, 28(3), 280-293. **doi:10.1080/02697459.2013.787710**

McGray, H., Hammill, A., Bradley, R., Schipper, E. L., & Parry, J. E. (2007). *Weathering the storm: Options for framing adaptation and development.* (Vol. 57). Washington, DC: World Resources Institute.

McNeeley, S. M. & Lazrus, H. (2014). *The cultural theory of risk for climate change adaptation. Weather, climate, and society*, 6(4), 506-519. **doi:10.1175/wcas-d-13-00027.1**

Meader, N. (2002). *A theoretical and methodological examination of cultural theory applied to environmental issues* [Doctoral dissertation]. University of Surrey. **http://epubs.surrey.ac.uk/851/1/fulltext.pdf**

Mickwitz, P., Aix, F., Beck, S., Carss, D., Ferrand, N., Görg, C., & Bommel, S. V. (2009). *Climate policy integration, coherence and governance (9789521133794)*. PEER. **http://edepot.wur.nl/3987**

Milman, O., Holden, E., & David, A. (2018, 30 October). *The unseen driver behind the migrant caravan: climate change*. The Guardian. **https://www.theguardian.com/world/2018/oct/30/migrant-caravan-causes-climate-change-central-america**

Mimura, N., Pulwarty, R. S., Duc, D. M., Elshinnawy, I., Redsteer, M. H., Huang, H. Q., Nkem, J. N., & Sanchez Rodriguez, R. A. (2014). Adaptation planning and implementation. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, 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* (pp. 868–898). Cambridge University.

Ministerio de Agricultura y Ganadería de la República de Costa Rica. (2011). *Plan de Acción para el cambio climático y la gestión agroambiental (2011–2014)*. **https://www.mag.go.cr/biblioteca_virtual/bibliotecavirtual/a00299.pdf**

Ministerio de Agricultura y Ganadería de la República de Costa Rica. (2018). *Planes regionales de acciones climáticas y gestión de riesgos del sector Agropecuario 2018–2022*. **https://www.infoagro.go.cr/CambioClimatico/Paginas/planes.aspx**

Ministerio de Agricultura y Ganadería de la República de El Salvador. (2015). *Estrategia Ambiental de adaptación y mitigación al cambio climático del sector agropecuario, forestal y acuícola*. **https://www.mag.gob.sv/download/estrategia-ambiental-de-adaptacion-y-mitigacion-al-cambio-climatico-del-sector-agropecuario-forestal-y-acuicola/**

Ministerio de Medio Ambiente y Recursos Naturales de Nicaragua. (2002). *Decreto Ejecutivo No. 78-2002 De normas, pautas y criterios para el ordenamiento territorial*. **http://legislacion.asamblea.gob.ni/normaweb.nsf/b34f77cd9d23625e06257265005d21fa/3978e356f78cc1db062570ce005cc0d4?OpenDocument**

Ministerio de Agricultura y Ganadería de la República de El Salvador. (2017a). *Política de cambio climático para el sector agropecuario, forestal, pesquero y acuícola*.**https://www.mag.gob.sv/wp-content/uploads/2021/06/4Politica-MAG-en-CC.pdf**

Ministerio de Agricultura y Ganadería de la República de El Salvador. (2017b). *Plan Nacional de cambio climático y Gestión de Riesgos Agroclimáticos para el sector agropecuario, forestal, pesquero y acuícola*.**https://www.transparencia.IntergovernmentalPanelonClimateChangegob.sv/institutions/mag/documents/185733/download#:%7E:text=As%C3%AD%2C%20el%20Plan%20Nacional%20de,y%20Mitigaci%C3%B3n%20al%20Cambio%20Clim%C3%A1tico**

Ministerio de Agricultura, Ganadería y Forestería de la República de Nicaragua. (2013). *Plan de adaptación a la variabilidad y el cambio climático en el sector agropecuario, forestal y pesca en Nicaragua*. **https://extwprlegs1.fao.org/docs/pdf/nic148691.pdf**

Ministerio de Ambiente de la República de Panamá. (n.d). *Tercera Comunicación Nacional sobre Cambio Climático Panamá*. **https://dcc.miambiente.gob.pa/biblioteca-climatica/**

Ministerio de Ambiente y Energía de la República de Costa Rica (2007). *Estrategia Nacional de Cambio Climático.* 1 ed.- San José, CR: Editorial Calderón y Alvarado S. A.

https://cambioclimatico.go.cr/wp-content/uploads/2018/08/ENCC.pdf

Ministerio de Ambiente y Energía de la República de Costa Rica (2006). *Manual de Instrumentos Técnicos para el Proceso de Evaluación del Impacto Ambiental (Manual de EIA)-Parte III* Decreto Ejecutivo 32967, del 20/02/2006. Recuperado de: **http://www.pgrweb.go.cr/scij/Busqueda/Normativa/Normas/nrm_texto_completo.aspx?param1=NRTC&nValor1=1&nValor2=57062&nValor3=72443&strTipM=TC**

Ministerio de Ambiente y Energía de la República de Costa Rica. (2007). *Estrategia Nacional de Cambio Climático*. San José, CR: Editorial Calderón y Alvarado S. A **https://cambioclimatico.go.cr/wp-content/uploads/2018/08/ENCC.pdf**

Ministerio de Ambiente y Energía de la República de Costa Rica. (2014*). Plan de Acción de la Estrategia Nacional de Cambio Climático*. **https://www.uned.ac.cr/extension/images/ifcmdl/amas/recursos/cambio-climatico/plan-de-accion-estrategia-nacional-cambio-climatico.pdf**

Ministerio de Ambiente y Energía de la República de Costa Rica. (2015). *Estrategia para la adaptación del sector biodiversidad de Costa Rica al cambio climático (2015–2025) y su Plan de Acción*. **https://www.sinac.go.cr/ES/docu/coop/proy/Estrategia%20de%20adaptaci%C3%B3n%20al%20cambio%20clim%C3%A1tico.pdf**

Ministerio de Ambiente y Energía de la República de Costa Rica. (2017). *Política Nacional de Adaptación al Cambio Climático* 2018–203. **https://cambioclimatico.go.cr/politica-nacional-de-adaptacion/#:%7E:text=La%20visi%C3%B3n%20propuesta%20para%20la,participativa%2C%20que%20permitan%20prevenir%20y**

Ministerio de Ambiente y Recursos Naturales de la República de El Salvador. (2013). *Estrategia Nacional de Cambio Climático*. **https://rcc.marn.gob.sv/handle/123456789/10**

Ministerio de Ambiente y Recursos Naturales de la República de El Salvador. (2017). *Plan Nacional de cambio Climático de El Salvador.* **https://rcc.marn.gob.sv/bitstream/handle/123456789/50/Plan%20Nacional%20de%20Cambio%20Clim%C3%A1tico.pdf?sequence=1&isAllowed=y**

Ministerio de Ambiente y Recursos Naturales de la República de El Salvador. (2018). *Tercerca Comunicación Nacional de Cambio Climático de El Salvador*. **https://rcc.marn.gob.sv/handle/123456789/341?show=full**

Ministerio de Ambiente y Recursos Naturales de la República de El Salvador. (2022). *Official website sobre cambio climático*. **https://rcc.marn.gob.sv/handle/123456789/2**

Ministerio de Ambiente y Recursos Naturales de la República de Guatemala. (2015). *Segunda Comunicación Nacional sobre Cambio Climático Guatemala*. **https://mem.gob.gt/wp-content/uploads/2020/10/12.-Segunda-Comunicacion-Nacional-Sobre-Cambio-Climatico-Guatemala.pdf**

Ministerio de Ambiente y Recursos Naturales de la República de Guatemala. (2019). *Política Nacional de Cambio Climático*. **https://www.segeplan.gob.gt/downloads/clearinghouse/politicas_publicas/Recursos%20Naturales/Politica%20Nacional%20de%20Cambio%20Clim%C3%A1tico%20Guatemala.pdf**

Ministerio de Ambiente y Recursos Naturales de la República de Nicaragua. (2010). *Estrategia Nacional Ambiental y del Cambio Climático y su Plan de Acción 2010–2015*. **https://www.preventionweb.net/publication/nicaragua-estrategia-nacional-ambiental-y-del-cambio-climatico-plan-de-accion-2010-2015#:%7E:text=La%20Estrategia%20Nacional%20Ambiental%20y%20de%20Cambio%20Clim%C3%A1tico%20se%20sustenta,poblaci%C3%B3n%20a%20un%20ambiente%20sano**

Ministerio de Ambiente y Recursos Naturales de la República de Nicaragua. (2018). *Tercera Comunicación Nacional de Cambio Climático Nicaragua*. **https://cambioclimatico.ineter.gob.ni/Tercera%20Comunicaci%C3%B3n%20Nicaragua.pdf**

Ministerio de Desarrollo Agropecuario de la República de Panamá y el Ministerio de Ambiente de la República de Panamá. (2018). *Plan Nacional de cambio climático para el sector agropecuario de Panamá*. **https://cdn1.miambiente.gob.pa/wp-content/uploads/2020/11/6.PLAN-NACIONAL-DE-CAMBIO-CLIMATICO-AGRO.pdf**

Ministerio de Economía y Finanzas de Panamá. (September 2023*). Official website*. Home page. **https://www.mef.gob.pa/**

Ministerio de Gobernación y Desarrollo Territorial de El Salvador. (sptember 2023). *Official website.* Home page, **https://www.gobernacion.gob.sv/marco-institucional/**

Ministerio de la Presidencia de Panamá. (2010). *Política Nacional de Gestión Integral del Riesgo*. **https://www.gacetaoficial.gob.pa/pdfTemp/26699_B/GacetaNo_26699b_20110112.pdf**

Ministerio de Medio Ambiente y Recursos Naturales de El Salvador. (2002*). Política Nacional de Ordenamiento y Desarrollo Territorial (Documento de Síntesis)*. **https://faolex.fao.org/docs/pdf/els146576.pdf**

Ministerio de Medio Ambiente y Recursos Naturales de El Salvador. (2004). *Plan Nacional de Ordenamiento y Desarrollo Territorial (Documento de Síntesis)*. **https://repo.funde.org/id/eprint/99/1/LIBROS-72.pdf**

Ministerio de Medio Ambiente y Recursos Naturales de El Salvador. (September 2023*). Official website*. Home page. **https://www.marn.gob.sv/**

Ministerio de Planificación Nacional y Política Económica de Costa Rica. (September 2023). Official website. Home page. **https://www.mideplan.go.cr/**

Ministerio de Vivienda y Asentamientos Humanos de Costa Rica. (2013a). *Plan de Ordenamiento Territorial 2014–2020*. **https://www.mivah.go.cr/Biblioteca_Politicas_PNOT.shtml**

Ministerio de Vivienda y Asentamientos Humanos de Costa Rica. (2013b). *Política Nacional de Ordenamiento Territorial 2012–2040*. **https://www.mivah.go.cr/Biblioteca_Politicas_PNOT.shtml**

Ministerio de Vivienda y Asentamientos Humanos de Costa Rica. (2018a). *Política Nacional de Desarrollo Urbano 2018–2030*. **https://www.mivah.go.cr/Biblioteca_Politicas_Politica_y_Plan_Nacional_Desarrollo_Urbano.shtml**

Ministerio de Vivienda y Asentamientos Humanos de Costa Rica. (2018b). *Plan de Acción 2018–2022 de la Política Nacional de Desarrollo Urbano 2018–2030*. **https://www.mivah.go.cr/Biblioteca_Politicas_Politica_y_Plan_Nacional_Desarrollo_Urbano.shtml**

Ministerio de Vivienda y Asentamientos Humanos de Costa Rica. (September 2023*). Official website*. Home page. **https://www.mivah.go.cr/InicioN.shtml**

Ministerio de Vivienda y Ordenación del Territorio de Panamá. (2015). *Resolución 732-2015 Guía para la elaboración de los esquemas de ordenamiento territorial*. **https://www.miviot.gob.pa/ordenamiento-territorial/**

Ministerio de Vivienda y Ordenamiento Territorial de Panamá. (September 2023*). Official website* Home Pagr.. **https://www.miviot.gob.pa/**

Ministerio del Ambiente y Energía de la República de Costa Rica/Instituto Meteorológico Nacional. (2014). *Tercera comunicación nacional a la Convención Marco de las Naciones Unidas sobre cambio climático*. San José, Costa **https://cambioclimatico.go.cr/wp-content/uploads/2020/10/Tercera.pdf**

Ministero dell'Ambiente e della Tutela del Territorio e del Mare, (2015) (testimony of Strategia Nazionale di Adattamento ai Cambiamenti Climatici). **http://www.pdc.minambiente.it/sites/default/files/allegati/Strategia_nazionale_adattamento_cambiamenti_climatici.pdf**

Montesano, F. S., Biermann, F., Kalfagianni, A., & Vijge, M. J. (2023). *Can the sustainable development goals green international organisations? Sustainability integration in the International Labour Organisation. Journal of Environmental Policy & Planning*, **25**(1), 1–15. **https://doi.org/10.1080/1523908X.2021.1976123**

Moser, S. C., & Ekstrom, J. A. (2010). *A framework to diagnose barriers to climate change adaptation. Proceedings of the National Academy of Sciences*, 107(51), 22026-22031. **doi:10.1073/pnas.1007887107**

Moser, S. C., J. A. Ekstrom, J. Kim, and S. Heitsch. 2019. *Adaptation finance archetypes: local governments' persistent challenges of funding adaptation to climate change and ways to overcome them. Ecology and Society* 24 (2):28. **https://doi.org/10.5751/ES-10980-240228**

Município do Porto. (2015). Estratégia Municipal de Adaptação às Alterações Climáticas do Porto.

Municipalidad de San Francisco del Valle (2018). *Plan de Desarrollo Municipal de San Francisco del Valle de Ocotepeque. Documento facilitado por la municipalidad.*

Municipalidad de Upala. (2012a). *Plan Cantonal de Desarrollo Humano Local, Upala 2013-2023. Documento facilitado por la municipalidad.*

Municipalidad de Upala. (2012b). *Plan Regulador del Cantón de Upala: Alcance Ambiental. Documento facilitado por la municipalidad.*

Nachmany, M., Fankhauser, S., Townshend, T., Collins, M., Landesman, T., Matthews, A., & Setzer, J. (2014). *The GLOBE climate legislation study: A review of climate change legislation in 66 countries.* GLOBE International and the Grantham Research Institute, London School of Economics.

Nalau, J., Preston, B. L., & Maloney, M. C. (2015). *Is adaptation a local responsibility? Environmental Science & Policy*, 48, 89-98.

New, M., D. Reckien, D. Viner, C. Adler, S.-M. Cheong, C. Conde, A. Constable, E. Coughlan de Perez, A. Lammel, R. Mechler, B. Orlove, and W. Solecki, 2022: Decision-Making Options for Managing Risk. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2539–2654, **doi:10.1017/9781009325844.026.**

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.

Nisbet, M. C. (2009). Communicating Climate Change: Why Frames Matter for Public Engagement. Environment: Science and Policy for Sustainable Development, 51(2), 12–23. **https://doi.org/10.3200/ENVT.51.2.12-23**

NCCARF. (2013). *Climate proofing Australia's infrastructure, policy guidance brief, 7*. National Climate Change Adaptation Research Facility. **https://nccarf.edu.au/wp-content/uploads/2019/04/INFRASTRUCTURE_A4-Webview.pdf**

Noble, I. R., Huq, S., Anokhin, Y. A., Carmin, J., Goudou, D., Lansigan, F. P., & Villamizar, A. (2014). Adaptation needs and options. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, & 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* (pp. 833–868). Cambridge University.

Olazabal, M., Amorim-Maia, A. T., Alda-Vidal, C., & Goodwin, S. (2024). What is limiting how we imagine climate change adaptation? *Current Opinion in Environmental Sustainability, 71*, 101476. **https://doi.org/10.1016/j.cosust.2024.101476**

O'Riordan, T. & Jordan, A. (1999*). Institutions, climate change and cultural theory: towards a common analytical framework. Global Environmental Change*, 9(2), 81-93. **https://doi.org/10.1016/S0959-3780(98)00030-2**

Offermans, A. (2012). *The perspectives method: towards socially robust river management*: Maastricht University. Data Wyse / Universitaire Pers Maastricht. **https://doi.org/10.26481/dis.20121219ao**

Office of the United Nations High Commissioner for Human Rights. (2023). *Nicaragua: Crimes against humanity being committed against civilians for political reasons, investigation says* [Press release].

