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**Examining the Challenges in Mainstreaming Climate Change Adaptation into  
Local Land-use Planning: The Case of Albay, Philippines**

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## **Abstract**

Mainstreaming climate change adaptation (CCA) is an approach that links adaptation and sustainable development goals by integrating climate change information, concerns, and considerations into existing development planning, and policy- and decision-making processes. However, a gap exists in the operationalisation of mainstreaming, mainly because the tools and methodologies in mainstreaming neglect the institutional reforms needed in the approach. This thesis focused on mainstreaming CCA into local land-use planning, and asked “How can mainstreaming of CCA into local land-use planning be understood?” and “How can the challenges in the operationalisation of mainstreaming be overcome?” To answer these questions, a four-stage mixed methodology was devised and successfully applied in examining the challenges in mainstreaming CCA into local land-use planning in Albay, Philippines. Local land-use planning in Albay is a “critical case” because it presents evidence of institutional capacity for long-term adaptation to climate change, with indication of transformational opportunities for mainstreaming. The methodology applied the mixed method, case study, and scorecard approaches, and it involved triangulation by data technique (i.e., document review, interview, survey, and key informant consultations). By using this methodology, the research generated 20 quantitative “mainstreaming indicators” and produced qualitative assessments of the state-of-play and the challenges in local mainstreaming of CCA. Analyses revealed that (1) mainstreaming challenges exist within a spectrum, with barriers and opportunities for adaptation representing the extreme ends of this spectrum; (2) barriers can be overcome and can transcend into opportunities for mainstreaming CCA; (3) barriers can be classified according to varying levels of severity; and (4) barriers themselves are interconnected, but to differing degrees. Also, the research showed that mainstreaming operationalisation involves a network of interacting institutions and institutional arrangements that transcend across governance scales. Likewise, the challenges in mainstreaming CCA encompass a chain of interactions or interplays within the network (of institutions). Accordingly, overcoming mainstreaming challenges necessitates broad institutional reforms that go beyond the institutional setting where CCA is to be integrated. A deep understanding of these concerns can help scholars, practitioners, planners, and decision-makers anticipate the types of challenges to be encountered during the mainstreaming process; determine the severity of the impacts of these challenges; and formulate strategies that will overcome the challenges.



## **Declaration by author**

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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### **Keywords**

climate change adaptation, mainstreaming challenges, mainstreaming indicators, institutional capacity, resource capacity, information capacity, modified IAD, mixed methodology, barriers, opportunities

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## **List of Abbreviations used in the thesis**

A2C2	Albay in Action on Climate Change
AR	Assessment Report
CCA	Climate Change Adaptation
CCA-DRR	Climate Change Adaptation-Disaster Risk Reduction
CIRCA	Center for Initiatives and Research for Climate Adaptation
CRISTAL	Community-Based Risk Screening Tool–Adaptation and Livelihoods
CVCA	Climate Vulnerability and Capacity Analysis
DENR	Department of Environment and Natural Resources
DRR	Disaster Risk Reduction
DRRM	Disaster Risk Reduction and Management
HLURB	Housing and Land-use Regulatory Board
IAD	Institutional Analysis and Development framework
IAD-CCA	Institutional Analysis and Development framework for Climate Change Adaptation
IPCC	Intergovernmental Panel on Climate Change
KRA	Key Result Areas
LDRRM	Local Disaster Risk Reduction and Management
LDRRMO	Local Disaster Risk Reduction and Management Officer
LGU	Local Government Unit
MoEF	Ministry of Environment and Forests
NAP	National Adaptation Plan
NAPA	National Adaptation Programs of Action
OECD	Organisation for Economic Co-operation and Development
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PGA	Provincial Government of Albay
PLUC	Provincial Land-Use Committee
RA	Republic Act
SEA	Strategic Environmental Assessment
SPREP	Secretariat of the Pacific Regional Environment Programme
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development

## CHAPTER 1: INTRODUCTION

### 1.1 Background

Climate change exists and presents new and diverse risks. Although humanity is fundamentally adaptive, the increasing exposure and losses from the effects of climate change pose critical adaptation difficulties (Hedger et al. 2008; Preston et al. 2009). In response, the climate change debate has shifted from whether there is a *need* to adapt to *how* to adapt to the predicted impacts of climate change (Biesbroek et al. 2013; Noble et al. 2014). Decision-makers, practitioners, and scholars are now prioritising climate change adaptation (CCA) in their agendas, resulting in a rapid rise in the number of adaptation-related publications in the last decade (Inderberg & Eikeland 2009; Nicholson-Cole & O’Riordan 2009; IPCC 2014a, 2014b). Consequently, CCA is now an important research field (Gupta et al. 2010; Rodima-Taylor et al. 2012).

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) has been instrumental in shaping the direction of current adaptation research (IPCC 2007) from the biophysical to the social, economic and institutional aspects of adaptation (Dovers & Hezri 2010; Noble et al. 2014). This change has prompted researchers to focus on the linkages between CCA and sustainable development:

Sustainable development can reduce vulnerability to climate change, and climate change could impede the nations’ abilities to achieve sustainable development pathways (IPCC 2007, p. 20).

Hence, development and adaptation are acknowledged as mutually dependent strategies, and efforts to streamline climate-related concerns into the development-planning and decision-making processes are emerging (Ayers et al. 2014; Noble et al. 2014). Along with this is the change in the focus of CCA planning from impact, vulnerability, or risk assessments to adjusting the direction in development planning (Olhoff & Schaer 2010; Schipper et al. 2010). This approach in adaptation is called “mainstreaming.”

Mainstreaming CCA integrates climate change and adaptation concerns into a broader set of actions within the current development-planning, policy-making, and decision-making processes (OECD 2009; UNDP-UNEP 2011). It is a proactive, long-term adaptation planning measure that addresses the origins of vulnerability, deals with issues of adaptive capacity, and most importantly, is a primary prerequisite for sustainability (Agrawala 2006; Parry et al. 2007). As such, developing countries, which typically have low adaptive capacity and are the most vulnerable to the effects of climate change, are encouraged to apply CCA mainstreaming (Mertz et al. 2009; Ayers et al. 2014; IPCC 2014a).

Although research interest in mainstreaming CCA is growing, there is limited literature on how to operationalise the approach, especially at the local scale (Huxtable & Yen 2009; Olhoff & Schaer 2010; Mimura et al. 2014). Consequently, information is lacking on how to transcend from planning to the implementation of mainstreaming, identify the challenges in operationalising the approach, and assess the progress and setbacks of mainstreaming efforts (Persson & Klein 2008; Measham et al. 2011; Ayers et al. 2014).

Institutional issues are often neglected in mainstreaming CCA. The tools and methodologies applied in mainstreaming are typically concerned with climate change-related issues (vulnerability assessments, climate risk screening, impact models, climate change scenario building, etc.), and seldom address the institutional changes created by the approaches (Olhoff & Schaer 2010; Schipper et al. 2010; Lebel et al. 2012; SPREP & UNDP 2013; Hamin & Gurran 2014). This oversight also is observed in the general adaptation literature. Although scholars now are realising the significance of institutions in CCA research (Adger et al. 2005; Inderberg & Eikeland 2009; Rodima-Taylor 2012), the institutional dimension of CCA remains the least understood aspect of the issue (Evans & Stevens 2009; Pradhan et al. 2012; Rodima-Taylor 2012; Rodima-Taylor et al. 2012).

This chapter explores these concerns and establishes the foundations of this research. First, it introduces the concept of mainstreaming CCA, particularly as it relates to land-use planning. Second, it explores existing literature in order to identify knowledge gaps in this field, and probes how these gaps relate to mainstreaming CCA into land-use planning. Third, these discussions are framed to identify the research problem, research questions, aims, and objectives. The chapter concludes by explaining the general structure of the thesis.

## **1.2 What is mainstreaming climate change adaptation?**

In general, the term “mainstreaming” is defined as follows (1) to incorporate, bring, or place something into (Stevenson 2004); (2) to cause (someone or something) to be included in (Merriam-Webster [Online] n.d.); or (3) to integrate something into the mainstream (Collins Dictionaries 2012). The “mainstream” term, on the other hand, is the shared opinion, ideas, attitudes, or activities that are regarded by most people as normal or conventional (Stevenson 2004). As a concept, mainstreaming refers to “integrating an issue into existing (usually development) institutions and decision-making” (Ayers et al. 2014, p. 295). The mainstreaming concept is not new and has been used within the contexts of environment, gender issues, disaster risk reduction, poverty, and lately, in CCA (Klein et al 2005; Olhoff & Schaer 2010; Uittenbroek et al 2013).

As in other fields, mainstreaming is chiefly associated with the term “integrating”; thus, mainstreaming CCA is defined as integrating CCA issues, concerns, information, policies, and activities into all or any aspect of development-planning and decision-making processes and practices (Agrawala 2006; Ayers & Dodman 2010; Olhoff & Schaer 2010; Uittenbroek et al. 2013; Ayers et al. 2014). As the mainstreaming approach offers extensive benefits, it has gathered a growing number of advocates from international funding agencies such as the Asian Development Bank, the World Bank, United Nations Development Programme, and the likes. Similarly, it has emerged as a popular climate change response in developing countries such as Bangladesh, the Philippines, and Vietnam, among others (UNDP-UNEP 2011; UNDP 2012).

International funding organisations encourage developing countries to mainstream CCA as it is an adaptation approach facilitated through existing schemes. Hence, the strategy uses limited resources more efficiently, as compared to designing and creating new or separate institutions for managing CCA (Klein et al. 2005, 2007; Lebel et al. 2012). Moreover, the approach combines several policy goals (i.e., reduce risk and vulnerability to climate change, build resilience against climate change, and plan for sustainable development); thus, it stimulates policy coherence (Risbey et al. 2006; Rauken et al. 2015). Likewise, integrating adaptation concerns into development activities will help new policies, strategies, or plans to avoid worsening system vulnerability (i.e., maladaptation) (Olhoff & Schaer 2010). Mainstreaming promotes synergy in planning as it accounts for the following information (1) how climate will change in the future; (2) the uncertainty of the climate information; and (3) the vulnerability of systems to this uncertain future (O’Brien et al. 2012). Essentially, mainstreaming adaptation minimises the trade-offs between climate change and sustainable development objectives, and maximises the opportunities that a harmonised planning and policy-making environment offers (Kok & de Coninck 2007; UNDP-UNEP 2011; Uittenbroek et al. 2013; Rauken et al. 2015).

Mainstreaming can exist at varying scales (i.e., international, regional, national, and local) and in different sectors (i.e., infrastructure, water, agriculture, poverty reduction, and education) (Kok & de Coninck 2007; OECD 2009; Tang et al. 2009; Dovers & Hezri 2010; UNDP-UNEP 2011). Whereas mainstreaming can be applied in various ways, mainstreaming CCA into land-use planning is paramount in achieving successful adaptation and sustainable development (Enemark 2012; Revi et al. 2014).

### **1.2.1 Mainstreaming climate change adaptation into local land-use planning**

Local land-use planning often is referred to as the “constitution for future development” (Tang et al. 2009, p. 368) since it encompasses most of the locality’s planning area, affects significant development concerns, reflects the community’s development goals, and represents the future direction of public policies. Thus, integrating CCA into land-use planning is a key strategy to ensure sustainable development and efficient use of limited resources amid climate change conditions. The approach enhances the capability of communities to address the present and expected climate change risks, and to respond to and recover from climate change impacts (Klein et al. 2005, 2007; IPCC 2014a).

Likewise, mainstreaming CCA into land-use planning is an important task because of the complex relationship between climate change and land-use—climate change affects both the “demand and supply for space” (Koomen et al. 2008, p. 262). By altering the present and future use of that space, climate change influences the use, productivity, and access to land (Koomen et al. 2008; Robichaud & Wade 2011). Consequently, land issues and policies are vital concerns in adaptation planning (Quan & Dyer 2008).

Mainstreaming CCA into land-use planning can be through (1) expanding planning horizons to incorporate longer climate predictions; (2) strategising development in flood-prone and other high-risk areas; (3) considering the medium- to long-term risks posed by climate change in vulnerable areas; (4) revising land-use regulations and standards that reflect climate variability; and (5) incorporating climate change risk assessments into land-information systems, among others (Govind 2011; UNDP-UNEP 2011; IPCC 2014a, 2014b). In the last decade, literature on mainstreaming CCA has included conceptual frameworks, guidelines, and handbooks on how to apply the approach. However, these documents only provide generic guidance for mainstreaming at the national, sectoral, programme and project levels. They do not offer detailed, operational instructions on how to implement the approach in practice (ADB 2005; Collins et al. 2005; Huxtable & Yen 2009; Olhoff & Schaer 2010). Essentially, “research is needed to establish the conditions under which the process of mainstreaming can be most effective” (Klein et al. 2005, p. 579).

Recently, several scholars have answered this call by investigating the mainstreaming process in specific cases. For example, researchers examined mainstreaming in development assistance in Mozambique (Sietz et al. 2011), urban planning in The Netherlands (Uittenbroek et al. 2013), municipal planning in South Africa (Pasquini et al. 2013), development planning in Bangladesh (Ayers et al. 2014), and environmental assessment in

Indonesia (Hamdani et al. 2014). Although these studies enrich the literature in mainstreaming CCA, significant knowledge gaps remain.

### **1.2.2 Issues in mainstreaming climate change adaptation**

This section presents two of the important concerns in mainstreaming CCA that require immediate attention—the barriers that impede the effective operationalisation of the approach, and the methodology for investigating CCA mainstreaming. Although the general idea of mainstreaming is progressing, information is still lacking on how to (1) identify the challenges of mainstreaming; (2) transcend mainstreaming from planning to implementation; and (3) evaluate mainstreaming efforts, especially at the local scale (Huq & Ayer 2008; Persson & Klein 2008; Measham et al. 2011). Thus, there are knowledge gaps in terms of the practical application, operationalisation, monitoring, and assessment of mainstreaming initiatives (Mangoyana et al. 2012; Uittenbroek et al. 2013; Mimura et al. 2014).

#### ***1.2.2.1 Barriers in mainstreaming climate change adaptation***

In practice, the operationalisation of mainstreaming has been slow and in some cases, it has not been implemented effectively (Uittenbroek et al. 2013; Revi et al. 2014; Lehmann et al. 2015). This is because information is lacking on how mainstreaming CCA can be applied on-ground, which consequently highlights a knowledge deficit regarding the mainstreaming process (Lal et al. 2012; Ayers et al. 2014; Picketts et al. 2014). This condition is aggravated by the lack of understanding about the barriers or challenges in the operationalisation of mainstreaming CCA at the local scale (Huq & Ayer 2008; OECD 2009; Mangoyana et al. 2012; Mimura et al. 2014).

Literature has referred to the barriers to adaptation in a number of ways, including limitations, constraints, obstacles, or challenges, that hinder, impede, restrain, limit, or delay planning, implementation, and the general advancement of CCA measures and approaches (Pervin et al. 2013; Ayers et al. 2014; Dang et al. 2014; Eisenack et al. 2014; Picketts et al. 2014; Waters et al. 2014). Early studies identified a wide array of barriers and grouped them under varying categories. For instance, Waters et al. (2014) identified 50 barriers spread across five classifications, namely governance, policy, psychosocial, resources, and information. Meanwhile, Dang et al. (2014) characterised the barriers to include socio-economic (e.g., lack of access to credit, lack of access to financial resources) and psychological (e.g., strength of belief to the existence of climate change, personal or community perception on climate risk) factors. Still, Ekstrom and Moser (2014) related the

barriers to institutional or governance issues; attitudes, values, and motivations of the actors involved; and leadership, among others. Clearly, these studies are answering the queries on (1) What are the barriers to adaptation? and (2) How are the barriers categorised?

However, on-ground mainstreaming conditions need answers to questions beyond identifying what the barriers to adaptation are. For example, some studies have shown that the refusal of local leaders to acknowledge climate change significantly hinders the ability of some local governments to plan for effective mainstreaming of CCA (Roberts 2008; Oberlack & Eisenack 2014). In the context of mainstreaming, this lack of leadership for CCA can be an effect of the lack of knowledge and awareness of climate change issues. In turn, this leadership dilemma can be the motivational impediment causing the community's unwillingness to act on climate change or the obstacle keeping the local government from prioritising CCA in the political agenda (Burch 2010; Gardner et al. 2010; Biesbroek et al. 2011; Oberlack & Eisenack 2014). In general, adaptation "barriers do not exist in isolation but are produced through inter-related processes" (Kuruppu & Willie 2015, p. 77). Interdependencies among the barriers to adaptation exist and since mainstreaming involves integrating development and adaptation processes and involves interactions among varying sectors, understanding these interdependencies (i.e., strength of associations and causal linkages) is crucial. Similarly, in-depth analysis of the circumstances surrounding the barriers is needed. These sets of information contribute to the assessment of how the barriers arise and continue to exist. Most importantly, they clarify how these barriers can be overcome and can be transformed into opportunities for adaptation (Burch 2010; Eisenack et al. 2014; Hamin et al. 2014; Klein et al. 2014). Essentially, more comprehensive knowledge concerning the nature of the barriers will help to more effectively mainstream CCA.

#### ***1.2.2.2 Methodology for assessing CCA mainstreaming***

The ability of planners, policy-makers, and other decision-makers to measure and examine effectively the complex processes involved in mainstreaming CCA, including the barriers to operationalisation, is constrained by the lack of methodologies to investigate how mainstreaming is applied in practice (Tang et al. 2009; Ayers et al. 2014). At times, the operationalisation of mainstreaming is delayed or hindered because of limited or no institutional preparation. To illustrate, practitioners in urban planning in the Rockhampton region in Australia believed:

...in the ability of existing urban planning practices and principles to accommodate and respond to climate change, but indicated that reforms in the governance of spatial modelling (i.e., the centralised generation and provision of data such as climate model information, together with user support for local councils) and a handbook for integration within risk management frameworks were required for mainstreaming (Fry & Williams 2013, p. 1).

This situation demonstrates that mainstreaming CCA goes beyond climate change issues. This is so because “[i]n practice, the pathway to mainstreaming is not linear. It is made up of a patchwork of processes, stakeholders and approaches that converge or co-exist” (Ayers et al. 2014, p. 302).

At present, handbooks and guidelines for the operationalisation of mainstreaming lack this perspective. For example, Daze et al. (2009), OECD (2009), USAID (2009) UNEP-UNDP (2011) and SPREP and UNDP (2013) all advocate for “applying the climate lens” to the on-ground application of mainstreaming. A climate lens is applied as the “first step in national, sector, local and project policy and programme planning” (Frankel-Reed et al. 2011, p. 1). Applying the climate lens entails examining each stage of policy, planning, or strategy formulation from a climate-risk perspective to ensure that climate change and sustainable development goals will be attained (Lebel et al. 2012; SPREP & UNDP 2013). Specifically, applying a climate lens involves analysing the degree to which (1) the policy, strategy, or plan may be vulnerable to climate change; (2) the climate change risks have been accounted for in formulating the policy, strategy, or plan; and (3) the policy, strategy or plan can exacerbate the impacts of climate change, thus resulting in maladaptation (i.e., increased vulnerability to climate change) (OECD 2009). As the term “climate lens” suggests, this step is focused on climate change concerns. However, mainstreaming CCA is a system of institutional changes that needs to consider the institutional transformations that mainstreaming CCA will need or create—a perspective that the current mainstreaming processes lack.

In addition, while most planners are aware and do acknowledge the need to act on climate change, they are uncertain about how to proceed (Hamin et al. 2014). Given that on-ground implementation of mainstreaming is not straightforward (Ayers et al. 2014); planners need a systematic methodology for analysing the institutional settings where CCA will be integrated. This is an important point especially since CCA is an “abstract concept” (Persson & Klein 2008, p. 13) that needs to be translated into a language that planners can understand. A possible course of action is to develop indicators to help planners assess mainstreaming situations, thus providing a solid basis for action in planning (Oates 2011). Some scholars



believe that metrics would help determine the state-of-play of the adaptation effort, evaluate and assess adaptation outcomes, and essentially measure adaptation progress and its effectiveness (Berrang-Ford et al. 2011; Mimura et al. 2014; Noble et al. 2014). Having mainstreaming indicators that can trace the “the extent to which targeted outcomes are occurring” would be most useful in both planning and policy-learning (Noble et al. 2014, p. 837).

Essentially, planning for the operationalisation of mainstreaming needs a methodology with an institutional perspective that can accommodate the non-linear nature of the approach. Thus, it calls for a methodology that can help planners to (1) investigate the existing institutional settings where CCA will be integrated; (2) monitor and assess the state-of-play of the mainstreaming process through quantitative measures; and (3) incorporate the barriers or challenges in mainstreaming CCA into the planning process.

### **1.3 Problem statement**

Developing countries such as the Philippines are encouraged to mainstream CCA into their land-use plans as a long-term strategy for addressing the effects of climate change. Although interest in mainstreaming CCA is growing, planners and decision-makers have little understanding of the practical aspects of the approach. There are knowledge gaps in terms of the workable application, operationalisation, monitoring, and assessment of mainstreaming initiatives, especially at the local scale. Consequently, there is a lack of information on the challenges encountered in operationalising the mainstreaming endeavour and on how to overcome these challenges.

### **1.4 Research questions and objectives**

Given the knowledge gaps outlined in the earlier discussion, this research addresses two questions:

- (1) How can mainstreaming climate change adaptation into local land-use planning be understood?
- (2) How can the challenges in the operationalisation of mainstreaming be overcome?

To answer these questions, this research analysed the challenges in integrating or “mainstreaming” CCA into local land-use planning in Albay, Philippines. It also determined how to identify, characterise, categorise, and assess these challenges in order to aid planners and decision-makers to overcome them effectively.

Accordingly, this research poses four objectives, namely:

*Objective 1: To explore the process of mainstreaming CCA, from its theoretical foundations to its operationalisation, with special interest in local land-use planning.*

This objective establishes (1) the need for research on mainstreaming CCA that specialises on local land-use planning; (2) why the research focuses on the challenges in operationalising the approach; and (3) what specific aspects of the mainstreaming challenges should be investigated intensively. This objective allows for a better understanding of the mainstreaming process, thereby setting the foundations for the significance of the research in the field of CCA.

*Objective 2: To determine the analytical framework and methodology that can (1) examine effectively the challenges in mainstreaming CCA into land-use planning; and (2) generate metrics that can be used by planners and decision-makers in addressing these challenges.*

This objective answers the call for a methodology and metrics for assessing the process of mainstreaming CCA, thereby indicating both scholarly and practical significance. This objective aims to improve the tool sets available for CCA planning, and decision- and policy-making.

*Objective 3: To analyse the state-of-play of and linkages between the challenges in mainstreaming CCA into land-use planning in Albay, Philippines, and how to overcome these challenges.*

This objective supports Objective 1 by providing empirical evidence to the theoretical aspects of mainstreaming CCA. Meanwhile, it also validates and verifies the effectiveness of the outputs of Objective 2. In effect, this objective integrates the various facets of the research. Most importantly, this objective addresses the primary knowledge gap in the field—the lack of practical application, operationalisation, monitoring, and assessment of mainstreaming initiatives—thus, it represents the core of the research.

*Objective 4: To generate a more refined understanding of the operationalisation of mainstreaming in local CCA.*

This objective is the synthesis of the first three objectives and determines the niche of the study within the realm of adaptation research, which is developing a mechanism to enable planners and policy-makers to operationalise local mainstreaming effectively.

## **1.5 Structure of thesis**

The research thesis is divided into three major parts, namely, the review of literature, the methodology, and the results and discussion (Box 1). The literature review (Chapter 2) answers the first objective and focuses on the mainstreaming approach, its varying definitions, types, benefits, and issues. Chapter 3 addresses the second objective, and presents the modified Institutional Analysis and Development (IAD) framework as applied to CCA mainstreaming research (IAD-CCA framework) and the mixed-methodology devised to investigate the local mainstreaming process and to examine its challenges. The methodology was applied in a case study, specifically, the mainstreaming of CCA into the local land-use planning in Albay, Philippines. The results chapters (Chapters 4 to 6) present the research outputs in relation to Objective 3. Chapter 4 presents the quantitative analysis (i.e., correlation analysis) made possible through the survey data generated using the mixed methodology (Chapter 3); in particular, it presents evidence on the degree of interconnections among the mainstreaming challenges. Chapter 5 introduces the mainstreaming challenges (i.e., factors that affect the effective operationalisation of mainstreaming CCA) and the mainstreaming indicators (i.e., metrics for mainstreaming evaluation and assessment). Chapter 6 provides in-depth qualitative analysis of the indicators highlighted in Chapter 5 (i.e., institutional capacity indicators). It revolves around the theme that developing the institutional capacities of local governments is crucial in the local mainstreaming process. Thus, aside from addressing Objective 3, this chapter contributes also to attaining Objective 4. Likewise, Chapter 7 addresses Objective 4 by further explaining the institutional dimension of CCA, and explores how institutional nestedness (i.e., hierarchical relationships of institutions) and the active participation of local governments can transform a challenge into an opportunity for mainstreaming. Chapter 8 concludes the research by synthesising the results and by discussing the contribution of the research. Lastly, the data collection tools, such as the survey questionnaire and the interview schedule, as well as the related publication entitled “An Analytical Framework for Investigating Complex Institutions in Climate Change Adaptation: The Institutional Environment Matrix”, are presented in the Appendix.

Box 1: Summary of dissertation chapters

**CHAPTER 1**

*Introduction*

**CHAPTER 2**

*Mainstreaming Climate Change Adaptation, A Review of Theory and Application*

- Introduces and explains the concept of mainstreaming CCA, and explores the issues and concerns in mainstreaming CCA to determine the gap between mainstreaming theory and application.

**CHAPTER 3**

*Methodology for Examining the Challenges in Mainstreaming Climate Change Adaptation*

- Argues that mainstreaming CCA necessitates both climate and institutional perspectives, and that examining the challenges in mainstreaming is a critical part of the mainstreaming process.
- Develops a mixed-methodology to examine mainstreaming challenges. This methodology was successfully applied in a case study in Albay, Philippines.

**CHAPTER 4**

*The Interconnected Nature of Challenges in Mainstreaming Climate Change Adaptation:  
Evidence from Local Land-Use Planning*

- Illustrates and measures the linkages between and among the mainstreaming challenges to understand better the relationships among the challenges, and thereby develop schemes to overcome these challenges.

**CHAPTER 5**

*Challenges in Mainstreaming Climate Change Adaptation into Local Land-Use Planning:  
Evidence from Albay, Philippines*

- Introduces the quantitative mainstreaming indicators used in the research that (1) measured the severity of the impacts of the challenges in mainstreaming CCA; and (2) explained the nature of the barriers and opportunities for mainstreaming CCA in Albay, Philippines.
- Presents the results/outputs that have the potential to help planners and decision-makers monitor the adaptation process and implementation, and also track the progress of adaptation efforts.

**CHAPTER 6**

*Institutional Capacity for Long-Term Climate Change Adaptation:  
Evidence from Land-Use Planning in Albay, Philippines*

- Assesses the state-of-play of the local mainstreaming process, explores the institutional dimension of mainstreaming CCA, and advocates for strengthening the institutional capacities of systems for a long-term adaptation to climate change.

**CHAPTER 7**

*Barriers and Opportunities in Mainstreaming Adaptation: A Critical Assessment*

- Determines the institutional roots from which barriers to mainstreaming CCA arise, and how the barriers potentially can be transformed into opportunities for mainstreaming.
- Explains how institutional nestedness and a polycentric type of governance influence the existence and persistence of barriers to CCA.

**CHAPTER 8**

*Conclusion, Policy Implications, and Future Research Possibilities*

- Synthesises the research findings and generates a more refined understanding of the operationalisation of mainstreaming CCA.

## **CHAPTER 2: MAINSTREAMING CLIMATE CHANGE ADAPTATION, A REVIEW OF THEORY AND APPLICATION**

### **2.1 Introduction**

In recent years, the strong linkages between development and the impacts of climate change have encouraged developing countries, which are considered most vulnerable to climate change, to apply an adaptation approach called “mainstreaming” (Ayers & Doman 2010; Field et al. 2014; IPCC 2014a). Mainstreaming climate change adaptation (CCA) is an approach that integrates climate change and adaptation concerns into a broader set of actions within the existing development planning, policy-making, and decision-making processes (OECD 2009; UNDP-UNEP 2011). For example, in the Philippines, climate change is integrated into the government processes and activities through the Climate Change Act of 2009. This law was supported by the Disaster Risk Reduction and Management Act of 2010, which decrees integrating not only climate change, but also disaster risk reduction (DRR) into the country’s national and local government policy-making processes, socioeconomic development planning and sectoral governance (i.e., environment, agriculture, water, energy, health, education, land-use and urban planning, etc.) (Republic of the Philippines 2009, 2010).

Similarly, Bangladesh accounted for the likely impacts of climate change in its National Perspective Plan 2010–2021, the primary plan responsible for growth and poverty alleviation in the country, and in its National Agricultural Policy (Planning Commission 2010; Ayers et al. 2014). India mainstreamed climate change through the Ministry of Urban Development’s National Mission for Sustainable Habitat Plan, which aimed to (1) re-orient urban planning to consider climate change; (2) develop capacity to respond to disaster; and (3) promote climate change awareness, among others (Sharma & Tomar 2010). Likewise, the Republic of Zambia incorporated climate change among the objectives and strategies listed in its Sixth National Development Plan, 2011–2015 (Republic of Zambia 2011). Ethiopia, on the other hand, formulated the Climate-Resilient Green Economy Strategy, which integrated both CCA and climate mitigation objectives into the five-year Growth and Transformation Plan for the country. This effort intended to “protect the country from the adverse effects of climate change and to build a green economy that will help realise its ambition of reaching middle income status before 2025” (Federal Democratic Republic of Ethiopia 2011). Clearly, mainstreaming CCA is advancing as an adaptation approach in several countries.

Amid the advocacy and interest in mainstreaming CCA, its practical on-ground application or operationalisation at the local scale remains very difficult to achieve (Huxtable & Yen 2009; Olhoff & Schaer 2010; Mimura et al. 2014). For example, the development of institutional frameworks for co-ordinating the array of adaptation initiatives involved in the approach is not keeping pace with the rapid progress in national and sub-national policies and strategies that initiate and promote the mainstreaming approach (Field et al. 2014). In theory, mainstreaming involves introducing new or modifying prevailing planning or decision-making processes, procedures, or practices (Lasco et al. 2009). The actual transition from mainstreaming planning to implementation lacks evidence and information (Olhoff & Schaer 2010; Schipper et al. 2010), and hence there is discord between mainstreaming theory and practice (Niang et al. 2014). As the key actors (i.e., planners and decision-makers) struggle to integrate adaptation into the existing development planning and policy domains (Uittenbroek et al. 2013; Noble et al. 2014), a key question persists: “What does mainstreaming look like in practice?” (Ayers et al. 2014, p. 293).

This chapter addresses the first objective, which is *to explore the process of mainstreaming CCA, from its theoretical foundations to its operationalisation, with special interest in local land-use planning*. In particular, this chapter analyses the mainstreaming process, and the gap between the theory and the operationalisation of mainstreaming. It has two main segments. The first section introduces mainstreaming of CCA; it defines and conceptualises the term, focuses on mainstreaming CCA as an institutional concern, and explains how mainstreaming CCA links to land-use planning. The second section focuses on the developments in the approach in relation to policy-making and planning, and its operationalisation.

## **2.2 Mainstreaming climate change adaptation – the theory**

This section presents the theoretical aspects of mainstreaming CCA, including how it is defined and some examples of how the approach can be operationalised. It also expounds on the institutional dimension of mainstreaming and introduces a crucial aspect of adaptation and sustainable development planning—mainstreaming CCA into local land-use planning.

### **2.2.1 Definitions and concepts**

Mainstreaming, as a concept, is not new and has been used in relation to education for handicapped children, gender issues, environment, disaster risk reduction, HIV/AIDS, and intercultural relations (Gupta & van der Grijp 2010; Olhoff & Schaer 2010). To illustrate, the

term mainstreaming became popular in the education field in the late 1970s, and was defined as integrating students with disabilities within general educational settings (Maheady et al. 2005; Sims & Voltz 2010). Gender mainstreaming, on the other hand, emerged in the mid-1990s following the Beijing Platform for Action during the United Nations (UN) Fourth World Conference on Women in 1995. Gender mainstreaming is the “process by which a gendered perspective (male and female) is integrated into the fabric of our communities, institutions, and lives” (Lyle-Gonga 2013, p. 209).

Thus, mainstreaming is a borrowed concept from other fields, and it is similarly applied under the context of “integration” of CCA (Agrawala 2006; Persson & Klein 2008; Ayers & Dodman 2010; Biesbroek et al. 2010; Chuku 2010; Olhoff & Schaer 2010; UNDP-UNEP 2011; Uittenbroek et al. 2013; Ayers et al. 2014; Giupponi 2014). It is associated with the terms “inclusion,” “consideration,” and “accounting for” climate change and adaptation in development decision-making (Huxtable & Nguyen 2009; Lasco et al. 2009; Pasquini et al. 2013). Thus, mainstreaming CCA is the process of integrating climate change and adaptation into development planning, programs, projects, policies, and goals, as well as sectoral decision-making, policy-making, budgeting, implementation and monitoring practices and processes (i.e., poverty reduction, livelihood security, water, environment, agriculture, land-use, etc.) (Agrawala 2006; USAID 2009; UNDP-UNEP 2011; Carlson 2012; Ogato 2013).

Mainstreaming CCA is founded on the notion that achieving sustainable development is difficult and cannot be achieved without considering climate change impacts. Likewise, effective climate adaptation is unlikely to happen without accounting for existing and future development actions (Olhoff & Schaer 2010; Schipper et al. 2010). Thus, in mainstreaming, the focus of both CCA and development planning shifts; the path or direction of one is considered in the other and vice versa. Essentially, mainstreaming is the synergy of climate change and sustainable development goals and agendas (Ayers & Doman 2010; Field et al. 2014; IPCC 2014a).

The growing popularity of mainstreaming stems from the notion that sustainable development and CCA are mutually dependent strategies (Ayers et al. 2014; Noble et al. 2014) that can be beneficial to each other. Likewise, when not attuned, each can be detrimental to the other (Klein et al. 2005; IPCC 2007). For example, the observed glacier retreat in Nepal has been attributed to climate change, with the expected risk of glacial lake outburst flooding in the area. This scenario highlights that if climate risks are not considered comprehensively in the country’s development planning (i.e., hydropower system design or rural development programs), then the nation’s development goals may not be attained under

future conditions (Agrawala & van Aalst 2006). In Ethiopia, future rainfall variability is associated with a high degree of uncertainty. Still, the current higher temperatures and changes in rainfall patterns are expected to influence water availability in the African river basins. Such probable climate risk needs to be integrated into the country's water management and planning to ensure sufficient and safe future water supplies (Conway & Schipper 2011; Oates et al. 2011; Ogato 2013). Water stress is also possible in Egypt where higher temperatures and rainfall pattern changes are likely to affect the Nile River. The climate threat is deeply interwoven in Egypt's economy as 95% of its freshwater needs for household and agricultural use is sourced from the river (Risbey et al. 2006).

Similarly, present development activities may obstruct future adaptation efforts or raise the vulnerability of people and communities if development and adaptation endeavours are not harmonised. For example, clearing of mangroves for commercial purposes or for human settlement can create irreversible consequences in areas likely to be subjected to climate change (OECD 2006). Such resources have been instrumental in minimising the impacts of climate change (i.e., intensified typhoons) in certain areas of the world. For example, the communities in some small islands in the Philippines survived during the most powerful typhoon in recent history, Typhoon Yolanda (international name: Typhoon Haiyan), because of the mangroves in the areas which acted as barriers to the threatening storm surges (Chatterjee 2013; David et al. 2013; Holtz 2013; NASA 2013). Hence, while CCA and development historically have been administered in separate fields, the needs under present and future climate conditions necessitate that they be addressed within a single domain; thus, the need for the mainstreaming approach (Ayers et al. 2014).

### **2.2.2 Mainstreaming climate change adaptation and institutional linkages**

This section establishes the linkages between CCA and institutions, in general, and mainstreaming CCA and institutions, in particular. Fundamentally, it explains why mainstreaming operationalisation needs an institutional perspective.

In dealing with climate change, it is crucial to understand that climate change is a “wicked” problem (FitzGibbon & Mensah 2012; Termeer et al. 2013; Head 2014; Perry 2015). The concept of wicked problems originated from the work of Rittel and Weber (1973) who coined the term to describe social and policy planning problems. They used the term wicked in “a meaning akin to that is malignant (in contrast to benign) or vicious (like a circle) or tricky (like a leprechaun) or aggressive (like a lion, in contrast to the docility of a lamb)” (Rittel & Weber 1973, p. 60). Wicked problems are difficult to address because they are



unsolvable; “at best they are only re-solved-over and over again” (Rittel & Weber 1973, p. 60). Climate change, as a wicked problem, is ambiguous (i.e., defined in varying ways), open ended (i.e., challenging to delineate the boundaries of its effect), unpredictable and intractable (i.e., addressing one generally results to unintended generation of new sets of wicked problems), and multifaceted (i.e., caused by multiple factors from multiple sources) (FitzGibbon & Mensah 2012; Termeer 2013; Head & Alford 2015). Accordingly, CCA has been referred to as a “wicked problem par excellence” (Termeer et al. 2013, p. 27).

Linking CCA with wicked problems expresses the complexity involved in the adaptation process. As such, the traditional methodologies (i.e. scientific and technical) and the available tools in policy analysis are ill-equipped to address CCA issues and concerns. This is so because CCA involves multi-level interventions spanning across households, communities, governments, NGOs, industries, and different sectors at several scales (from local to regional, national and international). Likewise, it warrants changes or adjustments in behaviours and value systems (Pettengell 2010; Berrang-Ford et al. 2011; Hamin et al. 2014; Perry 2015). Thus, as a wicked problem, CCA necessitates interdisciplinary approaches, interactive communication and governance strategies, and integration of varying knowledge systems (Ludwig 2001; FitzGibbon & Mensah 2012). Most importantly, CCA needs to be addressed through institutional means and perspective (Jentoft & Chuenpagdee 2009; Rodima-Taylor et al. 2011; Perry 2015).

The institutional dimension of climate change is critical in adaptation, especially in mainstreaming (OECD 2006; Agrawala & van Aalst 2006; UNDP-UNEP 2011). The whole concept of mainstreaming (i.e., synergy of climate change and sustainable development goals and agenda; and designing new or redesigning existing planning, policy-making, and decision-making structures) is an institutional concern (Young 2002; Ayers & Doman 2010; Field et al. 2014; IPCC 2014a, 2014b) that entails:

- (1) multilevel institutional coordination between different political and administrative levels in society;
- (2) key actors, advocates, and champions initiating, mainstreaming, and sustaining momentum for climate adaptation;
- (3) horizontal interplay between sectors, actors, and policies operating at similar administrative levels;
- (4) political dimensions in planning and implementation; and
- (5) coordination between formal governmental, administrative agencies, and private sectors and stakeholders to increase efficiency, representation, and support for climate adaptation measures (Mimura et al. 2014, p. 871).

The institutional changes created by mainstreaming CCA will affect some areas of reality that are already exposed to existing institutions, which prompts the need to understand

the environment where these institutional changes (e.g., creation of new policies or amendments in prevailing regulations) are to be implemented (Theesfeld et al. 2010). This insight is consistent with the growing realisation of the significance of institutions in CCA research (Adger et al. 2005; Inderberg & Eikeland 2009; Rodima-Taylor 2012). However, the institutional dimension of CCA is the least understood aspect of the challenge (Evans & Stevens 2009; Rodima-Taylor 2012; Rodima-Taylor et al. 2012; Pradhan et al. 2012).

This lack of understanding may be due to the complexity of an institutional analysis; it involves complicated concepts such as institutional arrangements and institutional interplays. Institutional arrangements are the specific guidelines designed to facilitate social interactions. They are the sets of rules or agreements that govern the activities of people and guide individual behaviours toward collective actions (Klein 2000). Meanwhile, institutional interplays are the interactions among institutions that build institutional relationships (Young 2002). Institutional interplays (1) are determined by the impact of one institution on another; (2) are multi-directional and involve functional interdependencies; and (3) include mutual influences or effects among institutions (Young 2002; Linner 2006). This suggests that institutional interplay is an institutional linkage that can result from institutional integration. In this sense, institutional interplay has a significant role in mainstreaming—which is essentially integrating CCA concerns into existing and functioning institutional settings (La Trobe & Davis 2005; Lebel et al. 2012).

Institutional analysis is significant in adaptation, but it is a key component in mainstreaming CCA. As such, the concept of institutions in the context of CCA must be examined. It is difficult to form strategies and actions to solve a problem if significant factors involved in the process are not defined clearly (Forsyth 2012). Having an inconsistent idea of what constitutes an institution may result in conceptual confusion. Consequently, this may make those problems involving complex institutions difficult to understand and address, especially in adaptation planning (Morrison 2006).

As mentioned earlier, adaptation involves multi-scale interventions that span households and communities, involve national and international dimensions, and encompass complex adjustments in behaviour and actions at all levels of society (Pettengell 2010; Berrang-Ford et al. 2011; Perry 2015). Moreover, climate change is a wicked problem (Lazarus 2010; FitzGibbon & Mensah 2012; Termeer et al. 2013; Head 2014; Perry 2015), hence, is a “cross-boundary, multilevel, multi-sectoral and multi-actor challenge” (Fröhlich & Knieling 2013, p. 21). Therefore, institutions under the climate change context:

...should have a synthesis of definition that has cross-disciplinary relevance. Therefore, institutions are the commonly known and acknowledged rules, social structures, and organisations founded on common belief systems that transform individual acts and expectations into collective actions, convert personal values into social norms and shared beliefs, and define the formal and informal behavioral systems of human existence. Rules, social structures, and organisations are all institutions (Cuevas et al. 2014, p. 2).