Oficina Espanola de Cambio Climatico. (2006) *Plan Nacional de Adaptacion al Cambio Climático (PNACC)*. **https://www.miteco.gob.es/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pna_v3_tcm7-12445_tcm30-70393.pdf**

Oficina Espanola de Cambio Climatico. (2017) *Septima Comunicacion Nacional de Espana Convencion Marco de Naciones Unidas sobre Cambio Climatico*. **https://www.miteco.gob.es/es/cambio-climatico/publicaciones/publicaciones/7cn_web_tcm30-438294.pdf**

Organisation for Economic Co-operation and Development. (2002). *Improving policy coherence and integration for sustainable development—A checklist*. Organisation for Economic Cooperation and Development (OECD) Observer.

Organisation for Economic Co-operation and Development (2023), "Climate adaptation: Why local governments cannot do it alone", OECD Environment Policy Papers, No. 38, OECD Publishing, Paris, **https://doi.org/10.1787/be90ac30-en.**

Pachauri, R. K., Gomez-Echeverri, L., & Riahi, K. (2014). *Synthesis report: summary for policy makers.*

Pasquini, L., Ziervogel, G., Cowling, R. M., & Shearing, C. (2015*). What enables local governments to mainstream climate change adaptation? Lessons learned from two municipal case studies in the Western Cape, South Africa. Climate and Development*, **7**(1), 60–70. **https://doi.org/10.1080/17565529.2014.886994**

Paul, C. J., Weinthal, E. S., Bellemare, M. F. & Jeuland, M. A. (2016) *Social capital, trust, and adaptation to climate change: Evidence from rural Ethiopia, Global Environmental Change* 36: 124-138. **https://doi.org/10.1016/j.gloenvcha.2015.12.003.**

Paz-Soldán, V. A., Valcarcel, A., Canal-Solis, K., Miranda-Chacon, Z., Palmeiro-Silva, Y. K., Hartinger, S. M., Suárez-Linares, A. G., Falla-Valdez, V., Intimayta-Escalante, C., Lehoucq, M., Pretell, A., & Castillo-Neyra, R. (2023). A critical analysis of national plans for climate adaptation for health in South America. Lancet regional health. Americas, 26, 100604. **https://doi.org/10.1016/j.lana.2023.100604**

Pendergraft, C. A. (1998). *Human Dimensions of Climate Change: Cultural Theory and Collective Action. Climatic Change,* 39(4), 643-666. **doi:10.1023/a:1005323809980**

Pietrapertosa, F., Khokhlov, V., Salvia, M., & Cosmi, C. (2018). *Climate change adaptation policies and plans: A survey in 11 South East European countries. Renewable and Sustainable Energy Reviews*, 81, 3041-3050. **https://doi.org/10.1016/j.rser.2017.06.116**

Portuguese Environment Agency. (2017). *7th National Communication to the United Nations Framework Convention on Climate Change 3rd Biennial Report to the United Nations Framework Convention on Climate Change 4th National Communication in the Context of the Kyoto Protocol*.

Pham, H., & Saner, M. (2021). A Systematic Literature Review of Inclusive Climate Change Adaption. Sustainability, 13(19), 10617. **https://doi.org/10.3390/su131910617**

Presidencia de Costa Rica; Ministerio de Planificación y Política Económica. (2015*). Plan Nacional de Desarrollo 2015-2018: Alberto Cañas*. **https://siteal.iiep.unesco.org/bdnp/237/plan-nacional-desarrollo-2015-2018-alberto-canas-escalante#:~:text=Presenta%20el%20Plan%2C%20el%20cual,lucha%20frontal%20contra%20la%20corrupci%C3%B3n**

Presidencia de El Salvador. (September 2023). *Official website*. Home Page. **https://www.presidencia.gob.sv/**

Presidencia de la República de Nicaragua; Instituto Nicaragüense de Estudios Territoriales. (2001). *Política General para el Ordenamiento Territorial*. **http://legislacion.asamblea.gob.ni/normaweb.nsf/b92aaea87dac762406257265005d21f7/c60847e89df22a6e062570a100581b30?OpenDocument**

Presidencia de Panamá. (2014). *Plan Estratégico de Gobierno 2015–2019 "Un solo país"*. **https://observatorioplanificacion.cepal.org/sites/default/files/plan/files/PanamaPlanEstrategicodeGobierno.pdf**

Preston, B. L., Westaway, R., Dessai, S., & Smith, T. F. (2009). *Are we adapting to climate change? Research and methods for evaluating progress. Proceedings from 89th American Meteorological Society Annual Meeting: Fourth Symposium on Policy and Socio-Economic Research*, Phoenix, Arizona, January 10–16.

Programa Estado de la Nación. (2016). *Quinto Informe Estado de la Región en Desarrollo Humano Sostenible. (Vol. 5) Costa Rica Programa Estado de la Nación*.

Protezione Civile. (2020). *Competenze*. **http://www.protezionecivile.gov.it/dipartimento/competenze**

Quintanilla, J., & Phillips, T. (2023, February 20). El Salvador crackdown breaks the gangs—at huge cost to human rights. The Guardian. **https://www.theguardian.com/world/2023/feb/20/bukele-el-salvador-gangs-crackdown**

Radhakrishnan, M., Pathirana, A., Ashley, R., & Zevenbergen, C. (2017). Structuring Climate Adaptation through Multiple Perspectives: Framework and Case Study on Flood Risk Management. Water, 9(2), 129. **https://doi.org/10.3390/w9020129**

Regione Emilia Romagna, (2013) (testimony of Piano Territoriale Regionale Dell'Emilia-Romagna). **https://territorio.regione.emilia-romagna.it/programmazione-territoriale/ptr-piano-territoriale-**

Regione Emilia-Romagna. (2016). *Ambiente*. Strategia Unitaria Di Mitigazione e Adattamento per i Cambiamenti Climatici — Ambiente. **https://ambiente.regione.emilia-romagna.it/it/cambiamenti-climatici/materiali-vari/documenti_vecchia_versione/strategia-regionale-per-i-cambiamenti-climatici**

Rittel, H. W., & Webber, M. M. (1973). Dilemmas in a general theory of planning. Policy sciences, 4(2), 155-169.

Rivera, C., & Wamsler, C. (2014). *Integrating climate change adaptation, disaster risk reduction and urban planning: A review of Nicaraguan policies and regulations. International Journal of Disaster Risk Reduction,* **7**, 78–90. **https://doi.org/10.1016/j.ijdrr.2013.12.008**

Robinson, S.-A. (2018). Climate change adaptation in small island developing states: Insights and lessons from a meta-paradigmatic study. *Environmental Science & Policy*, **85**, 172–181. **https://doi.org/10.1016/j.envsci.2018.03.030**

Runhaar, H., Wilk, B., Persson, Å., Uittenbroek, C., & Wamsler, C. (2018). Mainstreaming climate adaptation: Taking stock about "what works" from empirical research worldwide. *Regional Environmental Change*, **18**(4), 1201–1210. **https://doi.org/10.1007/s10113-017-1259-5**

Saito, N. (2013). Mainstreaming climate change adaptation in least developed countries in South and Southeast Asia. *Mitigation and Adaptation Strategies for Global Change*, **18**(6), 825–849. **https://doi.org/10.1007/s11027-012-9392-4**

Schaller, S., Jean-Baptiste, N., & Lehmann, P. (2016). Oportunidades y obstáculos para la adaptación urbana frente al cambio climático en América Latina: Casos de la Ciudad de México, Lima y Santiago de Chile. EURE (Santiago), 42(127), 257-278.

Schön, D. & Rein, M. (1994). Frame reflection: toward the resolution of intractable controversies. Basic Books.

Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente de la República de Honduras. (2010). *Estrategia Nacional de Cambio Climático*. **https://icf.gob.hn/wp-content/uploads/2022/02/2010-Estrategia-Nacional-de-Cambio-Climatico.pdf**

Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente de la República de Honduras. (2018a). Plan Nacional de Adaptación al Cambio Climático. **https://www.fao.org/faolex/results/details/es/c/LEX-FAOC208195/**

Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente de la República de Honduras. (2018b). *Segunda Comunicación Nacional del Gobierno de Honduras ante la Convención Marco de las Naciones Unidas sobre Cambio Climático.* **https://unfccc.int/sites/default/files/resource/hndnc2_0.pdf**

Secretaría de Estado en los Despachos de Recursos Naturales y Ambiente de la República de Honduras (2010). *Estrategia Nacional de Cambio Climático*. Tegucigalpa, Honduras. **https://icf.gob.hn/wp-content/uploads/2022/02/2010-Estrategia-Nacional-de-Cambio-Climatico.pdf**

Secretaría de Gobernación, Justicia y Descentralización. (2010*). Guía Metodológica: Elaboración Planes de Desarrollo Municipal (PDM) con enfoque de Ordenamiento Territorial*. **https://www.jica.go.jp/project/honduras/0603085/materials/pdf/guideline08.pdf**

Secretaría de Planificación y Programación de la Presidencia de Guatemala. (2018). *Guía Metodológica para la elaboración de los Planes Municipales de Desarrollo y de Ordenamiento Territorial de Guatemala*. **https://portal.segeplan.gob.gt/segeplan/wp-content/uploads/2022/08/Guia_PDM_OT.pdf**

Secretaría de Planificación y Programación de la Presidencia de Guatemala. (September 2023). Official website. **https://portal.segeplan.gob.gt/segeplan/**

Secretaría Ejecutiva de la Presidencia de Honduras. (2015). *Guía Metodológica para la Elaboración de Planes Municipales de Ordenamiento Territorial*. **http://www.miambiente.gob.hn/media/adjuntos/pdf/sinia/2018-02-20/17%3A48%3A34.029252%2B00%3A00/Guia-Metodologica_2017.pdf**

Secretaría Técnica de Planificación y Cooperación Exterior de Honduras. (2013*). Normativa para la formulación de planes de desarrollo municipal con enfoque de ordenamiento territorial Acuerdo no. 00132*. **https://www.tsc.gob.hn/biblioteca/index.php/normas/500-normativa-para-la-formulacion-de-planes-de-desarrollo-municipal-con-enfoque-de-ordenamiento-territorial**

Secretaría Técnica de Planificación y Cooperación Externa. (2013). *Normativa para la formulación de planes de desarrollo municipal con enfoque de ordenamiento territorial, Acuerdo no.* 00132. **https://www.tsc.gob.hn/biblioteca/index.php/normas/500-normativa-para-la-formulacion-deplanes-de-desarrollo-municipal-con-enfoque-de-ordenamiento-territorial**

Secretario de Gobernanza, Justicia y Descentralización de Honduras. (2010). *Guía Metodológica: Elaboración Planes de Desarrollo Municipal (PDM) con enfoque de Ordenamiento Territorial*. **https://www.jica.go.jp/project/honduras/0603085/materials/pdf/guideline08.pdf**

Secretario de Gobernanza, Justicia y Descentralización de Honduras. (September 2023). *Official website*. Home page. **https://www.sgjd.gob.hn/**

Segura, L. D., Crespo, O., & Hernández, M. L. (2015). *Las prioridades de la cooperación internacional y el Sistema de la Integración Centroamericana*. Proceedings from Ponencia del Quinto Informe del Estado de la Región. Retrieved September 25, 2018. **https://repositorio.conare.ac.cr/handle/20.500.12337/659**

Segura, L. D., van Zeijl-Rozema, A., & Martens, P. (2022). Climate change adaptation in Central America: A review of the national policy efforts. *Latin American Policy*, **13** (2), 276–327. **https://doi.org/10.1111/lamp.12277**

Segura, L.D., van Zeijl-Rozema, A., & Martens, P. (2023). *Policy integration of climate change adaptation in Central America: A review for development, land-use planning, and risk management.* Latin American Policy, 14, 534–567. **https://doi.org/10.1111/lamp.12314**

Segura, L.D & Bonilla, A. (2023) *La influencia de los marcos de referencia (framings) en la gobernanza de la adaptación al cambio climático y gestión del riesgo a nivel local: Los casos de Upala de Costa Rica y San Francisco del Valle de Ocotepeque Honduras.* . Relaciones Internacionales, 96(1), 93-130. **https://doi.org/10.15359/ri.96-1.4**

Semple, K. (2019). *Central American farmers head to the U.S., fleeing climate change. The New York Times*. Retrieved August 22, 2019. **https://www.nytimes.com/2019/04/13/world/americas/coffee-climate-change-migration.html?searchResultPosition=2**

Sietz, D., Boschütz, M., & Klein, R. J. T. (2011). *Mainstreaming climate adaptation into development assistance: Rationale, institutional barriers and opportunities in Mozambique*. Environmental *Science & Policy*, **14**(4), 493–502. **https://doi.org/10.1016/j.envsci.2011.01.001**

Slothuus, L. (2024). Political fatalism and the (im)possibility of social transformation. *Contemporary Political Theory, 24*(1), 41–59. **https://doi.org/10.1057/s41296-024-00685-1**

Sistema de la Integración Centroamericana (2010*). Estrategia regional de cambio climático*. Retrieved September 25, 2018. **https://www.sica.int/busqueda/secciones.aspx?IdItem=55544&IdCat=48&IdEnt=879**

Sistema Nacional de Protección Civil de Panamá. (September 2023). *Official website*. Home page. **https://www.sinaproc.gob.pa/**

Sistema Nacional para la Prevención, Mitigación y Atención de Desastres de Nicaragua. (2023). **https://www.sinapred.gob.ni/**

Sumari, B. K., Pauline, N., & Bwanduruko Mabhuye, E. (2024). Integrating Bottom-up and Top-down Approaches in Tanzania's Climate Change Adaptation Planning: Exploring Their Impact on Adaptive Capacity in Adaptation Projects. The Journal of Development Studies, 61(6), 851–868. **https://doi.org/10.1080/00220388.2024.2428608**

Smit, B., & Pilifosova, O. (2003). *Adaptation to climate change in the context of sustainable development and equity.* Sustainable Development, 8(9), 9

Spires, M., & Shackleton, S. E. (2017). A synthesis of barriers to and enablers of pro-poor climate change adaptation in four South African municipalities. Climate and Development, 10(5), 432–447. https://**doi.org/10.1080/17565529.2017.1410088**

Susienka, C., & Purves, G. (2024). Hope for a burning world: Climate nihilism and therapeutic hope. *Philosophy and Public Issues*, *1*(2024), 1–209. **https://doi.org/10.17473/2240-7987-2024-1-10**

Steg, L., & Sievers, I. (2000). *Cultural Theory and Individual Perceptions of Environmental Risks. Environment and Behavior,* 32(2), 250-269. **https://doi.org/10.1177/00139160021972513**

Swart, R. J., Biesbroek, R., Binnerup, S., Carter, T., Cowan, C., Henrichs, T., & Rey, D. (2009). *Europe adapts to climate change. Comparing National Adaptation Strategies in Europe* (9789521134517). Partnership for European Environmental Research. **https://edepot.wur.nl/11477**

Termeer, C., Dewulf, A., & Breeman, G. (2013). Governance of wicked climate adaptation problems. In *Climate change governance* (pp. 27-39): Springer.

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. **https://doi.org/10.1057/eps.2011.7**

The Economist Intelligence Unit (2023). *Democracy index 2022: Frontline democracy and the battle for Ukraine*. **https://www.eiu.com/n/campaigns/democracy-index-2021-download-success/**

Theory and Collective Action. Climatic Change, 39(4), 643-666. **doi:10.1023/a:1005323809980**

Thompson, M. (1990). Cultural Theory. New York: Routledge.

Thompson, M. (2003). Cultural Theory, Climate Change and Clumsiness. Economic and Political Weekly, 38(48), 5107-5112. **www.jstor.org/stable/4414349**

Toni, Marielena. (2020) The Role of framing in climate change adaptation planning processes in the Municipality of Bologna: a case study [Master´s thesis, Maastricht University]

Uittenbroek, C. J., Janssen-Jansen, L. B., & Runhaar, H. A. C. (2013). *Mainstreaming climate adaptation into urban planning: overcoming barriers, seizing opportunities and evaluating the results in two Dutch case studies. Regional Environmental Change,* 13(2), 399-411. **https://doi.org/10.1007/s10113-012-0348-8**

Uittenbroek, C. J., Janssen-Jansen, L. B., & Runhaar, H. A. C. (2016). *Stimuli for climate adaptation in cities: Insights from Philadelphia—An early adapter. International Journal of Climate Change Strategies and Management*, **8**(1), 38–56. **https://doi.org/10.1108/IJCCSM-06-2014-0069**

Uittenbroek, C. (2014). *How mainstream is mainstreaming?: The integration of climate adaptation into urban policy*. Utrecht University.