This chapter therefore argues that the mainstreaming process necessitates institutional analysis—a complicated process that needs to examine institutional arrangements and institutional interplays (Jordan & O’Riordan 1997; O’Riordan & Jordan 1999; Young 2002).

### **2.2.3 Sectoral mainstreaming: land-use planning**

Mainstreaming CCA across sectors is crucial in adaptation and sustainable development planning (Dovers & Hezri 2010). Sustainable development is affected by performances of the varying sectors, and these sectors are impacted by climate change (Ayers et al. 2014; Noble et al. 2014). Moreover, vulnerable people (i.e., poor) rely heavily on climate-sensitive sectors such as agriculture and fishery; thus, addressing the effects of climate change in these sectors becomes a priority (Huxtable & Yen 2009). Attending to the vulnerability of a sector to climate change is an effective way of improving the adaptive capacity of a system, which would reduce the risk of that system to climate change (Table 1) (USAID 2009; Cuevas 2011).

Mainstreaming CCA into land-use planning is one of the most important long term adaptation measures to respond to climate change. This is because land-use planning reflects the (1) rational allocation of space (Jordhal, Jr. 1984; Stewart et al. 2004); (2) the systematic assessment of land-use (FAO 1993); (3) community consensus on debated issues about development and infrastructure, etc. (Kaiser & Godschalk 1995); and (4) management of urban growth and change (Burby et al. 2000; Godschalk 2004; HLURB 2006). Consequently, scholars have explored the linkages between land-use planning and a wide variety of concerns, including ecology, wildlife and conservation, natural resources, welfare economics, transport, disaster and hazards, sustainable development, and lately, CCA (Cheshire & Sheppard 2002; Marshall & Banister 2008; Kaswamila & Songorwa 2009; Tang et al. 2009; Wang 2012; Silberstein & Maser 2013; Gottlieb 2014; Schmitz et al. 2015).

Table 1 Examples of mainstreaming by sector

<b>Sector</b>	<b>Description</b>
<i>Land-use planning</i>	Expanding the planning horizons of land-use plans to incorporate longer climate predictions Planning development according to the medium- to long-term risks posed by climate change on varying geographical zones (i.e., coastal areas vulnerable to sea level rise and storm surges) Revising regulations and standards to reflect climate variability (e.g., areas available for human settlements)
<i>Infrastructure</i>	Introducing disaster risk and climate change assessments in the construction of new roads, bridges, and other major infrastructures for an informed decision-making (i.e., infrastructure designs, materials used, construction techniques, etc.) Using hazard maps, climate forecasts, and other climate-related data to avoid building new infrastructure in areas at high risk of forest fires, flooding, or storm surges Considering climate change projections in designing sewage systems, drains, and storm water systems, etc.
<i>Agriculture</i>	Incorporating climate change adaptation in farming practices, irrigation system designs, community development plans and projects, etc.
<i>Education</i>	Promoting hazard-resilient construction for new and existing schools Incorporating effects of climate change on access to sanitation and safe water in designing schools and in planning for school programs
<i>Water</i>	Including climate forecasts, water resource assessments, and current natural hazard profiles in the designs of new programs (i.e., water safety planning)

Sources: OECD 2009; USAID 2009; AusAID 2010; UNDP-UNEP 2011

Over time, land-use planning concerns and processes have evolved based on society's changing needs and capacities. For instance, land-use planning in the late 20th century has been concerned with synthesising ecological conservation and economic development (van Lier 1998). Likewise, the planning process has progressed from "simple roots in civic design and zoning into an intricate combination of design, policy, and management" (Kaiser & Godschalk 1995, p. 365). On the other hand, land-use planning in the 21st century leans toward achieving sustainable development and addressing climate change (Godschalk 2004; IPCC 2014a), while the planning process has advanced to programming land-use models, utilisation of geographic information systems, and cross-scale and inter-sectoral evaluation and assessments (Dai et al. 2001; Stewart et al. 2004; Verburg et al. 2004). Land-use planning is expected to change further as advancements and practices in CCA planning are incorporated into the (planning) process.

However, integrating these two planning processes is complicated. Land-use and climate change have an intricate relationship that emerges from the impacts of climate change on both the supply of and demand for land (Koomen et al. 2008; Tang et al. 2009). To illustrate, future climate conditions can include accelerated sea level rise, intensified rainfall,

greater extreme temperatures, increased droughts and floods associated with El Nino events, and stronger cyclones and typhoons. The increased quantity of rainfall is projected to raise the incidence of floods, landslides, avalanches, and mudslides and aggravate soil erosion. In turn, the higher incidence of drought and flood are predicted to lessen the agricultural and rangeland productivity in prone regions; whereas the intensified storms will likely increase disaster events and damage to life and infrastructure. Meanwhile, the accelerated sea level rise is expected to inundate low-lying lands, cause greater coastal erosion, aggravate shoreline recession, decrease the number of coastal wetlands, and worsen coastal flooding and submergence of coastal lands (IPCC 2001, 2007, 2014a, 2014b; Ward 2011).

These climate change-related incidents will affect land-uses and will put pressure on decision-makers to address land-use changes. As climate change alters the physical characteristics of land, it will affect land productivity and the land's suitability for certain types of uses (Koomen et al. 2008). Given that land is a limited resource, its supply for certain land-uses (i.e., agriculture, forestry, etc.) will be impacted (Quan & Dyer 2008). Similarly, demand for land will change. For example, good grazing grounds during extreme droughts will be needed; safe shelters (i.e., emergency, transitional and permanent) during disasters caused by intensified typhoons, hurricanes or storms will be required; and new settlement areas will be demanded as people are forced to leave their homes due to varying kinds of climate-related circumstances (i.e., water shortage, flooding) (Orindi & Eriksen 2005; Freudenberger & Miller 2010; UN-HABITAT 2010).

Likewise, the implementation of adaptation measures can affect the supply of and demand for land because "future development options may be confined, and new spatial conflicts, e.g., between risk prevention and land-use interests, may emerge" (Putz et al. 2011, p. 4). For instance, maintaining mangroves as barriers to storm surges during typhoons or expanding risk-zone areas in anticipation of future hazards and disasters will lessen the available land for commercial purposes or for human settlements. Similarly, changing farming practices in rain-fed farms to adapt to extended drought may create a higher demand for irrigated lands (Freudenberger & Miller 2010; Putz et al. 2011).

Clearly, climate change and land-use linkages are complex. On one hand, the physical impacts of climate change on land influence the use, productivity, and access to land. On the other hand, the adaptive interventions also have a variety of implications for land-use (Quan & Dyer 2008). This complexity magnifies the significance of integrating the two planning dimensions (i.e., CCA and land-use) and the urgency of applying "climate conscious" planning (Lindley et al. 2006, p. 545).

Land-use planning can be applied at the national level where planning is concerned with (1) balancing the demand and supply of land among the varying economic sectors; (2) allocating resources for development; (3) coordinating national agencies for land-use; and (4) institutionalising national legislation for land tenure and resource rights (i.e., water, forest). On the other hand, the local level is where planning is focused on the actual use of land in specific areas. It is concerned with who can use the land, and what uses are permissible where and when (FAO 1993). Local land-use planning encompasses the entire planning area of the local jurisdiction, and thus it is crucial for local land management and local development (Tang et al. 2009). Meanwhile, “adapting to climate change is, in many ways, a local issue” (Hamin & Gurran 2014, p. 1), because it is at this level where the direct impacts of climate change are experienced (Sharma & Tomar 2010). Likewise, vulnerabilities and adaptive capacities of systems are founded by local conditions thereby substantiating the notion that adaptation is most effective at the local level (OECD 2009).

Accordingly, mainstreaming CCA into the local land-use planning is an effective means by which to address climate change, and is the response that establishes long-term adaptation action (Pasquini & Shearing 2014; Picketts et al. 2014; Rauken et al. 2015). This is because local land-use planning is the “constitution for future development” (Tang et al. 2009, p. 368), and mainstreaming CCA into local land-use plans enhances the capability of communities to address the present and expected climate change risks, and to respond to and recover from climate change impacts (IPCC 2014a). This approach, therefore, sets the foundation of future development that is sustainable under current, foreseen, and uncertain climate conditions.

## **2.4 Developments in mainstreaming climate change adaptation**

The preceding discussion presented the mainstreaming approach and the key ideas surrounding the concept. This section outlines how mainstreaming gained popularity as a CCA approach. First, it traces the events that led to the policies that support mainstreaming of CCA. Second, it illustrates the conditions in relation to planning and last, it describes the methodologies and approaches surrounding the operationalisation of mainstreaming.

### **2.4.1 Mainstreaming in policy-making**

This section examines the last three Intergovernmental Panel on Climate Change (IPCC) Working Group II’s Assessment Reports (AR) (i.e., 3<sup>rd</sup> in 2001, 4<sup>th</sup> in 2007, and 5<sup>th</sup> in 2014) to determine how mainstreaming CCA has developed over the years as a topic in

adaptation research. First, the number of times the term “mainstream” or “mainstreaming” CCA appeared in the reports was collated (Figure 1). The term was not mentioned in the IPCC AR3; mainstreaming first materialised in AR4 where it was formally defined in Chapters 14 and 17 as:

... the integration of policies and measures that address climate change into development planning and ongoing sectoral decision-making (Klein et al. 2007, p. 768 [Chapter 14]).

... the integration of climate change vulnerabilities or adaptation into some aspect of related government policy such as water management, disaster preparedness and emergency planning or land-use planning (Adger et al. 2007, p. 732 [Chapter 17]).

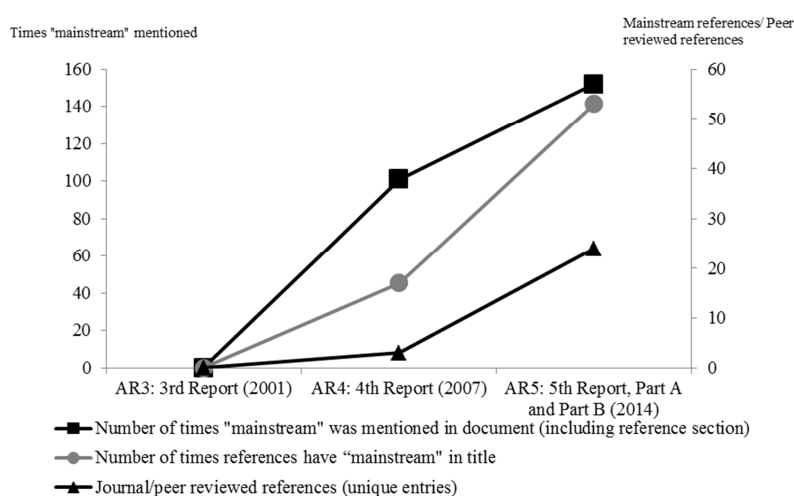


Figure 1 Visibility of “mainstreaming” in IPCC Assessment Reports (2001-2014)

Sources: IPCC 2001, 2007, 2014a, 2014b

Thus, the initial attention given by the IPCC AR4 to mainstreaming CCA influenced the interest of scholars on the approach (Dovers & Hezri 2010; Noble et al. 2014). In 2014, mainstreaming has become more pronounced in IPCC AR5. In this report, mainstreaming discussions have gone beyond the conceptualisation of the term into reporting its actual application. For example, in the Technical Summary chapter, Field et al. (2014) stated that:

In Asia, adaptation is being facilitated in some areas through mainstreaming climate adaptation action into subnational development planning, early warning systems, integrated water resources management, agroforestry, and coastal reforestation of mangroves (p. 51).

Similarly, Wong et al. (2014) mentioned in Chapter 5 that:

In Japan, coastal climate change adaptation has been mainstreamed into the framework of Coastal Disaster Management in the aftermath of the 2011 Tohoku Earthquake Tsunami (p. 390).

The number of times that the term “mainstream” or “mainstreaming” was incorporated into the title of references used in the IPCC AR4 and AR5 was also examined. Based on the frequency of the unique entries of such references in the reports (i.e., peer reviewed papers), it was concluded that the literature which focused on mainstreaming CCA is increasing (Figure 1).

The rising popularity of mainstreaming CCA is influenced largely by international funding mechanisms supporting the adaptation approach<sup>1</sup> (Measham et al. 2011; Lal et al. 2012). For example, the Least Developed Countries Fund, established under the United Nations Framework Convention on Climate Change, provides financial support to the formulation and implementation of the National Adaptation Programs of Action (NAPA) (Biagini & Dobardzic 2011). NAPAs are the means for least developed countries to convey their most pressing adaptation needs; they are also the foundations from which least developed countries build their National Adaptation Plans (NAPs) (Kissinger & Namgyel 2014; Mimura 2014). Whereas the NAPA identifies the country’s short-term and urgent adaptation actions, the NAP determines its medium- and long-term adaptation needs and outlines the strategies and schemes to address these needs (Noble et al. 2014). Thus, in these countries, CCA has been embedded in the development framework through the NAPAs and NAPs (Mimura et al. 2014). Specifically, concerns related to the adaptation approach include (1) ensuring CCA is mainstreamed effectively into national development; (2) mainstreaming adaptation across core development sectors; (3) using the Least Developed Countries Fund to finance CCA mainstreaming efforts; (4) recognising the barriers to mainstreaming adaptation; and (5) using mainstreaming to transform the planning processes and the promote long-term resilience (Huq et al. 2004; Biagini & Dobardzic 2011; LDC Expert Group 2012).

Advancement in mainstreaming CCA is likewise shaped by the advocacy of the donor, bilateral, and multilateral agencies (Agrawala 2006; Olhoff & C. Schaer 2010; Lal et al. 2012). International funding agencies are concerned with (1) the impacts of climate change on the operationalisation of the agencies’ respective projects and investments; and (2)

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<sup>1</sup> e.g. Least Developed Countries Fund, Special Climate Change Fund, Multi-donor Trust Fund on Climate Change, Pilot Programme for Climate Resilience under the Climate Investment Fund, Global Environment Facility Trust Fund, and the Adaptation Fund



the climate risks in the countries' own development efforts. Hence, these agencies “push” for the mainstreaming approach. Within this context, these organisational institutions are climate-proofing<sup>2</sup> their investments and making these investments relevant under future climate conditions (ADB 2005; van Aalst & Agrawala 2006; Ayers et al. 2014).

In 2006, the Organization for Economic Co-operation and Development (OECD) released the Declaration on Integrating Climate Change Adaptation into Development Cooperation. In this proclamation, OECD member countries and members of the European community agreed to “work to better integrate climate change adaptation in development planning and assistance, both within their own governments and in activities undertaken with partner countries” (OECD 2006, p. 6). The declaration was institutionalised in view of “helping vulnerable countries anticipate and adapt to the risks posed by climate variability and climate change,” thereby assisting these countries achieve their development goals (OECD 2006, p. 5). Following the declaration, the OECD published the Policy Guidance on Integrating Climate Change Adaptation into Development Co-operation, a document identifying strategies and approaches for mainstreaming CCA into development policies at the national, sectoral, and project levels (OECD 2009; Olhoff & Schaer 2010; Uittenbroek et al. 2013). Similarly, other international and development organisations such as the Asian Development Bank, the World Bank, and the United Nations agencies (i.e., UNEP, UNDP) have been interested in mainstreaming CCA and have developed tools and guidelines to promote the approach (Agrawala 2006; Agrawala & van Aalst 2006; Ayers & Dodman 2010; Lal et al. 2012). These handbooks and related documents provide generic guidance for mainstreaming at the national, sectoral, programme and project levels.

#### **2.4.2 Mainstreaming in planning**

Mainstreaming CCA is a multi-scale endeavour. In general, mainstreaming in development plans begins at the national scale where the general framework, within which sectoral and other sub-national levels operate, is presented. At this scale, national policy goals, long-term visions, and development strategies are outlined (Lebel et al. 2012). For example, the Twelfth Five Year Plan (2012–2017) of India mainstreamed CCA through the vulnerability assessments it required from the various sectors of the plan (Planning Commission 2013). Likewise, the National Sustainable Development Strategy 2010–2021 of Bangladesh moved from the traditional planning and budgeting practices to more strategic

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<sup>2</sup> Ensuring climate risks are reduced to acceptable levels through changes implemented in varying stages of a project or planning cycle.

ones by including the environment and climate change issues in the process (Planning Commission 2010). The Bangladesh Climate Change Strategy and Action Plan 2009 also specified mainstreaming climate change into the sectoral and spatial development planning of government ministries and local governments in order to protect vulnerable groups from the impacts of climate change (MoEF 2009).

Meanwhile, the Philippine Development Plan 2011–2016 listed mainstreaming of CCA and disaster risk reduction and management (DRRM) into the “existing policies (i.e., land-use, building code), plans (i.e., comprehensive land-use plan) and programs (i.e., researches, school curricula)” among the plan’s priority short-term activities (NDRRMC 2011, p. 15). Similarly, the Philippine National Climate Change Action Plan 2011–2028 outlined the mainstreaming of CCA and DRRM into local plans as a strategy to attain human security, along with climate-proofing energy systems and infrastructures to achieve sustainable energy. The plan also sets climate change adaptive housing and land-use development as target outputs under the climate-smart industries and services agenda (CCC 2011).

While the national plans establish the general direction of mainstreaming CCA, the sectoral level and the local scale plans carry out the specific mainstreaming actions (Lebel et al. 2012). However, as a relatively new approach, there is still little understanding of what mainstreaming requires in practice. Consequently, operationalisation of mainstreaming has been slow, and in some cases, has not been implemented effectively (Uittenbroek et al. 2013; Revi et al. 2014; Lehmann et al. 2015). For example, “progress in mainstreaming adaptation in some of the vulnerable sectors in India is still negligible (Nambi & Prabhakar 2011, p. 444) because of the barriers to adaptation encountered in its on-ground application. Likewise, mainstreaming in Bangladesh faced challenges that caused delays in its operationalisation, such as “inadequate coordination mechanisms among various ministries and line agencies, limited coordination capacity of the Ministry of Environment and Forests (MOEF) and other implementing agencies, losses of institutional memory in relevant agencies and ‘brain drain’ of trained officials” (Ayers et al. 2014, p. 302). Meanwhile, local planners in the Philippines found it difficult to mainstream CCA due to the lack of “formally issued implementing policy that would outline a clear methodology, procedure and standards on the integration of CCA and DRRM into local plans” (Mercado 2011, p. 7). Accordingly, local government units in the country clamoured for the completion of the Reference Manual on Mainstreaming Disaster Risk Reduction/Climate Change Adaptation in the Comprehensive Land-use Plans to

help local planners (RDC XII 2012).<sup>3</sup> Similar challenges and delays were experienced by countries such as Vietnam, Thailand, and Bhutan (Lhendup 2012; Sinh & Toan 2012; Chinvanno & Kerdsuk 2013). Thus, in practice, the operationalisation of mainstreaming has not advanced as fast as its conceptualisation due to the barriers or challenges that affect the mainstreaming process (Huq & Ayer 2008; Lal et al. 2012; Uittenbroek et al. 2013; Ayers et al., 2014; Revi et al. 2014; Lehmann et al. 2015; Rauken et al. 2015).

The subject of barriers to adaptation is a pressing theme in adaptation research, not only in mainstreaming. The term “barriers”, as used in the literature, has been referred to as challenges (Mitchell et al. 2006; Burch 2010; Pervin et al. 2013), constraints (Moser et al. 2008; Amundsen et al. 2010; Pasquini et al. 2013; Dang et al. 2014), or limitations (Measham et al. 2011; Oberlack & Eisenack 2014; Picketts et al. 2014). Ekstrom et al. (2011, p. 1) defined barriers as the “obstacles that delay, divert, or temporarily block the adaptation process.” Early works on the subject focused on identifying these barriers. Research interest, however, has transcended into (1) knowing the nature of the barriers; (2) determining how the barriers are classified; and (3) understanding how the barriers exist and persist (Amundsen et al. 2010; Farrell 2010; Moser & Ekstrom 2010; Roberts 2010; Sharma & Tomar 2010; Ekstrom et al. 2011). The current knowledge quest has extended to (1) defining the conditions and circumstance surrounding the barriers; (2) evaluating the impacts of the barriers to the adaptation process; and (3) resolving how to overcome the barriers (Burch 2010; Biesbroek et al. 2011; Eisenack et al. 2014; Klein et al. 2014).

The barriers to adaptation have been investigated widely (Amundsen et al. 2010; Burch 2010; Moser & Ekstrom 2010; Ekstrom et al. 2011; Eisenack et al. 2014; Waters et al. 2014), but research on the barriers to mainstreaming CCA is limited in comparison (Biesbroek et al. 2011; Nambi & Prabhakar 2011; Chevallier 2012; Pasquini et al. 2013; Lehmann et al. 2015). With the rapid advancement of mainstreaming CCA into the national planning and policy-making processes of developing countries, there is an immediate need to understand the barriers impeding its effective application on-ground, and to determine how to overcome these barriers.

### **2.4.3 Operationalising mainstreaming of climate change adaptation**

This section analyses the practical implementation of mainstreaming as evidenced by handbooks and guidelines. Specifically, it discusses the information gathered from around 30

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<sup>3</sup> The Housing and Land-use Regulatory Board released the “Supplemental Guidelines on Mainstreaming Climate and Disaster Risks in the Comprehensive Land-use Plan” in early 2014.

handbooks, guidelines, or mainstreaming documents, published between the years of the IPCC AR4 (2007) and AR5 (2014a, 2014b) releases. These documents were identified through a web search using the key words “handbook,” “guide,” “guidelines,” and “mainstreaming climate change adaptation.” This analysis confirmed the findings of Olhoff and Schaer (2010) that these documents typically presented generic guides, ideas, or conceptual frameworks on how to operationalise mainstreaming. This is because the “development of operational measures on integrating adaptation considerations within development activities is still at an early stage” (Gigli & Agrawala 2007, p. 10).

In the context of planning, one of the main problems in mainstreaming stems from the uncertainty about how to proceed with the approach (Hamin et al. 2014). Even with frameworks to follow, planners find it difficult to apply the approach in practice because of the challenges they encounter during the mainstreaming process (Ayers et al. 2014). Consequently, the majority of mainstreaming studies cites the barriers or challenges in mainstreaming CCA, rather than report on successful mainstreaming actions (Sharma & Tomar 2010; Nambi & Prabhakar 2011; Pasquini et al. 2013; Ayers, et al. 2014; Uittenbroek et al. 2014).

A few mainstreaming documents have offered detailed procedures on how to operationalise the approach, and an important concept they have introduced is the mainstreaming “entry point” (i.e., opportunity for mainstreaming) (Huxtable & Yen 2009; OECD 2009; Olhoff & Schaer 2010; UNDP-UNEP 2011; SPREP & UNDP 2013). An entry point can be through either (1) the level, scale, or scope of governance; or (2) the decision-making cycle. The former speaks of assessing climate-development linkages, raising awareness and building partnerships, and evaluating adaptation and capacity needs. Entry points at the national or regional scale include poverty reduction strategy papers, national development plans, national budget allocation processes, NAPA, etc., while the sectoral-level entry points can be through the fishery, water management, land-use, or education sectors. Finally, entry points at the sub-national levels can involve decentralisation policies, district plans, sub-national budgets (activity-specific) or municipalities, districts, provinces, ecosystems, watersheds, etc. (place-specific) (USAID 2009; UNDP-UNEP 2011).

The second perspective—via the decision-making cycle—considers entry points to be opportunities for identifying, implementing, or incorporating measures that support CCA into a given plan, policy, or project (OECD 2009; Olhoff & Schaer 2010). This outlook links the mainstreaming approach to the concept of a “climate lens” (USAID 2009; Hammil & Tanner 2011). Applying a climate lens entails analysing the (1) degree by which the policy, strategy,

or plan may be vulnerable to climate change; (2) degree by which the climate change risks have been accounted in formulating the policy, strategy, or plan; and (3) degree by which the policy, strategy or plan can exacerbate the impacts of climate change, thus, result to maladaptation (i.e., increased vulnerability to climate change) (OECD 2009).

In particular, applying the climate lens speaks of “an analytical tool to examine a strategy, policy, plan, programme or regulation” (OECD 2009, p.17). However, the climate lens is a recent concept (USAID 2009). Its mechanism has not yet been established, such that the OECD (2009) suggested the use of the Strategic Environmental Assessment (SEA) for the task. SEA refers to a variety of “analytical and participatory approaches that aim to integrate environmental considerations into policies, plans and programs” (OECD 2009, p. 185). Although the SEA is effective in integrating environmental concerns into the policy and planning processes to achieve sustainable development, it is limited in addressing climate change concerns (Gigli & Agrawala 2007). Climate change is a “wicked problem,” thus it is a complex concept surrounded by multiple linkages and high levels of uncertainty (Lazarus 2010; FitzGibbon & Mensah 2012; Termeer et al. 2013). This “wickedness” translates to CCA; hence, CCA is a concern “generated by multiple factors from multiple sources” where causal linkages are difficult to define (FitzGibbon & Mensah, 2012, p. 2). Accordingly, current planning practices and techniques need to respond to the challenges associated with climate change (Hamin & Gurran 2014).

A methodology that specifically addresses climate change is the Climate Vulnerability and Capacity Analysis (CVCA). This methodology is recommended by CARE International for applying the climate lens, and has been used to understand how climate change will impact communities (i.e., hazards, vulnerability, and adaptive capacities) (Daze et al. 2009). Because CVCA focuses on community-based adaptation, the methodology links climate and institutional issues in the analytical process. This is an important facet of the methodology because, as argued earlier, mainstreaming CCA is operationalised in an institutional setting. Still, CVCA cannot address the difficulties in the operationalisation of mainstreaming because it lacks focus on a crucial aspect of adaptation—the barriers or challenges to adaptation (Amundsen et al. 2010; Eisenack et al. 2014; Oberlack & Eisenack 2014).

The Community-Based Risk Screening Tool–Adaptation and Livelihoods (CRiSTAL) addresses this limitation. CRiSTAL is a software tool that assists local communities and project planners evaluate climate risks in planned and on-going development projects (Gigli and Agrawala 2007). CRiSTAL, advocated by the International Institute for Sustainable Development for applying the climate lens, acknowledges the significance of identifying the

barriers and opportunities for the implementation of an adaptation project (IISD 2012). However, the tool does not answer important questions about barriers to adaptation, such as (1) What is the nature of the barrier? (2) How do the barriers exist and persist? (3) What are the conditions and circumstance surrounding the barriers? (4) How can researchers assess the impacts of the barriers on the adaptation process? and (5) How can the barriers be overcome? (Burch 2010; Biesbroek et al. 2011; Clar et al. 2013; Eisenack et al. 2014). Therefore, the tool is limited in addressing the barrier concern.

Other tools for integrating climate change concerns into projects and plans show similar shortcomings. The Assessment and Design for Adaptation to Climate Change—A Prototype Tool (ADAPT) of the World Bank is primarily a risk-screening tool. Similarly, the Opportunities and Risks from Climate Change and Disasters of the UK Department for International Development concentrates on identifying activities at high risk to climate change and on determining those that provide opportunities for vulnerability and risk reduction (Gigli & Agrawala 2007). These tools focus on the climate change-related aspect of adaptation and overlook the institutional facet of, as well as the barriers to, adaptation.

## **2.6 Summary and conclusions**

Mainstreaming CCA is an adaptation approach that has been growing in popularity in recent decades as evidenced by (1) its prevalence in the IPCC's last two reports (i.e., AR4 and AR5); (2) the growing scholarly interest in the topic; (3) the financial support provided for the approach's adoption in developing countries; and (4) its presence in the NAPA and NAPs of these countries. The appeal of the approach emerges from the integral characteristic of mainstreaming—it is a synergy of CCA and sustainable development goals and agenda (IPCC 2007, 2014a; Biagini & Dobardzic 2011; Ayers et al. 2014; Noble et al. 2014). However, while the questions on the “whys” of mainstreaming CCA have been resolved, the answers on the “how” queries are still lagging. Although mainstreaming is a simple concept, it is poorly understood, which makes it challenging to operationalise (Oates 2011).

Mainstreaming handbooks, guidelines, and related documents have been produced to assist in operationalising the approach (Agrawala 2006; Agrawala & van Aalst 2006; Mitchell et al. 2006; Ayers & Dodman 2010; Lal et al. 2012). However, scholars and practitioners alike agree that the available materials are limited in addressing the difficulties in operationalising mainstreaming (Tang et al. 2009; Ayers et al. 2014; Goosen et al. 2014). Thus, it is often “argued that mainstreaming is not yet sufficiently taking place” (Lehmann et al. 2015, p. 93); and that based on empirical evidence, in practice, “actors are searching for

solutions to integrate the adaptation objective in existing policy domains” (Uittenbroek et al. 2013, p. 399). These notions suggest that there is a gap between the theoretical and practical spheres of the mainstreaming approach.

This chapter therefore addressed the first research objective by proposing that this gap may be due to lack of focus on the institutional facet of mainstreaming operationalisation. Current operational procedures for mainstreaming and the tools and techniques for application concentrate on science of climate change and other climate change-related concerns (i.e., climate change scenario building, vulnerability assessments, climate risk screening, climate change impact analysis, and the like) (OECD 2009; USAID 2009; UNDP-UNEP 2011). However, the operationalisation of mainstreaming needs to go beyond the issues of climate change (Ayers et al. 2014). First, CCA, in general, is a wicked problem that is difficult to tackle using the traditional scientific and technical methodologies; rather, it can be addressed effectively through institutional means. Second, mainstreaming CCA creates institutional changes and entails institutional transformations, and thus is an institutional concern. Yet, the institutional dimension of mainstreaming currently is neglected in its operationalisation.

Likewise, the methodologies for mainstreaming concentrate on what to integrate into existing plans in order to respond to climate change, such as the vulnerability and risks of populations, sectors, communities, etc. They overlook the challenges encountered in the integration process. Consequently, most mainstreaming studies cite the barriers or challenges in operationalising the approach rather than report on successful mainstreaming actions. This review, therefore, asserts that mainstreaming methodologies need to (1) incorporate an institutional perspective in the operational analysis of mainstreaming; and (2) place emphasis on identifying, understanding, and determining the origins of the barriers to operationalisation.

Advancing the knowledge base on the barriers to adaptation needs methodical planning because studying the challenges or barriers to adaptation needs to be context-specific (Biesbroek et al. 2013). It is feasible to generalise their nature and characteristics, but the manner or degree by which the barriers affect the adaptation process depends on individual settings (Mimura et al. 2014). Accordingly, intensive, detailed and rich analyses of the barriers to mainstreaming CCA are possible through a case study approach (Flyvbjerg 2011). These concerns are elaborated in the next chapter where the methodology devised by the research to address the gap in mainstreaming operationalisation is presented in detail.

## CHAPTER 3: METHODOLOGY FOR EXAMINING THE CHALLENGES IN MAINSTREAMING CLIMATE CHANGE ADAPTATION\*

\*Cuevas, S.C., Peterson, A., Morrison, T., & Robinson, C. (In press). Methodology for Examining the Challenges in Mainstreaming Climate Change Adaptation. *International Journal of Climate Change Strategies and Management*.

### 3.1 Introduction

Chapter 2 illustrated that although interest in mainstreaming climate change adaptation (CCA) is growing, there is limited information on how to operationalise the approach effectively, especially at the local scale (Huxtable & Yen 2009; Olhoff & Schaer 2010). Essentially, in practice, mainstreaming “is not yet sufficiently taking place” (Lehmann et al. 2015, p. 93) and practitioners are still “searching for solutions to integrate the adaptation objective in existing policy domains” (Uittenbroek et al. 2013, p. 399). This research posits that this slow development is caused, in part, by the neglect given to the institutional facet of mainstreaming in operationalisation. Current techniques and operational procedures for mainstreaming, such as vulnerability assessments, impact analysis, risk screening, and the like, focus on climate-related concerns (OECD 2009; USAID 2009; UNDP-UNEP 2011), and overlook (1) the existing institutional settings and institutional arrangements into which CCA will be integrated; (2) the institutional transformations generated by the integration process; and (3) the impacts of these institutional changes to the realities already subjected to the existing institutions. Consequently, mainstreaming CCA encounters a number of difficulties in practice, and most studies on the subject deal with the barriers or challenges in mainstreaming CCA, rather than illustrate effective mainstreaming actions (Lebel et al. 2012; Ayers et al. 2014; Uittenbroek et al. 2014; Lehmann et al. 2015).

Another set-back in mainstreaming operationalisation is the lack of methodologies to investigate how mainstreaming is applied in practice. This is a major gap in the literature primarily because CCA is a wicked problem that is complex, ambiguous, ill-defined, unpredictable, intractable, and multifaceted. The existing CCA methodologies focus on the science of climate change. However, although the technical climate-related issues are significant aspects in adaptation, they are not sufficient to address CCA concerns within the planning and policy-making domains (FitzGibbon & Mensah 2012; Termeer et al. 2013; Head & Alford 2015). Consequently, this condition constrains the capability of researchers, analysts, and practitioners to effectively measure and examine the complex processes involved in mainstreaming CCA (Tang et al. 2009; Ayers et al. 2014).



Likewise, in planning and policy-making, CCA is an “abstract concept” (Persson & Klein 2008, p. 13) that needs to be simplified in a language more familiar to planners and policy-makers. A possible way to address this concern is to develop indicators that can help planners examine and evaluate the state and progress of adaptation efforts. Through quantitative mechanisms, analysts can (1) determine the trade-offs involved in implementing adaptation measures; (2) track the advancements in the implementation; and (3) assess whether the targets of adaptation efforts are attained (Berrang-Ford et al. 2011; Engle 2011; UNDP-UNEP 2011).

This research aims to contribute to this discussion by devising a systematic methodology for examining the challenges in mainstreaming CCA. In particular, it argues that mainstreaming operationalisation necessitates a methodology that focuses on the challenges in applying the approach, and an analytical framework that can examine the mainstreaming process from an institutional perspective. In this research, these challenges refer to the factors that affect the effective operationalisation of mainstreaming CCA at the local scale; and these challenges can be transformed into opportunities that can help the mainstreaming process to be successful. Furthermore, to have in depth insights into these challenges, the research contends that the methodology should be able to monitor and assess the severity of the challenges through metrics; answer causal linkages among challenges; and solve the questions pertaining to the “whys” and “hows” of the subject (Hesse-Biber & Johnson 2013; Weaver-Hightower 2014). Hence, this research utilised a mixed-methods approach to address the task. Since examining the challenges or barriers to adaptation is context specific (Biesbroek et al. 2011), the research conducted a case study in Albay, Philippines to collect robust data and perform intensive and detailed analysis on these data (Flyvbjerg 2011).

This chapter begins with an overview of the four-stage mixed methodology developed by the research. Afterwards, it introduces the Institutional Analysis and Development (IAD) framework, and demonstrates how the IAD can be modified to better fit this CCA research. This is followed by sections on the case study area selection process, the data collection design (i.e., survey, interviews), and the development of quantitative mainstreaming indicators. Later, the issues encountered in applying the mixed methodology and some of the methodology’s limitations are presented. Accordingly, this Chapter addresses the second objective of the research which is— *to determine the analytical framework and methodology that can (1) examine effectively the challenges in mainstreaming CCA into land-use*

*planning; and (2) generate metrics that can be used by planners and decision makers in addressing these challenges.*

### **3.2 Mixed methodology in climate change adaptation research**

The research devised a four-stage methodology that (1) included a mixed method that utilised document reviews, interviews, a survey, and key informant consultations (i.e., triangulation by data method) as the main data sources; (2) used the modified Institutional Analysis and Development (IAD) framework as the primary analytical and data collection guide; and (3) employed the scorecard approach to generate quantitative data and indicators. This methodology was developed based on the notion that climate change is a complex (wicked) problem, a cross-sectoral issue, and an inter-disciplinary concern (Huxtable & Nguyen 2009; Nielsen & D’haen 2014).

The current climate change research has lagged behind this inter-disciplinary nature of the problem in terms of research cooperation, citation, and methodologies applied (Bjurstrom & Polk 2011). Thus, an avenue for collaboration among quantitative and qualitative researchers is needed for an effective interdisciplinary communication and cooperation in climate change research (Nielsen & D’haen 2014). Such synergy can be accomplished through the use of a mixed method approach.

Mixed method combines two complementary research methods—qualitative and quantitative—to answer a research question (Hesse-Biber & Johnson 2013). Although this method was formally recognised about thirty years ago, it was only in the last decade that it grew rapidly in popularity (Onwuegbuzie et al. 2009). It is a method that constantly is being tested in varying research problems, conditions, and disciplines (Siddiqui & Fitzgerald 2014). Thus, like CCA research, the mixed method approach is still evolving (Brannen 2005; Onwuegbuzie et al. 2009).

Through a mixed approach, the ability of the quantitative method in establishing or gauging the extent, status, or condition of a phenomenon can be enhanced by the capability of the qualitative method to answer “whys”, “hows”, and “so whats” queries (Weaver-Hightower 2014). Thus, a combination of the two is generally viewed as the best approach to accomplish an analytical task and answer complex interdisciplinary research questions (Flyvbjerg 2011; Hesse-Biber & Johnson, 2013). In particular, the mixed method in this study was accompanied by data triangulation (i.e., document, interview, survey, and key informant consultations) (Yin 2014).

As mentioned, the research methodology (Figure 2) involved four stages and used quantitative and qualitative methods, which varied according to the stage and purpose of the research (Brannen 2005). The methodology had two key facets, including the modified IAD framework and the case study approach. To illustrate, Stage 1 entailed document reviews and consultations with key informants. Based on the information gathered at this stage, the original evaluation criteria of the IAD were adjusted; and changes were applied to accommodate certain analytical needs of the research. The modified framework—IAD for mainstreaming CCA research (IAD-CCA)—was used as a guide in designing the activities in the next stages of the research.

Stage 2 involved the conduct of a survey among the key actors in the local land-use planning system in Albay and representatives of the national government, non-government agencies, and academic organisations who had experience in implementing projects concerning mainstreaming of CCA in local land-use plans. This design is akin to the “Extended Peer Community” facet of the “Post-Normal Science”<sup>4</sup> methodology that some scholars (Ludwig 2001; Saloranta 2001; Head 2014) have advocated in addressing wicked problems like climate change. This community is not limited to scientific specialists, public officials and other stakeholders. Rather, it includes all individuals with the interest to partake in resolving the issue. Hence, a variety of perspectives is incorporated in the assessment and decision-making processes (Ravetz 1999; Saloranta 2001)

Meanwhile, a scorecard approach was applied to enable quantification of the respondents’ answers, thus allowing for quantitative indicators to be generated (i.e., mainstreaming indicators). The subsequent computed mainstreaming indicator scores helped to establish the key issues that needed to be clarified during the semi-structured in-depth interviews conducted in Stage 3. In turn, the data gathered from the interviews verified and validated the mainstreaming indicator scores and raised additional issues and concerns regarding the mainstreaming process. These (issues and concerns) were further investigated through document reviews and consultations with key informants in Stage 4. All the information gathered were qualitatively analysed using the IAD-CCA framework as a guide (i.e., using the modified evaluation criteria to assess the patterns of interactions and outcomes of these interactions) (Figure 2).

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<sup>4</sup> The post-normal science methodology was introduced by Funtowicz and Ravetz (1993) to manage contemporary problems which the methods and approaches of traditional science are unable to address effectively. Essentially, “the methodology of Post-Normal Science is meant to be applied whenever high stakes, risks and/or high uncertainty are involved in a policy-relevant issue” (Saloranta 2001, p. 396). Post-normal science complements the scientific expertise in order to produce better quality decisions regarding complex problems (Saloranta 2001).

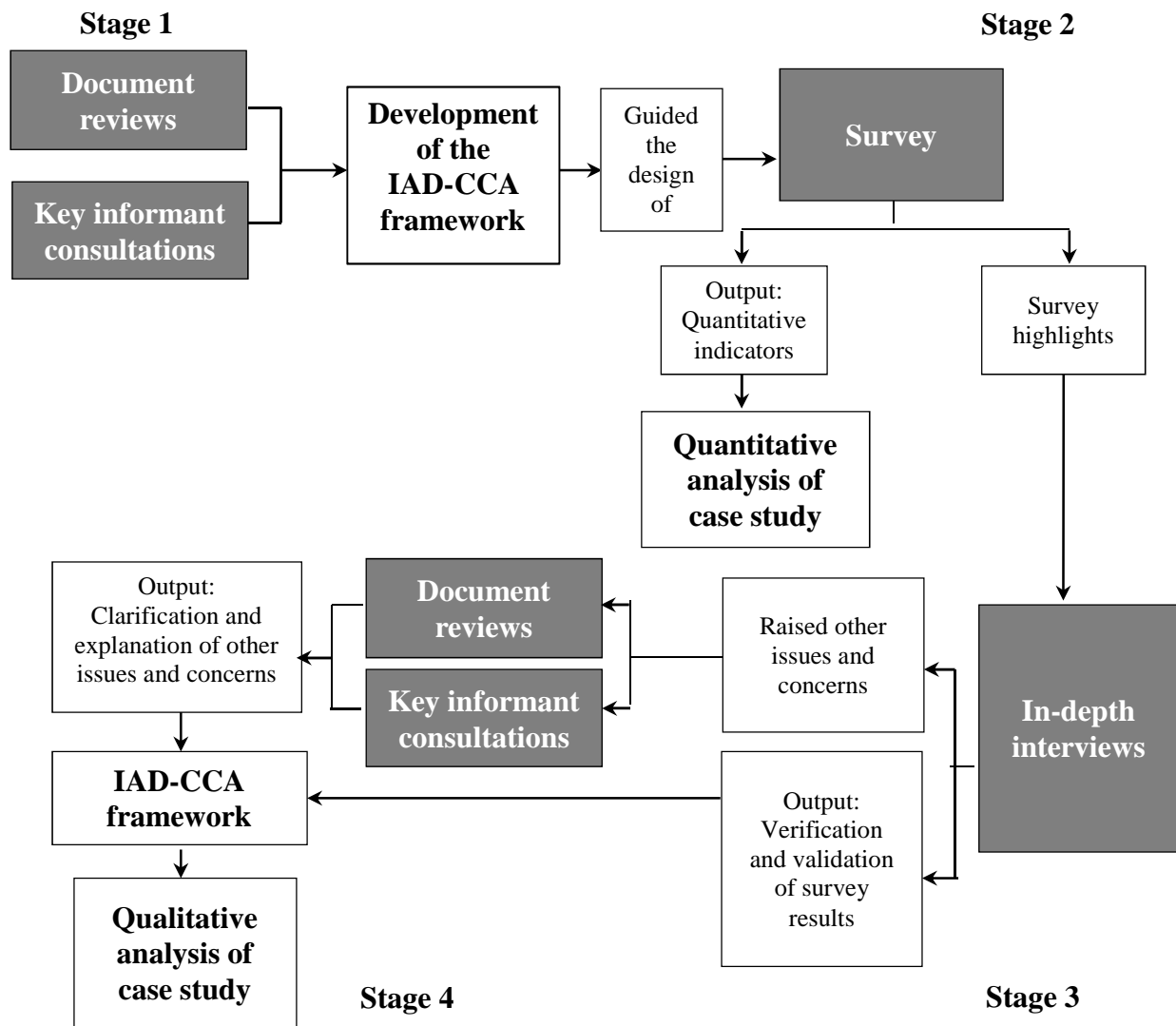


Figure 2 The research methodology

### 3.3 Analytical framework for examining the challenges in mainstreaming climate change adaptation

This section introduces the Institutional Analysis and Development (IAD), argues for the need to modify the framework to suit CCA research and outlines the process by which the IAD was transformed into the IAD as applied in mainstreaming CCA research (i.e., IAD-CCA). Four frameworks (i.e., Advocacy Coalition Framework, Institutional Analysis and Development Framework, Adaptive Capacity Wheel, and Adaptation, Institutions, and Livelihoods) were analysed to determine the most effective framework for examining the challenges in mainstreaming CCA (Table 2). The review showed Ostrom's (2007) IAD to be the most suitable framework for the task. First, the framework is designed specifically to examine institutional settings (Ostrom 2011), so it is equipped to analyse the setting where CCA is to be mainstreamed. Next, the IAD has a variable (i.e., biophysical conditions) that

can represent the impacts of climate change concerns in that setting (McGinnis 2011). Furthermore, the IAD has a systematic analytical process that can help users organise vast amounts of data; thus, it is very useful in outlining data collection for CCA research (Koontz 2006; Dick & Meinzen-Dick 2011). Also, the IAD is a framework that has been tested and applied successfully to a variety of institutional conditions and to an extensive range of problems and concerns, including CCA (Koontz 2006; Oberlack & Neumärker 2011).

The IAD focuses on the action arena, which is comprised of institutional arrangements and the actors who follow these arrangements. The action arena is influenced by a number of exogenous variables, namely, biophysical conditions, community attributes, and rules-in-use (Ostrom 2007). Based on the elements in the action arena, analysts can diagnose, explain, and predict the actors' patterns of interaction (i.e., aggregated individual choices, behaviours, and decisions of actors in the action arena) and the outcomes from these interactions (Rudd 2004; Di Gregorio et al. 2012). These patterns of interaction and outcomes are then assessed through a set of evaluation criteria. The criteria may differ based on the action arena; hence, analysts can determine how current institutional arrangements constrain or facilitate desirable outcomes depending on the specific actor or action situation selected, and how the action arena needs to be evaluated (McGinnis 2011; Ostrom 2011).

As stated in Chapter 2, this research used Cuevas et al.'s (2014, p. 2) definition of institutions under the CCA context, thus:

... institutions are the commonly known and acknowledged rules, social structures, and organisations founded on common belief systems that transform individual acts and expectations into collective actions, convert personal values into social norms and shared beliefs, and define the formal and informal behavioural systems of human existence. Rules, social structures, and organisations are all institutions.

Table 2 Comparison of institutional frameworks

Framework	Institutional Concept			Description	Focus of Analysis	Advantages and Limitations in Relation to Mainstreaming CCA	
	Rules	Social Structure	Organisation			Advantages	Limitations
Advocacy Coalition Framework	√	√	√	<ul style="list-style-type: none"> <li>• analyses problems involving significant goal conflicts, considerable technical disputes, and various actors from several layers of government (i.e., wicked problems) in the policy process</li> <li>• offers a theoretical guide for understanding the intricacies of political conflict and mobilisation</li> <li>• primary aim is to explain belief change and policy change over long periods of time</li> </ul>	Policy process	<ul style="list-style-type: none"> <li>• views institutions as rules, social structures, and organisations</li> <li>• provides a structured framework for policy analysis with: clear, causal assumptions; empirically testable hypotheses</li> <li>• considers the significance of scientific and technical information in policy and political disputes</li> <li>• applicable to various governing structures, cultural societies, and policy areas</li> <li>• addresses the issue of institutional nestedness</li> </ul>	<ul style="list-style-type: none"> <li>• can be time consuming, costly, and difficult to apply</li> <li>• assumes a decade or more timescale in understanding political conflict and policy change</li> <li>• may be ineffective in policy sub-systems without clear coalitions or with just one dominant policy coalition</li> <li>• needs further evidence and validation for application in CCA research</li> </ul>
Institutional Analysis and Development Framework	√			<ul style="list-style-type: none"> <li>• presents how rules, physical and material conditions, and attributes of the community affect the structure of action arenas, the incentives that individuals face, and the resulting outcomes</li> <li>• helps analyse situations involving people interacting together in a particular context and following specific rules (i.e., institutional settings)</li> </ul>	Institutional setting	<ul style="list-style-type: none"> <li>• effective in performing institutional analyses in diverse settings; across different systems; and institutions with intricate patterns of interactions and outcomes</li> <li>• provides a structured approach in collecting data and a systematic manner of analysing institutional concerns (i.e., settings, dynamics, influences and interactions)</li> <li>• flexible and practical; can be adjusted to suit the needs of the analysis</li> <li>• enables analysts to identify the barriers to effective performance of policies</li> <li>• addresses the issue of institutional nestedness</li> </ul>	<ul style="list-style-type: none"> <li>• views institutions as rules only</li> <li>• some specific features (i.e., evaluation criteria) are designed to analyse common pool resources, although the framework has been tested and successfully applied to a variety of institutional conditions and into an extensive range of problems and concerns</li> <li>• needs further evidence and validation for application in CCA research</li> </ul>

Framework	Institutional Concept			Description	Focus of Analysis	Advantages and Limitations in Relation to Mainstreaming CCA	
	Rules	Social Structure	Organisation			Advantages	Limitations
Adaptive Capacity Wheel	√	√		<ul style="list-style-type: none"> <li>• tool to assist researchers and policy makers understand, assess, and raise the ability of institutions in advancing the adaptive capacity of society</li> <li>• consists of six dimensions, namely, variety, learning capacity, room for autonomous change, leadership, availability of resources, and fair governance encompassing 22 criteria</li> </ul>	Institutions	<ul style="list-style-type: none"> <li>• provides both qualitative and quantitative analyses</li> <li>• presents a comprehensive list of adaptive capacity criteria and indicators applicable to CCA research</li> <li>• elements provide a comprehensive idea of the dimensions relevant to assess adaptive capacities</li> <li>• simple and can be understood by non-experts</li> <li>• focuses on analysis within institutions (internal)</li> </ul>	<ul style="list-style-type: none"> <li>• views institutions as rules and social structures only</li> <li>• provides limited institutional analysis because it does not provide a (an analytical) structure for examining the entire institutional setting</li> <li>• cannot assess the varying (external) factors affecting institutions, or examine institutional linkages, relationships, and interactions</li> <li>• does not address the concept of institutional nestedness and the issue of (institutional) scale</li> </ul>
Adaptation, Institutions and Livelihoods Framework			√	<ul style="list-style-type: none"> <li>• conceptual tool kit for examining institutional partnerships and impacts of these linkages on vulnerable social groups' access to resources</li> <li>• examines institutional linkages among public, private, and civil society institutions</li> <li>• centers on the importance of institutional partnerships in facilitating adaptation</li> </ul>	Institutions	<ul style="list-style-type: none"> <li>• presents a structured framework for analysing adaptation practices and the critical role of institutions in the process</li> <li>• presents an outline for analyzing adaptation practices through the analytical categories of adaptation responses</li> <li>• focuses on the local scale</li> </ul>	<ul style="list-style-type: none"> <li>• views institutions as organisations only</li> <li>• limited capability to perform extensive institutional analysis with rules and social structure institutions</li> </ul>

Sources: Jenkins-Smith & Sabatier (1994); Koontz (2006); Ostrom (2007, 2011); Sabatier & Weible (2007); Agrawal (2008); Ike (2009); Smajgl, Leitch, & Lynam (2009); Basurto et al. (2010); Gupta et al. (2010); McFadden, Priest, & Green (2010); Albright (2011); Dick & Meinzen-Dick (2011); Bettini et al. (2012); Getchell (2013).

Although the IAD views institutions as rules, the framework’s design enables users to examine the social structure-based and organisational institutions, and accordingly map their linkages to one another. To illustrate, the action arena is influenced by a number of exogenous variables including the rules-in-use (i.e., rule-based institutions) and the attributes of the community defined as relevant aspects of the social and cultural context (i.e., social structure-based institutions). Organisational institutions, on the other hand, are incorporated as actors in the action arena (Figure 3).

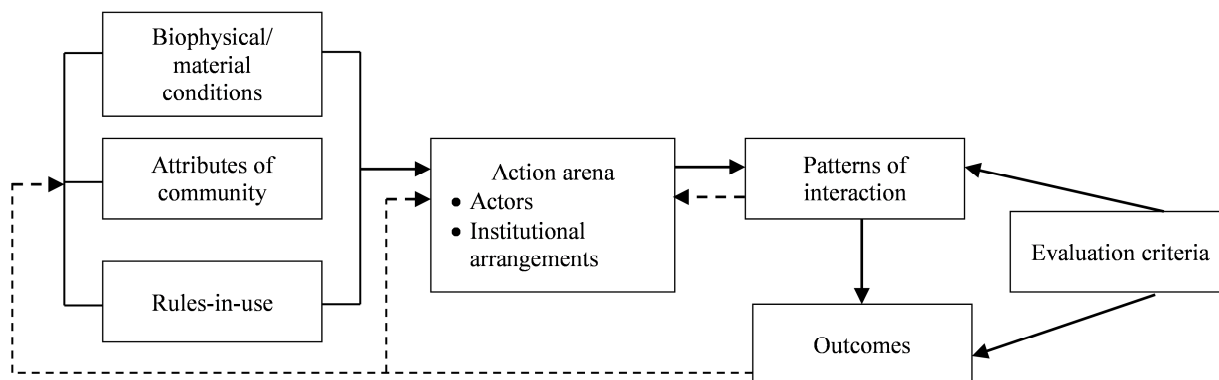


Figure 3 Basic components of the IAD

Source: Ostrom (2011, p. 10)

Furthermore, the framework is practical with a design that can be adjusted according to the needs of the problems being addressed (Rudd 2004). Generally, users change only the composition of the framework’s main variables whenever IAD is modified, and still maintain its general premise in mapping institutional linkages and relationships. Any of the IAD components can be adjusted, and there have been a number of scholars, such as Rudd (2004), Di Gregorio et al. (2012), Jones et al. (2013), and Ratner et al. (2013), who modified the evaluation criteria. Following these examples, this research replaced the evaluation criteria of the IAD with factors that influence the effective operationalisation of mainstreaming CCA (i.e., mainstreaming challenges). This research deemed the evaluation criteria to be key variables as they guide the users in (1) assessing the patterns of interactions of institutions; (2) evaluating which outcomes are acceptable and which need improvement; (3) analysing how the current institutional arrangements constrain or facilitate desired outcomes; and (4) formulating ideas on how to attain the preferred outcomes (McGinnis 2011). Most importantly, this flexible characteristic of the IAD allowed the research to address the framework’s limitation in examining institutions under the CCA context. That is, the concept of institutions—as rules, social structures, and organisations—was incorporated in the modified evaluation criteria of the IAD, transforming it into the IAD as applied in mainstreaming climate change adaptation or the IAD-CCA framework.



### **3.3.1 The IAD-CCA framework**

In this research, around 80 peer reviewed papers and over 60 book chapters, conference papers, international agency reports, and discussion papers were reviewed to develop the evaluation criteria of the IAD-CCA. For the purposes of this chapter, this section summarises the results of this review. Detailed discussions of each challenge listed in the evaluation criteria are presented in Chapter 4.

The literature on the practical application of the mainstreaming approach and the barriers for its local operationalisation is limited (Uittenbroek et al. 2013; Ayers et al. 2014); thus, this research used a multi-topic strategy to generate a robust set of challenges. The challenges affecting adaptation (in general) and the mainstreaming approach (in particular) were explored both at the national and local scales. The review revealed that the drivers or enablers of adaptation are the opportunities for adaptation, while the barriers are the factors that impede adaptation. Both factors exist at the extremes of the same scale or spectrum (Amundsen et al. 2010; Gardner et al. 2010; Oberlack & Eisenack 2014). For example, the lack of, or the growing awareness of climate change are respectively considered as barriers to and drivers for adaptation. Similarly, effective leadership can help communities prevail over barriers, while the lack of it can be a barrier itself to adaptation (Tang et al. 2009; Moser & Ekstrom 2010; Jones et al. 2013).

The body of research on the linkages between CCA and institutions is increasing, with several authors emphasising the significance of developing the institutional capacity of systems to address climate change (Adger et al. 2005; Burch 2010). Similarly, several studies have identified that the serious barriers to adaptation are institutional in nature (Eisenack et al. 2014; Oberlack & Eisenack 2014; Waters et al. 2014). Using the definition of Cuevas et al. (2014) of institutions in the CCA context, the following barriers or challenges were identified (1) factors influenced by rule-based institutions such as autonomy of local governments, local government prioritisation, commitment to CCA, and other institutional issues relating to policies, regulations, and the like (Pini et al. 2007; OECD 2009; Burch 2010; Ayers et al. 2014; Waters et al. 2014); (2) matters linked to social structure-based institutions such as community support, institutional incentives and local leadership (Burch 2010; Moser & Ekstrom 2010; Biesbroek et al. 2011; Oberlack & Eisenack 2014); and (3) organisational concerns like organisational cohesion, and organisational cooperation and collaboration arrangements (Pini et al. 2007; Amundsen et al. 2010; Biesbroek et al. 2011; Eisenack et al. 2014).

The challenges related to climate change information also are key factors that affect CCA. These include the (1) extent of knowledge and awareness of climate change issues; (2) availability, accessibility, credibility, and reliability of information; (3) manner by which information is communicated and translated by climate change experts; and (4) way the information is received by the users (i.e., planners and decision-makers) (Ekstrom et al. 2011; Ayers et al. 2014; Oberlack & Eisenack 2014). Meanwhile, resource constraints have always been a problem for local governments; however, they are highlighted in CCA because resources are crucial factors of adaptive capacity (Pini et al. 2007; Biesbroek et al. 2011). For example, lack of funds is typically among the primary reasons why the implementation of local adaptation is delayed (Moser & Ekstrom 2010; Lehmann et al. 2015). Local governments have limited capabilities to invest or begin new endeavours since their budgets are often overextended. With the additional responsibility for CCA, these shortcomings are magnified; local governments become more under-resourced, overcommitted, and overtasked (Pini et al. 2007; OECD 2009). Hence, the availability of funds can be a great barrier to CCA when it is lacking, and a significant opportunity when it is sufficient.

This research summarises the mainstreaming challenges into three capacity classifications—*institutional*, *information*, and *resource* capacities. *Institutional capacity* pertains to the rules, social structures, and organisations involved in mainstreaming CCA. *Information capacity* deals with the ability of a system to integrate climate change information (i.e., technical and scientific knowledge and data) into the information system of the planning and decision-making processes. Finally, *resource capacity* focuses on the financial and human resources that ensure the maintenance and continuation of the integration process. The mainstreaming challenges under these capacity groupings are the factors that replaced the evaluation criteria of the IAD, thus, transforming the framework into the IAD-CCA (Figure 4 and Table 3).

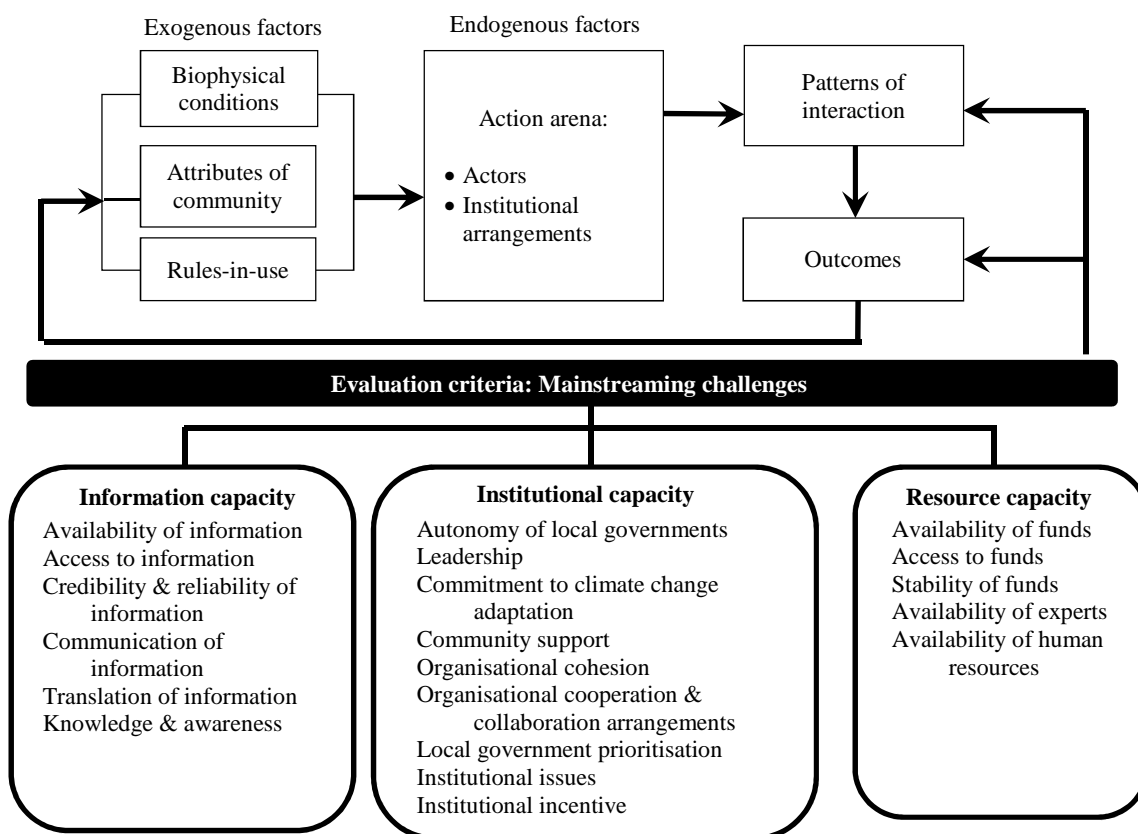


Figure 4 Modified Institutional Analysis and Development framework as applied in mainstreaming climate change adaptation: IAD-CCA framework

### 3.3.2 Quantitative aspect of the mixed methodology

Converting the mainstreaming indicators into quantitative measures was another significant adjustment in the IAD-CCA framework. In general, quantitative analysis and generating metric tools are relevant research designs in order to understand and evaluate CCA performances. Accordingly, this need was magnified in this CCA mainstreaming research (Horrocks et al. 2012; Miller et al. 2012).

The characteristics of a good adaptation indicator were identified to inform the criteria in designing the mainstreaming indicators. These characteristics are (Harley & van Minnen 2009; Horrocks et al. 2012; Miller et al. 2012):

- (1) simplicity – simple to understand and can be communicated readily to users with different backgrounds;
- (2) status check – able to track progress;
- (3) continuity and timeliness – can be updated;
- (4) relevance – significance and applicability at local scale;
- (5) clarity of purpose – what, why, and for whom; and
- (6) comparability – can be used to compare across sectors or time.

**Table 3 Components of the IAD-CCA evaluation criteria**

<b>Mainstreaming Challenge</b>	<b>Description</b>
<b><i>Information capacity</i></b>	
<i>Availability of information</i>	Level of available technical information on climate change
<i>Access to information</i>	Degree of user access to the available climate change information
<i>Credibility and reliability of information</i>	Level of trust and confidence of users in the scientific and technical information and their source/s
<i>Communication of information</i>	Quality of the active, iterative, and inclusive communication between climate experts, planners, and decision makers
<i>Translation of information</i>	Degree of usefulness of climate change knowledge provided by experts to planners
<i>Knowledge and awareness</i>	Degree of knowledge and awareness of planners and community members on climate change concerns and issues
<b><i>Institutional capacity</i></b>	
<i>Autonomy of local governments</i>	Level of local government autonomy (i.e., administrative and legislative powers and authority concerning CCA)
<i>Leadership (influence over collective behaviour)</i>	Absence or existence of a climate change "champion" in the locality, and the extent of the champion's influence on the behaviour of the community
<i>Commitment to CCA</i>	Absence or presence of an administrative and/or legislative framework for local adaptation
<i>Community support</i>	Degree of public support and local community participation on CCA initiatives
<i>Organisational cohesion</i>	Degree of coordination (or diversity) among organisations/agencies engaged in local CCA
<i>Organisational cooperation and collaboration arrangements</i>	Absence or existence of cooperation and collaboration arrangements among organisations concerning CCA
<i>Local government prioritisation</i>	Level of CCA agenda within the general development priorities in the local government
<i>Institutional issues</i>	Absence or presence of institutional questions or conflicts (i.e., related to, a product of, or influenced by formal rule-based institutions) that inhibit the effective integration of CCA into local land-use planning
<i>Institutional incentive</i>	Degree by which the benefits from adaptation encourage actors to operationalise the mainstreaming approach
<b><i>Resource capacity</i></b>	
<i>Availability of funds</i>	Level of available financial resources to support CCA initiatives
<i>Access to funds</i>	Degree of user access to the available CCA funds
<i>Stability of funds</i>	Level of consistency of available CCA funds
<i>Availability of experts</i>	Existence of climate change experts to train local planners
<i>Availability of human resources</i>	Existence of people to undertake the CCA tasks and responsibilities

*Note:* CCA – climate change adaptation

The scorecard approach was identified as the most suitable approach for converting the evaluation criteria in the IAD-CCA into quantitative indicators. The approach generates a numerical record of status and condition, which can measure the state-of-play and progress of activities in the setting being analysed (UNDP 2005; Bellamy & Hill 2010). Moreover, it (1) is easy to understand; (2) can be readily communicated to or interpreted by users with

varying backgrounds; (3) can be updated for timeliness and comparability across time; and (4) can be applied at the local scale (Frost 2007). The scorecard approach is also the technique that United Nations Development Programme (UNDP) uses to generate capacity development indicators. The method has been effective in quantifying the qualitative process of capacity development (UNDP/GEF 2003; UNDP 2005; UNDG 2008).

### ***3.3.2.1 Quantifying the challenges: Scorecard approach and valuations***

In designing the scorecard valuation, this research relied heavily on UNDP's procedures, particularly on the scorecard rating system used in the UNDP/Global Environment Facility (GEF) capacity development indicator methodology. In this methodology, each capacity result included a number of questions that represented a capacity indicator. The scorecards were in a form of descriptive sentences linked to each capacity development indicator with a numerical rating ranging from 0 to 4 (UNDP/GEF 2003; Bellamy & Hill 2010). The score for each question under a capacity category was averaged and the resulting value was considered as the overall rating (UNDG 2008).

The UNDP scorecard approach has been used in several studies. For example, Haanpää and Peltonen (2007) used it to analyse the institutional vulnerability in the Baltic Sea Region countries. In the survey questionnaire, the respondent chose a condition, among three statements, that best described the adaptive capacity of the nation. The statements were constructed in a progressive manner, from the basic (score = 1) to the highest level (score = 3). Thus, a higher score indicated a lower perceived national vulnerability to climate change impacts, and vice-versa (Haanpää & Peltonen 2007). The survey was distributed among the United Nations Framework Convention on Climate Change focal points, including the main personnel in key government agencies who were responsible for the environmental management and/or climate change issues in their respective countries.

In this research, the procedures described above were used in the scorecard valuation of the 20 mainstreaming indicators. Similar to the approach of Haanpää and Peltonen (2007), the scorecard was incorporated in a survey conducted among the significant actors in the action arena, the local land-use planning system. First, each question, which represented a challenge in the IAD-CCA evaluation criteria, had three answer choices. The choices were descriptive sentences that exemplified a progressing status of the system's capacity to prevail over the challenges (i.e. worst condition = 1; moderate condition = 2; best condition = 3). A "Don't know" category was also included among the choices to avoid forcing the respondents to make a choice when they had no knowledge of the item (Table 4). Accordingly, the

possible scores for each indicator were any value  $1 \leq n \leq 3$ . The closer the value of an indicator to 3, the more likely the system overcame or turned the challenge into an opportunity that helped mainstream CCA into the local land-use plans. Conversely, the closer the value of an indicator to 1, the more likely that the challenge was a barrier to mainstreaming; thus, it required intervention (See Appendix A2 for the complete survey questionnaire).

Table 4 Survey scorecard: Selected indicators for mainstreaming climate change adaptation into local land-use planning

<b>Mainstreaming Indicator</b>	<b>Description</b>	<b>Score</b>
<i>Availability of information</i>	The climate change-related information, with specific focus on typhoons, are	
	• not available.	1
	• available, but limited or inadequate.	2
<i>Access to information</i>	• are available and comprehensive.	3
	The climate change-related information, with specific focus on typhoons, are available but/and	
	• inaccessible.	1
<i>Leadership (influence over collective behaviour)</i>	• partially accessible.	2
	• completely accessible.	3
	A CCA champion (i.e., staunch advocate, promoter, implementer, of CCA initiatives) in the locality	
<i>Local government prioritisation</i>	• does not exist.	1
	• exists, but does not influence the behavior of the local community.	2
	• exists and influences the behavior of the local community.	3
<i>Institutional issues</i>	CCA is	
	• not in the local government agenda because there are more important issues.	1
	• in the local government agenda but underrepresented because there are more important issues.	2
<i>Institutional issues</i>	• a priority local government agenda.	3
	Institutional issues concerning land-use and land-use planning	
	• exist and are affecting the adaptation approach.	1
	• exist but are not affecting the adaptation approach.	2
	• do not exist.	3
	Other institutional issues	
• exist and are affecting the adaptation approach.	1	
• exist but are not affecting the adaptation approach.	2	
• do not exist.	3	

Note: The “Don’t know” choice is part of the survey questionnaire distributed to respondents in this study.  
CCA – climate change adaptation

### ***3.3.2.2 Computing for the mainstreaming indicators***

To verify and validate the survey results, in-depth interviews were conducted with the same pool of respondents. Equal weights were applied to each response in the survey in order to compute the final indicator score. Employing various weights usually entails a more complex series of assumptions and validations. However, this procedure was beyond what was required for an exploratory study such as the current investigation (Lebel et al. 2013).

Cronbach's alpha statistics—the most reported and used method to measure the reliability of estimates for indices—was computed to measure the reliability of indicator estimates. The alpha ( $\alpha$ ), which can have a value  $0 \leq \alpha \leq 1$ , gauges the survey's reliability by measuring the internal consistency of a test or scale items in the survey (Bravo & Potvin 1991; Santos, 1999). In general, the accepted value of  $\alpha$  is between 0.70 to 0.95, with  $\alpha > 0.9$  as excellent results;  $\alpha > 0.8$ , good; and  $\alpha > 0.7$ , as acceptable results (Gliem & Gliem 2003; Tavakol & Dennick 2011).

The utility of the IAD-CCA framework in examining the challenges in mainstreaming CCA, and the effectiveness of the mainstreaming indicators in assessing the state-of-play of the mainstreaming process were tested in a case study.

## **3.4 The case study approach**

This research asked, “How can mainstreaming of climate change adaptation into local land-use planning be understood?” and “How can the challenges in the operationalisation of mainstreaming be overcome?” Furthermore, it aimed to determine the state-of-play among the challenges in mainstreaming CCA. Hence, this research called for a strategy to answer questions pertaining to the “how” and “why” of a current problem (i.e., mainstreaming CCA) under conditions where the researcher has minimal or no control (i.e., over local mainstreaming operationalisation). Among the research strategies (i.e., experiment, history, archival analysis, survey), the case study was best suited to accomplish these research tasks (Scholz & Tietje 2002; Yin 2014). The case study enables exploration and explanation of a certain phenomenon (i.e., CCA mainstreaming), and is appropriate for answering questions dealing with operational links in real-life contexts (i.e., local mainstreaming implementation) (Yin, 2009; Scholz & Tietje, 2002).

Most importantly, the case study method was suitable for testing the utility of the IAD-CCA framework. The case study described and illustrated how varying conditions, interactions, arrangements, and outcomes were examined through an institutional perspective. It also allowed for an intensive, detailed, and rich analysis, which enabled in-depth

assessment of the phenomenon being examined (Flyvbjerg 2011). The IAD-CCA framework provided the case study with a structured approach for data collection and a systematic approach for data analysis (McFadden, Priest, & Green, 2010; Bettini et al., 2012). Therefore, with the combination of the case study method and the IAD-CCA framework, the research was able to identify and describe the challenges in the local mainstreaming measure, and explain how and why the challenges affected the local implementation of this adaptation strategy.

In particular, this research warranted a multiple-scale investigation; that is, the issues in mainstreaming CCA into land use plans at the higher and lower scales or levels of governance had to be investigated. Accordingly, the research involved a single case (i.e., mainstreaming CCA into local land use planning) with more than one unit of analysis, or a Type 2 case study<sup>5</sup> (Baxter & Jack 2008; Yin 2009). This Type 2 case study was achieved by choosing a critical case—one that has a strategic importance in relation to the general problem (Flyvbjerg 2011).

### **3.4.1 Case study area selection**

Because the case needed a multiple-scale analysis, the selection involved choosing the country to conduct the case (national/federal), and the localities in this country to investigate (subnational/local scales). To be a critical case, the research should be in a country highly impacted by climate change, actively applying the mainstreaming approach to adapt to climate change, and operationalising the approach in land-use planning at both the national/federal and sub-national/local scales. A web search of the “most vulnerable countries to extreme weather events or climate change” was conducted to narrow the country selection choices. A list of the top 10 countries impacted by climate change was compiled, based on: the Global Climate Risk Index<sup>6</sup> (generated by the Germanwatch (Kreft & Eckstein 2013; Kreft et al. 2014); the Climate Change Vulnerability Index<sup>7</sup> developed by the Verisk Maplecroft (Maplecroft 2012, 2013, 2014); countries at most risk to storm compiled by the

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<sup>5</sup> Yin (2009) identified four types of case study design, namely: Type 1, single case, holistic; Type 2, single case, embedded; Type 3, multiple-case, holistic; and Type 4, multiple-case embedded. A single case study may have more than one unit of analysis, which is called the Type 2 design (single-case, embedded). According to Baxter and Jack (2008) a holistic case study with embedded units can only analyse one unique or critical case.

<sup>6</sup> The Climate Risk Index indicates a level of exposure and vulnerability to extreme events that countries should understand as warning to be prepared for more frequent and/or more severe events in the future (Kreft et al. 2014, p. 3).

<sup>7</sup> The new Climate Change Vulnerability Index (CCVI), released by global risks advisory firm Maplecroft, enables organisations to identify areas of risk within their operations, supply chains and investments. It evaluates 42 social, economic and environmental factors to assess national vulnerabilities across three core areas.



World Bank (2008); and the most vulnerable countries to climate change based on the methodology developed by Wheeler (2011) of the Center for Global Development (Table 5).

The two countries commonly included in the lists were the Philippines (eight times) and Bangladesh (five times) (Table 5). Further investigation showed that both countries have been actively applying mainstreaming of CCA (Huq & Ayers 2008; Lasco et al. 2008, 2009; Mercado 2011; Pervin 2013; Ayers et al. 2014; Florano 2014). Likewise, both countries have CCA related legislation. Bangladesh has the Climate Change Trust Fund Act 2010, a policy that created the Bangladesh Climate Change Trust Fund for financing projects related to climate change (Pervin 2013), while the Philippines has the People's Survival Fund created in 2011 through the Republic Act No. 10174 (Republic of the Philippines 2011). Also, both countries have their own national plans for climate change—the Bangladesh Climate Change Strategy and Action Plan 2009 and the Philippine National Climate Change Action Plan 2011-2028.

However, the Philippines has a legislation that specifically mentions mainstreaming or integrating climate change in land-use planning—the Disaster Risk Reduction and Management Act of 2010 (Republic of the Philippines 2010). No similar legislation was identified during the web search for Bangladesh. Moreover, compared to the Bangladesh climate change plan, the Philippine plan has more specific content regarding land-use and land-use planning, such as (1) allocating the national government budget for direct and indirect CCA and mitigation in the land-use sector; and (2) implementing adaptive housing and land-use development. The Philippine plan also mentions integrating and harmonising CCA and DRR in the national and local agriculture and fisheries policies and plans, particularly targeting on lobbying “for congress to enact a national land use policy” (CCC 2011, p. 53). Given these findings, the research considered the Philippines to be a critical case in helping to understand local mainstreaming of CCA (Flyvbjerg 2011).

Table 5 List of the top 10 most vulnerable or at risk countries to climate change

Rank	Climate Risk Index (Germanwatch)			Climate Change Vulnerability Index (Maplecroft )		Countries at most risk to storm (World Bank)	Most vulnerable countries (Wheeler)	
	Long-term (1994-2013)	2012	2013	2012	2014	2009	2008	2015
1	Honduras	Haiti	Philippines	Haiti	<b>Bangladesh</b>	Philippines	Djibouti	China
2	Myanmar	Philippines	Cambodia	<b>Bangladesh</b>	Guinea-Bissau	<b>Bangladesh</b>	Kenya	Djibouti
3	Haiti	Pakistan	India	Zimbabwe	Sierra Leone	Madagascar	China	India
4	Nicaragua	Madagascar	Mexico	Sierra Leone	Haiti	Vietnam	Mozambique	Kenya
5	Philippines	Fiji	St. Vincent and the Grenadines	Madagascar	South Sudan	Moldova	Ethiopia	Somalia
6	<b>Bangladesh</b>	Serbia	Pakistan	Cambodia	Nigeria	Mongolia	Sri Lanka	Mozambique
7	Vietnam	Samoa	Lao PDR	Mozambique	DR Congo	Haiti	India	Philippines
8	Dominican republic	Bosnia and Herzegovina	Vietnam	DR Congo	Cambodia	Samoa	Somalia	<b>Bangladesh</b>
9	Guatemala	Russia	Argentina	Malawi	Philippines	Tonga	Cuba	Sri Lanka
10	Pakistan	Nigeria	Mozambique	Philippines	Ethiopia	China	Philippines	Ethiopia

Sources: World Bank 2009; Wheeler 2011; Maplecroft 2011, 2013; Kreft & Eckstein 2013; Kreft et al. 2014

### 3.4.1.1 National scale: Philippines

The Philippines is a developing country in Southeast Asia with a population of 93 million as of Census 2010 (PSA 2014). It is an archipelago with around 7,100 islands and is located within the Pacific typhoon belt. It experiences approximately 20 typhoons a year; thus, it is familiar with extreme weather events and weather-related hazards (Lasco et al. 2009; Yumul et al. 2011) (Figure 5). However, as compared to past experiences, the recent typhoons that have crossed the country have significantly intensified (CCC 2011; Cuevas 2012). For example, in November 2006, Typhoon Reming (international name: Durian) carried 466 millimeter (mm) of rainfall in 12 hours, the highest recorded in 40 years; the typhoon's maximum wind speed was recorded at 281 kilometers per hour. Likewise, in September 2009, Typhoon Ondoy (international name: Ketsana) produced 455 mm of rainfall within a 24-hour period, more than the average rainfall for that month, while the 24-hour rainfall delivered by Typhoon Sendong in 2011 (international name: Washi) exceeded the monthly average for December by 60% (Fano et al. 2007; NDRMMC 2012; PAGASA 2014).

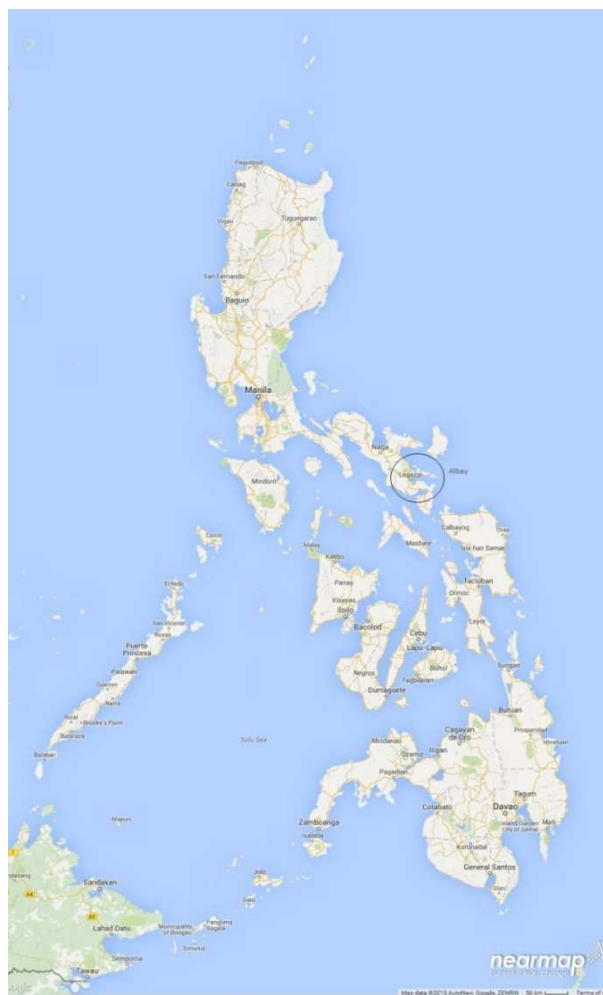


Figure 5 Philippines, with the Albay case study area encircled

Source: Nearthmap database 2015

The Philippines also is the world's third most vulnerable country to extreme events, and among the countries with most people exposed to such extreme events (CCC 2010; World Bank 2013a). As a storm surge "hotspot", the country can potentially experience more than 1,000 deaths from a storm surge (World Bank 2006). Such a catastrophe became real when Typhoon Yolanda (international name: Haiyan) crossed the Philippines in November 2013. Dubbed as the most powerful typhoon to make landfall in recent history, Typhoon Yolanda created storm surges that affected 16 million people and resulted in 6,300 dead; 28,689, injured; and 1,061, missing. The damages from the typhoon were estimated at PHP 89.6 billion (USD 2.1 billion) (Lagmay 2014; NDRRMC 2014). Plans for rehabilitation and rebuilding from the impacts of Typhoon Yolanda are scheduled until 2016 (OPARR, 2014).

These intensified typhoons have been attributed to climate change. Unfortunately, this is projected to continue, thus, Typhoon Yolanda will not be the last powerful typhoon that the Philippines will experience (World Bank 2013b; Lagmay 2014). As such, as early as 2009, the Philippines enacted the Climate Change Act (Republic Act [RA] 9729), a law that institutionalised mainstreaming of climate change into the policy-making, planning, and other decision-making processes of the government. Similarly, the Philippines acknowledged the strong connection between CCA and disaster risk reduction (DRR), and enacted the Disaster Risk Reduction and Management Act of 2010 (RA 10121). This legislation mandated climate change and DRR to be mainstreamed into the development plans (including land-use) of both the national government and the local government units (LGUs). Accordingly, the Philippines' efforts to adapt to climate change are closely tied to the country's DRR initiatives (i.e., CCA-DRR) (CCC 2011).

However, mainstreaming CCA is a new initiative in the Philippines; its operationalisation is still at its early stages, and thus, is a work in progress. Consequently, the serious threat of climate change and the infancy of the mainstreaming efforts in the Philippines make it an ideal area to study.

#### ***3.4.1.2. Provincial scale: Albay, Philippines***

The impacts of climate change are most experienced by local communities, hence, it is the level at which CCA measures are most important (Burch 2010; Hamlin et al. 2014). In the Philippines, the local government units (LGUs) are divided into three major levels: the provinces, cities/municipalities (towns), and barangays (villages). The province is the largest of the three, and is composed of either municipalities, cities, or both. Meanwhile, a barangay is the smallest LGU that makes up the municipalities or cities. The Philippines has 81 provinces, 144 cities, 1,490 municipalities, and 42,029 barangays (NSCB 2014, 2015).

One of the provinces in the country actively pursuing CCA-DRR initiatives is Albay. Albay in 2010 had a population of 1.2 million living in its 2,554.06 square kilometer land area (NSO 2010; Espinas 2013). Poverty incidence among families in Albay in 2012 is 33.9%, about 14.2 percentage points higher than the national incidence, of 19.7% (NSCB 2013). Agriculture is the key economic sector in the province; coconut, rice, sugar and abaca are among the province's main products. Albay is located at the southernmost tip of the main island of Luzon, and is around 550 kilometers (km) from the country's capital, Manila. It is surrounded by the Pacific Ocean, Samar Sea, and Sibuyan Sea from the east, southeast, and southwest directions, respectively (Uy et al. 2011; Espinas 2013) (Figure 5).