Unided Nations Development Program. (2016). *Human Development Report 2016. Human development for everyone*. **https://hdr.undp.org/sites/default/files/hdr_2016_statistical_annex.pdf**

United Nations (October 2022). *UNdata: A world of information*. **https://data.un.org/Data.aspx?d=SOWC&f=inID%3A122**

United Nations Framework Convention on Climate Change. (1992). United Nations Framework Convention on Climate Change: Resolution adopted by the General Assembly. Retrieved October 13, 2022, from **https://www.refworld.org/docid/3b00f2770.html**

United Nations. (2019). Goal 13: Take urgent action to combat climate change and its impacts. **https://www.un.org/sustainabledevelopment/climate-change/**

Van Asselt, M. (2000*). Perspectives on Uncertainty and Risk: The PRIMA Approach to Decision Support: Springer Science & Business Media.*

Verweij, M., Douglas, M., Ellis, R., Engel, C., Hendriks, F., Lohmann, S., . . . Thompson, M. (2006). *Clumsy solutions for a complex world: The case of climate change. Public Administration,* 84(4), 817-843. **https://www.researchgate.net/publication/227792836_Clumsy_Solutions_for_a_Complex_World_The_Case_of_Climate_Change**

Verweij, M., Luan, S., & Nowacki, M. (2011). *How to test cultural theory: Suggestions for future research*. PS: Political Science & Politics, 44(4), 745-748.

Viana, Julieanne. (2020) What drives the decision-making processes in adaptation planning at the local level?: Case study of Zaragoza, Spain [Master´s thesis, Maastricht University]

Viceministerio de Vivienda y Desarrollo Urbano de El Salvador. (2016). *Guía y Caja de Herramientas para la Planificación Micro-regional y Municipal*. **https://pubhtml5.com/mngg/dpup/basic/**

Vink, M. J., Dewulf, A., & Termeer, C. (2013). The role of knowledge and power in climate change adaptation governance: a systematic literature review. *Ecology and Society*, *18*(4). http://www.jstor.org/stable/26269416

Wamsler, C., & Pauleit, S. (2016*). Making headway in climate policy mainstreaming and ecosystem-based adaptation: Two pioneering countries, different pathways, one goal. Climatic Change,* **137**(1), 71–87. **https://doi.org/10.1007/s10584-016-1660-y**

World Health Organization. (1998). *How to implement computer-assisted drug registration: A practical guide for drug regulatory authorities*. **http://apps.who.int/medicinedocs/en/d/Jh2994e/3.1.html**

Wong, R., & van der Heijden, J. (2019*). Avoidance of conflicts and trade-offs: A challenge for the policy integration of the United Nations. Sustainable Development,* **27**(5), 838–845. **https://doi.org/10.1002/sd.1944**

World Bank. (2018). *Internal climate migration in Latin America*. Groundswell policy note. Retrieved August 22, 2019, from **https://documents.worldbank.org/curated/en/983921522304806221/Internal-climate-migration-in-Latin-America**

World Bank. (2018). *Internal climate migration in Latin America*.

World Bank. (2022). *Data Catalog: Worldwide governance indicators*. The World Bank Data. **https://datacatalog.worldbank.org/search/dataset/0038026/Worldwide-Governance-Indicators?showIndicators=true**

World Health Organization. (2022). *The Global Health Observatory*. **https://www.who.int/data/gho/data/indicators/indicators-index**

Woroniecki S, Krüger R, Rau A-L, et al. *The framing of power in climate change adaptation research. WIREs Clim Change*. 2019; 10:e617. **https://doi.org/10.1002/wcc.617**

Xue, W., Hine, D. W., Marks, A. D. G., Phillips, W. J., & Zhao, S. (2016). *Cultural worldviews and climate change: A view from China. Asian Journal of Social Psychology*, 19(2), 134-144. **Doi:10.1111/ajsp.12116**

Zant, M., Schlingmann, A., Reyes-García, V., & García-del-Amo, D. (2023). Incremental and transformational adaptation to climate change among Indigenous Peoples and local communities: A global review. Mitigation and Adaptation Strategies for Global Change, 28(57). **https://doi.org/10.1007/s11027-023-10095-0**

APPENDIX

CHAPTER 2 APPENDIX

Appendix 1. Key indicators of vulnerability and other indicators selected for Central American countries

Indicators	Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua	Panama	Source
Coverage of sanitation (% of population) (at least basic) 2000 & 2015	93.71% / 97.04%	83.41% / 83.09%	61.77% / 66.67%	63% / 78.98%	57.07% / 71.85	62.37% / 78.67%	WHO
Youth literacy rate, population 15–24 years, 2018 (2015 for Nicaragua)	99,4%	97,9%	94,6%	96,5%	91,5%	99,09%	WB1
Maternal mortality ratio (modeled estimate, per 100,000 live births) 2000 & 2015	40 / 28	73 / 48	161 / 103	85 / 67	162 / 101	91 / 58	WB1
Literacy rate, adult total (% of people ages 15 and above) (2018)	97,8%	89%	80%	87,2%	28% (2015)	95,4	WB1
Number of people undernourished (millions) (3-year average 2012–2014 & 2014–2016)*	0.20 / 0.20	0.70 / 0.70	2.70 / 2.80	1.20 / 1.30	1.20 / 1.20	0.30 / 0.30	FAO

Voice and accountability (Percentile rank) 2006 & 2016	75 / 84	51 / 53	41 / 36	42 / 32	40 / 28	66 / 64	WB2
Civil liberties (1 highest, and 7 lowest) 1972, 1991, and 2017	1 / 1 / 1	3 / 4 / 3	3 / 5 / 4	3 / 3 /4	3 / 3/ 4	6 /2 / 2	Freedom House
Political rights (1 highest, and 7 lowest) 1972, 1991 and 2017	1 / 1 / 1	2 / 3 / 2	2 / 3 / 4	7 / 2 / 4	4 / 3/ 5	7 / 4 / 2	Freedom House
Government effectiveness (Percentile rank) 2006 & 2016	56 / 67	51 / 42	33 / 30	30 / 23	20 / 24	56 / 61	WB2
Ratio of adult literacy rate of females to males (2007 / 2011)	100	94	87	100	100	99	UN
Life expectancy at birth, total (years), 1960 & 2016	60 / 79	49 / 72	46 / 73	46 / 74	46 / 73	60 / 77	WB1
Other indicators selected							
Climate Risk Index average rank 1997–2015	> 100 Rank	11 – 20 Rank	11 – 20 Rank	1 Rank	4 Rank	51-100 Rank	German Watch
Total Green-house gas emissions (% change from 1990) 2012	42,8	88,1	111,4	49,1	59	138,4	WB1
Renewable electricity output (1990 % 2015)	97.52 / 99.00	93.19 / 57.82	91.62 / 60.39	98.27 / 42.27	61.35 / 50.05	85.26 / 65.32	WB1
Forest area (% of land area) 1990 & 2015	56.9 / 57.8	34.6 / 29.2	44.6 / 33.4	62.4 / 57.7	53.1 / 32.4	61.9 / 57.6	WB1
GDP per capita (current U.S.$), 1970 & 2017	533 / 12,225.5	308.4 / 3,910.2	349 / 4,454.0	266.1 / 2,453.7	322,7 / 2,159.1	889.2 / 15,146.4	WB1

Access to drinking water (% of population), 2000 & 2015	94% / 99.7%	78.23% / 97.22%	86.41% / 92.85%	85.17% / 94.25%	80.65% / 81.44%	89.56% / 93.56%	WHO
Human Development Index 2016	66 Rank (0.776)	117 Rank (0.680)	125 Rank (0.640)	130 Rank (0.625)	124 Rank (0.645)	60 Rank (0.788)	UNDP
Urban Population (1960 & 2017)	34% / 78%	38% / 71%	31% / 50%	22% / 56%	39% / 58%	41% / 67%	WB1
*The original indicator was calorie intake per capita, but the source used in the study was not available for CA so this other indicator is used.							

Source: World Health Organization (WHO). *"The Global Health Observatory" Data retrieved from: https://www.who.int/data/gho/data/indicators/indicators-index* The World Bank (WB). *"DataBank" Data retrieved from*: https://data.worldbank.org/ Food and Agriculture Organization (FAO). *"FAOSTAT" Data retrieved from:* https://www.fao.org/faostat/en/#country The World Bank (WB) *"Data Catalog: Worldwide Governance Indicators"* Data retrieved from: https://datacatalog.worldbank.org/search/dataset/0038026/Worldwide-Governance-Indicators?-showIndicators=true Eckstein, D., Künzel, V. & Schäfer, L. (2017) *"Global Climate Risk Index 2018. Who suffers most from extreme weather events? Weather-related loss events in 2016 and 1997 to 2016. Retrieved from https://www.germanwatch.org/sites/default/files/publication/20432.pdf* United Nations (UN) *"UNdata: a world of information".* Data retrieved from: http://data.un.org/Data.aspx?d=SOWC&f=inID%3A122 United Nations Development Program (UNDP). *"Human Development Report 2016. Human development for everyone"* Data retrieved from: https://hdr.undp.org/sites/default/files/hdr_2016_statistical_annex.pdf

Appendix 2. The national adaptation policies and legal framework documented in 6 Central American countries (as of August 2018)

Country	National Adaptation Strategy (NAS)	Type of document	Year	Authority responsible for the NAS
Panama	Política Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2007	National Environmental Authority, shifted in 2015 to Ministry of Environment
Costa Rica	Estrategia Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2007	Ministry of Environment and Energy
Guatemala	Política Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2009	Ministry of Environment and Natural Resources
Honduras	Estrategia Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2010	Secretary of State for Natural Resources and Environment
Nicaragua	Estrategia Nacional Ambiental y del Cambio Climático	Strategy including both mitigation and adaptation	2010	Ministry of Environment and Natural Resources
El Salvador	Estrategia Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2013	Ministry of Environment and Natural Resources
Costa Rica	Política Nacional de Adaptación al Cambio Climático 2018–2030	Policy document centered on adaptation	2017	Ministry of Environment and Energy
Honduras	Estrategia Nacional de Cambio Climático	The policy document is in drafting process	Under development	Secretary of State for Natural Resources and Environment
Nicaragua	Política Nacional de Cambio Climático	The policy document was in a consultative process in the first semester of 2018.	Under development	Ministry of Environment and Natural Resources

Country	National Adaptation Plan (NAP)	Type of document	Year	Authority responsible for the NAP
Panama	Plan de Acción de la Política Nacional de Cambio Climático	Action Plan including both mitigation and adaptation	2007	National Environmental Authority, shifted in 2015 to Ministry of Environment
Nicaragua	Plan de Acción 2010-2015 de la Estrategia Nacional Ambiental y del Cambio Climático (still valid until new policy is approved)	Short-term plan including both mitigation and adaptation	2010	Ministry of Environment and Natural Resources
Costa Rica	Plan de Acción de la Estrategia Nacional de Cambio Climático	Short-term plan including both mitigation and adaptation	2014	Ministry of Environment and Energy
Guatemala	Plan de Acción Nacional de Cambio Climático	Short-term plan including both mitigation and adaptation	2016	National Council of Climate Change Secretary of the Presidency for Planning and Programming
El Salvador	Plan Nacional de cambio Climático de El Salvador	Short-term plan including both mitigation and adaptation	2017	Ministry of Environment and Natural Resources
Honduras	Plan Nacional de Adaptación al Cambio Climático	Short-term plan centered on adaptation	2018	Secretary of State for Natural Resources and Environment, Secretary of State for Finance and the Interinstitutional Committee of Climate Change
Costa Rica	Plan Nacional de Adaptación al Cambio Climático	The Ministry of Environment is drafing a plan exclusively on adaptation	Under development	Ministry of Environment and Energy

Country	National Climate Legislation (NCL)	Type of document	Year	Authority responsible for the NCL
Nicaragua	Ley No. 647 de reformas y adiciones a la Ley No.217 Ley general del Medio Ambiente y los Recursos Naturales	Reform to integrate climate-change mitigation and adaptation as part of the law of environment	2008	Congress of the Republic of Nicaragua
El Salvador	Decreto No. 233 Ley del Medio Ambiente (y su reforma 158 del 2012)	Reform to integrate climate-change mitigation and adaptation as part of the law of environment	2012	Congress of the Republic of El Salvador
Honduras	Ley de Cambio Climático. Decreto No. 297-2013	Law on Climate Change including both mitigation and adaptation	2013	Congress of the Republic of Honduras
Guatemala	Ley Marco para regular la reducción de la vulnerabilidad, la adaptación obligatoria ante los efectos del cambio climático y la mitigación de gases de efecto invernadero Decreto número 7-2013	Law on Climate Change including both mitigation and adaptation	2014	Congress of the Republic of Guatemala
Panama	Ley No. 41 Ley General del Ambiente y reformas (18-2003, 44-2006, 65-2010, and 8-2015	Reform to integrate climate change mitigation and adaptation as part of the law of environment	2015	Congress of the Republic of Panama

Country	Sectorial National Strategies and Plans	Type of document	Year	Authority responsible
El Salvador	Ley Marco de Cambio Climático	The Ministry of Environment with the help of PNUD has been elaborating the proposed law	Under development	Ministry of Environment and Natural Resources
Costa Rica	Proyecto de Ley 20.527 Ley de incorporación de la variable del cambio climático como eje transversal obligatorio en las políticas públicas ambientales	Project of law to mandate the mainstreaming of climate change into public policies	Under development	Congress of the Republic of Costa Rica
Costa Rica	Plan de Acción para el cambio climático y la gestión agroambiental (2011-2014)	NAP (both CCA-CCM) for agriculture and food sector	2011	Ministry of Agriculture and Stockbreeding
Nicaragua	Plan de adaptación a la variabilidad y el cambio climático en el sector agropecuario, forestal y pesca en Nicaragua	NAP (CCA only) for agriculture, forestry, and fishing sector	2013	Ministry of Agriculture, Stockbreeding and Forestry
Honduras	Estrategia Nacional de adaptación del sector agroalimentario de Honduras (2014–2024)	NAS (CCA only) for agriculture and food sector	2014	Inter-institutional Committee of Climate Change Secretary of State for Agriculture and Stockbreeding

Country	Sectorial National Strategies and Plans	Type of document	Year	Authority responsible
Costa Rica	Estrategia para la adaptación del sector biodiversidad de Costa Rica al cambio climático (2015–2025)	NAS (CCA only) for biodiversity sector	2015	Ministry of Environment and Energy
Costa Rica	Plan de Acción de la Estrategia para la adaptación del sector biodiversidad de Costa Rica al cambio climático (2015–2025)	NAP (CCA only) for biodiversity sector	2015	Ministry of Environment and Energy
El Salvador	Estrategia Ambiental de adaptación y mitigación al cambio climático del sector agropecuario, forestal y acuícola	NAS (both CCA-CCM) for agriculture, forestry, stockbreeding, fishing and aquaculture sector	2015	Ministry of Agriculture and Stockbreeding
El Salvador	Política de cambio climático para el sector agropecuario, forestal, pesquero y acuícola	NAS (Both CCA-CCM) for agriculture, forestry, stockbreeding, fishing, and aquaculture sector	2017	Ministry of Agriculture and Stockbreeding
El Salvador	Plan Nacional de cambio climático y Gestión de Riesgos Agroclimáticos para el sector agropecuario, forestal, pesquero y acuícola	NAP (CCA only) for agriculture, forestry, stockbreeding, fishing, and aquaculture sector	2017	Ministry of Agriculture and Stockbreeding

Country	Technological Needs Assessment (TNA)	Type of document	Year	Authority responsible for the TNA
Panama	Plan Nacional de cambio climático para el sector agropecuario de Panamá	NAP (both CCA-CCM) for agriculture and stockbreeding sector	2018	Ministry of Agriculture and Stockbreeding Development Ministry of Environment
Costa Rica	Planes regionales (8 planes) de acciones climáticas y gestión de riesgos del sector Agropecuario 2018–2022	NAP's 8 plans for all regions of the country for agriculture and stockbreeding	2018	Ministry of Agriculture and Stockbreeding
El Salvador	Política de Cambio Climático para sector de Obra Pública, Transporte, Vivienda y Desarrollo Urbano;	NAS in drafting process, no information on the contents has been release	Under development	Ministry of Public Works, Transport, Housing and Urban Development
Guatemala	Plan de Acción de Cambio Climático para el sector Agropecuario	NAP on agriculture and stockbreeding sector, no information on the content has been release	Under development	Ministry of Agriculture, Stockbreeding and Nutrition
Costa Rica	Evaluación de Necesidades Tecnológicas ante el Cambio Climático: Informe Final sobre Tecnologías en Adaptación	Short-term plan centered on technologies for adaptation in priority sectors	2012	Ministry of Environment and Energy

Country	Sectorial National Strategies and Plans	Type of document	Year	Authority responsible
El Salvador	Síntesis de la evaluación de necesidades tecnológicas y Plan de Acción para transferencia de tecnologías priorizadas en adaptación al cambio climático	Short-term plan centered on technologies for adaptation in priority sectors	2013	Ministry of Environment and Natural Resources
Honduras	Plan de Acción Tecnológico de Honduras	Short-term plan centered on technologies for adaptation in priority sectors	2017	Secretary of State for Natural Resources and Environment
Panama	Evaluación de necesidades tecnológicas ante el cambio climático: Plan de Acción de tecnología sector recursos hídricos	Short-term plan centered on technologies for adaptation in priority sectors	2017	Ministry of Environment
Nicaragua	Estudio de Tecnologías de Adaptación al Cambio Climático en Sectores Priorizados (incluye plan de acción tecnológico)	Study and plan centered on technologies for adaptation in priority sectors	2018	Ministry of Environment and Natural Resources

Source: Authors' elaboration.