Because of its geographical location, Albay is highly vulnerable to climate-related disasters. Accordingly, most of its municipalities (towns), located along its 364 km coastline, is exposed to storm surges during typhoons and other impacts of climate change extreme events (Manila Observatory 2005; Salceda & Rangasa 2011). Around 88 typhoons have crossed within the 50 km radius of Albay within the last 65 years; some of these typhoons were the strongest recorded in the country (PAGASA 2014). This includes typhoon Reming (International name: Durian) in 2006, which resulted in 1,023 deaths, several hundred missing people, and estimated damage of PHP 3.2 billion (USD 64.2 million) (Salceda & Rangasa, 2011). To adapt and build communities that are resilient to climate change, the Provincial Government of Albay has implemented some of the best CCA-DRR practices (i.e., local CCA-DRR policies, projects, and programs) in the country. The provincial government has been successful in its efforts and Albay's CCA endeavours have been recognised both nationally and internationally (Claudio 2012; UNISDR 2012a). In fact, the Albay case has been cited in the Intergovernmental Panel on Climate Change 5th Assessment Report to be among the leading CCA practices in the world (Mimura et al. 2014). Accordingly, the Albay experience offered a robust set of information concerning the challenges in mainstreaming CCA.

#### ***3.4.1.3 Municipal/City scale: Camalig Municipality and Legazpi City in Albay, Philippines***

The local land-use plan, or the comprehensive land-use plan as commonly referred in the Philippines, is the primary document that contains the physical framework and fundamental basis of spatial development of an LGU. These plans are developed at the municipal and city levels (HLURB 2001). At present, Albay is comprised of 18 LGUs, specifically three cities and 15 municipalities (NSCB 2014). Due to time and financial constraints, two LGUs in Albay province were studied. These areas included an LGU with,

and another without, a modified local land-use plan (i.e., with CCA and DRR components). The case study hypothesised that:

- (1) a LGU with a modified local land-use plan would provide information on the challenges it encountered while amending the land-use plan, the manner by which it addressed the challenges, and whether the LGU was able to overcome the challenges; and
- (2) a LGU without a modified land-use plan would provide information on the preliminary challenges in mainstreaming CCA-DRR into land-use plans, and would help identify the factors that currently affect the process of transforming the plan.

The LGU without the modified land-use plan was preselected based on the evidence that LGU personnel have undergone training on integrating CCA-DRR into the local land-use plan. The accessibility of LGU information (i.e., the LGU was visible on the internet and had a website) was also among the selection criteria.

The LGU that best matched the criteria was Camalig, which is a rural municipality with a population of 63,585 (as of 2010) spread across its 50 barangays (NSO 2010). Local land-use plans with CCA-DRR components included Daraga and Malinao municipalities and Legazpi City (Personal communication 2014). Selecting the second LGU was based on the following conditions:

- (1) availability and accessibility of LGU information—as reflected in the visibility of the LGU in the internet, i.e., existence of an LGU website, and
- (2) ease of communication—refers to the condition of correspondence, i.e., whether the LGU responded to the researcher’s attempts to communicate via electronic mail.

Pini et al. (2007) illustrated that urban and rural settings experience varying barriers to local natural resource management and environmental sustainability. The same was expected in relation to efforts to mainstream CCA and DRR. Thus, a robust set of data was expected when Camalig (rural area) was paired with a city LGU. Based on these conditions, Legazpi City (the provincial capital) was selected as the second LGU (Table 6). This proved to be a good choice, in terms of time and costs, since Legazpi City also hosts almost all the offices of the provincial respondents.

Table 6 Local scale area selection process

Criteria	Daraga	Malinao	Legazpi City
Availability and accessibility of LGU information	✓	X	✓
Ease in communication	X	X	✓
Urban area	X	X	✓

### 3.4.2 Selection of survey and in-depth interview respondents

The survey conducted in the case study applied a purposive sampling technique to ensure that the respondents were knowledgeable about mainstreaming CCA into local land-use plans. It also employed snowball sampling or chain referral sampling for additional respondents. Accordingly, the survey was conducted among the key actors in the local land-use planning system in Albay and representatives of the national government, non-government agencies, and academic organisations who had experience in implementing projects concerning mainstreaming of CCA in local land-use plans.

The composition of the survey respondents has a design similar to the extended peer community—lay and technical stakeholders—facet of the post-normal science methodology. Under the post-normal context, the quality of the decision-making process depends on the open discourse between and among all those affected by the issue, and the extended peer community provides “extended facts” (e.g., personal or anecdotal experience, contextualised insights) regarding the concern at hand (Ravetz 1999; Saloranta 2001). Essentially, this line of thought advocates that “no particular expertise can deliver certainty for policy issues in the post-normal domain, and no expertise can claim a monopoly of wisdom and competence” on a complex issue (Petersen et al. 2011, p. 373).

In the Philippines, the local land-use plan or the comprehensive land use plan is developed at the municipal and city levels. Meanwhile, the plans are reviewed and approved at the provincial level (HLURB 2006). The Housing and Land Use Regulatory Board (HLURB), the primary institution tasked to provide land use plan guidelines, devised the 12-step process to comprehensive land use planning that is followed by all the LGUs in the Philippines. To limit the research coverage, the survey was designed to investigate the mainstreaming conditions under the step concerned with the actual preparation of the local land use plan—Step 7: Preparing the Land Use Plan (Figure 6).

The respondents at the city/municipal level included the members of the (1) Municipal/City Planning Development Offices that generate the plans; and (2) the Disaster Risk Reduction Office (Legazpi City) which is responsible for the CCA-DRR program of the LGU. At the provincial level, the respondents included members of the Provincial Land Use

Committee (PLUC), who review and approve the plan. Specifically, the respondents included representatives from the Provincial Planning and Development Office, Housing and Land Use Regulatory Board Region V, Department of Interior and Local Government Region V, Department of Agrarian Reform Region V, Department of Environment and Natural Resources Region V, Albay Public Safety and Emergency, and the Provincial Agriculturist (Table 7).

Another set of respondents was selected based on their capability to provide insights with regard to the issues prevailing at the national scale (Figure 6). They were the:

- (1) key project personnel and national institutional representatives involved in activities and programs for mainstreaming CCA into the local land-use plans; and
- (2) experts on CCA and/or land-use planning from the academe and other institutions with local level experience.

Particularly, the respondents were representatives from the national offices of the Housing and Land Use Regulatory Board, Climate Change Commission, and the National Economic and Development Authority, and the institutions of the UN Human Settlement Programme, Philippine Institute of Environmental Planners, and the University of the Philippines Los Banos. These respondents were implementers of national climate change policies or CCA projects, or advisers of LGUs in the mainstreaming process. The results of the in-depth interviews revealed that this set of respondents had a unique perspective on the mainstreaming endeavour. While having a national level perspective on the mainstreaming concerns, the respondents also had knowledge of the issues existing in localities other than Albay. Therefore, they indirectly represented the assessments for other LGUs in the Philippines. With this, the research was able to generate data for two cases—Albay and LGUs other than Albay.



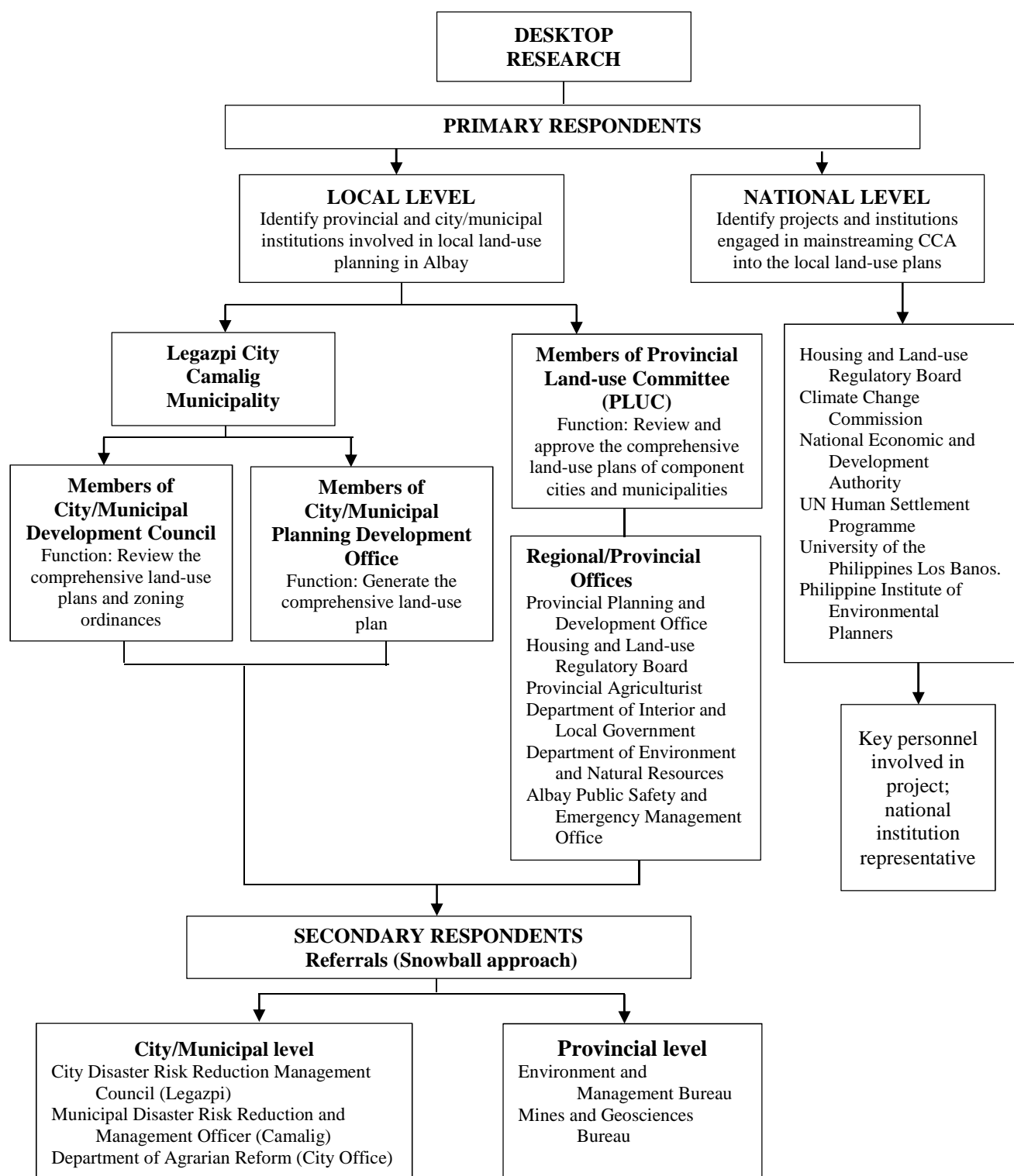


Figure 6 Survey and interview respondents

Table 7 Data collection scheme 1: Method, scale and coverage

	Municipal government	Provincial government	National government	NGOs	Academe	Research
<i>Survey</i>	7	13	5	2	2	-
<i>Interviews</i>	5	11	3	0	2	-
<i>Key informants</i>	0	0	3	3	8	-
<i>Documents</i>	20	13	46	5	11	331

Snowball sampling or chain referral sampling was used to obtain additional survey respondents, who included representatives from the Regional Offices of the Environment and Management Bureau and the Mines and Geosciences Bureau at the provincial level, and the City Disaster Risk Reduction Management Council (Legazpi), Municipal Disaster Risk Reduction and Management Officer (Camalig), and the Department of Agrarian Reform (City Office) at the city/municipal level. The search for local respondents ceased when respondents started referring people who had already been surveyed/interviewed.

The same respondents as that of the survey served as the respondents of the interview. Particularly, five were interviewed among the nine survey respondents at the national scale; 11 among 13 respondents at the provincial scale; and five were interviewed among the seven survey respondents at the city/municipal scale (Table 7).

### **3.4.3 Survey, interview, and consultation set-up**

The survey questionnaires were disseminated using two mediums and in two stages. The first stage involved sending the questionnaires via electronic mail in February 2014, where about 35% of the primary respondents replied. The second stage was conducted in the Philippines, in which hard copies of the survey forms were personally delivered to the primary and secondary respondents in April and May 2014.

The one-hour interviews were semi-structured and involved in-depth discussions of the challenges highlighted in the preliminary results of the online survey, namely, *institutional issues, institutional collaboration and cooperation arrangements, organisational cohesion, and availability of human resources*. The interview schedule was later adjusted in the field to focus more on *institutional issues* and *leadership*, the indicators deemed most significant based on the survey results and initial interviews conducted. Furthermore, questions were asked regarding the interviewee's perceptions of the following concerns (1) the significance of mainstreaming CCA into the local land use planning process; (2) the mind-set of the local planners regarding mainstreaming CCA into land use planning; and (3) the overall progress in mainstreaming CCA into the local land use plans in Albay (local scale) and the Philippines (national scale). The interviews were recorded and later transcribed.

Key informants from both the local and national governments were further consulted to clarify some concerns raised during the interviews. The informants were representatives of the institutions that played crucial roles in the issues mentioned by the interview respondents, such as the Department of Budget and Management, the Civil Service Commission, and the Climate Change Commission. Documents like government memoranda, national and local

laws and regulations, handbooks, and guidelines, were also reviewed for supplemental information.

### **3.5 Data collection scheme**

At this point, the individual stages of the mixed methodology have been discussed, from the modification of the IAD to the conduct of the surveys, interviews and consultations with key informants. This section integrates this information into the data collection scheme used in this research.

Climate change concerns were incorporated in the IAD-CCA framework through the exogenous variables that affect the local mainstreaming setting (action arena). Thus, the data gathered on the biophysical conditions, attributes of the community, and the rules-in-use enabled the identification of the elements that affected mainstreaming CCA at the local scale, which, by transitivity, also influenced the challenges encountered in operationalising the mainstreaming approach. The components of the action arena (i.e., actors and institutional arrangements) provided information on the state-of-play of the local mainstreaming activity, whereas the evaluation criteria explained the patterns of interactions and outcomes from operationalising the adaptation measure.

To gather the data outlined in the IAD-CCA framework, the research applied a strategy for collecting information from multiple data sources—the triangulation by data method (i.e., document, interview, survey, and key informant consultations) (Yin 2014). Through this scheme, the limitations of one data source were supplemented by the strengths of another, thereby enabling the collection of robust data and performance of extensive analyses on these data (Tables 7 and 8).

Table 8 Data collection scheme 2: Requirements and methods

<b>Data requirements: IAD-CCA components</b>	<b>Data methods</b>			
	Survey	Interviews	Consultations (key informants)	Documents
<b>Bio-physical conditions</b>				
<i>Climate change events</i>				✓
<i>Land-use patterns</i>				✓
<i>Physical characteristics</i>				✓
<b>Community attributes</b>				
<i>Norms, practices, and traditions that influence decision-making</i>		✓		✓
<i>Administrative/political subdivisions</i>		✓		✓
<i>Economic activities</i>				✓
<i>Demographic characteristics</i>				✓
<b>Rules-in-use</b>				
<i>National laws and policies</i>		✓	✓	✓
<i>Local laws and policies</i>		✓		✓
<b>Action arena</b>				
<i>Key actors in land-use planning</i>		✓	✓	✓
<i>Key actors in climate change</i>		✓	✓	✓
<i>Institutional arrangements, mandates, and responsibilities of key actors</i>		✓	✓	✓
<b>Patterns of interaction</b>				
<i>Relationships and linkages of key actors</i>	✓	✓	✓	✓
<b>Outcomes</b>				
<i>Mainstreaming of climate change adaptation into local land-use plan conditions</i>	✓	✓	✓	✓
<b>Evaluation criteria</b>				
<i>Mainstreaming indicators: identifying barriers and opportunities</i>	✓	✓	✓	✓
<i>Mainstreaming indicators: analysis</i>	✓	✓	✓	✓

*Note:* The survey incorporates snowball approach and scorecard technique.  
Document pertains to desktop or document review.

### 3.6 Methodology issues and limitations

This section presents the issues encountered in developing the mixed-methodology, from modifying the IAD framework, designing the quantitative aspect of the methodology, to the actual application of the plans and methodological designs in the field. For example, the IAD framework views institutions as rules only (Ostrom 2007). However, the concept of institutions in CCA encompasses rules, social structures, and organisations (Cuevas et al. 2014). The IAD-CCA addressed this issue by incorporating the integrated institutional definition into the institutional capacity component of the evaluation criteria.

Due to the methodology's purposive sampling design—typically applied “to pick a small number of cases that will yield the most information about a particular phenomenon” (Teddlie and Yu, 2007, p. 83)—the survey and interviews included a small sample size. With the aim of gathering “greater depth of information from a smaller number of carefully

selected” people (Teddlie and Yu, 2007, p. 83), all LGU personnel who had intimate knowledge of mainstreaming CCA into the local land use plans were sought as respondents. To minimise the non-response in this highly specialised investigation, the questionnaires were disseminated in two stages—online survey and then field survey. With this strategy, the target people were included successfully among the survey respondents, allowing for in-depth investigation of the critical case of the research. According to Maxwell (2009), a systematically selected small sample (for typicality and relative homogeneity) can enable confident conclusions to be made in qualitative research.

Working with small sample sizes is generally an issue in performing statistical inference and hypothesis testing. However, the works of Bridge and Sawilowsky (1999), Januřsonis (2009), Fitts (2010), Fritz et al. (2012), and de Winter (2013) showed that applying standard statistical analyses on small sample sizes can be feasible and valid. Likewise, the scorecard approach also has been applied effectively on a small sample size to create quantitative metrics (Haanpää and Peltonen, 2007). Still, to ensure the reliability of estimates, Cronbach’s alpha statistics was computed on the data generated.

Other issues encountered pertained to the analysis of the mainstreaming indicators. For example, survey results implied that the questions for the availability of funds, experts, and human resources indicators should be modified. The computed indicator scores were not able to be taken at face value and the indicators required supplementary information and analysis to determine the “true” conditions surrounding the challenges. In particular, the questions for these indicators were concerned with the availability and regularity of resources. However, interviews revealed that the issue was not whether the resources were available, but whether they were sufficient to operationalise mainstreaming CCA efficiently.

While the four-stage mixed methodology was effectively applied in practice, it has some limitations. First, the methodology was restricted to investigating only the variables outlined in the IAD-CCA framework, and thus examined only the challenges identified in its evaluation criteria component. The IAD-CCA offers 20 mainstreaming indicators, and does not claim to exhaust all the possible challenges that systems may encounter in mainstreaming CCA. However, because of the IAD-CCA’s flexible design, other researchers can adjust (i.e., augment or lessen) the evaluation criteria depending on their respective research needs.

Also, this mixed research methodology highly depended on the quantitative results. Essentially, if the indicator scores did not reflect the true conditions in the field, then the qualitative interviews would have been misdirected. Thus, it was crucial that the quantitative data collection instruments, especially the survey questionnaire, had the capability to gather data that best reflected the on-ground conditions.

### **3.7 Summary**

The four-stage mixed methodology devised by this research is a systematic and practical process that can be used by analysts, planners, and decision-makers in setting the direction and prioritising activities in mainstreaming CCA. It has two key aspects, the modified IAD framework (i.e. IAD-CCA) and the case study. The IAD-CCA outlined the data requirements and analytical design of the research, whereas the case study method provided the structure, focus, and boundaries for the data collection activities. Thus, the IAD-CCA framework's theoretical underpinnings on the challenges in local mainstreaming were complemented by the case study.

This research recognised the significance of the IAD's flexible design, and replaced the IAD's evaluation criteria with the mainstreaming challenges in Stage 1. Twenty mainstreaming challenges were identified through document reviews and were spread across three capacity classifications, namely, institutional, information and resource capacities. Although this research presents a relatively extensive list of mainstreaming challenges, it does not claim to record all the possible challenges that systems may encounter in mainstreaming CCA. Accordingly, the evaluation criteria can be further modified depending on the needs of the research.

The scorecard approach was effective in converting these challenges into quantitative indicators in Stage 2; afterwards, the in-depth interviews verified and validated the indicator scores in Stages 3. Data gathered through triangulation by source (i.e., document reviews, key informant consultations, and in-depth interviews) were used for the qualitative analysis conducted in Stage 4, with the IAD-CCA framework employed as the analytical guide. In essence, the qualitative analysis provided deeper understanding of the issues highlighted in the survey, thereby strengthening the significance of the quantitative measures. This confirms the notion that qualitative analysis is equally important as the quantitative analysis; the former provides a detailed observation of the phenomenon investigated and presents supplemental understanding of the quantitative results (Yin 2014).

### **3.8 Conclusion**

There is a growing interest in mainstreaming as an adaptation approach, and an increasing number of countries are encouraged to implement it (UNDP-UNEP 2011; World Bank 2013b; Ayers et al., 2014). However, in practice, mainstreaming encounters a number of difficulties, hence, it has been slow to operationalise (Uittenbroek et al. 2013; Lehmann et al. 2015). This research contends that this setback is likely caused by the lack of attention

given to the institutional facet of mainstreaming operationalisation. The current methodologies and tools for mainstreaming concentrate on climate-related concerns, and they neglect (1) the existing institutional settings and institutional arrangements into which CCA will be integrated; (2) the institutional transformations generated by the integration process; and (3) the impacts of the institutional changes caused by mainstreaming to certain realities already subjected to the existing institutions.

Thus, this research argues that mainstreaming operationalisation needs a methodology that focuses on the challenges in mainstreaming CCA and an analytical framework that can examine the mainstreaming process from an institutional perspective. To have intensive insights into these challenges, the methodology should be able to monitor and assess the severity of the challenges through metrics; answer causal linkages among challenges; and solve the questions pertaining to the “whys” and “hows” of the subject. Accordingly, this research devised the four-stage mixed methodology and applied it in examining the challenges in mainstreaming CCA into local land-use planning in Albay, Philippines.

The research attained its second objective by effectively applying the mixed methodology in practice. Although the methodology is at its initial stages of development, it generated results that have the potential to help analysts, planners, and decision-makers determine the state-of-play of the challenges in mainstreaming CCA and make informed decisions for overcoming these challenges. Thus, the mixed methodology can be a useful in advancing the operationalisation of mainstreaming CCA. This notion is supported by the succeeding chapters which illustrate how the research was able to identify and examine the primary barriers and other main challenges that hinder the operationalisation of the approach at the local scale.

The next chapter presents the analysis on the quantitative data generated by the four-stage mixed methodology. Specifically, it discusses the correlation analysis conducted to determine the linkages and interconnections between and among the challenges in mainstreaming CCA.

## **CHAPTER 4: THE INTERCONNECTED NATURE OF THE CHALLENGES IN MAINSTREAMING CLIMATE CHANGE ADAPTATION: EVIDENCE FROM LOCAL LAND-USE PLANNING\***

\*Cuevas, S.C. (Under review). The Interconnected Nature of Challenges in Mainstreaming Climate Change Adaptation: Evidence from Local Land-use Planning. *Climatic Change*.

### **4.1 Introduction**

Climate change adaptation (CCA) has become a significant concern in the 21st century, and recent discussions on CCA have focused on its transition from conceptualisation to implementation. This shift has not been easy due to difficulties (i.e., barriers, obstacles, limitations, constraints, deficits, problems, or challenges to adaptation) that obstruct, delay, or deter the adaptation process, thereby undermining progress in CCA research, policy-making, and planning (Moser et al. 2008; Amundsen et al. 2010; Biesbroek et al. 2013; Clar et al. 2013; Eisenack et al. 2014). Hence, analysis of the barriers to adaptation has become important in adaptation research, which has begun to identify, categorise, and determine the characteristics of the barriers, why these barriers emerge, and how they can be overcome and turned into opportunities for adaptation (Burch 2010; Ekstrom et al. 2011; Eisenack et al. 2014; Waters et al. 2014; Lehmann et al. 2015). However, the complex nature of the barriers to CCA is not fully understood. For example, information is lacking on how to analyse systematically the interconnections and relationships among the challenges (Clar et al. 2013) and how to quantify the indicators that can help measure these linkages (Biesbroek et al. 2013). Accordingly, empirical evidence that demonstrates these interconnections and their impacts on the adaptation process is limited (Eisenack et al., 2014; Hamin et al. 2014).

Methodical planning is needed to address these knowledge gaps because the challenges or barriers to adaptation are context-specific (Biesbroek et al. 2013). Although it is possible to generalise the nature of these challenges, determining how they affect the adaptation process and the magnitude of these effects depends on the conditions existing in individual settings (Mimura et al. 2014). Hence, this research investigated barriers to CCA by utilising a case study in Albay, Philippines, and focused on the challenges in mainstreaming CCA into local land-use planning.

Understanding the nature of the challenges in mainstreaming, and the interconnections among these challenges, is important to ensure effective on-ground implementation (Biesbroek et al. 2013; Waters et al. 2014). This research addressed an often overlooked aspect of mainstreaming operationalisation—the institutional dimension of the approach. Essentially, this chapter is the first among the four chapter discussions, providing



evidence that the barriers to mainstreaming operationalisation are better understood by analysing them within the institutional context where CCA is to be mainstreamed.

The chapter begins with a review of the factors affecting adaptation, including mainstreaming (i.e., mainstreaming challenges) and the linkages among these factors. The results of the correlation analysis, the computed values of the mainstreaming indicators, and some qualitative assessments are then presented. This analysis concludes that in Albay, Philippines, mainstreaming challenges are interconnected, but to varying degrees. Moreover, the mainstreaming challenges that demonstrate the most interconnections (to other challenges) are *knowledge and awareness*, *local government prioritisation*, *institutional incentives*, *availability of funds*, *access to funds*, and *stability of funds*. Also, that a tripartite relationship can exist among mainstreaming challenges; in particular, there are strong linkages between *local leadership*, *local government prioritisation*, and the local government's *commitment to CCA*.

This chapter is the first of the three that address the third objective which is—to *analyse the state-of-play of and linkages between the challenges in mainstreaming CCA into land-use planning in Albay, Philippines, and how to overcome these challenges*. The focus of this chapter is on the nature of and interdependencies among the challenges to mainstreaming CCA based on the empirical evidence in the Albay case study. The intensive qualitative analyses of the results, including the in-depth interpretation of the mainstreaming indicator scores, are presented in Chapters 5, 6, and 7.

## **4.2 Identifying the challenges in climate change adaptation**

The challenges or barriers to adaptation are the factors that hinder, impede, restrain, inhibit, limit, block, or delay planning, operationalisation, and overall progress of CCA measures and approaches (Moser et al. 2008; Amundsen et al. 2010; Burch 2010; Ekstrom et al. 2011; Ayers et al. 2014; Eisenack et al. 2014). In this chapter, the expressions “challenges” and “barriers” are used interchangeably; the two terms will be further qualified when the results of the research are revealed in later chapters.

Although there is some research analysing the mainstreaming of CCA, studies that examine its practical local application to planning are still lacking. Likewise, information concerning the barriers and limitations of its operationalisation is limited (OECD 2009; Measham et al. 2011; Biesbroek et al. 2014). Thus, to identify a robust set of mainstreaming challenges, a wide array of literature was reviewed, including studies that focused on the barriers, constraints, limitations, and issues in general and local CCA, and general and local mainstreaming of CCA. Accordingly, the document review of this literature suggested

linkages between the barriers and the (low) ability of a system to respond to climate change impacts, i.e., adaptive capacity (Adger et al. 2005; Smit & Wandel 2006; Parry et al. 2007). To further comprehend these linkages, the existing literature on the enablers or determinants of adaptive capacity was examined (OECD 2006; Burch 2010; Gardner et al. 2010; Eisenack et al. 2014).

The document review revealed that the *drivers* or *enablers* of adaptation are the opportunities, while the *barriers* are the factors that impede adaptation; both factors exist at the extremes of the same scale or spectrum (Roberts 2008; Amundsen et al. 2010; Dovers & Hezri 2010; Gardner et al. 2010; Oberlack & Eisenack 2014). For example, the lack of, or the growing awareness to climate change are respectively considered as barriers to or drivers for adaptation. Similarly, effective leadership can help communities prevail over barriers, while the lack of it can be a barrier itself to adaptation (Tang et al. 2009; Roberts 2008; Moser & Ekstrom 2010; Jones et al. 2013).

In this research, mainstreaming challenges are the factors that affect or influence the effective operationalisation of the mainstreaming measure, either as barriers or opportunities. These mainstreaming challenges are summarised into three capacity classifications, namely, *institutional*, *information* and *resource capacities*. The 20 mainstreaming challenges listed as the evaluation criteria in the IAD-CCA framework were identified from this document review.

#### **4.2.1 Institutional challenges**

Planning for climate change is a challenge about “leadership, co-ordination, and collective action”, thus it is about institutions (Evans & Stevens 2009, p. 2). The body of research on the linkages between CCA and institutions is increasing, with several authors emphasising the significance of developing the institutional capacity of systems to address climate change (Adger et al. 2005; Agrawal 2008; Amundsen et al. 2010; Burch 2010; Gupta et al. 2010). Similarly, several studies have identified that the serious barriers to adaptation are institutional in nature (Eisenack et al. 2014; Oberlack & Eisenack 2014; Waters et al. 2014). The next discussions present the various institutional challenges identified in literature, classified under the integrated institutional definition—rule-based, social structure-based, and organisational (Cuevas et al. 2014).

##### **4.2.1.1 Rule-based institutions**

The rule-based institutional challenges relate to how formal institutions affect the *commitment to CCA* of local governments, the *local government prioritisation of CCA*, the

*autonomy of local governments* to make decisions on the CCA, and other rule-based *institutional issues*. These challenges are discussed in detail in this section.

For instance, the absence of formal legislation that mandates actors to incorporate adaptation in their activities is a serious barrier to adaptation (Biesbroek et al. 2011; Hamin et al. 2014; Waters et al. 2014). This lack of formal laws creates an “institutional void” in the system—a condition in which the institutions that motivate, support, and facilitate CCA are scarce (Biesbroek et al. 2011, p. 186). On the other hand, the existence of formal laws and regulations promoting CCA facilitates the “institutionalisation of climate change response measures within standard operating procedures” of the local system (Burch 2010, p. 287). Thus, a local regime with a legislative structure dedicated to CCA reflects the local government’s *commitment to CCA*; such commitment is an essential factor in effective adaptation (Pini et al. 2007; Tang et al. 2009; Duff 2011).

Still, the CCA agenda is difficult to progress when it competes with other local priorities that local governments argue are more pressing, such as poverty alleviation, access to clean water, access to primary education, and the likes (Measham et al. 2011). This situation often results in CCA concerns being set aside and given a low priority in the local agenda (Tang et al. 2009; Picketts et al. 2014). When adaptation is not a local priority, time, attention, and resources are diverted away from this endeavour (Agrawala & van Aalst 2006; OECD 2009; Biesbroek et al. 2011; Measham et al. 2011). This makes *local government prioritisation* of CCA a significant challenge. Similarly, the *autonomy of local governments* to formulate and implement their own choices concerning their jurisdictions is an important institutional factor in CCA (Pini et al. 2007). Local governments need to be empowered to make decisions (e.g., legislative, political, financial, etc.) and shape their own local plans and actions (OECD 2009; Measham et al. 2011).

A wide array of institutional concerns in different localities and settings influences CCA efforts. Scholars referred to these factors as institutional constraints (Measham et al., 2011) or institutional deficits (Oberlack & Eisenack 2014). In this research, they are known as *institutional issues*. For example, Burch (2010) identified the lack of coherence in climate change approaches in British Columbia, Canada as a considerable barrier to local climate change actions. Ayers et al. (2014, p. 48) cited that the “turbulent political system” in Bangladesh significantly constrains CCA planning in that country. Several studies have identified other barriers, such as mismatched timescales between climate change projections and development planning horizons, and specific sectoral issues (e.g., poorly defined property rights and land tenure schemes) (Agrawala & van Aalst 2006; OECD 2009).

#### **4.2.1.2 Social structure-based institutions**

This section discusses the social structures, such as attitudes, values, norms, practices, and beliefs, that influence how and why individuals and societies engage in CCA and adaptation planning (Biesbroek et al. 2011; Cuevas et al. 2014; Lehmann et al. 2015). It presents the challenges relating to *community support* to CCA, *institutional incentives* to engage in CCA, and the local *leadership* supporting CCA. Particularly, the *community's support* for adaptation and the manner by which actors are *incentivised* to adapt to climate change affect people's mindsets toward the endeavour. Likewise, the collective behaviour for climate change can be the result of a type of local *leadership*, specifically, the leadership of a local climate change champion.

The presence or absence of community support can substantially affect CCA. Strong community support defines the readiness of people to act and address climate change and suggests positive behaviour and attitudes toward CCA. Most importantly, it indicates the willingness of the community to accept and abide by the rules and regulations related to CCA (Burch 2010; Biesbroek et al. 2011; Waters et al. 2014). Meanwhile, *incentivising* planners, policy-makers, and other decision-makers to address CCA similarly influences behaviours toward the undertaking (Agrawala & van Aalst 2006; Oberlack & Eisenack 2014). As individual attitudes and the conduct of planners and decision-makers are crucial determinants of adaptation planning, instilling the benefits of CCA into their consciousness would encourage the creation of mindsets that are in favour of CCA (Mitchell et al. 2006; Gardner et al. 2010; Lehmann et al. 2015).

Another key component in local CCA is *leadership* or the “emergence of an identifiable political/administrative champion(s) for climate change issues” (Roberts 2008, p. 527). Leadership is a crucial aspect at any stage of the adaptation process. A climate change champion can raise awareness of climate change, initiate CCA efforts, put CCA high into the local government agenda, and uphold future CCA initiatives. Conversely, the absence of such a leader can weaken the climate change agenda and be a critical barrier to the endeavour (Burch 2010; Moser & Ekstrom 2010; Oberlack & Eisenack 2014; Waters et al. 2014).

#### **4.2.1.3 Organisational institutions**

The challenges related to organisational institutions primarily deal with the institutional arrangements between organisations that build cooperation and collaboration across scales, and the linkages among organisations that bring either cohesion or fragmentation among institutions.

The lack of *organisational cohesion* or the existence of organisational fragmentation is an incessant barrier, especially to an interdisciplinary, cross-sectoral and multi-level concern such as CCA (Amundsen et al. 2010; Eisenack et al. 2014). Lack of organisational cohesion can happen when CCA is isolated from the development agenda, which can accordingly manifest in the form of (1) unclear responsibilities or division of duties on CCA by varying organisations; (2) absence of organisational structure that determines the tasks of multiple departments concerning CCA; and (3) disorganised CCA efforts (Pini et al. 2007; Burch 2010; Waters et al. 2014). When responsibilities and tasks are vague, lack of organisational cohesion can lead to “institutional crowdedness,” in which there is an overabundance of institutions with authority to influence CCA decisions (Biesbroek et al. 2011, p. 186).

The degree of cooperation and collaboration among organisational institutions is also linked to the lack of organisational cohesion. This factor is treated separately to emphasise the significance of institutional arrangements in structuring the rules governing interactions among individuals and societies. Likewise, *cooperation and collaboration arrangements* focus on the existence of mechanisms that facilitate these arrangements. Essentially, cooperative and collaborative arrangements can ensure compatible and complementary outcomes. On the other hand, ill-defined or conflicting arrangements between organisations can result in redundant, contradicting, or counterproductive CCA efforts (Duff 2011; Cuevas et al. 2014; Oberlack & Eisenack 2014). In fact, this particular concern about the lack of organisational cooperation, collaboration, and coordination “may be considered a main reason why adaptation mainstreaming is lacking” (Lehmann et al. 2015, p. 86).

#### **4.2.2 Information challenges**

The challenges related to climate change information are key factors that affect CCA. These include the extent of knowledge and awareness of climate change issues; the availability, accessibility, credibility, and reliability of information; the manner by which information is communicated and translated by climate change experts; and the way the information is received by the users (i.e., planners and decision-makers) (Mitchell et al. 2006; Mukheibir & Ziervogel 2007; Ekstrom et al. 2011; Ayers et al. 2014).

The level of awareness of climate change and its predicted impacts can shape the attitudes, behaviours, priorities, and the actions of local governments toward CCA, and this can result in powerful opportunities or barriers to adaptation (OECD 2009; Biesbroek et al. 2013; Oberlack & Eisenack 2014). To illustrate, sufficient *awareness and knowledge* of climate change impacts can urge local authorities to commit to CCA, and accordingly raise

adaptation high onto the local government agenda. Conversely, decision-makers and communities who refuse to recognise that climate change is real or have limited knowledge of climate change risks can remove CCA from the local agenda (Tang et al. 2009; Eisenack et al. 2014).

In the context of adaptation, scientists and local communities are parts of the same climate change information coin. The scientists generate and transmit the information, whereas the local communities receive and use the information. Hence, the challenges in information need to be perceived as the factors that influence the linkages between the giver and receiver of climate change information. For instance, the *availability of information* (or lack thereof) is a serious problem in adaptation. In retrospect, this factor also becomes a barrier when the available information does not match the needs of the users of information. For example, local planners and decision makers would need hazard maps with high resolution at local scales, but available data are often available only at national scales. Similarly, when the data are not customised for the site where CCA will be operationalised, there is a mismatch of availability and need. In this sense, the outputs of science and technology become irrelevant to CCA (Amundsen et al. 2010; Gardner et al. 2010; Waters et al. 2014).

Climate change data also become ineffective when users cannot *access the information*. This occurs when (1) users are not aware of the existence of the information; (2) users do not know how to retrieve the information; or (3) data are not for public use because they are generated and maintained by private entities (Gardner et al. 2010; Moser & Ekstrom 2010; Ekstrom et al. 2011; Nambi & Prabhakar 2011). Data should also be *credible and reliable* for users to apply the data to CCA. This factor incorporates the attitude and trust of the receiver in relation to the source of the information (Cash et al. 2003; Ekstrom et al. 2011; Measham et al. 2011). It determines the willingness of the recipients to use the data, thereby, leading to informed adaptation actions (Henry & Dietz 2011).

How climate change information is *communicated to users* affects how information is received, thus representing a substantial challenge in CCA. According to Cash et al. (2003, p. 8088), “active, iterative, and inclusive communication between experts and decision makers” is key in mobilising information into action. Thus, effective communication needs frequent and regular two-way dialogue between the source and the receivers (Cash et al. 2003; Mitchell et al. 2006). However, this approach should be accompanied by an efficient *translation of information*. Whereas the way information is communicated affects the attitude of recipients toward the information—specifically, their acceptance and willingness to use the information—the way information is translated influences its utility. That is, the way

complex ideas and scientific findings are explained would determine how users understand and utilise the information (Agrawala and van Aalst 2006; Biesbroek et al. 2011; Jones et al. 2013).

### 4.2.3 Resource challenges

Resource constraints have always been a problem for local governments. However, they are highlighted in CCA because resources are crucial factors of adaptive capacity (Pini et al. 2007; Biesbroek et al. 2011). For example, lack of funds is typically among the primary reasons why the implementation of local adaptation is delayed (Gardner et al. 2010; Moser & Ekstrom 2010; Lehmann et al. 2015). Local governments have limited capabilities to invest or begin new endeavours since their budgets often are overextended. With the additional responsibility for CCA, these shortcomings are magnified; local governments become more under-resourced, overcommitted, and overtasked (Pini et al. 2007; OECD 2009; Measham et al. 2011). Hence, the *availability of funds* can be a great barrier to CCA when it is lacking, and a significant opportunity when it is sufficient.

Along with the availability of funds, the *access to these funds* is crucial to CCA. Access would include (1) being aware that the funds exist; (2) the convenience in fund processing; and (3) having simple requirements to secure the fund (Biesbroek et al. 2011; Dang et al. 2014). A *stable and predictable fund source* is likewise significant, especially at the local scale (Pini et al. 2007; Kato 2014). Adaptation is an added concern to the local government that can overstretch their already strained financial capacities. Thus, the more likely that a local government will assume the financial responsibility of implementing CCA once funding ceases, the less likely it is that the local government will pursue CCA. Consequently, short-term remedies rather than long-term CCA approaches are implemented (Pini et al. 2007; Measham et al. 2011).

In CCA, the need for adequate resources extends beyond finance. The *availability of staff* dedicated solely to CCA is an important factor in local adaptation (Burch 2010). Because climate change is a long-term challenge, the stability of tenure of the human resources is vital—the permanency of the workforce can help ensure the continuity of CCA activities (Gardner et al. 2010). This issue becomes more complex because the requirements for such positions are specific—trained, skilled, and knowledgeable about climate change (Roberts 2008; Nambi & Prabhakar 2011; Ekstrom & Moser 2014; Oberlack & Eisenack 2014). Accordingly, investing in human resources becomes necessary.

The *availability of experts* to facilitate the training and education of CCA personnel is another issue (Mukheibir & Ziervogel 2007; Amundsen et al. 2010). Experts in this field are

scarce and thus, this problem hinders both the resource and information capacities of localities.

#### **4.2.4 Linkages among the challenges in mainstreaming**

As presented in the preceding discussions, there is an expanding literature on the barriers to adaptation, and a number of studies have focused on identifying these barriers. The task now is to go beyond recognising and classifying barriers, to focusing on the interconnections and interdependencies among them (Ekstrom et al. 2011; Eisenack et al. 2014). Understanding these linkages can help stakeholders to determine how these barriers can be overcome (Biesbroek et al. 2013).

The barriers to adaptation are interconnected or interlinked because “barriers do not exist in isolation, but are produced through interrelated processes” (Kuruppu & Willie 2015, p. 77). To illustrate, having unclear delineation of responsibilities among the institutions concerned with CCA affects the level of coordination among these organisations. This condition then results in poor organisational collaboration, which may further result in duplication of organisational efforts (Gardner et al. 2010). Hence, within the organisational context, a single issue can create a domino effect which debilitates the ability of organisations to address CCA concerns effectively. Meanwhile, because the barriers are interdependent, they either support or weaken each other (Eisenack et al. 2014). For example, Hamin et al. (2014) concluded that leadership was the major barrier to local climate change actions in the coastal cities and towns in Massachusetts, USA. This lack of leadership constrained the time and financial resources allocated to adaptation, which consequently restricted the planners’ capacity to overcome the technical barriers.

Still, although it is recognised that barriers to adaptation are interconnected (Hamin et al. 2014; Lehmann et al. 2015), little is known about the extent of these relationships. This becomes problematic since “understanding the interdependencies of barriers is central for explaining their occurrence, persistence, and resolution” (Eisenack et al. 2014, p. 869). As such, generating quantifiable connections among these barriers would help researchers to develop a reliable basis for their qualitative assessments (Hamin et al. 2014). A quantitative approach can strengthen analysis and can help establish a baseline against which future actions and developments can be compared (Burch 2010; Lehmann et al. 2015); thus, the significance of the mixed methodology devised by this research.



### **4.3 Nature of the challenges in mainstreaming climate change adaptation into local land-use planning**

This chapter presents only the quantitative analysis conducted in Stage 2 of the mixed-methodology. Specifically, it shows the results of the pair-wise correlation analysis conducted on the survey data and presents the computed mainstreaming indicator scores. A correlation analysis is a statistical technique that determines whether two variables are associated and measures the degree of this association. In general, it can be described as a study of interdependence (Asuero et al. 2006). A correlation coefficient ( $r$ ) equals to 1 reflects a perfect positive relationship;  $-1$  suggests the inverse; and  $r = 0$  implies no relationship (Moutinho 2011).

It is acknowledged that the correlation analysis was conducted on a set of data collected from small sample sizes of the provincial (i.e., 13 respondents) and city/municipal surveys (i.e., seven respondents). The small sample sizes were due to the highly specialised nature of the investigation; respondents were limited to the members of the Provincial Land-use Committee for the provincial scale and to the city/municipal staff with knowledge of mainstreaming CCA into the local land-use plans. In general, local government units (LGUs) in the Philippines are understaffed, with people assuming multiple functions and positions (Corpuz 2012), and a one-person (staff) Municipal Planning Development Office is not uncommon (Interviews 2014). Still, all possible LGU personnel who had intimate knowledge of mainstreaming CCA into the local land-use plans were sought and were successfully included among the survey respondents.

Working with small sample sizes is usually a concern in conducting statistical inference and hypothesis testing. However, as mentioned in Chapter 3, Bridge and Sawilowsky (1999), Januřsonis (2009), Fitts (2010), Fritz et al. (2012), and de Winter (2013) agreed that applying standard statistical analyses on small sample sizes can be feasible and valid. In this research, the correlation analysis was used as a descriptive tool for examining the relationships among the mainstreaming challenges. The objective was not to generalise the results to a certain population, but to gather context-specific information. Thus, the results can be considered robust. Still, interpreting the correlation results should be done with caution because correlation only implies interconnections between variables and does not clarify causation (Moutinho 2011). Thus, on top of correlation analysis, additional information and supporting evidence are required for decision-making. This research addressed this through the in-depth interviews conducted in Stage 3, and the additional document reviews and consultations with key informants in Stage 4 of the mixed methodology.

The next discussions focus on the results of the correlation analysis and how they (correlation results) link to the mainstreaming indicator scores. This chapter focuses on the interconnections of the mainstreaming challenges, while the complete mainstreaming indicator scores together with their corresponding interpretations are discussed in Chapter 5. In particular, because correlation analysis only suggests interconnections among variables, this section explores the direction of the interconnections (i.e. causation) through the supplementary information provided by the mainstreaming indicators. The analyses are segmented by provincial and city/municipal scales.

### **4.3.1 Interconnections among mainstreaming challenges**

The correlation analysis presented is restricted to the mainstreaming challenges with  $r \geq 0.50$  (i.e., moderate correlation and more), highlighting those with  $0.70 \leq r \leq 0.89$  (i.e., high correlations or strong associations) and  $0.90 \leq r \leq 1.0$  (i.e., very high correlations or very strong associations) (Asuero et al. 2006). The frequencies of interconnections ( $r \geq 0.50$ ) that each challenge has to other challenges also are presented.

The correlation analysis of the provincial data showed strong (i.e.,  $0.70 \leq r \leq 0.89$ ) and very strong ( $0.90 \leq r \leq 1.0$ ) relationships (Table 9 and Figure 7) between and among resource capacity challenges (i.e., *availability of funds*, *access to funds*, *stability of funds*, *availability of experts*, and *availability of human resources*). Specifically, very strong associations ( $0.90 \leq r \leq 1.0$ ) between the (1) *stability of funds* and *availability of funds*; (2) *stability of funds* and *access to funds*; (3) *availability of funds* and *access to funds*; (4) *availability of funds* and *availability of experts* were observed. Whereas resource-related challenges have been perennially identified to be important in every stage of a CCA initiative (Measham et al. 2011), and it is acknowledged that resource barriers are linked to one another, these results presented the extent of these linkages. For example, lack of funding oftentimes translates to lack of staff dedicated to CCA activities (Gardner et al. 2010). However, in the Albay case, the relationship between human resources and access to funds ( $r = 0.86$ ) was stronger than the relationship between human resources and the availability of funds ( $r = 0.65$ ).

At the city/municipal scale (Table 10 and Figure 8), very high associations were registered between (1) *organisational cooperation arrangements* and *availability of information*; (2) *organisational cohesion* and *access to information*; (3) *leadership* (existence of a climate change champion) and *local government prioritisation* (of CCA); (4) *institutional incentive* and *knowledge and awareness*; and (5) *availability of funds* and *access to funds*.

Meanwhile, at the provincial scale, the challenges that registered the highest frequencies of interconnections (i.e.,  $r \geq 0.50$ ) to other mainstreaming challenges included: *stability of funds*, 12 interconnections; *access to funds* and *institutional incentives*, 11 each; and *availability of funds*, *local government prioritisation*, and *knowledge and awareness*, with 10 interconnections each. The notable frequency of interconnections at the city/municipal scale was posted by the *knowledge and awareness* challenge, at 9 interconnections (Figures 7 and 8).

Lastly, at the provincial scale, there were strong tripartite relationships among (1) *knowledge and awareness*, *stability of funds*, and *access to funds*; (2) *local government prioritisation*, *availability of experts*, and *access to funds*; (3) *institutional incentive*, *availability of experts*, and *stability of funds*; and (4) *institutional incentive*, *availability of experts*, and *access to funds* (Figure 7). At the city/municipal scale, this relationship was most evident among (1) *leadership*, *local government prioritisation* and *commitment to CCA*; (2) *leadership*, *local government prioritisation*, and *availability of experts*; (3) *translation of information*, *availability of funds* and *access to funds*; and (4) *availability of funds*, *access to funds*, and *availability of human resources* (Figure 8). The tripartite relationship indicated that a change in the status of one challenge could affect the statuses of the other two challenges, and vice-versa. This notion was confirmed and further explored in the discussion on the mainstreaming indicators.

Table 9 Mainstreaming indicators with correlation  $\geq 0.70$ , provincial scale

Mainstreaming challenges	Correlation coefficient	Mainstreaming challenges
Translation of information	0.7526*	Credibility & reliability of information
<b>Stability of funds</b>	0.7395*	Credibility & reliability of information
	0.7449*	Knowledge & awareness
	0.8470*	Institutional incentive
	<b>0.9067*</b>	<b>Availability of funds</b>
	<b>0.8989*</b>	<b>Access to funds</b>
Local government prioritisation	0.7245*	Community support
<b>Availability of experts</b>	0.7454*	Local government prioritisation
	0.7652*	Institutional incentive
	<b>0.8989*</b>	<b>Access to funds</b>
	0.7059*	Stability of funds
Institutional incentive	0.7762*	Translation of information
<b>Access to funds</b>	0.7094*	Knowledge & awareness
	0.7454*	Local gov't prioritisation
	0.8148*	Institutional incentive
	<b>0.8989*</b>	<b>Availability of funds</b>
Availability of human resources	0.8600*	Access to funds
	0.7126*	Stability of funds
	0.8898*	Availability of experts

\*Specifies the significance level of correlation coefficients at the 5% level or better (i.e., 95% confidence level).

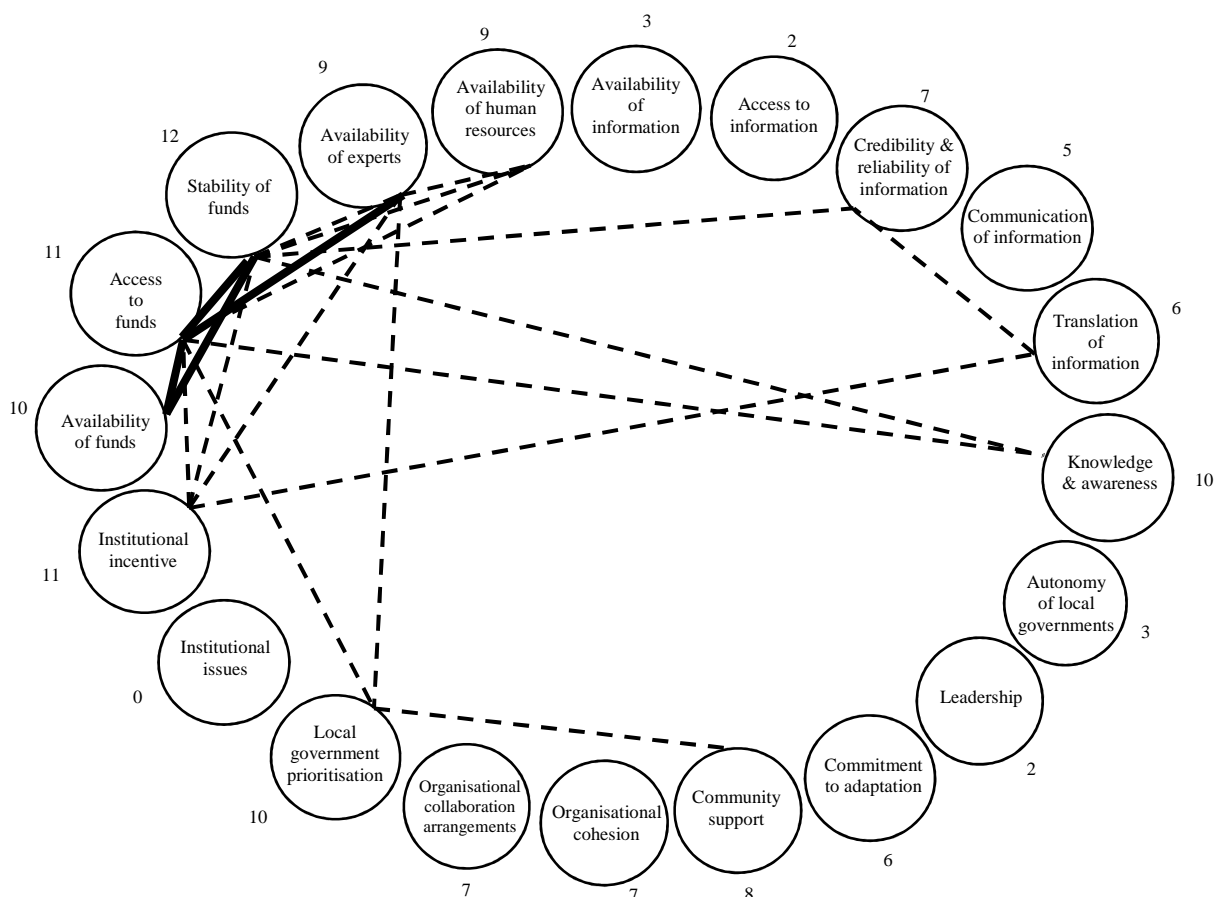


Figure 7 Interconnections among the mainstreaming challenges, provincial data

Notes: The broken lines depict strong relationships between mainstreaming challenges ( $0.70 \leq r \leq 0.89$ ). Solid lines illustrate very strong linkage ( $0.90 \leq r \leq 1.0$ ). The number near the circle depicts the frequency of linkages the mainstreaming challenge has with others at  $r \geq 0.50$ .

Table 10 Mainstreaming indicators with correlation  $\geq 0.70$ , city/municipal scale

Mainstreaming challenges	Correlation coefficient	Mainstreaming challenges
Translation of information	0.7500	Communication of information
<b>Access to funds</b>	-0.7500	Translation of information
	<b>1.0000*</b>	<b>Availability of funds</b>
Commitment to climate change adaptation	0.7500	Leadership
	0.7303	Communication of information
Availability of experts	0.7102	Knowledge & awareness
	0.7303	Leadership
	0.7303	Local government prioritisation
<b>Organisational cohesion</b>	<b>1.0000*</b>	<b>Access to information</b>
<b>Organisational cooperation arrangements</b>	<b>1.0000*</b>	<b>Availability of information</b>
<b>Local gov't prioritisation</b>	<b>1.0000*</b>	<b>Leadership</b>
	0.7500	Commitment to climate change adaptation
<b>Institutional incentive</b>	<b>0.9169*</b>	<b>Knowledge &amp; awareness</b>
Availability of funds	-0.7500	Translation of information
	0.7500	Availability of funds
Availability of human resources	0.7500	Access to funds
	0.7303	Stability of funds

\*Specifies the significance level of correlation coefficients at the 5% level or better (i.e., 95% confidence level).

Note: CCA – climate change adaptation



- (5) exploit the tripartite relationships of the mainstreaming challenges (i.e., *local leadership-local government prioritisation of CCA-commitment to CCA*) (discussed in 4.3.2).

#### **4.3.2 Tripartite relationship among leadership, local government prioritisation, and commitment to CCA**

This section focuses on the tripartite relationship among the challenges pertaining to *leadership, local government prioritisation, and commitment to CCA*, as illustrated by the correlation results; in particular, how this relationship relates to the mainstreaming indicator scores. Accordingly, the mainstreaming indicators are briefly introduced, while detailed discussions of the indicators are presented in Chapters 5, 6, and 7.

Cronbach's alpha ( $\alpha$ ) statistics for the local (i.e., provincial and city/municipal) data set was computed at 0.8925;  $\alpha$  for the provincial subset registered at 0.9487 and 0.9001 for the city/municipal subset. These results suggest reliable estimates for the mainstreaming indicators, provided that the accepted value of  $0.70 \leq \alpha \leq 0.95$  (Gliem & Gliem 2003; Tavakol & Dennick 2011).

Details from the interviews confirmed the notion that barriers should be prioritised differently as they have varying degrees of severity (Biesbroek et al. 2013; Waters et al. 2014). Essentially, the indicator scores presented the state-of-play related to the mainstreaming challenges at each governance scale (i.e., national, provincial, and municipal/city). The interviewees explained the reasons behind the scores and based on the interview assessments, the mainstreaming indicators were classified into four levels that illustrate the transition of the challenges from barriers to opportunities for mainstreaming. The first-level mainstreaming indicators (i.e., with scores  $1.0 \leq n < 2.0$ ) represented the primary barriers that constrained the effective integration of CCA into the local planning system. Conversely, the fourth-level mainstreaming indicators (i.e., with scores  $\geq 2.5$ ) indicated those challenges that the system has already overcome, have positive effects on the implementation process, and, therefore, are considered as opportunities for mainstreaming. Indicators with scores  $2.0 \leq n < 2.25$  and  $2.25 \leq n < 2.5$  were categorised as second- and third-level barriers, respectively. In essence, the indicator scores identified the problems in mainstreaming by level of significance, and hence can help planners and decision-makers prioritise activities.

Analysis of the mainstreaming indicator scores supported the tripartite relationship among *leadership, local government prioritisation, and commitment to CCA* challenges. *Leadership* pertains to the absence or existence of a climate change champion in the locality,

and the extent of the champion's influence on the behaviour of the community. Meanwhile, *local government prioritisation* refers to the level of CCA agenda within the general development priorities in the local government. Finally, *commitment to CCA* pertains to the absence or presence of an administrative and/or legislative framework for local adaptation. The local *leadership* indicator (score: provincial=2.67; city/municipal=2.57) was assessed as an opportunity for mainstreaming CCA due to the existence of a climate change champion—Governor Jose Salceda, the chief executive officer of the province (Figure 9). Governor Salceda was an effective champion, hence the United Nations International Strategy for Disaster Reduction acknowledged him as a “Senior Champion” of CCA and DRR in 2010, as well as a “Champion for Making Cities Resilient” (PreventionWeb 2010; UNISDR 2012b).

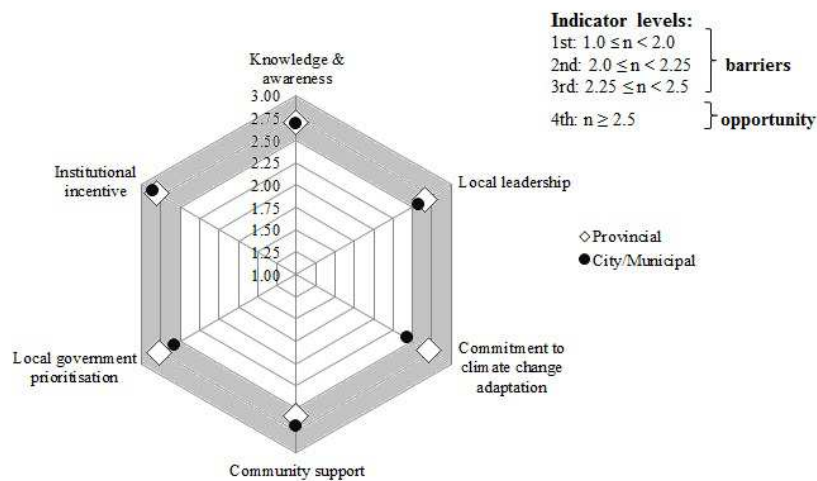


Figure 9 Mainstreaming indicators linked to local leadership: Albay, Philippines

Note: Grey area represents the region where challenges have been transformed into opportunities for mainstreaming CCA.

Under the governor’s leadership, the Provincial Government of Albay institutionalised CCA as a priority agenda by virtue of Provincial Resolutions 2007-04 and 2007-24. Both local regulations aimed to influence the political and social consciousness of the people in the government, private sector, and communities in Albay with regard to CCA (PGA 2007; Lasco et al. 2008). Such policies, along with many others, established a legislative framework for CCA in the province. Consequently, the local government prioritisation indicator (score: provincial=2.77; city/municipal=2.57) was evaluated as an opportunity at both provincial and city/municipal scales. However, the commitment to CCA indicator (score: provincial=2.71; city/municipal=2.43) was an opportunity only at the provincial scale; it was considered as a third-level barrier at the city/municipal scale (Figure 9). These assessments imply that although commitment to CCA is not a serious constraint at

the city/municipal scale, more work is needed to completely overcome the challenge and transform it into an opportunity for mainstreaming. Hence, the implication of a climate change champion at the city/municipal scale can then be explored.

The very strong interconnection between *leadership* and *local government prioritisation*, as suggested by the correlation analysis, was corroborated by the assessments of the respondents, such as:

There are a lot of traditional politicians who are more focused on projects related to poverty, social services, infrastructure, and the like, because the votes are there. Climate change looks into the future and not the present; therefore, climate change would not be in most politicians' agenda and priorities. Instead, they would have short-term insights rather than long-term plans for future climate change impacts....Hence, the importance of a climate change champion....It takes a governor to be the champion of climate change (in the province). If climate change is not among the priorities of the governor, only a small number of people will respond to the climate change efforts.

With regard to the relationship between *leadership* and *commitment to CCA*, one respondent stated:

There should be a (climate change) champion, and this should be the local chief executive. Likewise, this champion should be supported by the local legislative body. Essentially, the local government functionaries—like the heads of departments and technical staff—will not be very effective if these two bodies (executive and legislative bodies of local governments) are not synergised in supporting CCA.

#### **4.3.3 Relationship between knowledge and awareness and institutional incentive**

This section explores the direction of the very strong relationship ( $r=0.92$ , city/municipal scale) between *knowledge and awareness* and the *institutional incentive* indicators. The *knowledge and awareness* indicator refers to the level of understanding of planners, decision makers, and the communities regarding the implications of climate change (knowledge), or their acknowledgement of the existence of climate change (awareness). Meanwhile, *institutional incentive* measures the degree by which the benefits from adaptation encourage actors to operationalise the mainstreaming approach.

In Albay, the knowledge and awareness indicator (score: provincial=2.70; city/municipal=2.69) was an opportunity (Figure 9). Most of the respondents attributed this condition to the climate change champion, specifically, “because Governor Salceda has been actively advocating for CCA-DRR, hence, the people in Albay, including the planners and the Municipal Planning and Development Council, are aware of climate change” (Interviews 2014). Some of the initiatives that contributed to this high level of knowledge and awareness



included institutionalising organisations that can advance the knowledge of planners, decision-makers and the community on climate change (i.e., Center for Initiatives and Research for Climate Adaptation [CIRCA] and Climate Change Academy). CIRCA was created through the Provincial Executive Order 2007-12-A and became Albay's main organisation for CCA and climate risk reduction research (Lasco et al. n.d.). Meanwhile, the Climate Change Academy, institutionalised through a Memorandum of Agreement between the Provincial Government of Albay and the province's leading university (i.e., Bicol University), facilitated the education of local stakeholders on both climate change and disaster risk concerns (PGA and CIRCA 2010). The Climate Change Academy had since conducted seminars, workshops, and trainings on climate change, CCA, and DRR (Interviews 2014).

The institutional incentive indicator (score: provincial=2.81; city/municipal=2.86) was likewise evaluated as an opportunity in Albay (Figure 9). Most respondents rated mainstreaming of CCA into the local land-use planning process as very important, and credited this mind-set to the improved knowledge and awareness of planners on climate change issues. As such, the respondents stated:

In my opinion, about 80% of the planners in Albay have the mind-set that integrating CCA-DRR into the local land-use plans should be prioritised.

As planners become aware of climate change concepts, impacts, etc., they are encouraged to include climate change mitigation and adaptation into their local plans.

Local government units (staff) have attended trainings and seminars on CCA to improve their understanding of climate change, including their (staff's) appreciation of CCA. So, I think they know the significance of integrating CCA into the local land-use plans.

My technical staff has been attending climate change seminars, workshops, and trainings, and they highly appreciate the importance of integrating CCA-DRR into the local land-use plans. (Interviews 2014)

Whereas the correlation results showed strong interconnection between *knowledge and awareness* and *institutional incentives*, the testaments of the interviewees illustrated the direction of the relationship. That is, high *knowledge and awareness* of climate change was the cause, and a high level of appreciation of the benefits of CCA (i.e., *institutional incentive*) was the effect.

#### 4.4 Summary and conclusions

Understanding the challenges for adaptation is significant for the successful on-ground application of the mainstreaming approach (Amundsen et al. 2010; Biesbroek et al. 2013; Clar et al. 2013; Eisenack et al. 2014). Mainstreaming challenges are the factors that affect or influence the effective operationalisation of the mainstreaming measure, and can be represented either as barriers or opportunities. Operational advice on mainstreaming CCA typically concentrates on climate-related issues, and recommended tools and techniques to address these issues include vulnerability assessments, climate risk screening, and climate change scenario building, among others (Olhoff & Schaer 2010; Lebel et al. 2012; SPREP & UNDP 2013). The institutional dimension of applying the approach in practice is often overlooked.

This chapter contends that analysing the challenges in mainstreaming within the institutional context can help planners, analysts, and practitioners to improve their understanding of the nature of the challenges. This chapter answered the third research objective—to *analyse the state-of-play of and linkages between the challenges in mainstreaming CCA into land-use planning in Albay, Philippines, and how to overcome these challenges*—by confirming that the barriers to adaptation were interconnected or interlinked, and that these relationships existed at varying degrees of intensity. Furthermore, the challenges had varying frequencies of interconnections; some challenges were more interconnected than others. To illustrate, the challenge relating to *knowledge and awareness* was evaluated among those with the highest frequencies of interconnections with other challenges. Moreover, this challenge had a strong association with *institutional incentive*. Qualitative assessments verified these relationships and showed that the improved *knowledge and awareness* incentivised the Albay planners to apply the mainstreaming approach in local land-use planning. Another notable result was the tripartite relationship among *leadership, local government prioritisation* and *commitment to CCA* challenges. Assessments showed that the existence of a climate change champion in Albay resulted in the Provincial Government of Albay *prioritising CCA* and in creating a provincial government *committed to CCA*.

This chapter demonstrated how quantitative (i.e., correlation analysis, mainstreaming indicators) and qualitative (i.e., indicator score assessments) techniques, methods, and analyses can be used in formulating strategies for an efficient mainstreaming process. In particular, it showed how the mainstreaming indicators were effective in providing supplementary information to the correlation analysis. That is, the indicator scores confirmed the relationships implied by the correlation coefficients, and also clarified the direction (i.e.,

causation) of these relationships. However, the utility of the mainstreaming indicators go beyond providing supplementary evidence on the relationships among the mainstreaming challenges, a notion that is explained in the next chapter.

## **CHAPTER 5: CHALLENGES IN MAINSTREAMING CLIMATE CHANGE ADAPTATION INTO LOCAL LAND-USE PLANNING: EVIDENCE FROM ALBAY, PHILIPPINES\***

\*Cuevas, S.C., Peterson, A., Robinson, C. & Morrison, T. H. (2015). Challenges in Mainstreaming Climate Change Adaptation into Local Land-use Planning: Evidence from Albay, Philippines. *The International Journal of Climate Change: Impacts and Responses*, 7(3):45–65.

### **5.1 Introduction**

The previous chapters argued that while research interest in mainstreaming is growing, information remains limited, especially on the practical application of the approach at the local scale, and on the barriers to the effective operationalisation (Measham et al. 2011; Mangoyana et al. 2012; Uittenbroek et al. 2013; Mimura et al. 2014). This knowledge gap is exacerbated further by the absence of metrics to measure the extent of the barriers' impacts on achieving adaptation outcomes. Adaptation indicators that can track the process, implementation, scope, and the degree to which targeted outcomes are attained would be useful for planning and policy-learning (Noble et al. 2014). This chapter addresses this setback, and analyses the quantitative mainstreaming indicators developed in the research. Specifically, these indicators illustrate how the challenges in adaptation affect the mainstreaming endeavour.

Critical issues in adaptation research pertain to the barriers or challenges obstructing, delaying, diverting or blocking the adaptation process (Ekstrom et al. 2011). Previous research identified the pressing queries regarding the barriers to mainstreaming CCA, and CCA in general, as (1) What are the barriers to adaptation?; (2) How are the barriers categorised?; (3) What is the nature of the barriers?; (4) Why and how do barriers appear and persist?; and (5) How can the barriers be overcome? (Amundsen et al. 2010; Farrell 2010; Moser & Ekstrom 2010; Roberts 2010; Sharma & Tomar 2010; Eisenack et al. 2014). Still, more information is needed to fully understand the complexities in overcoming these barriers and effectively operationalising an adaptation measure.

The mainstreaming indicators introduced in this chapter address the first three queries, while the last two questions are answered in Chapters 6 and 7, respectively. In particular, this chapter argues that understanding the nature of the barriers is crucial in operationalising and analysing the mainstreaming process (Biesbroek et al. 2013; Waters et al. 2014). Thus, quantitative indicators that can assess the state-of-play of a mainstreaming endeavour are significant tools in formulating effective mainstreaming strategies.

This chapter supports Chapter 4 and continues to address the third objective—to *analyse the state-of-play of and linkages between the challenges in mainstreaming CCA into land-use*

*planning in Albay, Philippines, and how to overcome these challenges.* The chapter begins with a review of how the mainstreaming indicators used in this research were generated. These indicators are the quantitative representation of the factors that affect the effective operationalisation of mainstreaming, which are collectively referred to in the previous chapters as “mainstreaming challenges”. The characteristics of the challenges are then analysed leading to the following conclusions:

- (1) mainstreaming challenges exist within a certain spectrum, with the barriers and opportunities for adaptation representing the extreme ends of this spectrum; and
- (2) the barriers can affect the mainstreaming process at varying degrees of severity.

The above set of information can help local governments to prioritise the challenges that need to be addressed (i.e., primary barriers) and determine which factors can be utilised to help in the mainstreaming process (i.e., opportunities). Additional key findings include:

- (1) one mainstreaming challenge can be either a key barrier or opportunity to another mainstreaming challenge; and
- (2) when the barriers are overcome, they can become opportunities for mainstreaming CCA.

Based on these results, this chapter concludes that by knowing the relationships among the mainstreaming challenges, planners and decision makers can formulate strategies that can have maximum impacts on mainstreaming CCA.

## **5.2 Generating the mainstreaming indicators**

In Chapter 3, the modified Institutional Analysis and Development (IAD) framework (IAD-CCA) was introduced as the research’s primary analytical tool. The IAD is a “multi-tier conceptual map” that examines institutional settings or those situations that involve people interacting together in a particular context (Ostrom 2011, p. 9). It was deemed the most suitable framework for the research since mainstreaming CCA is essentially an institutional concern and should be analysed under an institutional perspective (Agrawala & van Aalst 2006; Ayers & Dodman 2010).

The IAD-CCA evaluation criteria are composed of factors that reflect the challenges in mainstreaming CCA. The evaluation criteria are significant variables in the framework as they are used as guides to identify the patterns of interactions generated in the institutional setting under analysis (i.e. local land-use planning). Moreover, the criteria determine which outcomes are good or poor. The evaluation criteria used in this research’s IAD-CCA

comprised 20 mainstreaming challenges, classified under the information, institutional, and resource capacity groupings; these challenges were used as the basis for designing the survey questionnaire. The survey focused on the respondents' assessment of the local mainstreaming progress, and scorecards were applied to quantify the participants' responses. In particular, each survey question had three answer choices that illustrated a possible condition surrounding the mainstreaming challenge. The described conditions improved at each subsequent answer choice. The worst condition was given a score of 1 and the best possible state was assigned a score of 3. Accordingly, each mainstreaming challenge was converted into a quantitative mainstreaming indicator with a value ranging from  $1 \leq n \leq 3$ . The indicators assessed the state-of-play of the mainstreaming process and evaluated whether a particular indicator was a barrier or an opportunity. Equal weights were applied to the answers supplied by the survey respondents.

Using the statistical software STATA, Cronbach's alpha statistics—a popular method to measure the reliability of estimates for indices—was computed. Alpha ( $\alpha$ ), expressed as a number between 0 and 1, measures the internal consistency of a test or scale items in a survey to gauge the survey's reliability (Bravo and Potvin 1991; Santos 1999; Gliem and Gliem 2003; Tavakol and Dennick 2011).

The survey results determined the direction of the subsequent semi-structured interviews on the same set of respondents. The interviews focused on the mainstreaming indicators that scored closest to either 1 or 3, and aimed to confirm and further explain the mainstreaming indicator scores. Additional information to support the survey results were acquired by consulting with key informants and reviewing documents such as national and local laws and regulations, government memoranda, LGU reports, and other related studies.

### **5.3 Challenges mainstreaming CCA-DRR into land-use planning**

This section presents the results of the mainstreaming indicator scores; the interpretation of these scores; and the core on-ground conditions relating to the scores. It describes how the mainstreaming indicators illustrated the state-of-play of the mainstreaming process in Albay, Philippines.

#### **5.3.1 Survey results**

The Cronbach's alpha statistics was computed to estimate the reliability of the survey instrument used to generate the indicator estimates. In general, the accepted value of alpha ( $\alpha$ ) ranges from 0.70 to 0.95 (Tavakol and Dennick 2011); specifically,  $\alpha > 0.9$  is considered as excellent;  $\alpha > 0.8$ , good;  $\alpha > 0.7$ , acceptable;  $\alpha > 0.6$ , questionable;  $\alpha > 0.5$ , poor; and the

value of  $\alpha < 0.5$  as unacceptable (Gliem and Gliem 2003). Analysis of the entire dataset resulted in  $\alpha = 0.8595$ . Alpha on the data subsets—national, provincial, city/municipal—was also computed, resulting to  $\alpha$  equal to 0.8097, 0.9487, and 0.9001, respectively, suggesting that the survey results provided reliable estimates for the mainstreaming indicators.

As detailed in Chapter 4, the mainstreaming challenges can be either serious barriers or opportunities for mainstreaming, depending on the conditions surrounding the challenges. The assessments of the respondents indicated that the challenges in mainstreaming exist in a certain spectrum that has levels depicting the transition of the challenges from barriers to opportunities for mainstreaming. Consequently, in this research, four categories in the spectrum were designed. First, the indicators with scores  $1.0 \leq n < 2.0$  were considered first-level or the primary barriers to mainstreaming CCA. The first-level mainstreaming indicators represented the primary barriers that constrained the effective integration of CCA into the local planning system. Indicators that scored from  $2.0 \leq n < 2.25$  were second-level barriers; they were less significant than the primary (barriers) but were considered to be serious problems. Indicators that scored from  $2.25 \leq n < 2.5$  were third-level barriers that represented those mainstreaming challenges that were transitioning from barriers to opportunities for mainstreaming. Lastly, the fourth-level mainstreaming indicators (i.e., with scores  $\geq 2.5$ ) were challenges that the system had already overcome and had positive effects on the implementation process, and, therefore, were opportunities for mainstreaming. In essence, the indicator scores reflected the state-of-play of the mainstreaming challenges at each governance scale (i.e., national, provincial, and municipal/city).

The indicator scores at all scales (Figure 10) identified the *institutional issues* indicator as the primary barrier to mainstreaming CCA into the local land-use plans and therefore a key impediment to the effective operationalisation of the local mainstreaming endeavour. Interviews revealed these issues to be the (1) fragmented national laws; (2) overlapping policy requirements that burden LGUs; and (3) the lack of detailed guidelines for mainstreaming CCA-DRR into the local land-use plans. These issues can be summarised as the lack of institutional support mechanisms for mainstreaming CCA (detailed discussions presented in Chapter 6). Next highlighted, as second-level barriers, were the *availability* and *access to information* indicators. In contrast, the *credibility and reliability of information*, *local government prioritisation*, *institutional incentive*, and *stability of fund* indicators were assessed as opportunities for mainstreaming CCA (Figure 10).

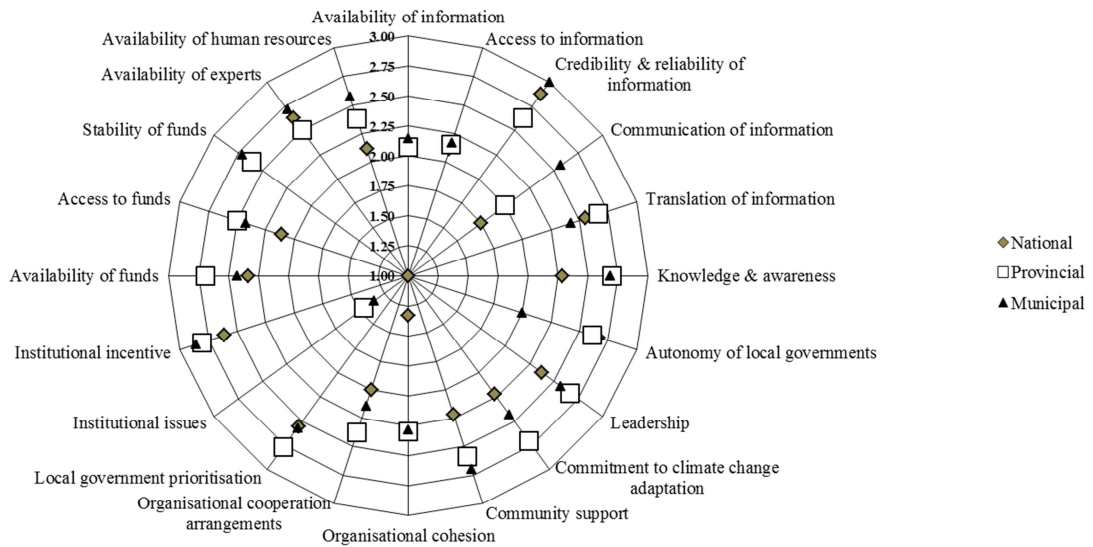


Figure 10 Mainstreaming indicator scores and levels, by scale

Some variations in the assessments across scales reflected the differences in the conditions in Albay (both provincial and city/municipal) and other LGUs in the country, particularly in terms of the following: *knowledge and awareness*, *leadership*, and *community support*. These indicators were assessed as opportunities at the provincial and city/municipal scales, but were barriers at the national scale evaluations. Similarly, the *commitment to CCA* and *access to funds* were opportunities at the provincial scale of Albay, but were second-level barriers at the national scale. These differences were caused by the existence of a climate change champion in Albay (i.e., *leadership* indicator), in the person of the provincial chief executive, Governor Jose Clemente Salceda (see Chapters 6 and 7 for more analysis).

Other indicator scores reflected the national versus local perspectives, that is, the national respondents generally reacted to the question in terms of the national institutions involved in climate change and land-use planning. On the other hand, the local respondents (i.e., provincial and city/municipal) evaluated the question in relation to the local institutions in Albay. This case applied to the *organisational cohesion*, *local government prioritisation*, and *institutional incentive* indicators.

Based on the interviews, the scores for the indicators *communication of information*, *translation of information*, *autonomy of local government*, and *organisational cooperation and collaboration arrangements* had to be clarified at the individual scale. That is, the issues encompassing the indicators could not be generalised across scales and were investigated from the national to the provincial and to the city/municipal scales.



Finally, the interview results suggested that the scores for the *availability of funds*, *experts*, and *human resources* could not be taken at face value. The questions related to these indicators needed to more closely reflect the “true” conditions surrounding the challenges. For example, scores on the *availability of funds* were based on questions concerned with the availability and regularity of funds for mainstreaming activities. The interview results showed that although funds were available, they were not sufficient to finance the various adaptation needs of the LGUs. Likewise, what these funds were allocated for was not explicitly defined. The same argument applied to the *availability of experts* and the *availability of human resources* indicators. The interviews also disclosed that although climate change experts were available, their number was insufficient to effectively address the needs of all LGUs. Similarly, the respondents reported that there were deeper institutional concerns than the availability of local personnel to undertake CCA activities that hindered the mainstreaming process. This last point is expounded in Chapter 6, which presents the in-depth qualitative analysis the indicator related to this concern (i.e., institutional issues indicator).

### **5.3.2 Nature of mainstreaming challenges**

This section presents the nature or characteristics of the mainstreaming challenges as gleaned from the case study analysis. It elaborates on the mainstreaming challenge spectrum advocated by the research, expounds the discussion on the mainstreaming challenge levels, and continues to explain the linkages among the mainstreaming challenges.

#### **5.3.2.1 Mainstreaming challenge spectrum**

Mainstreaming challenges exist within a certain spectrum, with the barriers and opportunities for adaptation representing the extreme ends of this spectrum. Knowing which challenges are barriers and which are opportunities can help planners and decision makers prioritise activities. For example, if the *institutional issues* indicator is a primary barrier to mainstreaming CCA (at all scales), then this signifies the importance of institutional capacity development (Table 11). This also confirms the notion that despite the level of technology, information, and financial and human resources, weak and ineffective institutional structures inhibit the success of an adaptation measure (Inderberg and Eikeland 2009; Ayers et al. 2014) (See Chapter 6 for extensive discussion on this indicator).

Table 11 Matrix of challenges in mainstreaming climate change adaptation and disaster risk reduction into the local land-use plans: Albay, Philippines

Scale	Mainstreaming indicator levels			
	1 <sup>st</sup>	Barriers 2 <sup>nd</sup>	3 <sup>rd</sup>	Opportunity 4 <sup>th</sup>
<i>ALL scales</i>	<ul style="list-style-type: none"> <li>• Institutional issues</li> </ul>	<ul style="list-style-type: none"> <li>• Availability of information</li> <li>• Access to information</li> </ul>		<ul style="list-style-type: none"> <li>• Credibility and reliability of information</li> <li>• Local government prioritisation</li> <li>• Institutional incentive</li> <li>• Stability of funds</li> </ul>
<i>National/ other LGUs</i>	<ul style="list-style-type: none"> <li>• Communication of information</li> <li>• Organisational cohesion</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge &amp; awareness</li> <li>• Commitment to CCA</li> <li>• Community support</li> <li>• Organisational cooperation and collaboration arrangements</li> <li>• Access to funds</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership</li> </ul>	<ul style="list-style-type: none"> <li>• Translation of information</li> <li>• Autonomy of local governments</li> </ul>
<i>Provincial</i>		<ul style="list-style-type: none"> <li>• Communication of information</li> </ul>	<ul style="list-style-type: none"> <li>• Organisational cohesion</li> <li>• Organisational cooperation and collaboration arrangements</li> </ul>	<ul style="list-style-type: none"> <li>• Translation of information</li> <li>• Knowledge &amp; awareness</li> <li>• Autonomy of local governments</li> <li>• Leadership</li> <li>• Commitment to CCA</li> <li>• Community support</li> <li>• Access to funds</li> </ul>
<i>City/ Municipal</i>		<ul style="list-style-type: none"> <li>• Autonomy of local governments</li> <li>• Organisational cooperation and collaboration arrangements</li> </ul>	<ul style="list-style-type: none"> <li>• Translation of information</li> <li>• Commitment to CCA</li> <li>• Organisational cohesion</li> <li>• Access to funds</li> </ul>	<ul style="list-style-type: none"> <li>• Communication of information</li> <li>• Knowledge &amp; awareness</li> <li>• Leadership</li> <li>• Community support</li> </ul>

Notes: Mainstreaming indicator levels: 1<sup>st</sup> –  $1.0 \leq n < 2$  (primary barrier); 2<sup>nd</sup> -  $2 \leq n < 2.25$ ; 3<sup>rd</sup> -  $2.25 \leq n < 2.5$ ; 4<sup>th</sup>:  $n \geq 2.5$  (opportunity).

\* The following indicators are not included in the matrix as they could not be taken at face value: *availability of funds*, *availability of experts*, and *availability of human resources*. Survey questions relating to these indicators need to be modified to determine the “true” conditions surrounding the challenges.