Appendix 3. Coding Document

Due to the length of the appendix (21 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://doi.org/10.5281/zenodo.17527157

Appendix 4. List of policy outputs on Climate Change approved and under development in Central America as of August 2018

Country	National Adaptation Strategy (NAS)	Type of document	Year	Authority responsible for the NAS
Panama	Política Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2007	National Environmental Authority, shifted in 2015 to Ministry of Environment
Costa Rica	Estrategia Nacional	Strategy including both mitigation and	2007	Ministry of Environment
Guatemala	Política Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2009	Ministry of Environment and Natural Resources
Honduras	Estrategia Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2010	Secretary of State for Natural Resources and Environment
Nicaragua	Estrategia Nacional Ambiental y del Cambio Climático	Strategy including both mitigation and adaptation	2010	Ministry of Environment and Natural Resources
El Salvador	Estrategia Nacional de Cambio Climático	Strategy including both mitigation and adaptation	2013	Ministry of Environment and Natural Resources
Costa Rica	Política Nacional de Adaptación al Cambio Climático 2018–2030	Policy document centered on adaptation	2017	Ministry of Environment and Energy
Honduras	Estrategia Nacional de Cambio Climático	The policy document is in drafting process	Under development	Secretary of State for Natural Resources and Environment
Nicaragua	Política Nacional de Cambio Climático	The policy document was in a consultative process in the first semester of 2018.	Under development	Ministry of Environment and Natural Resources

Country	National Adaptation Plan (NAP)	Type of document	Year	Authority responsible for the NAP
Panama	Plan de Acción de la Política Nacional de Cambio Climático	Plan including both mitigation and adaptation	2007	National Environmental Authority, shifted in 2015 to Ministry of Environment
Nicaragua	Plan de Acción 2010-2015 de la Estrategia Nacional Ambiental y del Cambio Climático (still valid until new policy is approved)	Short-term plan including both mitigation and adaptation	2010	Ministry of Environment and Natural Resources
Costa Rica	Plan de Acción de la Estrategia Nacional de Cambio Climático	Short-term plan including both mitigation and adaptation	2014	Ministry of Environment and Energy
Guatemala	Plan de Acción Nacional de Cambio Climático	Short-term plan including both mitigation and adaptation	2016	National Council of Climate Change Secretary of the Presidency for Planning and Programming
El Salvador	Plan Nacional de cambio Climático de El Salvador	Short-term plan including both mitigation and adaptation	2017	Ministry of Environment and Natural Resources
Honduras	Plan Nacional de Adaptación al Cambio Climático	Short-term plan centered on adaptation	2018	Secretary of State for Natural Resources and Environment, Secretary of State for Finance and the Interinstitutional Committee of Climate Change
Costa Rica	Plan Nacional de Adaptación al Cambio Climático	Plan exclusively on adaptation is being drafted by the Ministry of Environment	Under development	Ministry of Environment and Energy

Country	National Climate Legislation (NCL)	Type of document	Year	Authority responsible for the NCL
Nicaragua	Ley No. 647 de reformas y adiciones a la Ley No.217 Ley general del Medio Ambiente y los Recursos Naturales	Reform to integrate climate-change mitigation and adaptation as part of the law of environment	2008	Congress of the Republic of Nicaragua
El Salvador	Decreto No. 233 Ley del Medio Ambiente (y su reforma 158 del 2012)	Reform to integrate climate-change mitigation and adaptation as part of the law of environment	2012	Congress of the Republic of El Salvador
Honduras	Ley de Cambio Climático. Decreto No. 297-2013	Law on Climate Change including both mitigation and adaptation	2013	Congress of the Republic of Honduras
Guatemala	Ley Marco para regular la reducción de la vulnerabilidad, la adaptación obligatoria ante los efectos del cambio climático y la mitigación de gases de efecto invernadero Decreto número 7-2013	Law on Climate Change including both mitigation and adaptation	2014	Congress of the Republic of Guatemala
Panama	Ley No. 41 Ley General del Ambiente y reformas (18-2003, 44-2006, 65-2010, and 8-2015	Reform to integrate climate-change mitigation and adaptation as part of the law of environment	2015	Congress of the Republic of Panama

Country	National Adaptation Plan (NAP)	Type of document	Year	Authority responsible for the NAP
El Salvador	Ley Marco de Cambio Climático	The proposal of law has been under elaboration by the Ministry of Environment with the help of PNUD	Under development	Ministry of Environment and Natural Resources
Costa Rica	Proyecto de Ley 20.527 Ley de incorporación de la variable del cambio climático como eje transversal obligatorio en las políticas públicas ambientales	A project of law to mandate the mainstreaming of climate change into public policies	Under development	Congress of the Republic of Costa Rica
Costa Rica	Plan de Acción para el cambio climático y la gestión agroambiental (2011-2014)	NAP (both CCA-CCM) for the agriculture and food sector	2011	Ministry of Agriculture and Stockbreeding
Nicaragua	Plan de adaptación a la variabilidad y el cambio climático en el sector agropecuario, forestal y pesca en Nicaragua	NAP (CCA only) for agriculture, forestry, and fishing sector	2013	Ministry of Agriculture, Stockbreeding and Forestry
Honduras	Estrategia Nacional de adaptación del sector agroalimentario de Honduras (2014-2024)	NAS (CCA only) for agriculture and food sector	2014	Inter-institutional Committee of Climate Change Secretary of State for Agriculture and Stockbreeding

Country	National Adaptation Plan (NAP)	Type of document	Year	Authority responsible for the NAP
Costa Rica	Estrategia para la adaptación del sector biodiversidad de Costa Rica al cambio climático (2015-2025)	NAS (CCA only) for biodiversity sector	2015	Ministry of Environment and Energy
Costa Rica	Plan de Acción de la Estrategia para la adaptación del sector biodiversidad de Costa Rica al cambio climático (2015-2025)	NAP (CCA only) for biodiversity sector	2015	Ministry of Environment and Energy
El Salvador	Estrategia Ambiental de adaptación y mitigación al cambio climático del sector agropecuario, forestal y acuícola	NAS (both CCA-CCM) for agriculture, forestry, stockbreeding, fishing, and aquaculture sector	2015	Ministry of Agriculture and Stockbreeding
El Salvador	Política de cambio climático para el sector agropecuario, forestal, pesquero y acuícola	NAS (Both CCA-CCM) for agriculture, forestry, stockbreeding, fishing and aquaculture sector	2017	Ministry of Agriculture and Stockbreeding
El Salvador	Plan Nacional de cambio climático y Gestión de Riesgos Agroclimáticos para el sector agropecuario, forestal, pesquero y acuícola	NAP (CCA only) for agriculture, forestry, stockbreeding, fishing, and aquaculture sector	2017	Ministry of Agriculture and Stockbreeding
Panama	Plan Nacional de cambio climático para el sector agropecuario de Panamá	NAP (both CCA-CCM) for agriculture and stockbreeding sector	2018	Ministry of Agriculture and Stockbreeding Development Ministry of Environment

Country	National Adaptation Plan (NAP)	Type of document	Year	Authority responsible for the NAP
Costa Rica	Planes regionales (8 planes) de acciones climáticas y gestión de riesgos del sector Agropecuario 2018-2022	NAP's 8 plans for all regions of the country for agriculture and stockbreeding	2018	Ministry of Agriculture and Stockbreeding
El Salvador	Política de Cambio Climático para sector de Obra Pública, Transporte, Vivienda y Desarrollo Urbano;	NAS in the drafting process; no information on the contents has been released	Under development	Ministry of Public Works, Transport, Housing and Urban Development
Guatemala	Plan de Acción de Cambio Climático para el sector Agropecuario	NAP on agriculture and stockbreeding sector; no information on the content has been released	Under development	Ministry of Agriculture, Stockbreeding and Nutrition
Costa Rica	Evaluación de Necesidades Tecnológicas ante el Cambio Climático: Informe Final sobre Tecnologías en Adaptación	Short-term plan centered on technologies for adaptation in priority sectors	2012	Ministry of Environment and Energy
El Salvador	Síntesis de la evaluación de necesidades tecnológicas y Plan de Acción para transferencia de tecnologías priorizadas en adaptación al cambio climático	Short-term plan centered on technologies for adaptation in priority sectors	2013	Ministry of Environment and Natural Resources
Honduras	Plan de Acción Tecnológico de Honduras	Short-term plan centered on technologies for adaptation in priority sectors	2017	Secretary of State for Natural Resources and Environment

Panama	Evaluación de necesidades tecnológicas ante el cambio climático: Plan de Acción de tecnología sector recursos hídricos	Short-term plan centered on technologies for adaptation in priority sectors	2017	Ministry of Environment
Nicaragua	Estudio de Tecnologías de Adaptación al Cambio Climático en Sectores Priorizados (incluye plan de acción tecnológico)	Study and plan centered on technologies for adaptation in priority sectors	2018	Ministry of Environment and Natural Resources

CHAPTER 3 APPENDIX

Appendix 1: List of policy outputs documented as part of this chapter

Country	Document name	Type of document	Sector	Year of publication
Costa Rica	National Risk Management Policy 2016-2030 Política Nacional de Gestión del Riesgo 2016-2020	Policy/Strategy	Risk management	2015
	National Plan on Risk Management 2016-2020 Plan Nacional de Gestión del Riesgo 2016-2020	Action Plan	Risk management	2016
	National Land-Use Planning Policy 2012-2040 Política Nacional de Ordenamiento Territorial 2012-2040	Policy/Strategy	Land-use planning	2013
	National Plan of Land-use Planning 2014-2020 Plan Nacional de Ordenamiento Territorial 2014- 2020	Action Plan	Land-use planning	2013
	National Development Plan 2015-2018 "Alberto Cañas Escalante" Plan Nacional de Desarrollo "Alberto "Alberto Cañas Escalante"	Action Plan	Development	2015
	National Law on Emergencies and Risk Prevention No. 8488 Ley Nacional de Emergencias y Prevención del Riesgo No. 8488	Legislation	Risk management	2006
	Regulation No. 6296 Manual of regulation plans as land-use planning tool Reglamento No. 6296 Manual de planes reguladores como instrumento de ordenamiento territorial	Regulation	Land-use planning	2017

Country	Document name	Type of document	Sector	Year of publication
Costa Rica				
	National Urban Development Policy 2018-2030 Política Nacional de Desarrollo Urbano 2018-2030	Policy/Strategy	Land-use planning	2018
	Action Plan 2018-2022 of the National Urban Development Policy 2018-2030 Plan de Acción 2018-2022 de la Política Nacional de Desarrollo Urbano 2018-2030	Action Plan	Land-use planning	2018
Guatemala	National Policy for Disaster Risk Reduction in Guatemala Política Nacional para la Reducción de Riesgo a los Desastres en Guatemala	Policy/Strategy	Risk management	2011
	National Strategy of Risk Reduction of Climate Change related Disasters Estrategia Nacional de Reducción de Riesgo de Desastres vinculados al Cambio Climático	Policy/Strategy	Risk management	2016
	"K´atun Our Guatemala National Development Policy and Plan 2032 K´atun Nuestra Guatemala Política y Plan Nacional de Desarrollo 2032"	Policy/Strategy	Development	2015
	General Policy of Government 2016-2020 Política General de Gobierno 2016-2020	Action Plan	Development	2016

Guatemala	Law of Housing and Human Settlements Decree No.120-96 Ley de Vivienda y Asentamientos humanos. Decreto No. 120-96	Legislation	Land-use planning	1996
	Methodological guide for the elaboration of the Municipal Development Plan and land-use plan in Guatemala Guía Metodológica para la elaboración de los Planes Municipales de Desarrollo y de Ordenamiento Territorial de Guatemala	Technical guide	Land-use planning	2018
	Legislative Decree 109-96 Law of the National Coordinator for Disasters Reduction (CONRED) Decreto Legislativo 109-96 Ley de la Coordinadora Nacional para la Reducción de Desastres (CONRED)	Legislation	Risk management	1996
Honduras	Republic of Honduras Country Vision 2010-2038 and Plan of Nation 2010-2022 Legislative Decree No. 286-2009 República de Honduras Visión de País 2010-2038 y Plan de Nación 2010-2022. Decreto Legislativo No. 286-2009	Policy/Strategy	Development	2010
	Strategic Plan of Government 2014-2018 “Everyone’s Plan for a better life.” Plan Estratégico de Gobierno 2014-2018 “El plan de todos para una vida mejor”	Action Plan	Development	2015

Honduras	State Policy for Comprehensive Risk Management in Honduras Política de Estado para la Gestión Integral del Riesgo en Honduras	Policy/Strategy	Risk management	2013
	National Plan of Comprehensive Risk Management 2014-2019 Plan Nacional de Gestión Integral de Riesgos 2014-2019	Action Plan	Risk management	2014
	Law of the National Risk Management System (SINAGER) Decree No. 151-2009 Ley del Sistema Nacional de Gestión de Riesgos (SINAGER)	Legislation	Risk management	2009
	Law of Land-use planning Decree No. 180-2003 Ley de Ordenamiento Territorial Decreto No. 180-2003	Legislation	Land-use planning	2003
	Normative for the elaboration of municipal development plans with an approach of Land-use planning Accord No. 00132 Normativa para la formulación de planes de desarrollo municipal con enfoque de ordenamiento territorial Acuerdo no. 00132	Regulation	Land-use planning	2013
	Methodological Guide for the elaboration of Municipal Land-use plans Guía Metodológica para la Elaboración de Planes Municipales de Ordenamiento Territorial	Technical guide	Land-use planning	2015
	Methodological guide: Construction of Municipal Development Plans (PDM) with emphasis on Land-use Planning Guía Metodológica: Elaboración Planes de Desarrollo Municipal (PDM) con enfoque de Ordenamiento Territorial	Technical guide	Land-use planning	2010

El Salvador	Five-Year Development Plan 2014-2019: A productive, educated and secure El Salvador. Plan Quinquenal de Desarollo 2014-2019: El Salvador productivo, educado y seguro.	Action Plan	Development	2015
	Decree No. 644 Law of Land-use planning and territorial development Decreto No. 644 Ley de Ordenamiento y Desarrollo Territorial	Legislation	Land-use planning	2011
	National Land-use and territorial development Policy (synthesis document) Política Nacional de Ordenamiento y Desarrollo Territorial (Documento de Síntesis)	Policy/Strategy	Land-use planning	2002
	National Land-use planning and territorial development Plan (synthesis document) Plan Nacional de Ordenamiento y Desarrollo Territorial (Documento de Síntesis)	Action Plan	Land-use planning	2004
	Legislative Decree No. 777 Law of Civil Protection, disasters prevention, and mitigation Decreto Legislativo No. 777 Ley de Protección Civil, Prevención y Mitigación de Desastres	Legislation	Risk management	2005
	National Civil Protection Plan Plan Nacional de Protección Civil	Action Plan	Risk management	2016
	Plan El Salvador Sustainable "for the right to development in harmony with the environment." Plan El Salvador Sustentable "Por el derecho a un desarrollo en armonía con el medio ambiente"	Policy/Strategy	Development	2018