Similarly, knowing the opportunities can help decision makers determine which factors can be utilised to help in the mainstreaming process. To illustrate, *credibility and reliability of information* as an opportunity implies that planners considered the information

generated by the official government data producers to be reliable and credible. This knowledge can help decision makers allocate resources more efficiently. Further, since LGUs were willing to incorporate the information into the local land-use plans, policy- and decision-makers can instead focus their efforts on matching the data made available by producers to the needs of the users, and improve the user *access* to the information (2nd level barriers in Albay and other LGUs). Likewise, the *stability of funds* as an opportunity suggests that (1) CCA-DRR funds were part of the national and local budgets; (2) financial sources for long-term CCA-DRR activities existed; and (3) LGUs can initiate activities without concern that the funding would cease. For example, the People’s Survival Fund provides financial funding for CCA-DRR initiatives and the Disaster Risk Reduction and Management Act mandates the creation of the Local Disaster Risk Reduction and Management Fund to support CCA-DRR activities. Meanwhile, the Climate Change Act decrees government financial institutions to provide LGUs with preferential financial packages for climate change-related projects. Moreover, this Act orders the LGUs to allocate climate change funds (i.e., for programs and plans) from their annual appropriations. Therefore, the results imply that creating new fund sources was not a priority problem; instead, efforts should focus on (1) ensuring that the available funds are adequate to support local CCA efforts; (2) improving the coverage of the funds to include CCA planning initiatives such as mainstreaming; and (3) guaranteeing that intended beneficiaries know how to access these financial sources (2nd level barrier in other LGUs).

#### **5.3.2.2 Mainstreaming challenge levels**

The mainstreaming barriers exist in varying degrees of severity (i.e., mainstreaming indicator levels). Policy-learning can be improved by understanding how a barrier can transcend from a lower to a higher level within the mainstreaming challenge spectrum. For example, *organisational cohesion* was a primary barrier at the national scale, but was a third-level barrier in Albay. During the interviews, the respondents clarified that the lack of organisational cohesion was an “inherent problem in the Philippine government system.” Essentially, the various government departments or organisations have their own key result areas (KRAs) that guide their respective goals and activities. These KRAs are set individually and independently from one organisation to another; hence, the KRAs seldom align. Consequently, even with a common agenda such as CCA-DRR, the organisations tend to formulate disharmonised programs, projects, responsibilities, and tasks because these activities are all based on their individual KRAs. With every organisation concerned with meeting its own KRA, efforts are often not in synergy. The lack of organisational cohesion is

translated at the local scale as the unfamiliarity of government field offices concerning the function of their institution in local CCA-DRR activities. Local offices follow their organisations' KRAs and mandated functions. Since these functions are typically not harmonised with one another, the local offices cannot participate effectively in local CCA-DRR initiatives.

In Albay, organisational cohesion was a third-level barrier, indicating better conditions in the province compared to the national scale, especially in land-use planning. This was because the Provincial Government of Albay had issued local policies and regulations that clarified the roles of the varying field offices in terms of mainstreaming CCA into the local land-use plans. Specifically, the Provincial Executive Order 2007-07 incorporated the Mines and Geosciences Bureau and the Environmental Management Bureau, two key agencies that generate climate change-related data, in the Provincial Land-use Committee. Likewise, the Provincial Executive Order No. 2008-03 included the Albay Public Safety and Emergency Management Office into the committee. Essentially, these pieces of local legislation created an institutional structure that combined the organisations involved in land-use planning and those linked to climate change and CCA into a common effort—mainstreaming CCA into local land-use plans. This set of information is important in a variety of ways. First, it indicates that lack of organisational cohesion seriously impedes the mainstreaming endeavours and that national efforts are needed to ease the problems created by this barrier. Second, it confirms that local efforts can help transition the challenge from a key barrier into a lesser constraint (i.e., third-level barrier); however, more is needed to transform organisational cohesion as an opportunity.

The concept of mainstreaming challenge levels is also demonstrated by the *access to funds* indicator scores. This indicator defines the user's awareness of the existence of the CCA funds, the convenience of fund processing, and the simplicity of the requirements of securing the funds. In the other LGUs, as represented by the national score (i.e., 2.11), *access to funds* was considered as a serious problem or a 2<sup>nd</sup> level barrier. On the other hand, this indicator was an opportunity at the provincial scale and a 3<sup>rd</sup> level barrier at the city/municipal scale. The difference in scores was due to the local initiatives in Albay which made CCA-DRR funds more accessible in the province. For example, the Provincial Government of Albay had itemised the Albay in Action on Climate Change (A2C2) program in the provincial budget. The A2C2 was an initiative of the Provincial Government of Albay to pioneer the mainstreaming of CCA-DRR into local development efforts and policies (Uy et al. 2011; Salceda 2012). Similarly, the Provincial Government of Albay allocated a regular budget to the Center for Initiatives and Research for Climate Adaptation (CIRCA), the

institution assigned to implement the A2C2 program (PGA 2008; Salceda & Rangasa 2011). Meanwhile, the Albay Public Safety & Emergency Management Office, institutionalised in 1994 as a provincial agency in charge of disaster management, had expanded its concerns to include CCA (Lasco et al. 2008; Interviews 2014). Accordingly, the Provincial Government of Albay strengthened the ability of to spearhead CCA-DRR programs. The agency had a regular allocation from the annual provincial budget and had access to the calamity fund for its operations (Salceda 2012). Thus, access to funds was gauged as an opportunity at the provincial scale (score: 2.50).

The Provincial Government of Albay also “tries to complement the funds and resources” of its component LGUs (Interviews 2014). For example, upon the request of a municipality that was “struggling to use the hazard maps in analysing land-uses,” the Provincial Government of Albay funded a two-day training on hazard mapping which was presided by the Mines and Geoscience Bureau Region 5 (Interviews 2014). Still, respondents evaluated access to funds as a third-level barrier at the city/municipality scale (score: 2.42) (Figure 10). The results of the interviews suggested that the LGUs at this scale were aware of the existence of funds for CCA, but they lacked the additional information and institutional mechanisms to have convenient access to the funds. As some respondents shared:

While we know that the (CCA) funds are mandated by law, we are not privy to where the funds are allocated.

A certain percentage of the economic development fund and special appropriations from the local savings can be used for CCA, as long as it is supported by an approved local board ordinance (Interviews 2014).

Thus, in the Albay context, access to funds need not be prioritised by the provincial government and current activities just need to be continued since the indicator was assessed as an opportunity. However, the city/municipal score suggested that while the effects of the provincial efforts trickle down to the city/municipal scale, more was needed to overcome the challenge completely. Actions to consider include (1) improving the city/municipal government (staff, planners, officials) knowledge on the allocation of the CCA funds (i.e., what funds can be used for which activities); and (2) formulating local ordinances regarding local budget support for CCA activities. Meanwhile, the conditions at LGUs other than Albay imply that access to funds is a priority challenge that needs to be addressed. Being a 2nd level barrier, serious interventions from the national, provincial, and city/municipal scales may be in order.

### 5.3.2.3 *Mainstreaming challenge linkages*

The results presented in Chapter 4 identified that challenges themselves are interlinked. This chapter expands this finding to indicate that the challenges can either be barriers or opportunities to one another. For example, if climate change-related information is not deemed credible and reliable, then information will not be trusted and used. This condition is a barrier to the advancement of knowledge and awareness of planners, decision makers, and society on climate change and adaptation. Likewise, a challenge, when turned into an opportunity, can positively influence another (challenge). For instance, when CCA is a priority, the local government's commitment to CCA may progress, leading to an institutionalised legislative or administrative framework for adaptation. Similarly, CCA activities may no longer compete for local funding against other goals in the local agenda, which may raise the availability of funds for CCA efforts.

Linkages among the mainstreaming challenges are best illustrated by the ripple effects of having a climate change champion (i.e., *leadership* indicator) in Albay. For one, Governor Salceda was influential in institutionalising CCA as a *priority* agenda in the local government. Under his leadership, CCA was established as a provincial policy by virtue of Provincial Resolution 2007-04. This was supported by the Provincial Resolution 2007-24, which decreed Albay as “one of the first and pioneering prototype province that will adopt climate change adaptation.” This policy aimed to instill CCA into the political and social consciousness of the present and future generations of government officials and people in Albay (PGA 2007). These provincial policies and regulations, along with many others, established a legislative framework for CCA in the province and created a provincial government *committed to CCA*. Likewise, the varying initiatives under the governance of the climate change champion helped (1) decision makers, planners, and the local communities in Albay become *aware and knowledgeable* on CCA concerns; (2) *incentivise* planners and decision makers to mainstream adaptation into planning and other decision-making processes; and (3) gain *community support* for CCA initiatives (Table 12). The role of the climate change champion in the local mainstreaming process in Albay is elaborated in Chapter 6.

Table 12 Primary local laws, programs and activities in Albay related to climate change adaptation

<b>Policy/Activity/Program</b>	<b>Description</b>
<i>Provincial Executive Order 2007-12-A</i>	Established the Center for Initiatives and Research for Climate Adaptation (CIRCA) as a key institution on climate change.
<i>Memorandum of Agreement between the Provincial Government of Albay and Bicol University</i>	Institutionalised the Climate Change Academy as Albay’s main arm in enhancing and strengthening the theoretical knowledge and practical skills of major local stakeholders on climate and disaster risk assessment.
<i>Provincial Council Appropriation Ordinance 2007-01</i>	Identified Albay in Action on Climate Change (A2C2) program as a provincial budgetary item with corresponding funds for its activities.
<i>Provincial Council Resolution 2008-44</i>	Urged the Provincial Government of Albay-CIRCA, Department of Agriculture, Department of Environment and Natural Resources, and the Department of Agrarian Reform to conduct training and workshops to incorporate climate change in the local land-use plans.
<i>Provincial Executive Order No. 2011-02</i>	Stipulated for the Climate Change Academy to hold environmental classes at the key university in the region (Bicol University) starting 2011.
<i>2007 First National Conferences on Climate Change Adaptation</i>	Provincial Government of Albay spearheaded the first National Conferences on Climate Change Adaptation which was at the provincial capital (Legazpi City). This brought the concept of climate change into the doorstep of the people in Albay.
<i>2008 First Interfaith Forum on Climate Change Adaptation</i>	Brought together people from the Catholic, Islam, Iglesia ni Cristo, and Seventh Day Adventist faiths to discuss CCA and DRR.

Sources: Lasco et al. n.d.; Lasco, et al. 2008; UNISDR 2012; various Provincial Resolutions; Personal Communication 2014

## 5.4 Summary and conclusions

In this research, mainstreaming challenges are the factors that affect or influence the effective operationalisation of the mainstreaming measure, and can be represented either as barriers or opportunities. These mainstreaming challenges are summarised into three capacity classifications—institutional, information, and resource capacities. The mainstreaming challenges, when transformed as quantitative mainstreaming indicators, effectively assessed the conditions surrounding the process of mainstreaming CCA into the local land-use plans in Albay, Philippines.

To understand better *the state-of-play of and linkages between the challenges in mainstreaming CCA (Objective 3)* this chapter identified the barriers to mainstreaming CCA according to the severity of their effects on the endeavour. Specifically, the *institutional issues* indicator was assessed as the primary barrier in operationalising the approach, followed by the *availability of and access to information* as second-level barriers. Knowing the extent of a barrier’s impact on the mainstreaming process can assist planners and decision- makers in prioritising the barriers to address. This is significant, especially in the local context where local governments face a number of governance and development

constraints. For example, the literature identifies barriers related to adaptation funds to be among the primary reasons why the implementation of local adaptation is delayed (Gardner et al. 2010; Moser & Ekstrom 2010; Lehmann et al. 2015). In response, the government may concentrate on creating new funds for CCA. However, the case study suggests that there is no immediate need to create new funds in the Philippines, as stable funds for CCA already exist. Instead, the more pressing concern involves improving the access of users to these funds (i.e., second-level barrier in LGUs other than Albay). Similarly, understanding the severity of the impacts of a certain barrier can help in policy-learning. To illustrate, how the organisational cohesion indicator became a third-level barrier in Albay can be a learning experience for the national government and the other LGUs in the country.

Meanwhile, several indicators were evaluated as opportunities for mainstreaming CCA, including—*credibility and reliability of information, local government prioritisation, institutional incentive, and stability of funds*. These assessments suggest that barriers can be overcome to transcend into opportunities for mainstreaming CCA. Also, the mainstreaming challenges themselves are linked and can be barriers or opportunities to one another. By knowing the relationships among the mainstreaming challenges, planners and decision-makers can formulate strategies that can have maximum impacts on mainstreaming CCA. This chapter introduced the quantitative mainstreaming indicators the research developed to help planners and decision-makers monitor the adaptation process and its implementation, and also track the progress of adaptation efforts. Also, it illustrated how the mainstreaming indicators can be used in prioritising and devising strategies to address the adaptation challenges, thereby illustrating the promise of these tools in adaptation planning and decision-making. The next chapter solidifies the importance of these metrics, as it presents the in-depth interpretations of the two very important challenges in mainstreaming CCA in the Albay case—*institutional issues* and *local leadership*.



## **CHAPTER 6: INSTITUTIONAL CAPACITY FOR LONG-TERM CLIMATE CHANGE ADAPTATION: EVIDENCE FROM LAND-USE PLANNING IN ALBAY, PHILIPPINES\***

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### **6.1 Introduction**

One of the key challenges in climate change adaptation is the tendency of individuals to resist and delay change, or the failure of institutions to create an enabling environment that can promote efforts to plan for and respond to the effects of a changing climate. For this reason, improving an adaptation approach utilising existing schemes (i.e., plans, strategies, organisational institutions, etc.) is more appropriate than designing and creating new or separate institutions for managing climate change adaptation (CCA) (Klein et al. 2005).

Chapter 4 introduced the various challenges in mainstreaming operationalisation and discussed the nature of these challenges through quantitative analysis, particularly, correlation analysis and assessments by mainstreaming indicator scorings. Chapter 5 further explained how the indicator scores can be interpreted and illustrated how the challenges in mainstreaming exist within a certain spectrum, with the barriers and opportunities for adaptation representing the extreme ends of this spectrum. This chapter continues this discussion and explores further the primary barriers (i.e., *institutional issues*) and the substantial opportunity (i.e., local *leadership*) for mainstreaming CCA that were highlighted by the mainstreaming indicators.

CCA is generally viewed as a technical problem; hence, most adaptation studies have focused on assessing the environmental impacts of climate change and the resulting vulnerabilities due to the system's biological risk exposure to these hazards (Resurreccion et al. 2008; Lebel et al. 2012). However, climate change and CCA are challenges about "leadership, coordination, and collective action," and thus they are about institutions (Evans & Stevens 2009, p. 2). Regardless of the existing technology, information, and financial and human resources, weak and inefficient institutional structures significantly constrain the success of an adaptation measure (Inderberg & Eikeland 2009; Ayers et al. 2014).

This chapter moves closer to *determining how to overcome the challenges in mainstreaming CCA* (i.e., Objective 3) by verifying the significance of institutions in the context of CCA through quantitative indicators and qualitative assessments. The mainstreaming indicators provided the quantitative aspect of the analysis, while the IAD-CCA framework was the tool used in qualifying the indicator scores. The IAD-CCA was

most useful in organising the data collected and in providing structure for analysing the institutional setting where CCA was being mainstreamed. For example, the mainstreaming indicator that garnered the lowest score (i.e., closest to the value of 1) was examined first. The responsibilities and linkages among the key actors involved in this challenge were then identified. Next, the institutional arrangements that guided the actions of these actors were mapped to determine their patterns of interactions. Subsequently, the outcomes of these patterns of interaction were determined. The underlying issues related to the patterns of interaction and outcomes were examined to understand further the score associated with the mainstreaming challenge

By using the IAD-CCA framework in the analysis, this chapter explains how institutional issues impede the effective operationalisation of mainstreaming CCA and establishes the significance of developing the institutional capacity of systems to address the challenges in mainstreaming. Also, it illustrates how the existing institutional support mechanisms helped the local leadership (i.e., climate change champion) in Albay, Philippines to become a substantial opportunity for mainstreaming. Consequently, this chapter proposes that, in mainstreaming CCA, institutional capacity development is more important than the need to advance information and resource capacities. The key finding identified in this chapter also *generated a more refined understanding of the operationalisation of mainstreaming in local CCA (Objective 4)*.

## 6.2 Significance of developing institutional capacity for mainstreaming CCA

This section presents the core on-ground conditions relating to the mainstreaming indicator scores, specifically, the two indicators—*institutional issues* and *local leadership*—highlighted as the primary barrier and substantial opportunity, respectively, for mainstreaming CCA into the local land-use plans (Table 13). Institutional issues refer to the absence or presence of rule-based institutional questions or conflicts that inhibit the effective integration of CCA into local land-use planning. On the other hand, leadership pertains to the absence/existence of a CCA “champion” in the locality and the extent of the champion's influence on the community's behaviour.

Table 13 Primary barrier and substantial opportunity for mainstreaming climate change adaptation into local land-use plans in Albay, Philippines

Mainstreaming indicator	National	Provincial	City/Municipal
<i>Institutional capacity</i>			
<i>Leadership</i>	2.38	2.67	2.57
<i>Institutional issues</i>	1.00	1.46	1.36

Note: Indicator levels = 1<sup>st</sup> -  $1.0 \leq n < 2$ ; 2<sup>nd</sup> -  $2 \leq n < 2.25$ ; 3<sup>rd</sup> -  $2.25 \leq n < 2.5$ ; 4th:  $n \geq 2.5$

### **6.2.1 Institutional issues**

As presented in Chapter 5, the indicator scores suggested that the primary barriers to mainstreaming CCA into the local land-use plans in the Philippines, and Albay in particular, were linked to institutional capacity (i.e., *institutional issues*). Specifically, these issues included (1) fragmented national laws and regulations; (2) overlapping or multiplicity of policy requirements; and (3) a shortage in guidelines for mainstreaming CCA into the local land-use plan. The issues all relate to the lack of institutional mechanisms that support the mainstreaming initiative. Another identified institutional issue was associated with political concerns (i.e., decision-making influenced by personal interests of politicians).

#### **6.2.1.1 Fragmented laws and regulations**

During the interviews (at all scales), the respondents cited the institutionalisation of the Local Disaster Risk Reduction and Management (LDRRM) officer as a key concern in mainstreaming CCA. At first glance, this issue seemed to fall under the *availability of human resources* challenge. However, intensive analysis revealed the key issue was discord among the regulations affecting the creation of this government position (i.e., fragmented laws and regulations). Creating the LDRRM Officer position in cities and municipalities is critical in advancing local climate change concerns in the Philippines. This position assumes the tasks and responsibilities related to CCA-DRR at the local scale, including spearheading the mainstreaming of CCA into the local land-use plan.

By virtue of the Disaster Risk Reduction and Management Act of 2010 (RA 10121), all local government units (LGUs) are mandated to create the LDRRM officer position, subject to the rules and regulations of the Department of Budget and Management (i.e., the key agency responsible for the government budget) concerning the budgetary source, and dependent on the standards and guidelines provided by the Civil Service Commission (i.e., central personnel agency mandated to formulate policies and regulations for government employment). Based on the Department of Budget and Management Memorandum dated March 15, 2012, all personal services requirements (i.e., salaries and compensations of government employees) for the LDRRM officer were required to be sourced from the LGU funds, and be subject to the personal services limitation of the LGU budgets. This personal services limitation is governed by Section 325 of the Local Government Code (RA 7160), which states that the personal services of LGUs should not exceed 45% and 55% of their funds, for first to third income class provinces, cities, and municipalities, and fourth class or lower, respectively. As one of the respondent commented, the Local Government Code is regarded as the “bible” of LGUs as it outlines all the power, authority, responsibilities, and

(allowable and prohibited) acts of LGUs. This rule on personal services limitation posed a significant problem since most (if not all) LGUs had reached their respective budgetary ceilings.

However, LGUs are mandated to comply with the law. Thus, without sufficient financial resources to create a permanent LDRRM officer, LGUs resorted to designating the position to existing regular and permanent LGU personnel. This meant that aside from the usual responsibilities of the staff, s/he was allocated additional tasks and “great accountability especially when there are disasters”, without additional compensation, financial or otherwise. This scenario explains the high score for the mainstreaming indicator *availability of human resources*, especially at the city/municipal scale. Hence, although there were available LGU personnel tasked to attend to CCA concerns, these personnel were the designated LDRRM officers who were typically overworked, underpaid, and unmotivated (Interviews 2014).

The few LGUs that had the funds to create the LDRRM officer position were faced with another institutional constraint, that is, the lack of standards and guidelines for creating such a position. Prior to April 2014, the Civil Service Commission has not determined the said guidelines. In such cases, the local chief executives (i.e., mayors) typically exercised their authority to create casual local government positions “without need of approval or attestation by the Civil Service Commission,” as provided by Section 77 of the Local Government Code. However, this authority was oftentimes influenced by the “padrino” system, the norm or value system of political patronage where a person gives or gains favour, promotion, or political appointment through social (friendship) or familial affiliation, instead of merit and qualifications. These political appointments often result in LDRRM officers with less than the desired knowledge, experience, and appreciation of climate change concerns. In cases where the appointed LDRRM officer is qualified and/or experienced, the temporary status of the position presents another difficulty. As a political appointee, the LDRMM officer is co-terminus with the mayor (chief executive at the city/municipal scale). Thus, a change in local political power signifies losses in human resource investments, which in this case is the CCA-DRR trained LDRRM officer (Interviews 2014).

In early 2014, these budgetary and guidelines issues were addressed by a Technical Working Group composed of the Civil Service Commission, National Disaster Risk Reduction and Management Development Council, Department of Interior and Local Government, and the Department of Budget and Management. The Technical Working Group formulated the implementing guidelines for establishing the Local Disaster Risk Reduction and Management Offices in provinces, cities, and municipalities. These guidelines were issued on April 4, 2014 through the Joint Memorandum Circular No. 2014-1 among the

four agencies. Specifically, Section 4.3 of the Joint Memorandum waives the enforcement of the budgetary personal services limit, thus enabling the LGUs to finance the initial year requirements for creating the LDRRM officer position. As the “usual practice” in these cases, the personal services for the LDRRM officer can now be incorporated as a regular item in the succeeding fiscal budget allocations, thereby providing steady funds for the position (Interviews 2014). Similarly, the Joint Memorandum provides the necessary standards and guidelines for creating the position as stated in “Section 6: Position Titles, Qualification Standards, and Salary Grades for the Technical Staff of the LDRRMO.”

While the impacts of the Joint Memorandum are yet to be realised, the amendments and the new sets of rules it provides are evidence of institutional mechanisms that support the institutional foundation for CCA. This institutional support is relevant to improve the resource capacity of LGUs, especially since the national directives for CCA-DRR are continuously being implemented. For example, in June 2014, the Department of Interior and Local Government issued Memorandum Circular 2014-70 instructed the LGUs to formulate their local disaster preparedness plans in anticipation of the erratic typhoons expected in 2014.

#### ***6.2.1.2 Lack of guidance for mainstreaming CCA into the local land-use plan***

In 2009 and 2010, the Climate Change Act (RA 9729) and the Disaster Risk Reduction and Management Act (RA 10121) were implemented, respectively, thereby institutionalising the CCA-DRR agenda in the Philippines. However, mainstreaming CCA-DRR is a new initiative; hence, information regarding its operational procedures is limited. Consequently, its operationalisation becomes a challenge, especially at the local scale (Olhoff & Schaer 2010; Mercado 2011). Since the Climate Change Act has been enacted, the mechanisms to support its implementation have been insufficient (i.e., lack of guidelines to support the mainstreaming efforts). The LGUs have found it difficult to comply with the existing laws (Interviews 2014). Perhaps the closest to an LGU-oriented CCA-DRR mainstreaming guideline is the document produced by the National Economic and Development Authority in 2008 entitled, *Mainstreaming Disaster Risk Reduction in Subnational Development and Land-use/Physical Planning in the Philippines*. Still, this guideline is more effective at the provincial rather than at the city or municipal scale. Likewise, it is too technical for LGU decision-makers and planners (Mercado 2011). Thus, LGUs have appealed for additional documents to support mainstreaming CCA into the local land-use plan (RDC Region XII 2012).

In early 2014, the Housing and Land-use Regulatory Board (HLURB) released the “Supplemental Guidelines on Mainstreaming Climate and Disaster Risks in the Comprehensive Land-use Plan” (Personal communication 2014). This document was produced in collaboration with the Climate Change Commission, and in consultation with other partner agencies (i.e., National Economic and Development Authority, Department of Interior and Local Government, etc.). The feat was accomplished through the Project Climate Twin Phoenix, with assistance from the United Nations Development Programme and Australian Agency for International Development (ReliefWeb 2014; Interviews 2014). Although this development is expected to improve LGUs’ capacities to mainstream CCA-DRR into the local land-use plan, its impacts are yet to be determined.

### 6.2.1.3 Overlapping and multiple policy requirements

LGUs are mandated to comply with approximately 30 sectoral plans as stipulated by various laws and regulations (Mercado 2011) (Table 14). Complying with these rules has been a challenge for LGUs not only due to the lack of resources, but also because LGUs regard some of the mandated plans as repetitive, unnecessary, and generally overwhelming in number (Gotis 2008; Interviews 2014). According to local respondents, the multiple requirements prevent the understaffed LGUs from focusing on mainstreaming CCA into local plans, including the local land-use plan.

Table 14 Selected local government unit mandated plans and their legal basis

<b>Mandated local plans</b>	<b>Legal basis</b>
<i>Comprehensive Land-use Plan</i>	RA 7279: Urban Development and Housing Act of 1992
<i>Local Shelter Plan</i>	RA 7160: Local Government Code of 1991
<i>Comprehensive Development Plan</i>	RA 7160: Local Government Code of 1991
<i>Local Development Investment Plan</i>	
<i>Annual Investment Program</i>	
<i>Executive and Legislative Agenda</i>	
<i>Local Climate Change Action Plan</i>	RA 9729: Climate Change Act of 2009
<i>Local Disaster Risk Reduction and Management Plan</i>	RA 10121: Disaster Risk Reduction and Management Act of 2010
<i>Local Poverty Reduction Action Plan</i>	RA 8425: Social Reform and Poverty Alleviation Act of 1997 DBM-DILG-DSWD-NAPC Joint Memorandum Circular No. 1 Series of 2012: Policy Guidelines and Procedures in the Implementation of Bottom-Up Planning and Budgeting for the FY 2013 Budget Preparation
<i>Local Solid Waste Management Plan</i>	RA 9003: Ecological Solid Waste Management Act of 2000
<i>Local Tourism Development Plan</i>	RA 9593: The Tourism Act of 2009
<i>Strategic Agricultural and Fisheries Development Zones Plan</i>	RA 8435: Agriculture and Fisheries Modernization Act of 1998
<i>Local Nutrition Action Plan</i>	DILG Memorandum Circular 2012-89: Adoption of the Philippine Plan of Action for Nutrition (PPAN) 2011-2016

Notes: RA – Republic Act; DBM – Department of Budget and Management; DILG – Department of Interior and Local Government; DSWD – Department of Social Welfare and Management; NAPC – National Anti-Poverty Commission

#### **6.2.1.4 Political concerns**

Politics also affected the mainstreaming of CCA, particularly when members of councils or the local chief executives decided on local land-use plan concerns for personal gains. Most of the institutional arrangements created by the Local Government Code provide local politicians a number of avenues to influence the land-use planning procedure. For one, the Local Development Councils, the main body that formulates the local plan, is predominantly comprised of politicians (Serote 2004). Similarly, politicians rule the legislative body that enacts the plan into zoning ordinances (Sec. 446 and Sec. 457 of the Local Government Code). Sections 54 and 55 of the Local Government Code also authorise local executives to approve or veto local ordinances, including those related to zoning regulations. Hence, local politicians can reject proposals for the conversion or reclassification of lands in critical sites or danger zones when such changes threaten their personal investments located at the sites (Interviews 2014). This practice is predominant in the Philippines where “zoning classifications are likewise the subjects of political trade-offs, compromise, and corrupt practices” (Corpuz 2012, p. 9).

These issues show that institutions significantly influence the process of mainstreaming CCA into the local land-use plan. This is further supported by the next section which provides evidence that an institutional challenge, when transformed into an opportunity, also is key to the effective operationalisation of the mainstreaming approach.

#### **6.2.2 Leadership: Climate change champion**

A key component in local CCA is leadership or the “emergence of an identifiable political/administrative champion(s) for climate change issues” (Roberts 2008, p. 527). Leadership is a crucial aspect at any stage of the adaptation process. Furthermore, a climate change champion can raise awareness of climate change, initiate CCA efforts, put CCA high into the local government agenda, and uphold future CCA initiatives. Hence, having such a leader can be a significant opportunity, whereas the absence of a champion can weaken the climate change agenda and be a critical barrier to the endeavour (Roberts 2008; Burch 2010; Moser & Ekstrom 2010; Oberlack & Eisenack 2014; Waters et al. 2014). In this research’s context, the champion may take the form of an institutional organisation or an individual whose position symbolises a social structure-based institution that can form individual and social expectations, and can influence relations, interactions, behaviours, and conduct of people (Cuevas et al. 2014).

### **6.2.2.1 National scale**

The *leadership* indicator was assessed as a third-level challenge at the national scale (Table 13). The Climate Change Act institutionalised the Climate Change Commission as the key agency tasked to coordinate, monitor, and evaluate government programs and action plans relating to climate change, thus making the agency the main climate change champion in the country.

In relation to land-use planning, the Climate Change Commission spearheads the Ecotowns (ecosystems town) project, an initiative that aims to develop climate change-resilient towns with improved adaptive capacities. The project also aims to demonstrate the convergence of CCA and mitigation actions, as well as the integrated ecosystem-based management approach in planning (CCC 2011). Through Memorandum of Agreements, the Climate Change Commission works closely with the 10 LGUs involved in the project. In the beginning (of the project), the mayors of the participating LGUs were a mix of climate change skeptics, non-believers, believers, and individuals who lacked interest in the issue. As the Ecotown project progressed and the Climate Change Commission and LGUs worked together, some of the mayors realised the significance of CCA (in general) and mainstreaming CCA into local plans (in particular). As such, they were influenced to champion CCA in their localities. This development paved the way for more effective and efficient transactions of CCA initiatives (Interviews 2014).

However, the Climate Change Commission is a national agency. Although it can be effective at the national scale, it has limited impact at the local scale. Therefore, for the on-ground mainstreaming of CCA initiatives, having a climate change champion at the local scale is a significant factor. This was confirmed by the evidence from Albay.

### **6.2.2.2 Local scale: Albay province**

By virtue of the Local Government Code, LGUs in the Philippines have extensive local autonomy and increased powers, authority, responsibilities, and resources to govern their localities (Gonzales 1997; Serote 2004). Consequently, local leadership is critical in the development of an LGU. Similarly, it can be a major factor in the demise of a LGU due to corrupt local leaders. Although the latter are prevalent in the Philippines, as evidenced by the earlier discussion on political concerns, this chapter focuses on how local leadership can be vital in advancing local CCA. More importantly, it aims to demonstrate that the institutional mechanisms to support local leaders (i.e., Local Government Code) are already established in the Philippines. In Albay, these mechanisms were utilised by the climate change champion in the person of the provincial chief executive (i.e., Governor Jose Salceda).



The provisions of the Local Government Code offered Governor Salceda the essential institutional support to advocate and execute CCA initiatives effectively in the province of Albay. For example, according to the Local Government Code [Section 465 (b) (2) (ii)] the provincial governor has the authority to call for conventions, conferences, seminars, or meetings on concerns he deems significant to promote the general welfare of the province and its constituents. Thus, in 2007, the Provincial Government of Albay assembled government officials, academics, researchers, NGOs, the business sector, local community representatives, and donor communities into the First National Conference on Climate Change Adaptation to discuss the climate change agenda. The conference resulted in the “Albay Declaration on Climate Change Adaptation” that called for the early passage of the Climate Change Act, and consequently the creation of the Climate Change Commission. In 2009, the provincial government again organised and co-hosted the Second National Conference on Climate Change Adaptation (Benson 2009; Salceda and Rangasa 2011). These activities, along with numerous others, helped raise the knowledge and awareness of the public on climate change issues and gain community support on CCA endeavours. This condition is expected to assist the people who will be affected by modifications in the local land-use plan to understand the need and significance of the changes.

Section 465 of the Local Government Code also authorises the provincial governor to (1) initiate and propose legislative measures to the provincial council; (2) issue executive orders for the enforcement and execution of laws; (3) exercise general supervision and control over all programs, projects, services, and activities of the provincial government; and (4) initiate and maximise the generation of resources and revenues, and apply the same to the implementation of development plans, program objectives and priorities. Hence, Governor Salceda, through the powers and authority of his position, implemented and influenced a number of CCA-DRR initiatives.

For example, Governor Salceda promoted mainstreaming CCA-DRR into the local land-use plan through the Provincial Executive Order 2007-07, which incorporates the Mines and Geosciences Bureau and the Environmental Management Bureau in the Provincial Land-use Committee (i.e., committee that reviews and approves the plan). These two agencies are among the key government institutions that generate climate change-related data. Likewise, through the Provincial Executive Order No. 2008-03, the Albay Public Safety and Emergency Management Office was included in the committee. These developments are expected to ensure that CCA-DRR will be incorporated in the revised local land-use plans of LGUs. Likewise, the legislative actions helped improve *organisational cohesion* in the province’s land-use planning system by clarifying the responsibilities of varying institutions concerning

mainstreaming of CCA. Hence, the indicator was assessed as a third level barrier, illustrating its transition from a potential primary barrier toward becoming an opportunity for mainstreaming. According to one respondent:

In Albay, institutions are working well in relation to CCA-DRR. For example, in other provinces, only the Department of Environment and Natural Resources is a member of the Provincial Land Use Committee; but in Albay, the Mines and Geosciences Bureau, Environmental Management Bureau, and Philippine Institute of Volcanology and Seismology are members too, via Provincial Executive Orders. Thus, climate change data producers are able to provide inputs on how CCA-DRR should be incorporated in the local land-use plans. Because of this arrangement, a direct communication line between data producers and the data users was established.

Moreover, a Memorandum of Agreement between the Provincial Government of Albay and Bicol University has established the Climate Change Academy (now known as the Disaster Risk Reduction Management Training Institute) as Albay's main arm in enhancing and strengthening the knowledge and skills of major local stakeholders on climate and disaster risk assessment. This was followed by the Provincial Executive Order 2011-02 that stipulates for the Climate Change Academy to hold environmental classes at the key university in the region (i.e., Bicol University) starting 2011. Like the activities that promoted the dissemination of climate change information, these regulations enabled land-use planners to become more knowledgeable about climate change issues. Such understanding helped them see the benefits of mainstreaming CCA into the local land-use plan, *incentivised* them to operationalise the mainstreaming approach, and improved their *commitment to CCA*. As one respondent stated:

In my opinion, about 80% of the planners in Albay have the mindset that integrating CCA-DRR into the local land-use plan should be prioritised. This is because of Governor Salceda, who has been actively advocating for CCA-DRR. That is also why the people in Albay, including the planners and the Municipal Planning and Development Council, are aware of climate change.

Finally, as a climate change champion, Governor Salceda was able to place CCA-DRR as a priority agenda of the local government, as evidenced by the number of climate change-related activities in the province. Consequently, the *local government prioritisation* indicator was assessed as an opportunity at the local scale (provincial and city/municipal).

### 6.3 Summary and conclusion

This chapter comprehensively assessed the *state-of-play of the local mainstreaming process in Albay, Philippines* (i.e., Objective 3), and established the initial foundations for *generating a more refined understanding of the operationalisation of mainstreaming in local CCA* (i.e. Objective 4). The quantitative aspect of the research provided an evaluation of the conditions on-ground and therefore served as guides in determining the challenges that need to be prioritised to effectively mainstream CCA-DRR into the land-use planning process. Based on the indicator scores, this chapter focused on the *institutional issues* surrounding the operationalisation of the approach. The qualitative analysis highlighted why and how institutions can be primary barriers to the local mainstreaming process in the Philippines, as can be seen through the (1) fragmented national laws and regulations; (2) overlapping and multiple policy requirements; and (3) lack of guidelines for mainstreaming CCA into the local land-use plans. These barriers can be summarised as the absence of institutional mechanisms that support the foundations for CCA, specifically the Climate Change Act of 2009 (RA 9729) and the Disaster Risk Reduction Management Act of 2010 (RA 10121).

Mainstreaming CCA is a change that will require broader institutional reforms. Thus, understanding the planning context where these institutional changes (e.g., creation of new policies or amendments in prevailing regulations) are to be implemented is critical (Theesfeld et al. 2010). For example, the provisions in the Disaster Risk Reduction Management Act with regard to the institutionalisation of the LDRRM officer could not be implemented effectively due to budgetary constraints and limited standards and guidelines for implementation. The case implies that institutional mechanisms to support the institutional foundations for CCA are essential to mainstream CCA effectively and to transform mainstreaming challenges into opportunities.

This point is demonstrated also by the circumstances surrounding the leadership challenge, that is, the existence of a climate change champion in Albay. A significant feature included in this mainstreaming indicator was the ability of the champion to influence the behaviour of people and initiate collective action. Leadership became an opportunity to raise the knowledge and awareness of planners, decision-makers, and the community on climate change concerns; positively influence the commitment of the local governments to CCA-DRR initiatives; place CCA-DRR among the priority agenda of the local governments; gain community support for CCA-DRR; and provide institutional incentive through motivating planners and decision-makers to mainstream CCA-DRR into the local plans. Hence, these commonly identified “obstacles to mainstreaming in the Philippines” (Lasco et al. 2008, p. 14) were transformed into opportunities in Albay. The analysis also suggested that in the

Philippines, the local government chief executives are important to champion CCA at the local scale. Vital to this (analysis) is the recognition that local leaders, as climate change champions, have the institutional support to initiate and execute a number of CCA-DRR activities, policies, and orders, by virtue of the Local Government Code.

The institutional dimension of climate change is a crucial facet of adaptation (Adger 2000; Lebel et. al 2012). Institutional changes and concerns are among the important factors that determine the success or failure of an adaptation measure, especially at the local scale (Orindi & Eriksen 2005). This is particularly true in the Philippine context where the improvements in institutional capacities of LGUs can result in a reduction in climate change-associated risks, and where local government institutions are crucial in facilitating local adaptation (Lasco et al. 2008; Uy et al. 2011; Cuevas 2012).

This chapter has strengthened the significance of developing institutional capacities of systems for a long-term adaptation to climate change. To further improve the knowledge on the operationalisation of the mainstreaming initiative and fully achieve the research Objective 4 (i.e., *to generate a more refined understanding of the operationalisation of mainstreaming in local CCA*), Chapter 7 explores how institutional nestedness affects the mainstreaming process in Philippines and how the polycentric type of governance relates to the challenges in mainstreaming CCA in the country.

## **CHAPTER 7: BARRIERS AND OPPORTUNITIES IN MAINSTREAMING ADAPTATION: A CRITICAL ASSESSMENT**

### **7.1 Introduction**

Climate change presents unprecedented risks to society. Thus, the climate change debate has changed from whether there is a need to adapt to how to adapt (Amundsen et al. 2010; Biesbroek et al. 2011). Chapter 2 illustrated that adaptation literature is focusing on the cross-sectoral and interdisciplinary nature of climate change concerns. Hence, adaptation research now is exploring the linkages between CCA and sustainable development, and addressing them as mutually dependent strategies through mainstreaming of CCA (Agrawala & van Aalst 2006; Huxtable & Nguyen 2009).

However, while the queries on the “whys” of mainstreaming have been settled, the “how” questions remain unanswered. Research indicates that “mainstreaming is not yet sufficiently taking place” (Lehmann et al. 2015, p. 93), and that in practice, “actors are searching for solutions to integrate the adaptation objective in existing policy domains” (Uittenbroek et al. 2013, p. 399). While there are handbooks and guidelines to assist in operationalising mainstreaming, scholars and practitioners alike agree that these documents are limited in addressing the challenges in applying the approach on-ground (Ayers et al. 2014; Goosen et al. 2014). Thus, mainstreaming studies commonly cite the barriers or challenges in mainstreaming CCA, rather than account for successful mainstreaming actions (Sharma & Tomar 2010; Nambi & Prabhakar 2011; Uittenbroek et al. 2013; Ayers, et al. 2014).

This research proposes that this situation is caused partly by a lack of understanding of the institutional dimension of the approach. Essentially, the operational procedures devised to apply mainstreaming (i.e., vulnerability assessments, climate risk screening, impact models) focus on climate-related issues (Olhoff & Schaer 2010; Schipper et al. 2010; Lebel et al. 2012). However, mainstreaming operationalisation necessitates more than a climate change perspective. The entire concept of mainstreaming—designing new or modifying existing planning, policy-making, and decision-making structures—is an institutional concern (Ayers & Dodman 2010; Ayers et al. 2014) [Refer to Chapter 3].

Understanding the barriers in adaptation (in general) and mainstreaming CCA (in particular) is important as it can help planners and policy-makers develop the appropriate institutional support to address climate change (Dovers & Hezri 2010; Ekstrom et al. 2011). Research in CCA barriers is emerging, and there are a number of concerns that need to be explored (Biesbroek et al. 2011). Currently, clear conclusions on the subject are that barriers

in adaptation exist, most barriers have historical roots, some barriers are deep-rooted in the system, and it takes time to overcome these barriers. What is less clear includes (1) what these barriers are and their nature, which the research addressed in Chapters 4 and 5; (2) why and how barriers arise and endure, which the research clarified in Chapter 6; and (3) how the barriers can be overcome, which the research discusses in this chapter (Amundsen et al. 2010; Burch 2010; Moser & Ekstrom 2010; Biesbroek et al. 2011; Eisenack et al. 2014).