Panama	Strategic Plan of Government 2015-2019 "Just one country." Plan Estratégico de Govierno 2015-2019 "Un solo país"	Action Plan	Development	2014
	Strategic National Plan with Vision of State Panama 2030 Plan Estratégico Nacional con Visión de Estado Panamá 2030	Policy/Strategy	Development	2017
	Law No. 6 of 2006 that regulates the Land-use planning for the urban development and other dispositions Ley No. 6 del 2006 que reglamenta el Ordenamiento Territorial para el Desarrollo Urbano y dicta otras disposiciones.	Legislation	Land-use planning	2006
	Law No. 7 of 2005 Re-organize the National Civil Protection System Ley No. 7 del 2005 que Reorganiza el Sistema Nacional de Protección Civil	Legislation	Risk management	2005
	National Comprehensive Risk Management Policy Política National de Gestión Integral del Riesgo	Policy/Strategy	Risk management	2010
	Regulatation 732-2015 Guide for the elaboration of the land-use plan blueprint. Resolución 732-2015 Guía para la elaboración de los esquemas de ordenamiento territorial	Regulation	Land-use planning	2015

Nicaragua	Axes of the National Human Development Program 2018-2021 Ejes del Programa Nacional de Desarrollo Humano 2018-2021	Action Plan	Development	2017
	General Policy for Land-use planning Política General para el Ordenamiento Territorial	Policy/Strategy	Land-use planning	2001
	Executive Decree No. 78-2002 Norms, standards, and criteria for land-use planning Decreto Ejecutivo No. 78-2002 De normas, pautas y criterios para el ordenamiento territorial	Regulation	Land-use planning	2002
	Methodology for the Drafting of the Studies of Land-use planning Metodología para la elaboración de los Estudios de Ordenamiento Territorial	Technical guide	Land-use planning	2009
	Law No. 337 That creates the National System for Disasters Prevention, Mitigation, and Attention (and its reform by the law 863-2014) Ley No. 337 Ley creadora del Sistema Nacional para la Prevención, Mitigación y Atención de Desastres (y su reforma en la ley 863-2014)	Legislation	Risk management	2000

Appendix 2: Participation of institutions leading each sector in Central America into inter-institutional committees and in the creation of specialized units for CCA

Country	Sector	Sectoral Institutional presence in the interdepartmental committees of Climate change		Specialized Unit of Climate Change in the organizational structure
		Institution	Membership in the committee	
Costa Rica	General development	Ministry of National Planning and Economic Policy (MIDEPLAN)	Member	No unit reported
	Land-use planning	Ministry of Housing and Human Settlements (MIVAH) National Institute of Housing and Urbanism (INVU)	Participate under invitation No member	No unit reported No unit reported
	Risk management	National Commission on Risk Prevention and Emergencies Attention (CNE)	Participate under invitation	No unit reported
El Salvador	General development	Technical Planning Secretariat (SETEPLAN)	Member	No unit reported
	Land-use planning	National Council of land-use planning and territorial development Ministry of Environment and Natural Resources (MARN)	No member Member	No unit reported Unit reported
	Risk management	National Directorate of Civil Protection (Protección Civil)	Member	No unit reported
Guatemala	General development	Secretary of Planning and Programming of the Presidency (SEGEPLAN)	Member	No unit reported
	Land-use planning			
	Risk management	National Coordinator for Disaster Reduction (CONRED)	Member	No unit reported

Honduras	General development	Secretary for General Coordination of Government (SCGG)	Member of the technical committee	No unit reported
	Land-use planning	Secretary of Governance, Justice, and Decentralization (SGJD)	No member	No unit reported
	Risk management	Permanent Committee on Contingencies (COPECO)	Member of the technical committee	No unit reported
Nicaragua	General development	National Council for Social and Economic Planning (CONPES)	No member	No unit reported
	Land-use planning	Nicaraguan Institute of Territorial Studies (INETER) Ministry of Environment and Natural Resources (MARENA)	Member Member	Unit reported Unit reported
	Risk management	National System for the Prevention, Mitigation, and Attention of Disasters (SINAPRED)	No member	No unit reported
Panama	General development	Ministry of Economy and Finance (MEF)	Member	No unit reported
	Land-use planning	Ministry of Housing and Land-Use Planning (MIVIOT)	Member	No unit reported
	Risk management	National System of Civil Protection (SINAPROC)	Member	No unit reported

Appendix 3. Coding Document

Due to the length of the appendix (21 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://doi.org/10.5281/zenodo.17527157

CHAPTER 4 APPENDIX

Appendix 1: Summary of the Risk management adaptation approach

	Description	Example from Eakin (2009)	General examples
Spatial scale of implementation	Sector focus	Place-based risks to specific activities or population in the UK understanding the impact of CC.	Sectorial strategies on CCA such as agriculture, infrastructure, coastal areas.
Temporal emphasis of implementation	Short-term and medium-term future risks	Tend to privilege here and now threats than long-term surprise events.	Usually incorporates CC to specific threats currently present in the sector, e.g. in agriculture drought is the current hazard, then studies how CC can increase risk from that hazard, what extra actions should be taken to reduce it.
Actors	Public-private partnerships	UK created an autonomous agency with great attention to the demands and needs from stakeholders, which eventually are in charge of implementing (including funding) the CCA actions.	This approach privileges to create incentive structures and enabling environments from public sector to facilitate adaptations of other actors. E.g. performing risk assessments to identify threats and give advice to the public on possible measures to reduce risk.
Policy goal	Address known and evolving risks	In the UK example by analysing CC impacts on specific sector or communities with relevant stakeholders.	Adaptation is basically trying to address the consequences and impacts of the perturbations and stressors from natural hazards.

Desired outcome	Maximum loss reduction at lowest cost	In the UK facilitate adaptation with a greater understanding of the impacts of CC. So, stakeholders can use the knowledge to better inform their decisions. (Demand driven adaptation)	Protect assets and lives by minimizing negative consequences of atmospheric and geological hazards causing natural disasters to humans.
Strategies	Two main strategies: first risk-reducing investments and secondly creating adaptive capacity and enabling environment so stakeholders can make adaptation decisions.	In the UK example the second strategy was privileged.	By creating early warning systems, Semarang authorities procured to create conditions for decision making while facing a threat. Also, the water reservoir systems aimed to reduce the excess of water in extreme weather events. (Risk-reducing investments)
Tools	Climate impact assessment analyses the potential positive and negative effects of changes in climate parameters on terrestrial and marine systems, including ecosystems and socio-economic systems.	This same tool was used in the UK.	Sometimes this is named climate risk assessment, or in general risk assessment. Some cases such as Costa Rica, environmental assessments have integrated risk and climate variables.

Kind of actions-options preferred	Risk Avoidance: e.g. not building in risk-prone areas. Risk transfer: e.g. taking insurance. Risk minimization: e.g. investments to reduce exposition to risk such as dikes, levees, and other infrastructure. Risk acceptance: invest despite the possibility of a threat, is greater the reward from investing or cost of not investing is higher than perceived risk.	The UK case was creating the conditions for stakeholders' decision making to reduce risk (using the actions mentioned)	In the Semarang case the authorities prioritized flooding mitigation, therefore most of the actions procure to minimize risk by creating water reservoirs to reduce stress in flood prone areas and increase forest cover in the high river basin to reduce run-off.

Source: Own elaboration based on Fünfgeld and McEvoy (2011), McEvoy et al., 2013; and Eakin (2009).

Based on this approach, an individualist will support action to increase information and knowledge on risk but mostly will procure to ensure a freer market approach to manage it. Technological fixes are preferred by individualists so investments in artificial islands, sea walls, and barriers, dikes, all these are options that fall well in this worldview to address floods and sea level rise; desalinization plants, increase water catchment, new investments in water treatment are examples of good actions in this perspective to address drought.

Furthermore, hierarchist could also seek a risk-based approach but the measures privileged will differ from individualists, in the sense that enhance regulations, new zoning and spatial planning restrictions, building codes, etc. will be an important part of the menu of a hierarchist response using the risk management approach.

Appendix 2: Summary of the Resilience approach

	Description	Example from Eakin	General examples
Spatial scale of implementation	Large-scale coupled social-ecological systems, for example populate watersheds.	In the Australia case the authorities centred their intervention in just one threat/hazard and therefore invested in adaptations for just that single stressor, avoiding an overall approach to the system creating more negative effects.	"Climate proofing spatial planning" or "resilient cities" are typical large-scale systems addressed by resilience approach.
Temporal emphasis of implementation	Long-term future	In the Australian case, by focusing on one single hazard (stressor) the actions taken in short-term made the system more vulnerable in the long-term.	Climate-proofing spatial planning in Netherlands is well known strategy together with the room for the river, they both centre on the country capacity to address flooding on the long-term.
Actors	Civil society, public sector	The Australia case initially was developed by the state government to benefit the farmers of the area, after the errors documented they decentralized the management of the system with more governmental investments.	The Netherlands approach required a close work between many different stakeholders including national and local government, academia, private sector, and civil society.
Policy goal	Enhance systems capacity for recovery and renewal.	In the Australia case the goal was risk-based adaptation to one stressor instead of system's capacity to cope with change.	By creating participative learning spaces, for co-creating of knowledge the Netherlands procured to increase the capacity to experiment and learn as part of its resilience strategy.

Desired outcome	Minimize probability of rapid, undesirable, and irreversible change	In the Australia case a resilient strategy would have focus on increasing the system's capacity to cope with change, but it rather focussed on threat (risk-approach)	Climate-proof cities in the case of Netherlands.
Strategies	Three main strategies: - Identifying possible disturbances and opportunities that CC will bring and the system's current capacities to cope. - Creating the conditions in the system to reorganize and cope with stressors. - Facilitating the learning spaces to improve the system's capacity to adapt.	The Australia case developed partially the first strategy but just focused in one stressor, the other two strategies are missing.	Netherlands approach follow all three strategies.
Tools	Climate change resilience assessment (because of the contested nature of the frame there are different frameworks to assess resilience)	Not used in Australia.	In Netherlands the Delta Plan (main strategy for resilience) included the following steps: Mapping vulnerability Conducting dialogue and drawing strategies Drawing implementation agendas Capitalizing on linkage opportunities Promotion and facilitation Regulation and embedding Responding to calamities

Kind of actions-options preferred	Transition and improvement are key elements to address resilience. There is not trade-off between ecological integrity and human welfare, therefore, sustainable development is possible and desirable.	Australian case required a more nature based-solution (revegetation) to increase the system resilience and not only technical fixes.	Options included such green/blue infrastructure within the city spatial planning, smart city strategies, mainstreaming adaptation into sectorial areas, also actions taking consideration mitigation as well. Climate proofing the spatial planning is also common. Urban living labs are also key actions to facilitate learning and experimenting.

Source: Own elaboration based on Fünfgeld and McEvoy (2011), McEvoy et al., 2013; and Eakin (2009).

Three main strategies are preferred by the resilience approach, first identifying possible CC-related disturbances and opportunities and the system´s capacity to cope; second, creating conditions to reorganize and cope with stressors, and third, facilitating learning spaces to improve the system´s capacity to adapt. Resilience assessment is the main tool followed (there are different frameworks on how to conduct this) some actions preferred are green/blue infrastructure, smart city strategies, mainstreaming adaption into sectorial plans, climate proofing land-use planning, etc. (Eakin et al., 2009).

Concerning this approach to CCA, the hierarchist is the perspective that will favor resilience the most (McNeeley & Lazrus, 2014). This premise is close to the hierarchists' perspective of structured problems or moderately structured (ends) when information regarding the system´s capacity and possible hazards and risks is uncertain.

Appendix 3: Summary of the Vulnerability approach

	Description	Example from Eakin	General examples
Spatial scale of implementation	Places, communities, groups.	In Brazil the authorities decided to focus its strategy in reducing social inequalities and developing capacities (they centred the strategy in the most vulnerable communities)	In Bangladesh one of the strategies followed has been the diversification of livelihoods with the most vulnerable people to flooding.
Temporal emphasis of implementation	Past and present vulnerabilities	In Brazil the authorities decided to include the most vulnerable communities to a social program to reduce their present vulnerability (somehow addressing the past inequalities) of their country. In the short-term by giving humanitarian relief, they interact with present vulnerabilities.	The actions taken both in Brazil and Bangladesh are an example of the emphasis on the present vulnerabilities.
Actors	Public sector, vulnerable groups	The same groups are in the Brazilian example.	In the case of Bangladesh as many other least develop countries the role of development agencies is also key.
Policy goal	Protect populations most likely to experience harm	The Brazilian case is a good example of the emphasis on protecting the most vulnerable population from flooding in this case.	Same for Bangladesh case.
Desired outcome	Minimize social inequity and maximize capacities of disadvantaged groups	By including the most vulnerable population in social welfare programs Brazil is minimizing its inequity.	The same can be said to the case in Bangladesh.

Strategies	Two main strategies: - Reducing the exposure and sensitivity of the most vulnerable populations. - Enhancing their capacity to manage risks and cope with loss via transfers of resources and targeted investments.	Both strategies can be seen implemented in the Brazilian case.	In the Bangladesh case the second strategy is privileged.
Tools	Climate change vulnerability assessment (contextual vulnerability) Including steps such as: - identifying vulnerable groups. - assessing sensitivity. - assessing future vulnerability. - linking vulnerability to adaptation policy	The case description implies that 1 and 2 was completed.	In the Bangladesh case all four steps appear to be addressed.

Kind of actions-options preferred	Transformational change is the key word in this frame. Some labelled the approach climate resilient development (especially when apply to least develop countries). Some actions are addressing past vulnerabilities (for example cultural patterns of women exclusion to inherited land is critical in some countries), or exclusion and racism again indigenous population in Latin America. Actions such as investing in public housing, subsidies, improvement of public services such as education and health services. Diversifying the livelihoods is key for addressing future vulnerability. Community empowerment is also common.	The Brazilian case they addressed current vulnerability with economical transfers to the most vulnerable group.	Community-based adaptation, ecosystem-based adaptation, promotion of indigenous knowledge, precautionary principle and resilient development. More traditional development actions such as poverty reduction, improving housing, access to public services, including education and health services are considered basic actions to reduce vulnerability.

Source: Own elaboration based on Fünfgeld and McEvoy (2011), McEvoy et al., 2013; and Eakin (2009).

For CCA egalitarians will embrace a vulnerability-based approach. This is centered on places, communities, and groups, with a temporal emphasis on past and present vulnerabilities, the actors are mostly public sector and vulnerable groups; the policy goal is to protect populations that would experience harm and the outcome is to minimize social inequity and maximize capacities of disadvantaged groups. This approach is closer to the sustainable development community of practice and due to its center on fairness and vulnerable groups this conceptual frame shares elements with the egalitarian social solidarity (the vulnerable groups represent the fatalist perspective). This perspective could be linked with a moderately structured (means) or even with unstructured problems perspective when transformational change is pushed by egalitarians in clear opposition with hierarchist (the state) and individualist (the market).

Appendix 4: Matrix of cultural theory connections between the four perspectives with the environment and climate change based on selected authors.

Due to the length of the appendix (26 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://www.scidb.cn/en/s/3q6Vjy

Appendix 5: Interview framework

Introduction to the interview

My doctoral research focuses on understanding the logic of public decision-making processes at the local level with respect to adaptation to climate change. Above all, I aim to understand the dynamics between public, private and civil society actors, and how decision-making processes incorporate learning spaces and knowledge production. In this sense, the research develops five case studies located in different countries, with municipalities with different characteristics, and at different stages in the local planning process integrating climate change adaptation. It is of interest to this investigation to study the actors that were or are part of the process, their roles, their position on the subject, as well as the spaces and types of interaction that took place within the framework of the process, as well as the very results of the process of planning and its implementation.

Authorizations:

- An informed consent form is attached so please read and sign it.

The interview will be recorded only with your authorization.

- A summary of the interview will be sent to you in writing so that you can provide comments and adjustments if necessary.

- The results of the case study will be shared with the authorities and other actors who have participated in the interviews, they will be incorporated into the doctoral thesis, as well as scientific articles and academic conferences. Your data will be processed anonymously.

Questions:

A. Organizational affiliation and relationship with local planning processes

1. What organization do you belong to and what position do you have in it?
2. In what local planning processes have you been or are you involved in the municipality?
3. How has been your involvement in these processes.
4. What has been the role of your organization and your own role in those process? Can you please give some examples?

B. Perspective on climate change and adaptation planning

1. What is your organization perspective towards climate change? How important is it in comparison with other challenges? Who should tackle this issue? Does the local government should do something about it? What kind of actions do you think should be taken?
2. How would you define climate change adaptation? Do you think the local government should take adaptation actions? Should climate change and adaptation be integrated into the planning process such as those related to land-use, general development and risk management?
3. The following instrument seeks to know your opinion regarding the environment and human action. Please answer how much you agree or disagree with the following phrases.

Statement	Please select one answer to each question accordingly with your perspective				
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There are limits to growth beyond which our industrialized society cannot expand					
The government should dictate clear rules about what is and what is not allowed					
The environment is very adaptable and will recover from any harm caused by people					

There is no use worrying about the environment, I can do nothing about it anyway					
When humans interfere with nature it often produces disastrous consequences					
More scientific research is required to stablish the extent of the environmental problems					
Humans have the right to modify the natural environment to suit their needs					
Environmental protection methods are pointless because nature is unpredictable					
Humans must live in harmony with nature in order to survive					
Steps should be made to regulate behavior harmful to the environment					
I have very little control over environmental risk					
The balance of nature is very delicate and easily upset					
The public require educating on the dangers of environmentally damaging activities					
Humans need not adapt to the natural environment because they can remake it to suit their needs					
There is no point engaging in environmental action since it rarely changes anything					

C. About the planning process at local level.

1. Describe the planning process in which you were participating:

   a. What objective had the process?

   b. Could you describe the steps and methods followed in the process?

   c. What kind of assessments were conducted in order to determinate the base line of the municipality?

d. Which organizations participated in it?

e. What opinion did the different actors have about the process and its products? How do you know this? Provide examples

f. Could you describe the products and results obtained in it?

g. Who and how could make the decisions to approve or reject the products of the planning process?

h. Why the regulations and recommendations product of the process were not finally adopted?

i. What kind of barriers were present in the planning process and how much impact did they had on the outcomes?

j. What do you think was decisive for the process to finally end without the approval of the new regulations?

2. In the planning process, were elements related to climate change addressed?

a. Could you give examples of how CC was addressed and what discussions took place around it?

b. Were issues related to disaster risk management addressed as well?

c. What decisions were made regarding these issues? Were they finally integrated or not in the products and final results?

D. Consultations on participatory and learning processes

1. Do you think the planning process opened spaces for different sectors and organizations to participate?

2. Could you describe how participative the process was? What kind of participative actions were held? How many times were these spaces given throughout the process?

3. Do you think that these spaces facilitated the acquisition by the different sectors of new knowledge and, at the same time, contributed knowledge or information to others?

4. Were there spaces exclusively to provide training or exchange of information? Could you describe those spaces? Who participated in these spaces?

5. Do you think that these spaces had a positive impact on the planning process?

6. Do these spaces influenced opposing or doubtful actors to change their opinion of the planning process and outcomes? Could you describe an example?

7. In your view, was sufficient participation of outside actors (outside of your organisation) provided within the planning process?

8. Were there any actors who opposed approving new regulations and adopting the recommendations? How much impact could these actors have on the final result?

Is there anything else you would like to add?

Appendix 6: Interview transcripts of Costa Rica

Due to the length of the appendix (137 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link:https://www.scidb.cn/en/s/EJzAvu

Appendix 7: Interview transcripts results of Costa Rica

Due to the length of the appendix (43 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link:https://www.scidb.cn/en/s/EJzAvu

Appendix 8: Interview transcripts of Honduras

Due to the length of the appendix (168 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link:https://www.scidb.cn/en/s/EJzAvu

Appendix 9: Interview transcripts results of Honduras

Due to the length of the appendix (18 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link:https://www.scidb.cn/en/s/EJzAvu

CHAPTER 5 APPENDIX

Appendix 1: Interview transcripts of Portugal Case[3]

Due to the length of the appendix (75 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://www.scidb.cn/en/s/3q6Vjy

Appendix 2: Interview transcripts results of Portugal Case

Due to the length of the appendix (8 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://www.scidb.cn/en/s/3q6Vjy

Appendix 3. Codified Interviews and Surveys for Italy[4]

Due to the length of the appendix (15 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://www.scidb.cn/en/s/FbQJzu

Appendix 4: Interview meta-level analysis coding document and results for Spain[5]

Due to the length of the appendix (28 pages), this has been uploaded to the following server. Please follow the link to review this appendix.

Link: https://www.scidb.cn/en/s/FbQJzu

3 The authorship of this appendix belongs to Bentley, 2020.

4 The authorship of this appendix belongs to Toni, 2020.

5 The authorship of this appendix belongs to Viana, 2020.

IMPACT PARAGRAPH

On November 22, 2016, Hurricane Otto, a Category 3 event, made landfall in Costa Rica, marking the first time a hurricane had ever been recorded to enter the country directly. By the 25th, 10 people had died (most of them in Upala municipality), and 3370 people were moved to temporary shelters; economic losses were estimated at around $192 million. Several weeks later, it was discovered that local authorities in Upala had been warned of the danger of flash flooding and landslides a few years earlier. A proposal for a land-use plan integrating risk management measures to reduce exposure and increase conditions for mitigating the impacts of such events was archived due to political reasons.

Recognizing that hurricanes and other extreme weather events will become more frequent due to global warming, this case motivated me to investigate why some cities and municipalities are rapidly advancing in climate change adaptation and risk management. In contrast, others (as was the case in Upala) are failing to initiate such efforts. It was this question that inspired me to conduct this research with my team at the Maastricht Sustainability Institute.

We wanted to contrast successful cases with unsuccessful ones. From the very beginning, the case of Upala was selected. Located in Costa Rica, a country renowned for its forward-looking environmental policies and success in reforestation programs, it seemed odd that such a situation could be happening. It was imperative for me to learn from this case and avoid such situations from happening again. Together with my research team, we studied five cases in different countries (less developed countries in Central America and three developed countries in Europe).

A key element in uncovering the answer to that initial question was that, despite the best intentions behind any policy process related to climate change adaptation or risk management, it was common to find opposition in different segments of the political spectrum (a similar observation has been made in other sustainability issues). Opposition was commonly evident even in the definition of the problem at stake. In democratic societies, debate and dialogue among diverse stakeholders are expected when examining public policy. How these different actors perceive and frame the problem will directly influence the outcome of such an endeavor.

Contribution to the scientific community

One of the very first findings we discovered while researching climate change adaptation policy development in Central America was that little to no research had been conducted by that time. This became the first obstacle, but also an opportunity to make a contribution. Central America is a developing region, part of the Global South. By the time we began our research, most of the scientific publications on climate change adaptation had focused on Europe, North America, Australia, and other developed countries.

By researching the process of adaptation policy in Central America, this thesis is contributing to filling this initial gap. Chapters two and three of the dissertation focused on how the policy process for adaptation was unfolding in this region (comprising Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama), first examining the process of creating national-level adaptation policies (the direct approach). Some findings reflect a learning curve passing from what we called two generations of adaptation policy, bringing higher quality of adaptation policy in the second generation, but, despite this progress, the region fragility in terms of political stability, institutional weakness and the emergence of other priorities (economic crisis, health crisis, even security crisis) was delaying the implementation of such policy outputs.

We also researched, for this region, how the process of policy integration for adaptation was advancing (or not) in relevant sectors such as Development Planning, Land-Use planning, and Risk Management (this is called the mainstream approach). By applying three key criteria, we can assess the levels of inclusion, consistency, and adaptation weighting in the policy outputs of these three sectors during the period from 1996 to 2018. Results showed that policy outputs were increasingly integrating adaptation concerns and goals as part of the sectorial ones (inclusion). This is especially true after the initial climate policies were approved in 2007.

The consistency level showed mixed results; some countries showed greater consistency, while others had more limited consistency. In terms of policy sectors, the land-use sector presented more consistency problems. Weighting follows similar results, for the sector of risk management, the levels were higher than for the other two. These two chapters will enable future research comparing the Central American experience to that of other developing regions, as well as laying a solid foundation for further research on adaptation progress and implementation in these countries.

The second section of the thesis focuses on policy development at the local level for adaptation. To conduct this research, we developed a framework that operationalized frame theory by integrating the four perspectives of Cultural Theory (egalitarian, hierarchist, individualist, and fatalist) as the meta level of framing, together with the three main conceptual approaches to adaptation (vulnerability, resilience, and risk management). We employ policy analysis, interviews, and a questionnaire to gather insights from key stakeholders in five cases.

The framework helps assess stakeholder worldviews and how they shape decisions on conceptual elements and operational aspects, such as tools, strategies, knowledge, participation, and adaptation measures. It is helpful to analyze the influence of these different frames on the policy outputs and measures selected within.

Findings of this section can contribute to the scientific community in the following ways: First, our research establishes connections between the four cultural perspectives and the primary conceptual approaches to adaptation (risk management, vulnerability, and resilience). This serves as a building block for future research and policy development, integrating adaptation options that are more acceptable to the different perspectives. Additionally, it has the potential

to map the main frames influencing adaptation processes by examining the concepts, methodologies, and key decision-making elements in the process design.

The second contribution is that our research demonstrated that national-level policy has a considerable impact on how the local level frames the adaptation process. The choices of concepts, methods, and process design from the national level were, in all our cases, followed by the local authorities, even when they had ample freedom to design their own process. The third contribution is our finding that the four cases with positive results in the adaptation process all include measures such as incentives, the creation of adaptation capacities, and co-production of knowledge, and they bring a long-term vision to future development; they do not include regulations, zoning, or limitations that directly impact specific sectors. Choosing the easy options for adaptation measures to ensure no opposition is directly connected with filtering strategies. The problem with such a strategy is that it postpones measures that require more aggressive adaptation actions, but at a higher level of resistance from different sectors—the kind of measures that will be required under more severe climate impacts. Because CCA is a contested field, with various stakeholders advocating different strategies, another contribution of this thesis is a framework that aims to make these perspectives explicit, thereby enhancing understanding of the trade-offs inherent in the chosen actions. Each decision stems from a particular frame and carries trade-offs, potentially creating opposition if not explicitly addressed. The framework helps assess stakeholder worldviews and how they shape decisions on conceptual elements and operational aspects, such as tools, strategies, knowledge, participation, and adaptation measures.

Contribution and relevance to society and decision-makers

Our society is moving closer to a future of over 2 degrees of global warming. As the climate crisis continues to affect every country on this planet, we will have to see such consequences through the eyes of someone who lost relatives due to floods or landslides. Through the eyes of a family that has lost their home due to wildfire, or a farmer whose crops failed due to drought. Climate change adaptation is becoming a key necessity in every country and city. But, at the same time, there are still people, leaders, or economic sectors with opposing views, even rejecting the basic idea that we are facing a climate crisis.

The contribution of this thesis is that it addresses the increasing necessity for a better understanding of how the different elements of society relate to climate change and adaptation, and how they perceive such processes. The findings underscore the need to balance diverse viewpoints in adaptation policymaking to enhance its effectiveness and acceptance, especially when discussing more stringent measures (such as zoning, higher taxation, and building codes). Policy makers can benefit from the correlations between the cultural perspectives and the preferred adaptation measures to ensure policy proposals that resonate with different sectors. This does not guarantee that intractable opposition will arise, but it creates better conditions to guide the policy process through such difficulties, leading to a more integrative policy outcome.

SUMMARY

Climate Change is one of the main global challenges of the 21st century. From permafrost melting and heavy precipitation to droughts, floods, and wildfires, damage to infrastructure, human migration and displacement, among others. These are just a few of the numerous consequences already being felt around the world, which will continue to worsen in the years to come. Since avoiding climate change is no longer an option, the Intergovernmental Panel on Climate Change emphasizes the urgency of adaptation action, recognizing that precautionary and anticipatory measures are more effective and less costly than last-minute emergency solutions. When conducting CC Adaptation and risk management processes, decision-makers must answer questions such as whether to adapt, what to adapt to, when to do so, how to do it, who should adapt, and who should bear the costs of adaptation. These and other questions that arise during the process are laden with normativity, in which the participating actors interact to guide answers to these questions according to their respective frames of reference. Therefore, many aspects of the decision-making process for climate change adaptation will be contested by different stakeholders, who will hold conflicting views on the problem and possible solutions. These should be addressed to advance and reach agreements, thereby moving to the implementation phase. Consequently, different authors have called for the need to "open the black box of decision making" to better understand why, in every policy process related to climate change adaptation, barriers occur, more than just trying to solve the barriers; what is necessary is to understand why they appear within the decision-making process. By revealing which frames are at play and how they influence adaptation policies, we can better understand why specific problems arise in drafting and implementing these policies.

As a tropical developing region, Central America is among the most vulnerable to current climate variability and future climate change, which is why the Sixth Assessment Report of the IPCC concludes that Central America has already been severely affected by changes in climate variability and extreme events. Food insecurity, human and economic losses are among the impacts in this region. Furthermore, the United Nations Economic Commission for Latin America and the Caribbean and the Programa Estado de la Nación have reached the same conclusion, acknowledging that in a highly vulnerable region, there is a grave potential for an increase in the risk of disasters and, therefore, multiple losses due to climate change. Despite the importance of CC for this vulnerable region, little research has been conducted on the development of adaptation policies. Two main questions are central in this dissertation:

a. What is the progress of the Central American countries developing Climate Change Adaptation policies, both from the dedicated and the mainstream approach to adaptation and how does this progress relate to the local level of government?

b. Why do some municipalities advance in the Climate Change Adaptation policy process while others don´t, and how would the inclusion of different and sometimes competing frames make advancement more likely?

For the first research question, this thesis developed a framework to assess the progress and quality of the adaptation policies approved in Central America, using both the direct and the mainstream approaches. For the direct approach, the framework looked at five key elements: first, identify the drivers motivating climate policy development; second, classify the objectives pursued by the policies; third, investigate the influence that such policies had on the subsequent process of policy integration (mainstreaming); fourth, review the vertical interactions among the national and local governments, and fifth, analyze the arrangements for implementation, evaluation and funding integrated into the policies. For the mainstream approach, the framework first classifies policy outputs into strategic, tactical, and operational levels for the sectors of General Development Planning, Risk Management, and Land-use Planning. Secondly, it uses the criteria to assess the levels of inclusion, consistency, and weighting of adaptation into the sectoral policies. Third, as in the direct approach, it examines vertical interactions between the national and local government levels by identifying the level of participation of the latter in national policy development and later classifying the roles assigned to municipalities for implementation, funding, and monitoring. A total of 62 policy documents were analyzed to respond to this question.

For the second main research question, this thesis developed a framework to study frames about adaptation by focusing on the framing process at three distinct levels. First, at the meta-level, frames consisting of the core values and beliefs of people are analysed by using Cultural Theory, a relevant typology to understanding the different perspectives of a population by organizing them into a small set of groups accordingly to their worldviews toward different trends . Based on a division between group and grid, four worldviews are distinguished: Hierarchism, Egalitarianism, Individualism, and Fatalism. Each way of life has a specific approach to issues such as natural resources and human nature, even for climate change and adaptation. Second, the conceptual level, which is influenced by the meta-level, is linked with the creation of theories and definitions, in this case, related to adaptation. On the conceptual level, the main frames in policy approaches distinguished by adaptation literature are risk management (the most influential and original approach suggested by the IPCC), the vulnerability approach (more connected to development studies for developing countries), and the resilience approach (one of the most recent, highly influential on developed countries) which don't necessarily cancel each other and can influence the outcomes of the policy process. Third, at the operational level, it identified links between the different Cultural Theory perspectives and the adaptation approaches; these connections between frames at the meta- and conceptual levels can be used to understand operational-level decisions. This dissertation applies this framework to five cases: two from Central America with similar contextual conditions (Honduras and Costa Rica), and three from Europe (Italy, Portugal, and Spain) to achieve a diverse set of regions and development stages. A blend of policy analysis (31 national-level policies and 17 municipal policies) and 40 interviews were conducted.

This thesis comprises seven chapters; the first introduces the research problem, identifies the knowledge gap in relation to the two main questions, and lays out the thesis structure. Chapters two and three address the knowledge gap regarding progress on the CC Adaptation policy in Central America. Chapter Two developed a framework to analyze adaptation policies (the direct approach) in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The chapter addressed this by creating a dataset of all documented policies in each country, along with their main characteristics. A total of 18 policies were documented and studied. Chapter Three is devoted to exploring the progress of integrating adaptation into three key policy sectors in Central America (mainstream approach): general development, disaster risk management, and land-use planning. The chapter implemented a framework to assess the levels of inclusion, consistency, and adaptation weighting across the three sectors for 44 policy outputs.