This chapter begins by investigating the institutional dimension of CCA, and presents the concepts of institutional nestedness, institutional environment, and polycentricity. Next, discussion moves to how the barriers and opportunities for mainstreaming CCA were identified and qualitatively analysed. This chapter concludes that (1) institutional nestedness affects how some factors either become significant barriers or opportunities for mainstreaming CCA; (2) mainstreaming CCA involves a network of interacting institutions and institutional arrangements that transcend across governance scales; (3) local efforts are crucial in transforming potential barriers into opportunities for local mainstreaming; and (4) overcoming these challenges necessitates broad institutional reforms that go beyond the institutional setting where CCA is to be integrated. The findings of this chapter address the fourth objective which is—to generate a more refined understanding of the operationalisation of mainstreaming in local CCA.

## **7.2 Institutional dimension and the barriers in mainstreaming climate change adaptation**

Identifying the source or origin of a barrier (i.e., spatial/jurisdictional or temporal origins) helps to understand how that barrier fits into the CCA system (Moser & Ekstrom 2010). Likewise, it is important to determine the circumstances surrounding the barriers, and how the changes in institutional arrangements and institutional structures are linked to these barriers (Eisenack & Stecker 2012; Eisenack et al. 2014). These concerns involve multiple levels of governance. However, there is limited understanding of the roles of the federal/national, state, and local governments with regard to the barriers to CCA, and how the multilevel governance relationships affect these barriers (Farber 2009; Mukheibir et al. 2013).

Key to this line of investigation is the concept of institutional nestedness in the context of CCA (Corfee-Morlot et al. 2009; Measham et al. 2011). Institutional nestedness involves hierarchical relationships and rules, and deals with the “appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities” of institutions at multiple levels (Ostrom 1990, p. 90). This means that actions at higher levels of government

affect the responses of lower levels, and that clear directions on climate change actions from higher authorities are critical in local policy- and decision-making processes (Burch 2010; Amundsen et al. 2010). Accordingly, the concept of institutional nestedness is crucial in identifying the barriers in local mainstreaming (Corfee-Morlot et al. 2009; Measham et al. 2011).

However, climate change is a “wicked problem” (Lazarus 2010; FitzGibbon & Mensah 2012), and is characterised as a “cross-boundary, multi-level, multi-sectoral and multi-actor challenge” (Fröhlich & Knieling 2013, p. 21). Thus, effective adaptation requires a system in decision-making spread across multiple centers at multiple levels. That is, CCA responses should incorporate both the higher and lower levels of government, and should strike a balance between centralised and decentralised decision-making and governance (Lebel et al. 2006). Thus, some argue that the research on adaptation barriers needs to address multi-governance and cross-scale facets of adaptation (Amundsen et al. 2010; Biesbroek et al. 2011; Mukheibir et al. 2013). Similarly, others focus on the polycentric governance system for CCA in which multiple authorities under multi-layered institutional settings contribute to CCA policy formulation and implementation (Lebel et al. 2006; Ostrom 2010; Cuevas et al. 2014; Jordan & Huitema 2014).

Cuevas et al. (2014, p. 22) stated that the “institutional dimension of climate change adaptation involves an intricate web of relationships between and among institutions.” Institutions exist in an institutional environment or the “array of institutions that influence and affect climate change adaptation behaviours and decisions” (Cuevas et al., p. 2). Through a system of institutional arrangements, these institutions—rules, social structures, and organisations—(1) interact with and impact one another; (2) build institutional relationships; and (3) establish institutional linkages (Ostrom 1990, 2007; Heikkila et al. 2011). In relation to CCA, the interactions and interplays between and among institutions are exhibited when an adaptation measure is introduced into an institutional setting. For example, integrating CCA into local land-use plans introduces climate change related data into the current local land-use planning system. Because institutional interplays are not one directional, and therefore involve mutual influences or effects, the institutions existing in both the land-use planning system and the climate change information system will interact (Cuevas et al., 2014). Hence, the institutions in both settings will be affected by the mainstreaming approach. To understand better these kinds of institutional relationships and linkages, this chapter investigated the influence of institutional nestedness and the roles of local and national governments in mainstreaming CCA in Albay, Philippines, and determined how these concepts relate to the institutional dimension of CCA.

### **7.3 Influence of institutional nestedness on the mainstreaming process**

To explain how institutional nestedness affects the mainstreaming process, this section examines the following mainstreaming indicators— *institutional issues*, *availability of information*, *access to information*, and *credibility and reliability of information*.

#### **7.3.1 Primary barriers: Institutional issues**

The Albay experience identified the *institutional issues* indicator as the sole primary barrier in mainstreaming CCA-DRR into local land-use planning. This indicator is defined as the absence or presence of rule-based institutional questions or conflicts that inhibit the effective integration of CCA into local land-use planning. In-depth interviews revealed these key institutional issues as (1) fragmented national laws and regulations; (2) lack of guidelines for mainstreaming CCA-DRR into the local land-use plans; and (3) overlapping policy requirements (Chapter 6).

The difficulties experienced by the local government units (LGUs) in mainstreaming CCA stemmed from national institutional issues, the effects of which filtered down to the local environment. As discussed in Chapter 6, the first issue (i.e., fragmented national laws) involves the Disaster Risk Reduction and Management Act of 2010, a national law that mandates all LGUs to create the Local Disaster Risk Reduction and Management (LDRRM) officer position. This position is crucial as it assumes the tasks and responsibilities related to CCA-DRR at the city/municipal scale, including spearheading mainstreaming of CCA-DRR into the local land-use plan. Second, based on this Act, a national agency (i.e., Department of Budget and Management) identifies the fund source for the LDRRM officer's personal services requirements (i.e., salaries and compensations of government employees). The Department of Budget and Management Memorandum (March 15, 2012) names this fund source as the regular LGU fund. Third, usage of the LGU fund for personal services is restricted by the Local Government Code of 1991; thus, LGUs are constrained from hiring an LDRRM officer. Fourth, a national agency, the Civil Service Commission, is responsible for determining the standards for hiring the LDRRM officer; however, these standards were only issued in April 2014.

Hence, the disharmonies among rule-based national institutions and the inaction or the delayed actions of national organisational institutions were key sources of difficulties for the LGUs on this matter. Eventually, the issues were addressed through a collaborative effort of national government agencies, specifically, the issuance of a national directive (i.e., Joint Memorandum Circular No. 2014-1). The Memorandum Circular outlined the qualifications and standards for hiring an LDRRM officer, and the process that reconciled the provisions in



the Disaster Risk Reduction and Management Act and the Local Government Code. However, while this development may address the issue, its effects are yet to be determined (Chapter 6).

Similarly, the second issue, (i.e. lack of guidelines for mainstreaming CCA-DRR into the local land-use plan) was addressed by the “Supplemental Guidelines on Mainstreaming Climate and Disaster Risks in the Comprehensive Land-use Plan” released in the second quarter of 2014. This document was published by the Housing and Land-Use Regulatory Board (HLURB) and was an inter-agency “coordinated effort at the highest levels” (Interviews 2014). HLURB is a national government agency tasked to provide land-use planning guidelines in the Philippines by virtue of the Executive Order No. 648 (HLURB 2015). Although the HLURB has nine regional or field offices, the task of generating guidelines lies with the national office; the regional or field offices only implement and apply these guidelines in their respective areas (Republic of the Philippines 1987). Accordingly, the national office spearheaded the production of the said publication.

Finally, the difficulties arising from the third issue (i.e., overlapping national policies) can be addressed only at the national scale. In essence, there are approximately 30 local plans required from LGUs, by virtue of various national laws and regulations (Mercado 2011). These requirements overload the understaffed LGUs and prevent them from focusing on CCA-DRR related initiatives, including mainstreaming CCA-DRR into the local land-use plans (Interviews 2014).

Consequently, the resolve or failure of national institutions to act on matters affecting LGUs can either enable or constrain the ability of local governments to function efficiently in relation to CCA-DRR matters. As such, linkages between and among institutions across scales should be considered seriously, especially in CCA-DRR endeavours focused at the local scale (Cuevas et al. 2014).

### **7.3.2 Second level barriers: Availability and access to information**

The information capacity mainstreaming indicators primarily deal with the integration of technical and scientific climate change and land-use data. The indicator scores revealed two substantial barriers in mainstreaming CCA-DRR into the local land-use plans. These included the level of available technical information on climate change (i.e., *availability of information*) and the degree of user access to the available climate change information (i.e., *access to information*) (Figure 11). The survey and interviews presented several concerns regarding the available climate change-related data including (1) limited data in terms of availability at the lowest governance scale (municipal/city, villages); (2) substandard

technical features (e.g., low resolution of hazard maps); (3) obsolete data; and (4) insufficient data to conduct total risk and vulnerability assessments. For example, the Mines and Geoscience Bureau, one of the primary sources of geohazard maps in the Philippines, provides 1:50,000 scaled maps to the LGUs in Albay (MGB Region 5 2014). However, the survey respondents clarified that 1:20,000 or 1:10,000 scaled maps are needed to produce a local land-use plan with CCA-DRR components.

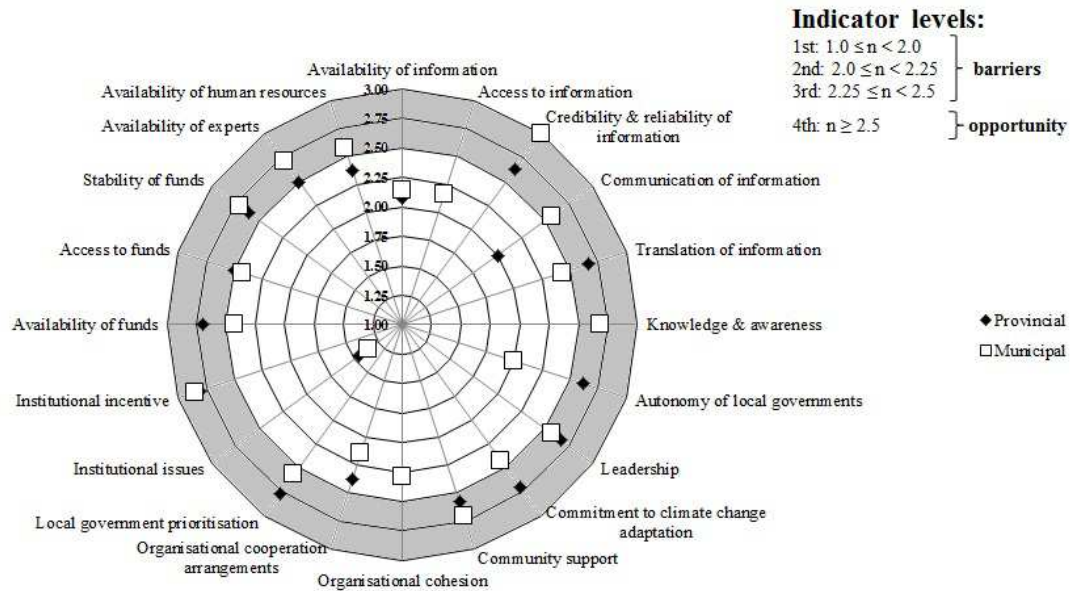


Figure 11 Radar chart of the indicators used to assess mainstreaming of CCA-DRR in Albay, Philippines: Barriers or opportunities?

Notes: Scores for the availability of funds, experts, and human resources indicators did not capture the “true” conditions relating to these challenges, thus, answer choices relating to these indicators need to be modified. Grey area represents the region where challenges have been transformed into opportunities for mainstreaming CCA.

The problem with *access to information* predominantly stemmed from the lack of local users’ knowledge of what information to use and how to access it. Electronic copies of the needed data were not available, thus causing access problems because users needed to personally collect the data from the agency source. In other instances, although digital data existed and was accessible from the internet, the data were in portable document formats (pdf files) and could not be edited to suit the needs of users. Finally, some data were available for a fee, which at times, LGUs were unable to afford (Interviews 2014).

Institutional nestedness is linked to the *availability and access to information* challenges through the organisational structure of the Philippine government. Government institutions are the main data sources of climate change information used by all LGUs, including Albay (refer next section). These institutions are part of the national government and are referred to as the national or central offices. They typically have field offices to help

with administrative tasks regarding field operations and engagements in local concerns (Republic of the Philippines 1987). In general, the functions of field government offices are governed by national rules, specifically the Executive Order No. 292, which present the key structures, procedures, functions, and rules of governance in the Philippines. Based on this rule, field offices are authorised only to implement laws, policies, plans, programs, rules, and regulations of the department or agency in the regional/local area; and to coordinate with the other regional offices of other departments, bureaus, agencies and LGUs in the area. Thus, the seat of authority of a government agency is with the national/central offices, although there are field offices tasked to address local affairs. Accordingly, for agencies that generate scientific data, the scientific tools, technologies, and the qualities of climate information available in the national offices dictate those existing in the field offices.

Some national rules also govern the national and field offices of specific government institutions. For example, the Department of Environment and Natural Resources Administrative Orders No. 95-23, No. 96- 40, and 97-11 instituted the functions of the central and regional offices of the Mines and Geoscience Bureau. Likewise, through the Executive Order 366, the Philippine Atmospheric, Geophysical, and Astronomical Services Administration, another primary source of climate change data, was re-organised into five technical divisions, five regional services divisions and two support divisions (PAGASA 2015).

In terms of access, the long-awaited Supplemental Guidelines is expected to improve the local users' familiarity with the data needs and their corresponding sources. For example, the Supplemental Guidelines identify the Mines and Geoscience Bureau; Philippine Atmospheric, Geophysical, and Astronomical Services Administration; and the Nationwide Operational Assessment of Hazards (a project of the Department of Science and Technology) as the chief sources of climate change information for land-use planning. This set of guidelines was a product of the national office of the HLURB and was a collaborative effort of other national institutions (HLURB 2014). In essence, the process of generating and accessing climate-related data in the Philippines is nested in a broader set of institutional arrangements characterised by a certain level of institutional hierarchy. As one respondent mentioned:

All development plans have guidelines on how they (plans) should be prepared... but basically, all guidelines originate from the top level (Interviews 2014).

### **7.3. 3 Opportunity: Credibility and reliability of information**

The analysis of the *credibility and reliability of information* (i.e., level of trust and confidence of users in the scientific and technical information and their source/s) provided evidence that the efforts and resolutions implemented at the higher levels of government also enable potential barriers to become opportunities for local mainstreaming.

Government institutions, based on their respective mandates, are the primary sources of scientific data for official government documents such as local land-use plans. To illustrate, Presidential Decrees No. 78 and No. 1149, and Executive Order 128 assign the Philippine Atmospheric, Geophysical, and Astronomical Services Administration to provide the official climatological, atmospheric, geophysical, and astronomical data of the country, including information on natural disasters such as typhoons, floods, earthquakes, and tsunamis. Meanwhile, by virtue of Department of Environment and Natural Resources Administrative Order No. 97-11, geohazard mapping is among the decreed responsibilities of the Mines and Geoscience Bureau. As such, the bureau implements the Geohazard Mapping and Assessment program that determines the areas in the country that are vulnerable to geologic hazards (DENR 2014).

Accordingly, the Comprehensive Land-use Plan Guidebook Volume 1, one of the key guides for land-use planners, identifies the Mines and Geoscience Bureau as a data source for geological or environmental hazard areas (HLURB 2006). Similarly, Department of Environment and Natural Resources Memorandum Circular No. 2011-005 names the Philippine Atmospheric, Geophysical, and Astronomical Services Administration as the data source for climate projections; and the Mines and Geoscience Bureau and the Philippine Institute of Volcanology and Seismology for natural hazards.

Essentially, these rules established “accountability” for the data. This was the primary reason why “as long as data are official,” local planners in Albay accepted the data provided by the government agencies. Clearly, institutional nestedness, that is, the institutional process created by national rule-based institutions, works in favour of transforming the issue of credibility and reliability of information from a potential barrier to an opportunity for mainstreaming CCA-DRR. Specifically, the climate change-related data were accepted by users, and local planners were willing to incorporate the information into the plans; hence the high score recorded for the credibility and reliability of information indicator (Interviews 2014).

## **7.4 Impacts of local initiatives on the barriers and opportunities for mainstreaming CCA-DRR into local land-use plans in Albay**

This section elaborates the significance of local initiatives on the operationalisation of the mainstreaming endeavour by exploring the circumstances surrounding the *organisational cohesion, local leadership, knowledge and awareness, local government prioritisation, community support, and institutional incentive* indicators. It shows that local initiatives were key factors that helped transcend most of the challenges from potential barriers into opportunities for mainstreaming in Albay.

### **7.4.1 Third level barrier: Organisational cohesion**

*Organisational cohesion* measures the degree of diversity or coordination among organisations/agencies engaged in local CCA. A low *organisational cohesion* score indicates a high degree of diversity among organisations; conversely, high scores signify that organisations are effectively coordinating with each other.

In Albay, *organisational cohesion* registered as a third-level barrier (Figure 11), denoting a certain level of coordination among organisations. However, the relationships among the organisations need to be improved for the indicator to be considered as an opportunity. The lack of cohesion among the institutions in Albay was manifested through the unfamiliarity of the field/local office heads of government agencies regarding their respective institution's role or function in local CCA-DRR activities. In these cases, organisations adhered to their mandated functions, and these functions typically did not align with each other. In other instances, these agencies were more concerned with their own CCA-DRR programs, thus, were unable to participate effectively in local CCA-DRR initiatives (Interviews 2014). The Provincial Government of Albay addressed this lack of organisational cohesion in land-use planning by providing the varying field offices with specific purposes and tasks. The Provincial Government of Albay issued local policies and regulations that established inter-institutional cooperation on CCA-DRR activities (Table 15). Thus, although organisational cohesion was a (third-level) barrier in mainstreaming CCA-DRR in Albay, it was not a serious threat.

### **7.4.2 Opportunity: Local leadership**

The leadership indicator refers to the absence or existence of a “climate change champion” in the locality, and to the extent of the champion's influence on the behaviour of the community. The leadership indicator was an opportunity in Albay due to the presence of Governor Jose Salceda, the chief executive officer of Albay who championed climate change

concerns in the province (Figure 11). Governor Salceda was very effective in influencing the behaviour of people and in initiating activities for CCA-DRR that the United Nations International Strategy for Disaster Reduction recognised him as a “Senior Champion” of CCA and DRR in 2010 and one of the “Champion for Making Cities Resilient” (PreventionWeb 2010; UNISDR 2012b).

Table 15 List of local policies in Albay that helped improve organisational cohesion

<b>Local Policy</b>	<b>Description</b>	<b>Effect</b>
<i>Provincial Executive Order 2007-07</i>	Included the Mines and Geosciences Bureau and the Environmental Management Bureau in the Provincial Land-use Committee	Clarified the roles of institutions that generate climate change-related data and engaged in climate change
<i>Provincial Executive Order 2007-12</i>	Included the Philippine Institute of Volcanology and Seismology in the Provincial Land-use Committee	adaptation-disaster risk reduction activities concerning integrating climate change
<i>Provincial Executive Order No. 2008-03</i>	Included the Albay Public Safety and Emergency Management Office in the Provincial Land-use Committee	adaptation into the local land-use plans
<i>Provincial Council Resolution 2008-44</i>	Urged the Provincial Government of Albay-Centre on Initiatives and Research on Climate Adaptation, Department of Agriculture, Department of Environment and Natural Resources, and Department of Agrarian Reform to work together and train local government units in incorporating climate-related hazards into the local land-use plans	Encouraged collaboration among organisations concerning mainstreaming climate change adaptation and disaster risk reduction

The Local Government Code of 1991 played a significant role in making the governor an effective climate change champion. This law provides LGUs in the Philippines extensive local autonomy in terms of powers, authority, responsibilities, and resources to govern their localities (Gonzales 1997; Serote 2004). Through this law, a governor is given substantial executive and legislative power and authority to undertake activities on concerns s/he deems significant to the general welfare of the province and its constituents (Republic of the Philippines 1991). Thus, as the head of Provincial Government of Albay, Governor Salceda initiated and has sustained a number of local CCA-DRR activities, policies, projects, and programs. As will be illustrated in the later sections, having a climate change champion was an opportunity in Albay that raised the *knowledge and awareness* of planners, decision-makers, and the community on climate change concerns; elevated CCA-DRR as a *priority agenda* of the LGUs; and was instrumental in getting *community support* for CCA-DRR initiatives and creating *institutional incentives* for planners and decision-makers to mainstream CCA-DRR into the local plans.

### 7.4.3 Opportunity: Knowledge and awareness

The *knowledge and awareness* indicator refers to the degree of understanding of planners and community members about the implications of climate change (knowledge), as well as their familiarity or recognition of the existence of climate change (awareness). In Albay, the *knowledge and awareness* indicator was an opportunity (Figure 11), suggesting that planners, decision-makers, and the community members alike are aware of the concept of climate change and the need to adapt.

The local activities, programs, and policies initiated by the Provincial Government of Albay highly contributed to this level of climate change knowledge and awareness. In 2007 and 2009, the Provincial Government of Albay spearheaded the first and second National Conference on Climate Change Adaptation, respectively (Lasco et al. 2008). The first conference was held at the provincial capital (Legazpi City) and brought the concept climate change to the people in Albay. In addition, the conference produced the “Albay Declaration on Climate Change Adaptation,” which was an initiative to promote CCA, mitigation, and enhanced resilience to hazards through information, legislation, and programs. This “declaration”, in turn, became instrumental in the passage of the Climate Change Act (Salceda & Rangasa 2011). Although the second conference was conducted at the national capital (i.e., Metro Manila), the active participation of the Provincial Government of Albay in this initiative helped introduce climate change into the consciousness of the local planners and decision-makers in Albay (Interviews 2014). In 2008, the Provincial Government of Albay also organised an inter-faith forum in Legazpi City, which brought people from the Catholic, Islam, Iglesia ni Cristo, and Seventh Day Adventist faiths to discuss CCA and DRR (Salceda & Rangasa 2011; UNISDR 2012a).

Policy-wise, the Provincial Executive Order 2007-12-A established the Center for Initiatives and Research for Climate Adaptation (CIRCA) as a key institution on climate change. CIRCA is Albay’s primary research institution for CCA and climate risk reduction; it also implements some of the province’s major adaptation programs and projects (Lasco et al. n.d.). The Provincial Government of Albay also signed a Memorandum of Agreement with Bicol University to establish the Climate Change Academy (now known as the Climate Change Adaptation and Disaster Risk Reduction Management Training Institute), which became the province’s main arm in enhancing and strengthening the theoretical knowledge and practical skills of major local stakeholders on climate and disaster risk assessment (PGA & CIRCA 2010). This was followed by the Provincial Executive Order No. 2011-02 that stipulated for the Climate Change Academy to hold environmental classes at the key university in the region (i.e., Bicol University) starting 2011.

Likewise, the Memorandum of Understanding between the Provincial Government of Albay-CIRCA and the University of the Philippines Los Baños sanctioned activities geared toward mainstreaming climate change into the academic curriculum of primary, secondary, and tertiary education in the province. With this, Albay became the first province to mainstream CCA in the education sector (Lasco et al. 2008).

These developments contributed to the relatively high level of knowledge and awareness to climate change in the province. Accordingly, this condition is expected to help community members understand the need for a local land-use plan with CCA-DRR concerns, and thereby support the endeavour (i.e., *community support* indicator); and planners and decision-makers see the benefits of mainstreaming CCA-DRR into the local land-use plans (i.e., *institutional incentive* indicator).

#### **7.4.4 Opportunity: Local government prioritisation**

The *local government prioritisation* indicator defines the CCA agenda within the general development priorities in the local government. CCA is a clear priority in Albay, as evidenced by the number of related local government programs and policies. The Provincial Council Resolution 2007-04 cemented this prioritisation by institutionalising CCA as a provincial policy. Similarly, through the Provincial Resolution 2007-24, which decreed Albay as “one of the first and pioneering prototype province that will adopt climate change adaptation,” CCA was further embedded as a priority of the province. Institutionalising CCA as a local government priority was an opportunity to impart CCA into the political and social consciousness of the present and future generations of government officials and people in Albay (PGA 2007).

With CCA as a priority, the Provincial Government of Albay also provided the LGUs legislative means to mainstream CCA-DRR into the local land-use plans. For example, Provincial Resolution 2008-44 urged the Provincial Government of Albay-CIRCA and other government agencies like the Department of Agriculture, Department of Agrarian Reform, among others, to conduct trainings and workshops on how LGUs can revise their local land-use plans (i.e., incorporate climate change impacts and risks). As one respondent shared:

One time, the Albay provincial government requested the Mines and Geoscience Bureau Region 5 to train an LGU that was struggling to use the hazard maps in analysing land-uses. The two-day training was funded by the provincial government.



#### **7.4.5 Opportunity: Community support and institutional incentive**

The *community support* and *institutional incentive* indicators refers to the degree of public support and local community participation on CCA initiatives, and the degree to which the benefits from adaptation encourage actors to operationalise the mainstreaming approach, respectively.

In Albay, this community support for CCA-DRR is reflected in the participation of community members in various CCA-DRR-related local government activities such as the “Mural Painting Competition on Climate Change Adaptation” among colleges and universities; first “Mayon Trail Run,” a marathon in celebration of the National Conference on Climate Change Adaptation first anniversary, among others (Lasco et al. 2008; Plan International 2010; Salceda & Rangasa 2011). Such support suggests the willingness of the community to accept CCA initiatives, including possible changes in land-uses.

When the respondents were asked to rate (from 1 to 5) the importance of mainstreaming CCA into the local land-use planning process, almost all gave the highest score of 5. Several respondents justified their answers based on economic reasons, such as the need to assure investors that the LGU offers investment areas that are safe, low risk, and not vulnerable to disasters. Some were concerned with minimising human casualties during future intensified typhoons, and indicated the need for safe and permanent settlement areas. Others rationalised their responses by considering climate change and DRR strategies as either opportunities or constraints in the context of land-use planning.

The actors involved in local land-use planning in Albay recognised the benefits of mainstreaming CCA-DRR into the local land-use plans, thereby minimising the possible resistance to or maximising the expected cooperation of planners, reviewers, and implementers in generating a local land-use plan with CCA-DRR components. This perception was highly influenced by the efforts of the local climate change champion. As one respondent stated:

In my opinion, about 80% of the planners in Albay have the mindset that integrating CCA-DRR into the local land-use plans should be prioritised. This is because of Governor Salceda who has been actively advocating for CCA-DRR. That is also why the people in Albay, including the planners and the Municipal Planning and Development Council, are aware of climate change.

#### **7.5 Institutional settings and institutional networks in climate change adaptation**

The preceding analyses demonstrate how the interplays between and among institutions existing within a hierarchical structure (i.e., institutional nestedness) influence the conditions surrounding the challenges in mainstreaming CCA, and indicate how the

institutions at the local scale can define the circumstances relating to the barriers and opportunities for effective operationalisation of mainstreaming. These assessments imply that the challenges in mainstreaming CCA involve a network of interacting institutions and institutional arrangements that transcend governance scales. This network is comprised of the institutional setting wherein CCA is being integrated and the institutional settings where the mainstreaming challenges operate. Essentially, each mainstreaming challenge exists and persists in another institutional setting with its own working or functioning institutions and institutional arrangements (Figure 12).

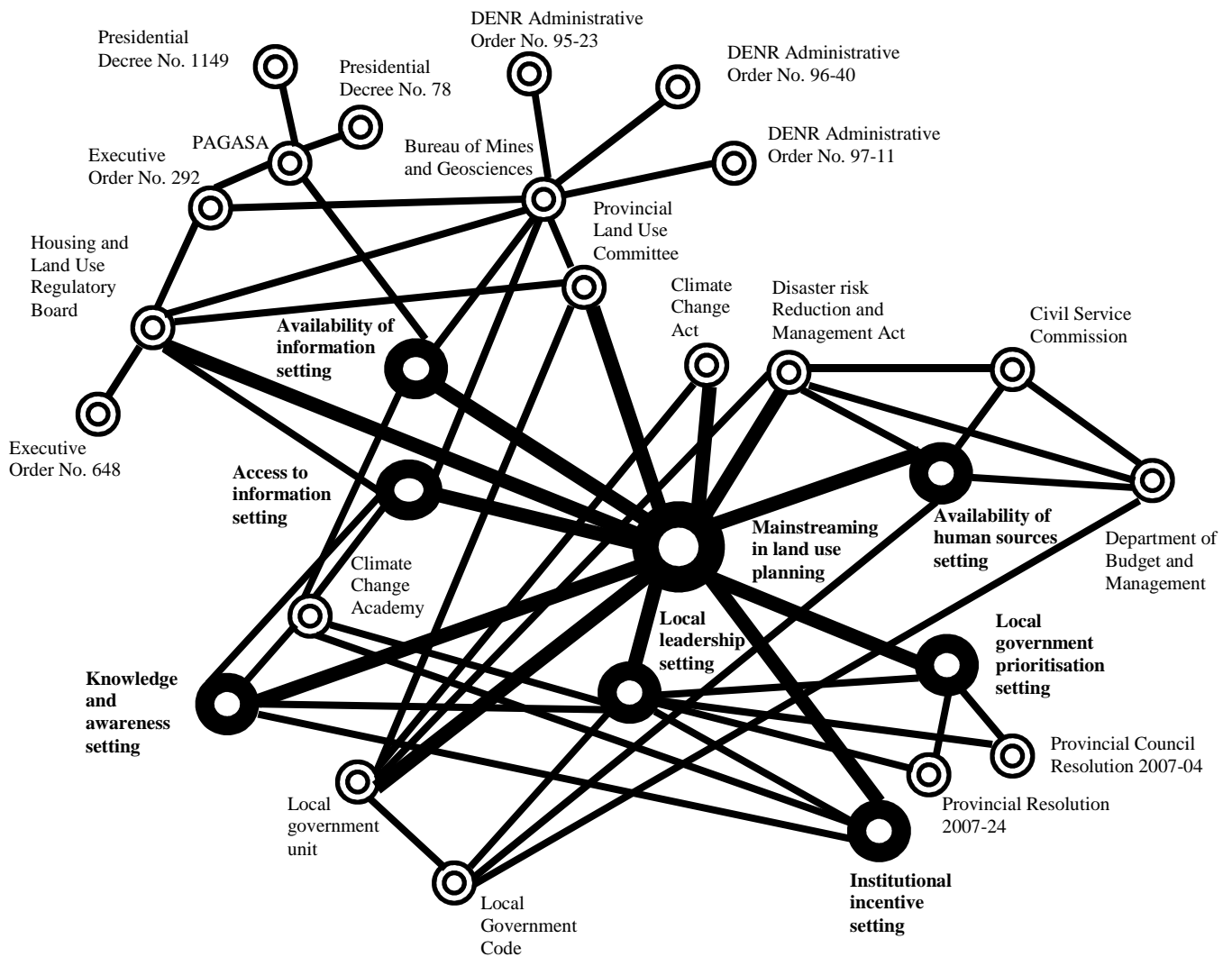


Figure 12 Network of selected institutions, institutional settings, and institutional arrangements for mainstreaming climate change adaptation: Case of local land-use planning in Albay, Philippines

*Notes:* The lines depict the institutional arrangements governing the varying institutional settings. Thick lines connote arrangements that directly link institutions or institutional settings to the mainstreaming setting. The thin lines signify arrangements that are not directly associated with the mainstreaming setting.  
DENR – Department of Environment and Natural Resources; PAGASA – Philippine Atmospheric, Geophysical, and Astronomical Services Administration

For example, the challenges related to the *availability of information* and *access to information* were assessed as second-level barriers, thereby suggesting that developing the information capacity of systems (i.e., ability to integrate climate change information into the information system of the planning and decision-making processes) is an important feat in mainstreaming. However, the producers, communicators, and translators of data are functioning in institutional settings outside land-use planning, and thus are governed by different sets of institutional arrangements. Specifically, the Mines and Geosciences Bureau and the Philippine Atmospheric, Geophysical and Astronomical Services Administration, key agencies that generate climate change-related data in the Philippines, are governed by national policies and regulations such as the Executive Order No. 292, the policy that presents the key structures, procedures, functions, and rules of governance in the Philippines. The Mines and Geosciences Bureau also adheres to the institutional arrangements stipulated in the Department of Environment and Natural Resources Administrative Orders No. 95-23, No. 96-40, and No. 97-11. On the other hand, the Philippine Atmospheric, Geophysical and Astronomical Services Administration's powers, duties and functions are dictated by Presidential Decrees No. 78 and No. 1149, and Executive Order 128, and its organisational structure are influenced by Executive Order 366 (Figure 12).

Meanwhile, local leadership was assessed as an opportunity because of the existence of the climate change champion in the person of the provincial governor. The champion is linked to the socio-political status of the governor position and is effective because of the Local Government Code that provided the governor with the crucial institutional support to execute, formulate, and conduct local CCA policies, programs, and activities.

All these rule-based institutions that transformed the challenges into either barriers or opportunities for mainstreaming were not parts of either the land-use planning system or the CCA mainstreaming institutional setting. Likewise, although these rules affected the local setting (i.e., local land-use planning system), they originated from the highest level of governance (i.e., national). These conditions illustrate that the challenges in mainstreaming CCA encompass a chain of interactions or interplays within the network of institutional settings and this notion suggests that overcoming mainstreaming challenges necessitates broad institutional reforms that go beyond the institutional setting where CCA is to be integrated.

Previous studies have associated CCA with network analysis. For example, Pahl-Wostl (2009) emphasised the significance of network governance in analysing the adaptive capacities of systems; Juhola and Westerhoff (2011) investigated the role of networks in adaptation governance; Funfgeld (2015) examined how transnational municipal networks

facilitate local CCA; and Ingold and Balsiger (2015) studied how collaboration networks or network relations affect the sustainability of local CCA actions. The results of this research in Albay support this direction of analysis. Essentially, by contending that effective mainstreaming operationalisation necessitates an institutional perspective, and by proving this notion to be critical in analysis, the research has produced empirical evidence that links the mainstreaming approach to institutional networks. This then unlocks a wide range of theoretical and analytical research possibilities associated with network analysis—network theory<sup>1</sup> and complex systems<sup>2</sup> (Amarala & Ottino 2004; Newman 2011; Kim 2013)—that can be explored in future research on mainstreaming operationalisation.

## 7.6 Summary and conclusion

There is a void in CCA literature concerning the practical on-ground application of mainstreaming, especially regarding the challenges or barriers that hinder its effective operationalisation (Ekstrom et al. 2011; Uittenbroek et al. 2013; Lehmann et al. 2015). This chapter filled this gap by offering empirical evidence on the conditions surrounding the challenges in mainstreaming CCA into local land-use planning in Albay. It clarified how the some factors were evaluated as either barriers or opportunities for mainstreaming, thereby raising the level of understanding on the persistence of some challenges as barriers to CCA. Thus, this chapter *generated a more refined understanding of the operationalisation of mainstreaming in local CCA* (Objective 4).

The findings in this chapter support the ideas this research argued in Chapter 2, namely, that:

- (1) the operationalisation of mainstreaming needs to go beyond the issues of climate change;
- (2) the mainstreaming process necessitates institutional analysis—a complicated process that needs to examine institutional arrangements and institutional interplays; and
- (3) the manner or degree by which the barriers affect the adaptation process depends on individual institutional settings.

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<sup>1</sup> Network theory has its origins in graph theory and has developed in different areas of the social and natural sciences and led to current trends in theoretical and empirical network research. Several scholars now agree that the study of networks, including the exploration of their variety and dynamics, is an important key to understanding the evolution and stability of physical and social structures (Odella 2011).

<sup>2</sup> A complex system is a system with a large number of elements, building blocks or agents, capable of interacting with each other and with their environment (Amaral & Ottino 2004, p. 148).

Likewise, the results validate the mixed methodology devised in Chapter 3, especially the methodology's IAD-CCA framework that effectively examined the local mainstreaming process from an institutional perspective.

Based on the analysis in this chapter, two significant concepts were identified as influential in the transition of the barriers into opportunities for local mainstreaming, namely, institutional nestedness and active participation of local governments. Institutional nestedness suggests that operationalising the mainstreaming approach is dependent on other levels, and that the actions of local governments on climate change concerns are often nested in institutional frameworks and processes at higher levels (Corfee-Morlot et al. 2009; Measham et al. 2011). The circumstances surrounding the primary and second-level barriers in Albay support this notion. Thus, the process of mainstreaming CCA-DRR at the local scale is nested in a broader set institutional arrangements characterised by a certain level of institutional hierarchy. Essentially, planners encountered barriers created at multiple levels of government (Hamin et al. 2014).

This is an important insight because part of the system's ability to overcome barriers in mainstreaming CCA stems from knowing the origin of the barrier. Specific barriers caused by issues at the higher level imply that local actors would not have direct control over the matter (Moser & Ekstrom 2010). However, as evidenced by the "2007 Albay Declaration on Climate Change Adaptation", an Albay initiative that influenced the passage of the Climate Change Act in 2010, local governments can indirectly address the challenge that originated from higher levels.

The chapter also demonstrated how mainstreaming challenges (i.e., *credibility and reliability of information*) can be addressed by higher level (i.e., national) decisions. Likewise, it shows how other challenges (i.e., *availability of information* and *access to information*) were affected by hierarchical institutional structures. Thus, although the chapter does not recommend possible solutions for overcoming these specific barriers, it argues that realising the effects of institutional nestedness in creating barriers in mainstreaming CCA can help actors determine the suitable institutional support to transform these barriers into opportunities.

The Albay case also offers evidence of the critical role of local efforts in preventing the challenges from becoming barriers, and in turning them into opportunities for local mainstreaming. This makes local administration a key component in CCA. The numerous local policies, projects, programs, and initiatives implemented by the Provincial Government of Albay and spearheaded by the climate change champion, Albay Governor Salceda, raised the knowledge and awareness of the people on climate change matters. These efforts resulted

in (1) a well-informed community that supports local government CCA-DRR initiatives; (2) knowledgeable planners and decision-makers who are incentivised to integrate CCA-DRR into the local land-use plans; and (3) local governments that prioritised CCA in their agendas. Essentially, the effective local climate governance advanced the participation, cooperation, and commitment of stakeholders in addressing climate change tasks and problems (Fröhlich & Knieling 2013).

A number of studies have emphasised the significance of local governments in addressing the challenges in CCA (Schreurs 2008; Burch 2010; Sharma & Tomar 2010; Pasquini & Shearing 2014). Similarly, others have highlighted the importance of the arrangements governing institutions at different levels—polycentric governance—in the context of CCA (Ostrom 2010; Corfee-Morlot et al. 2009). The findings of this chapter substantiate these notions. However, it concludes that operationalisation of mainstreaming is not an “either or” debate, nor is it a hierarchical versus decentralised decision-making dilemma. Local mainstreaming of CCA should account for both the institutional linkages across levels of government and the active participation of local governments. This is because the barriers to adaptation exist in different institutional settings that cut across governance levels. These settings become linked when an introduced adaptation measure interacts with the prevailing institutions functioning in these settings (Cuevas et al. 2014).

These findings imply that operationalisation of mainstreaming CCA is a multi-scale, multi-setting endeavour. This chapter contends that in designing strategies to address the challenges in mainstreaming CCA, analysts, planners, and decision-makers must understand that the challenges exist within a network of institutional settings, and that these challenges encompass a chain of institutional interactions or interplays within this network. Accordingly, overcoming these challenges necessitates broad institutional reforms that go beyond the institutional setting where CCA is to be mainstreamed. This line of thought opens a variety of analytical possibilities for mainstreaming research; in particular, scholars can explore network analysis for future research and investigation on mainstreaming operationalisation.

## CHAPTER 8: CONCLUSION, POLICY IMPLICATIONS, AND FUTURE RESEARCH POSSIBILITIES

### 8.1 Introduction

This dissertation began by presenting evidence that although interest in mainstreaming CCA has been growing, and several countries have applied the approach at the national scale, there is still limited information regarding its on-ground operationalisation. This has been identified as a crucial setback because it is at the local scale where specific mainstreaming actions are implemented, thus suggesting that mainstreaming has not advanced from conceptualisation and planning to the effective practical application. Many mainstreaming studies have cited the barriers or challenges in operationalising the approach (Sharma & Tomar 2010; Nambi & Prabhakar 2011; Pasquini et al. 2013; Ayers et al. 2014; Uittenbroek et al. 2014) rather than reported on successful mainstreaming undertakings. These circumstances highlighted the gap between mainstreaming theory and operationalisation, and prompted the need for a critical analysis of the local mainstreaming processes. This research focused on mainstreaming CCA in land-use planning, and asked the questions “How can mainstreaming of climate change adaptation into local land-use planning be understood?”, and “How can the challenges in the operationalisation of mainstreaming be overcome?”

Four objectives were formulated in this research to answer the above questions. The first three objectives were to (1) *explore the process of mainstreaming CCA, from its theoretical foundations to its operationalisation, with special interest in local land-use planning* (Chapter 2); (2) *determine an analytical framework and methodology that can examine effectively the challenges in mainstreaming CCA into land-use planning and generate metrics that can be used by planners and decision-makers in addressing these challenges* (Chapter 3); and (3) *analyse the state-of-play of and linkages between the challenges in mainstreaming CCA into land-use planning in Albay, Philippines, and determine how these challenges can be overcome* (Chapters 4, 5, and 6).

This final chapter synthesises the research findings and, along with Chapter 7, addresses the last research objective—to *generate a more refined understanding of the operationalisation of mainstreaming CCA*. Accordingly, Section 8.2 recalls the gap between mainstreaming theory and application that set the foundations for this research—which is the need to understand the institutional dimension on how to operationalise mainstreaming of CCA. Section 8.3 discusses the methodology that the thesis devised in order to answer the research questions. Section 8.4 highlights the key findings of the research analyses, focusing

on the nature of the mainstreaming challenges, and elaborates on the policy implications of these findings. Section 8.5 intensively examines the institutional dimension of mainstreaming CCA based on the research. Section 8.6 concludes with a statement on the challenges in mainstreaming CCA and the contribution of this research to the knowledge base on the operationalisation of mainstreaming. Lastly, Section 8.7 extends the chapter by presenting future research possibilities based on the findings from this research.