Chapter Four developed the theoretical framework for frame analysis for adaptation. This chapter documents and analyzes the results for Upala (Honduras) and San Francisco (Costa Rica) cases, including 22 interviews with key stakeholders of both cases. Chapter Five presents a comparative analysis of the results for the three European cases, Bologna, Porto, and Zaragoza. In total, 18 interviews were conducted in these three to assess the existing frames. This was performed with the help of master's students from the Maastricht Sustainability Institute; one was originally from Porto, Portugal, and the other from Bologna, Italy. They decided to study their home cities, both of which had approved local adaptation strategies. The last student was from Puerto Rico, but, because of language affinity, decided to study the case of Zaragoza, Spain, one of the country's leading cities. These use the same framework and methods developed and applied to the Costa Rican and Honduran cases.

Chapter Six is a general discussion of the results and findings for all five cases. This chapter allows us to explore the cases' similarities and differences within the framework developed and to compare the results with the current scientific literature. A main result discussed in this chapter is that our research establishes connections between the four cultural perspectives and the primary conceptual approaches to adaptation (risk management, vulnerability, and resilience). This serves as a building block for future research and policy development, integrating adaptation options that are more acceptable to the different perspectives. Additionally, it has the potential to map the main frames influencing adaptation processes by examining the concepts, methodologies, and key decision-making elements in the process design.

Finally, Chapter Seven summarizes the thesis's conclusions and addresses the research questions, considering how the inclusion of different, sometimes competing, frames could be balanced. It also makes some recommendations for policymakers and future research. A key recommendation is that the discussion and selection of adaptation measures should also reflect a combination of preferred options across different perspectives. Even with a risk management approach, preferred options will differ among individualists, hierarchists, and egalitarians. Therefore, an active effort should be made to ensure that the measures offer options acceptable to all perspectives. The fatalist perspective

is an elusive worldview when it comes to participating in such processes. However, this perspective provides a very different viewpoint on policy problems. Therefore, having representation from this worldview should be actively sought and sustained.

SAMENVATING

Klimaatverandering is een van de belangrijkste mondiale uitdagingen van de 21ste eeuw. Van het smelten van de permafrost en hevige neerslag tot droogtes, overstromingen en bosbranden, schade aan infrastructuur, menselijke migratie en gedwongen verplaatsing: dit zijn slechts enkele van de talloze gevolgen die wereldwijd reeds worden gevoeld en die in de komende jaren zullen verergeren. Aangezien het voorkómen van klimaatverandering niet langer een optie is, benadrukt het Intergovernmental Panel on Climate Change de urgentie van aanpassingsmaatregelen of klimaatadaptatie, in de wetenschap dat preventieve en anticiperende maatregelen doeltreffender en minder kostbaar zijn dan last-minute noodoplossingen. Bij het uitvoeren van processen voor klimaatadaptatie en risicobeheer moeten besluitvormers vragen beantwoorden zoals: of men zich moet aanpassen, waaraan men zich moet aanpassen, wanneer men dit moet doen, hoe men het moet doen, wie zich moet aanpassen en wie de kosten van aanpassing moet dragen. Deze en andere vragen die tijdens het proces opkomen, zijn beladen met normativiteit, waarbij de deelnemende actoren interacteren om antwoorden op deze vragen te formuleren volgens hun respectievelijke referentiekaders. Derhalve zullen vele aspecten van het besluitvormingsproces voor klimaatadaptatie worden betwist door verschillende belanghebbenden, die tegenstrijdige opvattingen over het probleem en mogelijke oplossingen zullen hebben. Deze moeten worden aangepakt om vooruitgang te boeken en overeenkomsten te bereiken, om zo de implementatiefase te bereiken. Daarom hebben verschillende auteurs opgeroepen om de "zwarte doos van de besluitvorming te openen" om beter te begrijpen waarom zich in elk beleidsproces met betrekking tot klimaatadaptatie barrières voordoen. Naast het proberen op te lossen van de barrières, is het noodzakelijk te begrijpen waarom ze verschijnen binnen het besluitvormingsproces. Door bloot te leggen welke kaders (frames) een rol spelen en hoe zij het adaptatiebeleid beïnvloeden, kunnen we beter begrijpen waarom specifieke problemen ontstaan bij het opstellen en uitvoeren van dit beleid.

Als tropische ontwikkelingsregio behoort Midden-Amerika tot de meest kwetsbare gebieden voor de huidige klimaatvariabiliteit en toekomstige klimaatverandering. Dit is de reden waarom het Zesde Assessment Rapport van het IPCC concludeert dat Midden-Amerika reeds ernstig is getroffen door klimaatvariabiliteit en extreme weersomstandigheden. Voedselonzekerheid en menselijke en economische verliezen behoren tot de gevolgen in deze regio. Verder zijn de Economische Commissie voor Latijns-Amerika en het Caribisch gebied van de Verenigde Naties en het Programa Estado de la Nación tot dezelfde conclusie gekomen, daarmee erkennend dat in deze zeer kwetsbare regio een ernstig potentieel bestaat voor een toename van het risico op rampen en meervoudige verliezen als gevolg van klimaatverandering. Ondanks het belang van klimaatverandering voor deze kwetsbare regio, is er weinig onderzoek verricht naar de ontwikkeling van adaptatiebeleid. Twee hoofdvragen staan daarom centraal in dit proefschrift:

a. Wat is de voortgang van de Midden-Amerikaanse landen bij het ontwikkelen van klimaatadaptatiebeleid, zowel vanuit specifiek klimaatbeleid (directe benadering) als de integratie van klimaatadaptatie in algemeen beleid (mainstream benadering) , en hoe verhoudt deze voortgang zich tot het lokale bestuursniveau?

b. Waarom maken sommige gemeenten vorderingen in het proces van klimaatadaptatiebeleid terwijl anderen dat niet doen, en hoe zou de inclusie van verschillende en soms concurrerende kaders vooruitgang waarschijnlijker maken?

Voor de eerste onderzoeksvraag heeft deze thesis een raamwerk ontwikkeld om de voortgang en kwaliteit van het goedgekeurde adaptatiebeleid in Midden-Amerika te beoordelen, gebruikmakend van zowel de directe als de mainstream benadering. Voor de directe benadering bekeek het raamwerk vijf kernelementen: ten eerste, het identificeren van de drijvende krachten achter de ontwikkeling van klimaatbeleid; ten tweede, het classificeren van de doelstellingen van het beleid; ten derde, het onderzoeken van de invloed die dergelijk beleid had op het daaropvolgende proces van beleidsintegratie (mainstreaming); ten vierde, het beoordelen van de verticale interacties tussen nationale en lokale overheden; en ten vijfde, het analyseren van de afspraken voor implementatie, evaluatie en financiering die zijn geïntegreerd in het beleid. Voor de mainstream benadering classificeert het raamwerk eerst beleidsoutputs op strategisch, tactisch en operationeel niveau voor de sectoren Algemene Ontwikkelingsplanning, Risicomanagement en Ruimtelijke Ordening. Ten tweede gebruikt het de criteria om de niveaus van inclusie, consistentie en wegingsfactoren voor adaptatie in het sectorale beleid te beoordelen. Ten derde, net als bij de directe benadering, onderzoekt het de verticale interacties tussen nationale en lokale bestuursniveaus door het participatieniveau van de laatstgenoemde in de nationale beleidsontwikkeling te identificeren, en vervolgens de aan gemeenten toegewezen rollen voor implementatie, financiering en monitoring te classificeren. In totaal werden 62 beleidsdocumenten geanalyseerd om deze vraag te beantwoorden.

Voor de tweede hoofdonderzoeksvraag ontwikkelde deze thesis een raamwerk om kaders (frames) over adaptatie te bestuderen door te focussen op het kadervormingsproces op drie afzonderlijke niveaus. Ten eerste, op het metaniveau worden de kernwaarden en overtuigingen van mensen geanalyseerd door gebruik te maken van Culturele Theorie, een relevante typologie om de verschillende perspectieven van een populatie te begrijpen, door de populatie in een kleine set groepen in te delen volgens hun wereldbeelden ten opzichte van verschillen. Gebaseerd op een indeling tussen groep en grid, worden vier wereldbeelden onderscheiden: Hierarchisme, Egalitarisme, Individualisme en Fatalisme. Elk wereldbeeld heeft een specifieke benadering van kwesties zoals natuurlijke hulpbronnen en de menselijke natuur, zelfs voor klimaatverandering en adaptatie. Ten tweede onderscheidt deze thesis het conceptuele niveau, dat wordt beïnvloed door het metaniveau, en dat is verbonden met de creatie van theorieën en definities, in dit geval gerelateerd aan adaptatie. Op het conceptuele niveau zijn de belangrijkste kaders die in beleidsbenaderingen worden onderscheiden in de adap-

tatieliteratuur, risicobeheer (de meest invloedrijke en oorspronkelijke benadering voorgesteld door het IPCC), de kwetsbaarheidsbenadering (meer verbonden met ontwikkelingsstudies voor ontwikkelingslanden) en de veerkrachtbenadering (een van de meest recente, zeer invloedrijk in ontwikkelde landen). Deze drie benaderingen sluiten elkaar niet noodzakelijkerwijs uit en kunnen de resultaten van het beleidsproces beïnvloeden. Ten derde, op het operationele niveau, identificeert deze thesis verbanden tussen de verschillende Culturele Theorie-perspectieven en de adaptatiebenaderingen; deze verbindingen tussen kaders op het meta- en conceptuele niveau kunnen worden gebruikt om beslissingen op operationeel niveau te begrijpen. Dit proefschrift past dit raamwerk toe op vijf casussen: twee uit Midden-Amerika met vergelijkbare contextuele omstandigheden (Honduras en Costa Rica), en drie uit Europa (Italië, Portugal en Spanje) om een diverse set van regio's en ontwikkelingsstadia te bereiken. Een mix van beleidsanalyse (31 beleidsstukken op nationaal niveau en 17 gemeentelijke beleidsstukken) en 40 interviews werden uitgevoerd.

Deze thesis omvat zeven hoofdstukken; het eerste introduceert het onderzoeksprobleem, identificeert de kenniskloof met betrekking tot de twee hoofdvragen, en schetst de structuur van de thesis. Hoofdstukken twee en drie zijn gewijd aan het aanpakken van de kenniskloof met betrekking tot de voortgang van het klimaatadaptatiebeleid in Midden-Amerika. Hoofdstuk twee ontwikkelde een raamwerk om adaptatiebeleid (de directe benadering) te analyseren in Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua en Panama. Het hoofdstuk behandelde dit door het creëren van een dataset van alle gedocumenteerde beleidsstukken in elk land, samen met hun belangrijkste kenmerken. In totaal werden 18 beleidsstukken gedocumenteerd en bestudeerd. Hoofdstuk drie is gewijd aan het verkennen van de voortgang van het integreren van klimaatadaptatie in drie belangrijke beleidssectoren in Midden-Amerika (mainstream benadering): algemene ontwikkeling, risicomanagement en ruimtelijke ordening. Het hoofdstuk implementeerde een raamwerk om de niveaus van inclusie, consistentie en adaptatie-weging over de drie sectoren te beoordelen voor 44 beleidsdocumenten.

Hoofdstuk Vier ontwikkelde het theoretisch kader voor kaderanalyse voor adaptatie. Dit hoofdstuk documenteert en analyseert de resultaten voor de gevallen Upala (Honduras) en San Francisco (Costa Rica), inclusief 22 interviews met belangrijke stakeholders van beide cases. Hoofdstuk V presenteert een vergelijkende analyse van de resultaten voor de drie Europese cases, Bologna, Porto en Zaragoza. In totaal werden er in deze drie steden 18 interviews afgenomen om de bestaande kaders te beoordelen. Dit werd uitgevoerd met de hulp van masterstudenten van het Maastricht Sustainability Institute; een van hen was oorspronkelijk afkomstig uit Porto, Portugal, en de andere uit Bologna, Italië. Zij besloten hun thuissteden te bestuderen, beide steden hadden goedgekeurde lokale adaptatiestrategieën. De laatste student was afkomstig uit Puerto Rico, maar besloot vanwege taalaffiniteit de case van Zaragoza, Spanje, een van de toonaangevende steden van het land, te bestuderen. Deze maken gebruik van hetzelfde kader en dezelfde methoden die werden ontwikkeld en toegepast op de Costa Ricaanse en Hondurese cases.

Hoofdstuk Zes is een algemene discussie van de resultaten en bevindingen voor alle vijf cases. Dit hoofdstuk stelt ons in staat de overeenkomsten en verschillen tussen de cases binnen het ontwikkelde kader te verkennen en de resultaten te vergelijken met de huidige wetenschappelijke literatuur. Een belangrijk resultaat dat in dit hoofdstuk wordt besproken, is dat ons onderzoek verbanden legt tussen de vier culturele perspectieven en de primaire conceptuele benaderingen van adaptatie (risicobeheer, kwetsbaarheid en veerkracht). Dit dient als een bouwsteen voor toekomstig onderzoek en beleidsontwikkeling, waarbij adaptatieopties worden geïntegreerd die meer acceptabel zijn voor de verschillende perspectieven. Bovendien biedt het de mogelijkheid om de belangrijkste kaders die adaptatieprocessen beïnvloeden in kaart te brengen door de concepten, methodologieën en cruciale elementen voor besluitvorming in het procesontwerp te onderzoeken.

Tenslotte vat Hoofdstuk Zeven de conclusies van de thesis samen en behandelt het de onderzoeksvragen, waarbij wordt overwogen hoe de inclusie van verschillende, soms concurrerende, kaders in evenwicht gebracht zou kunnen worden. Het doet ook enkele aanbevelingen voor beleidsmakers en toekomstig onderzoek. Een belangrijke aanbeveling is dat de discussie en selectie van adaptatiemaatregelen eveneens een combinatie van voorkeursopties vanuit de verschillende perspectieven moet weerspiegelen. Zelfs binnen een risicobeheerbenadering zullen voorkeursopties verschillen tussen individualisten, hierarchisten en egalitaristen. Derhalve dient een actieve inspanning te worden geleverd om te waarborgen dat de maatregelen opties bieden die voor alle perspectieven acceptabel zijn. Het fatalistische perspectief is een moeilijk te vatten wereldbeeld wanneer het gaat om deelname aan dergelijke processen. Desalniettemin biedt dit perspectief een zeer verschillend gezichtspunt op beleidsproblemen. Daarom dient representatie van dit wereldbeeld actief te worden nagestreefd en volgehouden.

RESUMEN

El cambio climático es uno de los principales desafíos globales del siglo XXI. Desde el deshielo del permafrost y las precipitaciones intensas hasta las sequías, inundaciones e incendios forestales, los daños a la infraestructura, la migración humana y el desplazamiento forzado, entre otros, constituyen solo algunas de las numerosas consecuencias que ya se sienten en todo el mundo y que continuarán agravándose en los años venideros. Dado que evitar el cambio climático ya no es una opción, el Panel Intergubernamental sobre el Cambio Climático enfatiza la urgencia de la acción de adaptación, reconociendo que las medidas precautorias y anticipatorias son más efectivas y menos costosas que las soluciones de emergencia de última hora. Al llevar a cabo los procesos de adaptación al cambio climático y de gestión de riesgos, los tomadores de decisiones deben responder a preguntas tales como: ¿Debe adaptarse?, ¿a qué adaptarse?, ¿cuándo hacerlo?, ¿cómo hacerlo?, ¿quién debe adaptarse? y ¿quién debe asumir los costos de la adaptación? Estas y otras preguntas que surgen durante el proceso están cargadas de normatividad, en la que los actores participantes interactúan para orientar las respuestas a estas preguntas de acuerdo con sus respectivos marcos de referencia. Por lo tanto, muchos aspectos del proceso de toma de decisiones para la adaptación al cambio climático serán impugnados por distintas partes interesadas, que sostendrán visiones contrapuestas sobre el problema y las posibles soluciones. Estas deben abordarse para avanzar y alcanzar acuerdos, y así pasar a la fase de implementación. En consecuencia, distintos autores han llamado a la necesidad de "abrir la caja negra de la toma de decisiones" para comprender mejor por qué ocurren barreras en todo proceso de políticas relacionado con la adaptación al cambio climático; más que solo intentar resolverlas, lo necesario es entender por qué aparecen dentro del proceso decisorio. Al revelar qué marcos están en juego y cómo influyen en las políticas de adaptación, podemos comprender mejor por qué surgen problemas específicos en su formulación e implementación.

Como región tropical en desarrollo, Centroamérica se encuentra entre las más vulnerables a la variabilidad climática actual y al cambio climático futuro, por lo que el Sexto Reporte de Evaluación del IPCC concluye que ya se ha visto severamente afectada por cambios en la variabilidad climática y por eventos extremos. La inseguridad alimentaria y las pérdidas humanas y económicas figuran entre los impactos en esta región. Además, la Comisión Económica de las Naciones Unidas para América Latina y el Caribe y el Programa Estado de la Nación han llegado a la misma conclusión, reconociendo que en una región altamente vulnerable existe un grave potencial de aumento del riesgo de desastres y, por lo tanto, de múltiples pérdidas debido al cambio climático. A pesar de la importancia del CC para esta región vulnerable, se ha investigado poco sobre el desarrollo de políticas de adaptación. Dos preguntas principales son centrales en esta disertación:

a. ¿Cuál es el progreso de los países centroamericanos en el desarrollo de políticas de adaptación al cambio climático, tanto desde el enfoque dedicado como desde la transversalización de la adaptación en otros sectores de la política pública, y cómo se relaciona este progreso con el nivel de gobierno local?

b. ¿Por qué algunos municipios avanzan en el proceso de políticas de adaptación mientras que otros no, y cómo la inclusión de marcos diferentes y a veces contrapuestos haría más probable el avance?

Para la primera pregunta de investigación, esta tesis desarrolló un marco analítico para evaluar el progreso y la calidad de las políticas de adaptación aprobadas en Centroamérica, utilizando tanto enfoques directos como transversales. Para el enfoque directo, el marco consideró cinco elementos clave: primero, identificar los impulsores que motivan el desarrollo de la política climática; segundo, clasificar los objetivos perseguidos por las políticas; tercero, investigar la influencia que tales políticas tuvieron en el proceso posterior de integración de políticas (transversalización); cuarto, revisar las interacciones verticales entre los gobiernos nacionales y locales; y quinto, analizar los arreglos para la implementación, evaluación y financiamiento integrados en las políticas. Para el enfoque de transversalización, el marco clasifica primero las políticas en niveles estratégicos, tácticos y operativos para los sectores de Planificación General del Desarrollo, Gestión del Riesgo y Ordenamiento Territorial. En segundo lugar, utiliza criterios para evaluar los niveles de inclusión, de consistencia y de ponderación de la adaptación en las políticas sectoriales. Tercero, al igual que en el enfoque directo, examina las interacciones verticales entre los niveles de gobierno nacional y local, identificando el nivel de participación de este último en el desarrollo de políticas nacionales y luego clasificando los roles asignados a los municipios para la implementación, el financiamiento y el monitoreo. Se analizó un total de 62 documentos de política para responder a esta pregunta.

Para la segunda pregunta de investigación, esta tesis desarrolló un esquema conceptual para analizar los marcos de referencia sobre la adaptación, centrándose en el proceso de enmarcado en tres niveles distintos. Primero, en los marcos a nivel meta, que consisten en los valores y creencias centrales de las personas, utilizando la Teoría Cultural, una tipología relevante para comprender las diferentes perspectivas de una población, organizándolas en un pequeño conjunto de grupos de acuerdo con sus visiones del mundo. Basadas en una división entre grupo y cuadrícula, se distinguen cuatro visiones del mundo: jerarquismo, igualitarismo, individualismo y fatalismo. Cada visión tiene un enfoque específico en temas como los recursos naturales y la naturaleza humana, incluidos el cambio climático y la adaptación. En segundo lugar, el nivel conceptual, influido por el nivel meta, está vinculado a la creación de teorías y definiciones, en este caso, relacionadas con la adaptación. A nivel conceptual, los principales marcos en los enfoques de política distinguidos por la literatura sobre adaptación son la gestión del riesgo (el enfoque más influyente y original sugerido por el IPCC), el enfoque de vulnerabilidad (más conectado con los estudios de desarrollo para países de renta media y

baja) y el enfoque de resiliencia (uno de los más recientes, muy influyente en los países desarrollados), los cuales no necesariamente se anulan entre sí y pueden influir en los resultados del proceso de políticas. Tercero, a nivel operativo, se identificaron vínculos entre las diferentes perspectivas de la Teoría Cultural y los enfoques de adaptación; estas conexiones entre marcos en los niveles meta y conceptual pueden utilizarse para comprender las decisiones operativas. Esta disertación aplica este marco a cinco casos: dos de Centroamérica con condiciones contextuales similares (Honduras y Costa Rica) y tres de Europa (Italia, Portugal y España) para lograr un conjunto diverso de regiones y etapas de desarrollo. Se realizó una combinación de análisis de políticas (31 políticas a nivel nacional y 17 políticas municipales) y de 40 entrevistas.

Esta tesis comprende siete capítulos; el primero introduce el problema de investigación, identifica la brecha de conocimiento en relación con las dos preguntas principales y presenta la estructura de la tesis. Los capítulos dos y tres se dedican a abordar la brecha de conocimiento con respecto al progreso de la política de Adaptación al CC en Centroamérica. El Capítulo Dos desarrolló un marco para analizar las políticas de adaptación (enfoque directo) en Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua y Panamá. El capítulo abordó esto creando un conjunto de datos con todas las políticas documentadas en cada país, junto con sus principales características. Se documentaron y estudiaron un total de 18 políticas. El Capítulo Tres se dedica a explorar el progreso de la integración de la Adaptación al CC en tres sectores políticos clave en Centroamérica (enfoque transversal): desarrollo general, gestión del riesgo de desastres y ordenamiento territorial. En el capítulo se implementó un marco para evaluar los niveles de inclusión, consistencia y ponderación de la adaptación en los tres sectores para 44 productos de política.

En el Capítulo Cuatro se desarrolló el marco teórico para el análisis de los marcos de referencia aplicado a la adaptación. Este capítulo documenta y analiza los resultados de los casos de Upala (Honduras) y San Francisco (Costa Rica), incluyendo 22 entrevistas con actores clave de ambos casos. El Capítulo Cinco presenta un análisis comparativo de los resultados de los tres casos europeos: Bolonia, Oporto y Zaragoza. En total, se realizaron 18 entrevistas en estas tres ciudades para evaluar los marcos de referencia existentes. Esta labor se llevó a cabo con la ayuda de estudiantes de maestría del Instituto de Sostenibilidad de Maastricht; una era originaria de Oporto, Portugal, y la otra de Bolonia, Italia. Ambas decidieron estudiar sus ciudades de origen, las dos ciudades con estrategias locales de adaptación aprobadas. La última estudiante era de Puerto Rico, pero, debido a su afinidad por el español, decidió estudiar el caso de Zaragoza, España, una de las ciudades más importantes del país. Estos casos emplean el mismo marco y los mismos métodos desarrollados y aplicados en los casos de Costa Rica y Honduras.

El Capítulo Seis constituye una discusión general de los resultados y hallazgos de los cinco casos. Este capítulo nos permite explorar las similitudes y diferencias entre los casos en el marco desarrollado y comparar los resultados con la literatura científica actual. Un resultado principal discutido en este capítulo es que nuestra investigación establece conexiones entre las cuatro perspectivas culturales y los principales enfo-

ques conceptuales de la adaptación (gestión del riesgo, vulnerabilidad y resiliencia). Esto sirve como base para futuras investigaciones y para el desarrollo de políticas, integrando opciones de adaptación más aceptables para las distintas perspectivas. Adicionalmente, tiene el potencial para cartografiar los principales marcos que influyen en los procesos de adaptación mediante el examen de los conceptos, metodologías y elementos clave de la toma de decisiones en el diseño del proceso.

Finalmente, el Capítulo Siete resume las conclusiones de la tesis y aborda las preguntas de investigación, considerando cómo podría equilibrarse la inclusión de perspectivas diferentes y, en ocasiones, contrapuestas. También formula recomendaciones para formuladores de políticas y para investigaciones futuras. Una recomendación clave es que la discusión y la selección de medidas de adaptación también deben reflejar una combinación de opciones preferidas por las diferentes perspectivas. Incluso dentro de un enfoque de gestión del riesgo, las opciones preferidas diferirán entre los individualistas, los jerarquistas y los igualitarios. Por lo tanto, debe realizarse un esfuerzo activo para garantizar que las medidas ofrezcan opciones aceptables desde todas las perspectivas. La perspectiva fatalista constituye una cosmovisión escurridiza al evadir la participación en tales procesos. Sin embargo, esta perspectiva ofrece un punto de vista muy diferente sobre los problemas de política. Por consiguiente, la representación de esta cosmovisión debe buscarse y mantenerse activamente.

ACKNOWLEDGEMENTS

There were moments in the past years in which I thought it would be impossible to complete this thesis and write this section. The closer I got to finishing the thesis, the more difficult it became to imagine this section. It is not that hard to acknowledge the people who have been supporting me during this journey, but it has been such a long path that the number of people who were part of it (some for more time than others) is extensive, and I´m afraid to leave someone out of this section.

This journey owes a considerable debt of gratitude to my supervisors. To my Promotor, Professor Pim Martens, thank you for opening the door of MSI for me; your patience along the way was key to reaching the final goal. You gave me the freedom and support to rethink what this thesis should be about. In every communication since the very beginning, you have found the right words to provide confidence and support in my ideas and work. To my Second Supervisor and Mentor, Annemarie van Zeijl-Rozema, this thesis was inspired by your questions, your keen eye for looking beyond the surface of the problem. I could not have reached this point without your unwavering support. In those moments of self-doubt and incapacity to "break the ice" of the process, it was your kind words, advice, and patience that fuel the last steps in this long path. Every conversation at MSI, later online, and finally during your visit to Costa Rica, was a safe space to share ideas, to find solutions, or even share a story or two. Thank you.

I also want to thank the comments and feedback from my assessment committee: Prof. Dr. Frank Boons (chair), Prof. Dr. Robbert Biesbroek, Prof. Dr. Chris Thomas, and Dr. Maud Huynen. Your observations allow me to improve my dissertation. I also want to acknowledge Dr. Carijn Beumer for joining the corona of my defense.

To my colleague and friend, Dr. Alexander López, thank you for your support in receiving the scholarship from the Universidad Nacional de Costa Rica at a very early stage in this pathway, and later for accepting to be part of the Corona. In this process, I also have to thank Max Saúrez, who, with Alexander, trusted in me.

The Ph.D. pathway is full of colleagues who, very early or later in the road, become important. From very early on, Alex Baker-Friesen and Lukas Figge were among those who made me feel welcome and gave me advice on the journey I was starting, and later on, a friendship that persists through time and distance. Dexon Pasaribu, mae, we both started with just a month of difference, but this pathway felt lighter thanks to your friendship, jokes, your advice, and, of course, sharing drinks and food. Manuel González, my Mexican friend, your friendship is invaluable. During the worst times of COVID and other difficulties, you were there to give support, advice, and to listen to the 99 problems. Mo Chen, you arrived a bit later in the Ph.D. program, but you quickly became a good friend and colleague, always with a smile and a good attitude.

Esther Agustin and Wija Yanto, thank you for receiving me during my time in Indonesia and for helping open doors for my field research. A great thanks for your patience to Marielena Toni, Carolina Bently, and Julieanne Viana, whose master's thesis I had the honor to supervise

Other colleagues with whom I had wonderful conversations and gave me advice along the way were Laura Kurth, Su Bingtao, Christian Scholl, Ceren Pekdemir, Astrid Offermans, Bram Oosterbroek, Joop de Kraker, Florian Goldschmeding, Mark Dijk, Ron Cörvers, Saskia Jamin, Xu Liu, and Veronique Vasseur—special thanks to Annet Grol, who gave me so much support and guidance.

I have to admit it was hard to make local friends in Maastricht, but fortunately, I made a good one. Christian Kranendonk, with whom we share clever conversations and enjoy excellent times no matter the weather. The expat community was quick to welcome me and give me good friends as well; in this list, Shane White became a great friend and teacher. I still have to beat you in a squash match. Alejandro Espinoza, in the worst times of COVID, you showed me what a good friend you are, and I will forever appreciate it. Thank you, Marco and Diego, who also let me share the good times and support during the difficult ones.

This list owes thanks to more friends and people that was very supportive during my time in Maastricht, especially Ahmad Hassan, Florentina Deliu, Alexandra, and Borut Vovsek. You were among the first friendships I made during my early days in Maastricht. Iona Fudulu, thank you for your kindness and support.

There is a group of close friends from Costa Rica that I also owe a lot to. Alberto Arias, a friend and companion in hundreds of battles; Ashley Rojas, since the very first course in the bachelor's, we became friends, and during my Ph.D, she has been a constant supporter; Jeannethe and Gabriela Calvo, more than friends, are like sisters to me, thank you for always believing in me. Carlos Oviedo, Gabael Armas, and Rajesh Chapagain are trusted colleagues and friends.

Fabiana, you have been a constant in the last years. Sorry for the challenging moments (I know there were plenty), and thank you for sharing the good ones with me. I look forward to sharing the best ones ahead. On many occasions, it was your company that helped me stay mentally healthy in the final years of this journey.

Finally — and very importantly —my family. The people who sacrificed the most are you. Countless family meetings, special occasions, laughter and tears, great news, happy news, and sad news that were shared in my absence. Thanks for supporting me all my life. Nela, Mauricio Mario, my three siblings, my (soon-to-be) 17 nephews, nieces, great-nephews, and great-nieces. David, Cristin, Jocelyn, Fabricio, Andrés, Adrián, María Paula, Natalia, Brenda, José Andrés, Ismael, Valentina, Juliana, Luciana, Oliver, Victoria, and bebé (on the way). I hope I can be a good example of keeping up the fight despite the challenges. My relatives in Miramar thank you for your love, Guiselle, Tony, German, Cristian, and Gabriel.

Mamá, tú más que nadie sabes de sacrificio, de amor, de valentía y de lucha constante. Fue tu ejemplo y tu disciplina lo que me permitió llegar a este punto de mi vida. Estoy agradecido con Dios por darme la mejor mamá-papá del mundo. No solo vales por dos, vales por mil. Este honor es tuyo.

ABOUT THE AUTHOR

Luis Diego Segura Ramírez was born in 1983 in San José, Costa Rica. In 2001, he obtained his high-school diploma at Liceo Teodoro Picado of Alajuelita, San José. He conducted his bachelor's degree at the School of International Relations of Universidad Nacional Costa Rica, and he graduated in 2005. By 2008, he had obtained his licenciatura in international relations, with an emphasis on international politics and diplomacy, from the same university. He received in 2007 a Postgraduate Diploma in Regional Integration with an emphasis in Central America, accredited by the Jesuit University Institute (ETEA, from Córdoba, Spain), the Foundation for Development and Cooperation, the General Secretariat of SICA, and the Spanish Cooperation Agency for Development (AECID). He received an MBA from the Universidad Latinoamericana de Ciencia y Tecnología (ULACIT) in Costa Rica in 2012, earning cum laude honors. He started his career at Fundación para la Paz y la Democracia (FUNPADEM), where he began in 2004 as an intern and rose through the ranks until resigning in 2012 as operations manager. During his time at this foundation, he worked on international cooperation projects in Central America, conducting field research, coordinating activities, workshops, and training across all six countries, among other responsibilities. He has worked with the Instituto Centroamericano de Administración Pública (ICAP) as a project officer on the initiative "Regional Mechanism for Climate Shielding of Local Public Infrastructure" (funded by the IDB) between 2013 and 2017. He also collaborated as a climate change adaptation expert and technical manager in the project "Central American and Caribbean initiative to strengthen the response of the National Public Investment Systems (SNIP) in the context of post-pandemic recovery" between January and June 2021 (GIZ Funding). He was also a project officer and climate change expert for Proyecto Construye phases I and II (2022 until February 2025), improving climate change adaptation capacities and governance at the local level in Guanacaste province of Costa Rica, implemented by the University for Peace with US Embassy funds.

He joined the School of International Relations of Universidad Nacional as a researcher and later as a lecturer in 2009. Since then, he has been teaching courses on interna-

tional relations theory, the theory of the state and political systems, political economy, Central America, and foresight analysis, among many others. His research interests centered around Central America and regional responses to sustainability problems, including policy development, climate change, and democracy.