## **8.2 Gap between theory and application of mainstreaming climate change adaptation**

General insight: Understanding the mainstreaming process entails examining the institutional dimension of the approach; thus, analysis of and planning for mainstreaming operationalisation necessitate an institutional perspective.

To address the first objective, the research investigated the theoretical underpinnings of the mainstreaming approach, tracked its path to popularity, and examined the status of its operationalisation. These activities entailed conducting intensive reviews of CCA literature, including the IPCC AR3, AR4, and AR5; handbooks and guidelines in mainstreaming CCA; peer reviewed papers related to mainstreaming CCA; government reports on country mainstreaming efforts; and documents relating to outputs of projects concerning mainstreaming of CCA (Chapter 2).

Two notable points were realised from the review. The first is that research interest in mainstreaming CCA has been increasing over the years, as outlined in the discussions in the IPCC reports released in 2001, 2007, and 2014. The concept of mainstreaming is not new and has been used in relation to education for handicapped children, gender issues, environment, disaster risk reduction (DRR), HIV/AIDS, and intercultural relations (Gupta & van der Grijp 2010; Olhoff & Schaer 2010); mainstreaming became associated with CCA only at the beginning of the 2000s. In fact, mainstreaming CCA as an adaptation approach was not mentioned in the IPCC AR3 in 2001. However, in 2007, the IPCC AR4 defined mainstreaming in several chapters (e.g., Chapters 2, 16, 17, and 18), advocated for the mainstreaming approach, and stated in its Technical Summary that “mainstreaming climate change issues into decision-making is a key prerequisite for sustainability” (Parry et al. 2007, p. 55). In 2014, the IPCC AR5 went beyond defining the term and presented explicit examples of how countries applied the approach at the national scale. For example, Wong et al. (2014, p. 390) stated that in Japan: “... coastal climate change adaptation has been mainstreamed into the framework of Coastal Disaster Management in the aftermath of the 2011 Tohoku Earthquake Tsunami.” Likewise, the number of references on mainstreaming



CCA increased significantly in the reports from 2007 to 2014. As such, mainstreaming CCA has become a more prominent topic in adaptation literature over the last decade.

Document reviews also revealed that more countries have acknowledged that (1) the difficulties in achieving sustainable development cannot be overcome without considering climate change impacts; and (2) effective climate adaptation is unlikely without accounting for existing and future development actions (Olhoff & Schaer 2010; Schipper et al. 2010). Consequently, mainstreaming CCA has become a popular adaptation approach, especially in developing countries. For example, Bangladesh, Ethiopia, India, the Philippines, and Zambia, among others, have integrated climate change issues and concerns into their respective country development plans. The growing recognition of mainstreaming has been influenced substantially by external forces that advocate for its implementation. Examples of these external influences are the international funding mechanisms such as the Least Developed Countries Fund, Special Climate Change Fund, Multi-donor Trust Fund on Climate Change, Pilot Programme for Climate Resilience under the Climate Investment Fund, Global Environment Facility Trust Fund, and the Adaptation Fund (Measham et al. 2011; Lal et al. 2012). Likewise, mainstreaming CCA as a strategy has advanced due to the active advocacy of donor, bilateral, and multilateral agencies (Agrawala 2006; Olhoff & Schaer 2010; Lal et al. 2012). Accordingly, most (if not all) mainstreaming handbooks and guidelines that prescribe its operationalisation have been produced by international organisations such as the Asian Development Bank, OECD, the World Bank, and the United Nations agencies (i.e., UNEP, UNDP), among others.

Based on these handbooks and guidelines, the operational procedures (i.e., vulnerability assessments, risk screening, impact modelling), the tools, and techniques to accomplish the mainstreaming task focus on the climate-related aspect of adaptation. Specifically, they concentrate on risk reduction and environmental impact assessment procedures (Klein et al. 2007). For example, the Assessment and Design for Adaptation to Climate Change—A Prototype Tool (ADAPT) of the World Bank is primarily a risk-screening tool. Meanwhile, the Opportunities and Risks from Climate Change and Disasters of the UK Department for International Development concentrates on identifying activities at high risk to climate change and on determining those that provide opportunities for vulnerability and risk reduction (Gigli & Agrawala 2007). Some, like the Climate Vulnerability and Capacity Analysis (CVCA) of CARE International and Community-based Risk Screening Tool—Adaptation and Livelihoods by the International Institute for Sustainable Development, went beyond vulnerability, risk, and environmental assessments; however, they still focused on climate change-related issues.

There have been significant advancements in mainstreaming CCA from its conceptualisation to its recognition as an important adaptation approach, and to its actual application to address climate change. With the encouragement of external influences (i.e., funding mechanisms, international organisations), several developing countries have incorporated climate change into their development plans, thereby setting the direction of their respective nations' linked CCA and sustainable development agendas. Similarly, there have been substantial developments in relation to tools and mechanisms to integrate climate change into the planning and decision-making processes. However, the progress of mainstreaming as an adaptation approach has been more of a top-down path, with less focus on the elements that can affect the actual integration process on-ground. That is, the existing operational procedures and tools neglect the most important aspect of mainstreaming, which is the institutional dimension of adaptation (Chapter 2).

This is a major gap in CCA literature primarily because climate change is a wicked problem that is complex, ambiguous, ill-defined, unpredictable, intractable, and multifaceted (Lazarus 2010; FitzGibbon & Mensah 2012; Head & Alford 2015). Consequently, CCA has been referred to as a “wicked problem par excellence” (Termeer et al. 2013, p. 27). The traditional methodologies (i.e. scientific and technical) and available tools in policy analysis are ill-equipped to address CCA issues and concerns. This is so because CCA involves multi-level interventions spanning across households, communities, governments, NGOs, industries, and different sectors at several scales (from local to regional, national and international) (Tol et al. 2000; Perry 2015). Likewise, it warrants changes or adjustments in behaviours and in value systems (Lorenzoni et al 2007; Pettengell 2010; Berrang-Ford et al. 2011; Hamin et al. 2014). As such, CCA, especially mainstreaming CCA, needs to be addressed through institutional means (Jentoft & Chuenpagdee 2009; Rodima-Taylor et al. 2011; Perry 2015).

Fundamentally, the whole concept of mainstreaming (i.e., synergy of climate change and sustainable development goals and agenda; designing new or re-designing existing planning, policy-making and decision-making structures) is an institutional concern (Young 2002; Ayers & Doman 2010). Particularly, the institutional aspects of mainstreaming are incorporated in the (1) guidelines for applying the adaptation measure; (2) governance arrangements accompanying the mainstreaming efforts; (3) institutional conditions where the mainstreaming policy is implemented; and (4) varying institutional levels or scales where the approach is applied (Brondizio et al. 2009; Theesfeld et al. 2010; Bettini et al. 2012). Therefore, since the settings where CCA will be integrated already exist within functioning institutions and institutional arrangements, mainstreaming CCA essentially is an approach

dominated by institutional changes, institutional transformations, and institutional reforms. Consequently, because the institutional aspect of mainstreaming CCA has been neglected, very few reports of successful on-ground application of the approach were identified during the course of this research. Instead, studies have cited the barriers or challenges in mainstreaming operationalisation.

### **8.3 Methodology for examining the challenges in mainstreaming climate change adaptation**

General insight: Mainstreaming operationalisation necessitates a methodology that focuses on the challenges in applying the approach, an analytical framework that can examine the mainstreaming process from an institutional perspective, and metrics that can translate climate change adaptation from an abstract to a more concrete concept.

To address the second objective, the research investigated literature from the fields of institutional analysis, methodological procedures, and CCA. The previous section established the need to focus on the institutional dimension of mainstreaming in operationalisation; hence, the review of institutional literature. Meanwhile, because information is lacking on how mainstreaming CCA can be applied on-ground, which consequently highlights a knowledge deficit regarding the mainstreaming process (Lal et al. 2012; Ayers et al. 2014; Picketts et al. 2014), methodological literature was also examined in this research. Finally, CCA literature was explored to determine how the overall methodology of the research should be designed.

The existing literature on mainstreaming CCA has identified a number of setbacks in its knowledge base. First is the lack of understanding regarding the barriers or challenges that slow or delay the effective operationalisation of the approach (Uittenbroek et al. 2013; Revi et al. 2014; Lehmann et al. 2015). Second is the absence of metrics to determine the state-of-play of the adaptation effort, to evaluate and assess adaptation outcomes, and to measure adaptation progress and its effectiveness (Berrang-Ford et al. 2011; Mimura et al. 2014; Noble et al. 2014). Lastly, climate change research has lagged behind the interdisciplinary nature of the problem in terms of research cooperation, citation, and the methodologies applied (Bjurstrom & Polk 2011). Hence, to have effective interdisciplinary communication and cooperation in climate change research, quantitative and qualitative researchers need an avenue for collaboration (Nielsen & D'haen 2014).

To address these setbacks, the research designed a mixed methodology that (1) focused on examining the challenges in mainstreaming CCA; (2) had an analytical framework that was able to investigate institutional settings; and (3) generated indicators for assessing mainstreaming endeavours. The methodological design incorporated a case study in order to answer the research question within a real-life context (Scholz & Tietje 2002; Yin 2014). In particular, the research's four-stage methodology (1) included a mixed method that utilised document reviews, interviews, a survey, and key informant consultations (i.e., triangulation by data method) as the main data sources; (2) used the modified Institutional Analysis and Development (IAD) framework as the primary analytical and data collection guide; and (3) employed the scorecard approach to generate quantitative data and indicators. The research methodology was successfully applied to the case of mainstreaming CCA into the local land-use planning system in Albay, Philippines (Chapter 3).

The four-stage mixed methodology was a systematic and practical process. Each stage in the methodology produced its own output, and each individual output significantly contributed to adaptation literature. Stage 1 developed the IAD-CCA framework; Stage 2 generated the quantitative mainstreaming indicators; Stage 3 devised the varying levels of severity by which the challenges (as represented by the indicators) impact the mainstreaming process; and Stage 4 produced the in-depth qualitative analyses of the challenges in mainstreaming CCA. Likewise, each stage was an important part in a chain of actions within the methodology, in which an output of one stage was an input in another (stage).

To illustrate, the research modified the IAD in Stage 1, thus, transforming it into the IAD as applied in mainstreaming CCA research (i.e., IAD-CCA). The IAD was the most suitable framework for this CCA research because it is designed specifically to examine institutional settings (Ostrom 2011). Hence, it can analyse the setting where CCA is to be mainstreamed and is equipped to examine the complexities in institutional arrangements and institutional interplays (Jordan & O'Riordan 1997; O'Riordan & Jordan 1999; Young 2002). Furthermore, the IAD variable that refers to the biophysical conditions of the system can represent the impacts of climate change concerns in that setting (McGinnis 2011). The IAD has a methodical analytical process that can help users organise vast amount of data (Koontz 2006; Dick & Meinzen-Dick 2011). This feature was very useful in designing the data collection activities of the CCA research. Also, the IAD is a framework that has been tested and applied successfully in a variety of institutional conditions and to an extensive range of problems and concerns, including CCA (Koontz 2006; Oberlack & Neumärker 2011).

Most importantly, the IAD has a flexible design which allowed the research to address the framework's limitation in examining institutions under the CCA context. Particularly, this

research replaced the evaluation criteria of the IAD with factors that influence the effective operationalisation of mainstreaming CCA (i.e., 20 mainstreaming challenges). The research summarised the mainstreaming challenges into three capacity classifications (i.e., *institutional*, *information*, and *resource* capacities). Meanwhile, the concept of institutions as rules, social structures, and organisations (Cuevas et al. 2014) was incorporated in the mainstreaming challenges under the institutional capacity classification. This research considered the evaluation criteria to be key variables as they guide the users in (1) assessing the patterns of interactions of institutions; (2) evaluating which outcomes are acceptable and which need improvement; (3) analysing how the current institutional arrangements constrain or facilitate desired outcomes; and (4) formulating ideas on how to attain the preferred outcomes (McGinnis 2011).

In Stage 2, the list of mainstreaming challenges guided the survey design. The survey was conducted among the key actors in the local land-use planning system in Albay and the representatives of national government and non-governmental organisations engaged in local mainstreaming of CCA. Specifically, each survey question represented a challenge in the IAD-CCA evaluation criteria. The scorecard approach was effective in converting these challenges into quantitative indicators (Chapters 4 and 5). The three-choice design of the survey questions was simple and straightforward. The respondents easily answered the survey, and thus the researcher processed the survey data without difficulty. Essentially, the scorecard approach was easy to understand and was readily communicated to or interpreted by users with varying backgrounds. Most importantly, it was applied at the local scale successfully. Accordingly, the resulting indicators have the potential to be used as benchmarks for determining the status of the mainstreaming challenges and they can be updated for timeliness and comparability across time.

The partial results of the mainstreaming indicators were generated in the field, and the indicator scores guided the line of questioning during the interviews in Stage 3. To illustrate, because the institutional issues indicator was assessed as a primary barrier, interview questions were directed at exploring these issues in greater depth. Consequently, the following were identified as the factors that constrained the capacity of local governments in Albay in mainstreaming CCA into the local land-use plans (1) fragmented national laws; (2) overlapping policy requirements; (3) lack of guidelines for mainstreaming CCA into the local land-use plans; and (4) political concerns.

The additional issues raised during the interviews were further investigated in Stage 4 through the document reviews (i.e., national and local laws and regulations, government memoranda, local government reports, and other related studies) and consultations with key

informants. For example, a representative from the Department of Budget and Management was interviewed to determine how the Joint Memorandum Circular No. 2014-1 issued in April 4, 2014 could address the problems created by the fragmented national laws. This problem speaks of the conflict between the Disaster Risk Reduction and Management Act and the Local Government Code regarding the budgetary requirements for hiring a local disaster risk reduction and management (LDRRM) officer (Chapter 6).

Also in Stage 4, the IAD-CCA framework helped organise the analysis of the data collected. To illustrate, based on the quantitative results of the evaluation criteria, the *institutional issues* indicator was prioritised in the analysis. One of the specific concerns related to this indicator was the fragmented national laws. At this point, the aim of the analysis was to determine the conditions surrounding this problem. The next step was to identify the rule-based institutions (i.e., policies) involved in the fragmented national laws issue (e.g., these were the Disaster Risk Reduction and Management Act and the Local Government Code). The specific institutional arrangements and institutional actors in these two policies that affect the mainstreaming process were examined. In particular, by virtue of the Disaster Risk Reduction and Management Act, the local government units in the Philippines are mandated to create the LDRRM officer position. This person is the primary local government staff concerned with CCA and DRR activities of the local government, including mainstreaming of CCA into the local land-use plans. However, hiring of the officer is subject to the rules and regulations of the Department of Budget and Management concerning budgetary source. The department, on the other hand, directed that the salary of the officer to be governed by the provisions of the Local Government Code on the rules regarding the local government budget (Chapter 6). Essentially, using the IAD-CCA structure as guide, (1) the interplays between and among the rule-based and institutional organisations connected to the mainstreaming of CCA into local land-use planning were examined; and (2) the existing and introduced institutional arrangements governing the actions of these institutions were analysed. Overall, the mixed methodology was applied effectively in practice; and it generated results that can assist analysts, planners, and decision-makers determine the state-of-play of the challenges in mainstreaming CCA and make informed decisions for overcoming these challenges.

## 8.4 Nature of challenges in mainstreaming climate change adaptation: Assessing linkages and state-of-play

General insights:

- (1) The mainstreaming challenges are interconnected at varying levels of intensity.
- (2) The challenges exist within a certain spectrum, with the barriers and opportunities for adaptation representing the extreme ends of this spectrum.
- (3) The barriers can affect the mainstreaming process at varying degrees of severity.
- (4) The barriers can be overcome and can transcend into opportunities for mainstreaming CCA.

Several researchers who have studied CCA measures and efforts have agreed that the barriers exist and that they are impeding the progress and success of adaptation efforts (Amundsen et al. 2010; Burch 2010; Biesbroek et al. 2011, 2013). One of the pressing questions addressed by existing research in this area is “What are the barriers to adaptation?” Accordingly, the knowledge base on identifying the barriers has grown. However, the current research need has moved beyond merely recognising and classifying these barriers. This is especially true in mainstreaming CCA since it deals with planning and policy- and decision-making processes. Planners and policy-makers need to understand fully these barriers and the circumstances surrounding them (barriers) in order to formulate effective plans and policies. Therefore, CCA research needs to (1) determine the nature of these barriers; (2) establish the interconnections and interdependencies among the barriers; (3) understand why and how barriers arise and endure; and (4) determine how the barriers can be overcome (Amundsen et al. 2010; Burch 2010; Moser & Ekstrom 2010; Biesbroek et al. 2011; Eisenack et al. 2014; Waters et al. 2014).

This thesis generated quantitative data that allowed for comprehensive data analysis to be conducted (i.e., ranking, descriptive statistics, etc.) on the challenges in mainstreaming CCA. Since this research was concerned with understanding the relationships among the barriers, correlation analyses were performed among the mainstreaming challenges. For example, based on the resulting correlation coefficients ( $r$ ) at the provincial scale, the highest frequencies of interconnections (i.e.,  $r \geq 0.50$ ) among the mainstreaming challenges stood at *stability of funds* (12 interconnections); *access to funds* and *institutional incentives* (11); and *availability of funds*, *local government prioritisation*, and *knowledge and awareness* (10). In comparison, the highest frequency of interconnections at the city/municipal scale was the *knowledge and awareness* challenge (9). Also, the correlation coefficients provided a concrete idea of the kinds of relationships that existed among the challenges. To illustrate, at

the provincial scale, while both the challenges pertaining to the *knowledge and awareness* ( $r = 0.740$ ) and *institutional incentive* ( $r = 0.847$ ) were linked to the *stability of funds*, the latter relationship was stronger than the former (Chapter 4).

Although the correlation analysis was context-specific, that is, the relationships among the challenges depended on the circumstances or conditions surrounding the mainstreaming process in Albay, Philippines, the results suggest that:

- (1) the mainstreaming challenges are interconnected to each other and that the interconnections among the mainstreaming challenges exist at varying levels of intensity;
- (2) different types of relationships among the challenges may exist (i.e., dual or tripartite relationships); and
- (3) tripartite relationships among the mainstreaming challenges can be significant factors in formulating strategies to overcome the challenges.

These sets of information have important planning and policy implications. In the case of Albay, Philippines, planners and decision-makers can use these results to (Chapter 4):

- (1) explore the following challenges in designing a strategy with potential extensive effects on the mainstreaming process: *stability of funds*, *access to funds*, *institutional incentives*, *availability of funds*, *local government prioritisation*, and *knowledge and awareness*;
- (2) investigate whether developing *resource capacity* and *knowledge and awareness* simultaneously can be an optimal strategy to an effective mainstreaming process;
- (3) consider the very strong association between *local leadership* and *local government prioritisation* of CCA in devising viable approaches to mainstreaming CCA; and
- (4) exploit the tripartite relationships of the mainstreaming challenges (i.e., *local leadership-local government prioritisation of CCA-commitment to CCA*) in planning for mainstreaming CCA.

Because of the case-study facet of the mixed methodology, similar analytical possibilities can be gathered in other studies, although results are likely to present different combinations of relationships among varying types of mainstreaming challenges. A case study is a “detailed examination of a single example” that can be used “in the preliminary stages of an investigation to generate hypotheses” (Flyvbjerg 2011, p. 301). As presented in Chapter 3, the Albay case is a “critical case” that has a strategic importance in relation to the



problem of local mainstreaming of CCA. Thus, the hypotheses gleaned from the case “could be expected to be valid for all” (Flyvbjerg 2006, p. 226) or at least to a wide range of cases. Chiefly, the Albay case study provides concrete, context-dependent knowledge regarding the local mainstreaming process, and offers a methodology that can be replicated under different conditions and circumstances (Flyvbjerg 2006, 2011). Accordingly, the results of other cases can validate the hypotheses advocated by this case study.

The quantitative mainstreaming indicators developed in this research can also help other researchers investigate their own cases. As discussed in Chapter 3, each mainstreaming indicator represented a challenge in the IAD-CCA evaluation criteria. Although the process by which these indicators were computed can be improved (i.e., three of the 20 indicators did not reflect the actual on-ground conditions), in general, the indicators measured effectively the severity of the impacts of the challenges to the mainstreaming process. Specifically, at all scales (i.e., national, provincial, city/municipal), the *institutional issues* indicator was assessed as the primary barrier in operationalising the approach. Interviews revealed these issues to be (1) fragmented national laws; (2) overlapping policy requirements; (3) lack of guidelines for mainstreaming CCA into the local land-use plans; and (4) political concerns. The indicator scores also implied that the *availability* and *access to information* were among the major challenges that should be prioritised. Conversely, the *credibility and reliability of information* and *stability of funds* were considered as opportunities to the mainstreaming endeavour.

The other indicator scores reflected the national versus local perspectives, that is, the national respondents generally reacted to the question in terms of the national institutions involved in climate change and land-use planning. On the other hand, the local respondents (i.e., provincial and city/municipal) evaluated the question in relation to the local institutions in Albay. This case applied to the *organisational cohesion*, *local government prioritisation*, and *institutional incentive* indicators. These results provided direction for additional and more intensive inquiries. To illustrate, *organisational cohesion* was a primary barrier at the national scale, but was a third-level barrier in Albay. As discussed in Chapter 5, the investigation revealed that the lack of organisational cohesion was an “inherent problem in the Philippine government system.” Government agencies or organisations in the Philippines design their goals and implement their activities based on their respective key result areas (KRAs). These KRAs are set individually and independently from one organisation to another; thus, the KRAs often do not align. Under this condition, the programs, projects, responsibilities, and tasks of varying organisations tend to be disharmonised even within a common agenda, such as CCA-DRR. At the local scale, this lack of organisational cohesion was translated as the

unfamiliarity of government field/local offices with the function of their institution in local CCA-DRR activities. Local offices follow their organisation's KRAs and mandated functions, and not the local government's CCA-DRR agenda.

In Albay, *organisational cohesion* was a third-level barrier, suggesting better conditions in the province as compared to the national scale, especially in land-use planning. This is because the Provincial Government of Albay issued local policies and regulations that clarified the roles of the varying field offices in terms of mainstreaming CCA into the local land-use plans. Particularly, the provincial government issued local regulations that included key agencies that generate climate-related data (i.e., Mines and Geosciences Bureau and the Environmental Management Bureau) and the main agency responsible for DRR in the province (Albay Public Safety and Emergency Management Office) among the members of the committee that reviews and approves the local land-use plans (i.e. Provincial Land-Use Committee). In essence, the provincial government created institutional mechanisms that linked the organisations involved in land-use planning, climate change, and CCA-DRR. These mechanisms clarified their individual roles and functions toward a common CCA-DRR agenda—mainstreaming CCA into local land-use plans (Chapter 5).

However, some variations in the assessments across scales reflected the differences in the conditions in Albay (both provincial and city/municipal) and other LGUs in the country, especially in relation to the following: *knowledge and awareness*, *leadership*, and *community support*. These indicators were assessed as opportunities at the provincial and city/municipal scales, but were barriers at the national scale. Similarly, the *commitment to CCA* and *access to funds* were opportunities at the provincial scale, but were second-level barriers at the national scale. These results suggested that there were conditions in Albay that separated the province from the other local government units in the Philippines. Further investigation showed that the primary cause of this difference was the existence of a climate change champion in Albay (i.e., *leadership* indicator), in the person of the provincial chief executive, Governor Jose Clemente Salceda. The governor was instrumental in turning a number of challenges from possible barriers into actual opportunities (i.e., barriers that have been overcome or factors that have positive influence on the mainstreaming process) for mainstreaming CCA in Albay. To illustrate, under the governor's leadership, CCA was institutionalised as a priority agenda in the provincial government, resulting in an assessment of the *local government prioritisation* of CCA as an opportunity at both provincial and city/municipal scales. The very strong correlation between the two mainstreaming challenges verified the relationship between the two indicators, and the qualitative assessments established the direction of this relationship. That is, *leadership* or existence of a climate

change champion was the cause, and the high *local government prioritisation of CCA* was the effect.

This research contends that knowing the extent of a barrier's impact on the mainstreaming process can assist planners and decision-makers in prioritising the barriers to address. This is significant especially in the local context where local governments face a number of governance and development constraints. Thus, in the Albay case, solving the institutional issues should be the priority. More importantly, knowing and understanding the nature of the challenges will help in formulating strategies to overcome these challenges. Although the results of this research are context-specific, some generalisations apply as follows (Chapters 4 and 5):

- (1) mainstreaming challenges exist within a certain spectrum, with the barriers and opportunities for adaptation representing the extreme ends of this spectrum;
- (2) depending on the conditions surrounding the barriers, they (barriers) can affect the mainstreaming process at varying degrees of severity;
- (3) a challenge can be a significant barrier or opportunity to another challenge; and
- (4) when the barriers are overcome, they can become opportunities for mainstreaming CCA.

## **8.5 Institutional dimension of mainstreaming climate change adaptation**

General insights:

- (1) The institutional mechanisms to support mainstreaming actions need to be in place for effective operationalisation.
- (2) Active participation of local governments helps transition the barriers into opportunities for local mainstreaming.
- (3) Mainstreaming CCA involves a network of interacting institutions and institutional arrangements that transcend across governance scales.
- (4) The challenges in mainstreaming CCA encompass a chain of interactions or interplays within the network of institutions.

This research is founded on the notion that mainstreaming operationalisation is an institutional concern that necessitates an institutional analysis. Based on this principle, the institutional setting where CCA is being mainstreamed (i.e., local land-use planning) was examined using the IAD-CCA framework; the evaluation criteria of the framework outlined the structure of the examination. Four major conclusions regarding the mainstreaming process were gathered from the analysis as follows:

- (1) institutional mechanisms to support the mainstreaming process are necessary for effective operationalisation;
- (2) local governments can significantly contribute to CCA policy formulation and implementation; thus, the active participation of local governments help transition the barriers into opportunities for local mainstreaming;
- (3) on-ground application of mainstreaming involves a network of interacting institutions and institutional arrangements that transcend across governance scales; thus, mainstreaming operationalisation should account for the institutional linkages across levels of government; and
- (4) the challenges in mainstreaming CCA encompass a chain of interactions or interplays within the network of institutions; hence, overcoming these challenges necessitates broad institutional reforms that go beyond the institutional setting where CCA is to be integrated.

First, the institutional mechanisms to support mainstreaming actions need to be in place for its effective operationalisation. This notion was confirmed through the assessment of the *institutional issues* indicator as a primary barrier to the effective mainstreaming operationalisation in Albay and the Philippines as a whole. In particular, these issues were fragmented national laws, overlapping policy requirements, lack of guidelines for mainstreaming CCA into the local land-use plans, and political concerns (Chapter 6).

To illustrate, when the Climate Change Act of 2009 and the Disaster Risk Reduction and Management Act of 2010 mandated for climate change and DRR to be mainstreamed in the government development planning and policy-making processes, plans needed to be revised. In the case of land-use planning, this involved the existing Comprehensive Land-Use Plan. However, the two introduced laws also required additional new plans to be generated. The Climate Change Act required the development of a Local Climate Change Action Plan, while the Disaster Risk Reduction and Management Act mandated the Local Disaster Risk Reduction and Management Plan. Meanwhile, by virtue of the Local Government Code of 1991 and the Urban Development and Housing Act of 1992, local governments need to produce not only the Comprehensive Land-Use Plan (local land-use plan) but also a Local Shelter Plan. Likewise, the Agriculture and Fisheries Modernization Act of 1998 called for a Strategic Agricultural and Fisheries Development Zones Plan. Hence, local government units in the Philippines are obligated to produce multiple plans based on varying laws, regulations, memorandum circulars, and other rule-based institutions. Consequently, the revisions and modifications needed to mainstream climate change into the local land-use plans brought

additional pressure and stress to the already under-staffed and under-resourced local government units. In essence, when the mainstreaming process was operationalised, institutional mechanisms to address the overlapping policy requirements were neglected. There was no institutional rule that directed the merging of related plans into a single all-inclusive plan with CCA-DRR components; nor were there amendments to the existing rules to avoid duplication of planning effort. Most especially, the impacts of designing the Local Climate Change Action Plan and Local Disaster Risk Reduction and Management Plan on the local government resources (i.e., additional burden) and the local planning system (i.e., repetitive plans if CCA-DRR is mainstreamed) were overlooked.

Another important issue was the lack of guidelines for mainstreaming CCA into the local land-use plans. When the Climate Change Act and the Disaster Risk Reduction and Management Act were enacted in 2009 and 2010, respectively, local government units were then required to produce updated local land-use plans with CCA-DRR components. However, the operational procedures for mainstreaming CCA-DRR (i.e., Supplemental Guidelines on Mainstreaming Climate and Disaster Risks in the Comprehensive Land-use Plan) were only released in early 2014. Thus, during the intervening years, local government units were unsure of how to fulfil their obligations as required by the legislation. As such, in 2012, the Regional Development Council (RDC) in General Santos City, Philippines filed a resolution requesting the National Economic and Development Authority, the main socio-economic planning agency in the Philippines, to “fast track the completion of the reference manual on mainstreaming disaster risk reduction/climate change adaptation in the comprehensive land-use plans” (RDC XII 2012, p. 1).

The assessments on the *leadership* indicator also illustrated the significance of institutional-support mechanisms for effective mainstreaming of CCA. Likewise, it revealed the second conclusion—that active participation of local governments help transition the barriers into opportunities for local mainstreaming. The *leadership* indicator was an opportunity for mainstreaming CCA in Albay due to the existence of the climate change champion in the person of the provincial chief executive, Governor Salceda. The position of Governor Salceda provided him the authority and power to be a positive influence in the operationalisation of the mainstreaming endeavour. In the Philippines, local chief executives have extensive administrative and legislative authority by virtue of the Local Government Code. Accordingly, this legislation offered institutional support, specifically, the autonomy needed by the provincial government to execute CCA-DRR activities, policies, and regulations for its jurisdiction. For example, Section 465 of the Local Government Code authorises the provincial governor to (1) initiate and propose legislative measures to the

provincial council; (2) issue executive orders for the enforcement and execution of laws; (3) exercise general supervision and control over all programs, projects, services, and activities of the provincial government; and (4) initiate and maximise the generation of resources and revenues, and apply the same to the implementation of development plans, program objectives and priorities. Hence, the climate change champion in Albay was able to implement and influence a number of CCA-DRR initiatives. Moreover, under the governor's leadership, the Provincial Government of Albay institutionalised CCA as a priority agenda by virtue of Provincial Resolutions 2007-04 and 2007-24. Both local regulations aimed to influence the political and social consciousness of the people in the government, private sector, and communities in Albay with regard to CCA (PGA 2007; Lasco et al. 2008). Such policies, along with many others, established a legislative framework for CCA in the province. Consequently, the *local government prioritisation* indicator was evaluated as an opportunity at both provincial and city/municipal scales. This condition (i.e., *local leadership* and *local government prioritisation* as opportunities) (1) raised the knowledge and awareness of planners, decision-makers, and the community on climate change concerns; (2) positively influenced the commitment of the local governments to CCA-DRR initiatives; (3) placed CCA-DRR among the priority agenda of the local governments; (4) helped gain community support for CCA-DRR; and (5) provided institutional incentive through motivating planners and decision-makers to mainstream CCA-DRR into the local plans.

The third conclusion relates to institutional nestedness, a concept that involves hierarchical relationships and rules at multiple levels of governance (Ostrom 1990). Institutions are typically nested in institutional frameworks and processes at higher level; thus, on-ground application of mainstreaming involves a network of interacting institutions and institutional arrangements that transcend across governance scales. For example, based on a number of national legislation, government institutions are the primary sources of scientific data for official government documents such as local land-use plans. These pieces of legislation turned the *credibility and reliability of information* challenge into an opportunity in Albay because the information provided by "official" sources were believed and accepted by planners and decision-makers. This acceptance was built on the principle that official data sources can be held accountable for the data produced and disseminated, and such accountability cannot be imposed on unofficial data sources.

The impacts of institutional nestedness are illustrated also by the circumstances surrounding the *institutional issues* indicator. Fundamentally, the complications that the local government units in Albay experienced with mainstreaming CCA stemmed from the effects of the actions of national institutions, which trickled down to the local environment. To

illustrate, the Disaster Risk Reduction and Management Act stipulated that local governments should create the position of the LDRRM officer in their respective units. However, there had been no national directives, regulations or other formal institutional rules that addressed the possible conflicts that may arise from this provision. As explained in Chapter 6, the rule that governed the source of the officer's salary is the Local Government Code of 1991; Section 325 of the Code stated that the personal services (salaries) of local government personnel should not exceed 45%–55% of the local government funds. However, this rule posed a significant problem to local governments because most (if not all) had already reached their respective budgetary ceilings for personal services. This meant that no budget was available to hire a new officer. This was only addressed in early 2014 when the a Technical Working Group<sup>3</sup> formulated the implementing guidelines for establishing the Local Disaster Risk Reduction and Management Offices in local government units via the Joint Memorandum Circular No. 2014-1. During the years after the law was implemented and before the implementing guidelines were issued, the tasks and responsibilities of the LDRRM officer had been designated to existing regular and permanent staff, without additional compensation, financial or otherwise. Thus, the disharmonies among rule-based national institutions and the inaction or the delayed actions of national organisational institutions were key sources of difficulties for the local government units on this matter.

The last conclusion advances the understanding of the institutional dimension of mainstreaming CCA. That is, each mainstreaming challenge exists and persists in its own institutional setting, with its own working or functioning institutions and institutional arrangements. These institutional settings are neither part of the land-use planning nor climate change adaptation systems (Figure 12 in Chapter 7). For example, in relation to the availability of information and access to information, the actions of producers, communicators, and translators of data were governed by sets of institutional arrangements not directly linked to the mainstreaming process. In particular, the Mines and Geosciences Bureau and the Philippine Atmospheric, Geophysical and Astronomical Services Administration, producers of climate change-related data, were governed by national rules such as Executive Order No. 292 that outlined the key structures, procedures, functions, and rules of governance in the Philippines. Also, the Mines and Geosciences Bureau followed the institutional arrangements specified in the Philippine Mining Act of 1995, and the Department of Environment and Natural Resources Administrative Orders No. 95-23, No. 96-40, and No. 97-11. Meanwhile, the Philippine Atmospheric, Geophysical and

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<sup>3</sup> Comprised of the Civil Service Commission, National Disaster Risk Reduction and Management Development Council, Department of Interior and Local Government, and the Department of Budget and Management.

Astronomical Services Administration's powers, duties and functions are shaped by Presidential Decrees No. 78 and No. 1149, and Executive Order 128. Likewise, the climate change champion, the governor of Albay, was working within the arrangements set by the Local Government Code—the rule that provided the governor position the authority and power to execute, formulate, and conduct local CCA policies, programs, and activities.

In essence, mainstreaming operationalisation involves a network of institutional settings, and the institutions governing the challenges in mainstreaming CCA interact within this network. These interactions generate a chain of institutional interplays, wherein one action can create a series of reactions that can make a challenge a serious barrier or an important opportunity for mainstreaming. A very apt example of this idea is the series of institutional interactions and interplays that were generated between and among rule-based institutions—Disaster Risk Reduction and Management Act, Local Government Code, Department of Budget and Management Memorandum (dated March 15, 2012)—and the institutional organisations—Department of Budget and Management, Civil Service Commission—as a result of one provision in the Disaster Risk Reduction and Management Act, specifically, the creation the local disaster risk reduction officer (refer Section 8.5 and Chapters 6 and 7). According to Kim (2013, p. 980) “institutions do not exist in isolation but as embedded in a maze-like structure”. In mainstreaming operationalisation, this structure exists as a network of institutional settings; therefore, overcoming the challenges in mainstreaming CCA necessitates broad institutional reforms that should reach across the various institutional settings within this network.

## **8.6 Final conclusions**

This research posed the questions “How can mainstreaming of climate change adaptation into local land-use planning be understood?” and “How can the challenges in the operationalisation of mainstreaming be overcome?” To answer these, the research examined the challenges in integrating or “mainstreaming” CCA into local land-use planning in Albay, Philippines, and determined how to identify, characterise, categorise, and assess these challenges in order to aid planners and decision-makers in overcoming them effectively. Hence, the thesis:

- (1) explored the process of mainstreaming CCA, from its theoretical foundations to its operationalisation, with special interest in local land-use planning;
- (2) formulated a methodology that examined effectively the challenges in mainstreaming CCA, and generated metrics that would address these challenges;



- (3) analysed the state-of-play and linkages between the different challenges in mainstreaming CCA into land-use planning in Albay, Philippines, and determined how these challenges can be overcome; and
- (4) generated a more refined understanding of the operationalisation of mainstreaming CCA at the local scale.

This research contributes to the expanding literature in mainstreaming CCA by addressing an important issue in the research field—examining the challenges in operationalising the approach at the local scale, and assessing how to overcome these challenges. In essence, the research provides empirical evidence of the practical application of the mainstreaming endeavour, thereby transcending analysis from theory to operationalisation through a case study in Albay, Philippines. Specifically, this research contributes to the knowledge in CCA mainstreaming through these three accomplishments:

- (1) It presents a systematic methodology that planners can use to examine the complexity of the mainstreaming process. This methodology:
  - (1.1) is comprised of an analytical framework that can investigate the institutional dimension (i.e., institutional changes and transformations) of CCA; and
  - (1.2) generates quantitative indicators to monitor and assess the state-of-play of the mainstreaming process, and thereby help transform the abstract nature of the climate change concept into concrete and measurable terms.

This methodology output is significant in planning. Although planners now acknowledge that there is a need to act on climate change, most are unsure about how to proceed with the initiative (Hamin et al. 2014). As mainstreaming operationalisation is not straightforward (Ayers et al. 2014), planners need a systematic methodology for examining the institutional settings into which CCA will be integrated. In general, the operational recommendations on mainstreaming CCA focus on climate-related issues and the suggested tools and techniques to address these issues include vulnerability assessments, climate risk screening, and climate change scenario building, among others (Olhoff and Schaer 2010; Lebel et al. 2012; SPREP & UNDP 2013). Thus, the analytical framework of this research, which can investigate the institutional dimension of CCA, provides a perspective that the current mainstreaming processes lack (Gigli & Agrawala 2007; Olhoff & Schaer 2010). Meanwhile, the quantitative indicators developed by this research can make the abstract concept of CCA more concrete (Persson & Klein 2008). The metrics,

therefore, can translate the state-of-play of the adaptation effort into a language that planners can understand, and thereby enable them to have a solid basis for action (Oates 2011).

- (2) This study advances CCA researchers' understanding of the nature, linkages, and interdependencies among the barriers to adaptation through the:
  - (2.1) quantitative mainstreaming indicators that measure the severity of the impacts of the challenges in mainstreaming CCA, and explain the nature of the barriers and opportunities for mainstreaming CCA;
  - (2.2) correlation analyses that quantitatively determine the degree by which mainstreaming challenges are linked to each other;
  - (2.3) assessments of the state-of-play of the local mainstreaming process and mainstreaming challenges;
  - (2.4) analyses that determine the institutional roots of the barriers in mainstreaming; and
  - (2.5) analyses of how the mainstreaming barriers potentially can be transformed into opportunities for mainstreaming.

This set of outputs is important in planning and decision-making because understanding the challenges in adaptation is key to the successful on-ground application of the mainstreaming approach (Amundsen et al. 2010; Biesbroek et al. 2013; Clar et al. 2013; Eisenack et al. 2014). These challenges that impede and obstruct the mainstreaming operationalization resulted to the overall progress of the endeavour to be slow and ineffective (Uittenbroek et al. 2013; Revi et al. 2014; Lehmann et al. 2015). Although the literature on the barriers or challenges to adaptation is expanding, with the works of Amundsen et al. (2010), Biesbroek et al. (2011, 2013, 2014), Dang et al. (2014), Matasci et al. (2014) and Lehmann et al. (2015), among many others, there are still unresolved issues concerning the nature of the barriers, linkages and interdependencies among the barriers, and how to overcome the barriers (Burch 2010; Eisenack et al. 2014; Hamin et al. 2014; Klein et al. 2014; Kuruppu & Willie 2015). The information generated by this research clarifies these issues, and thus provides a knowledge base that can assist CCA analysts, practitioners, and planners to formulate strategies that can overcome these barriers or challenges. Moreover, it demonstrates how quantitative (i.e., correlation analysis,

mainstreaming indicators) and qualitative (i.e., indicator score assessments) techniques, methods, and analyses can be used to accomplish this task of strategising.

- (3) This research advances and generates a more refined understanding of the institutional dimension of the mainstreaming process by:
- (3.1) illustrating the need for institutional mechanisms that support mainstreaming actions for effective operationalisation;
  - (3.2) demonstrating how the concept of institutional nestedness is linked with the challenges in mainstreaming CCA;
  - (3.3) explaining how active participation of local governments can help transition the barriers into opportunities for mainstreaming CCA; and
  - (3.4) conceptualising and exploring the network of interacting institutions and institutional arrangements involved in operationalising mainstreaming of CCA.

The institutional dimension of CCA remains the least understood aspect of the climate change issue (Evans & Stevens 2009; Pradhan et al. 2012; Rodima-Taylor 2012; Rodima-Taylor et al. 2012). The outputs from this research clarify certain aspects of this dimension. First, the research established that operationalisation of mainstreaming is a matter of institutional change and transformation; and the approach creates changes that will affect realities that are already functioning within existing institutional systems and institutional arrangements. Thus, this research strengthens the significance of developing the institutional capacities of systems for successful long-term adaptation to climate change. It also highlights the importance of institutional mechanisms to support the institutional changes resulting from the mainstreaming endeavour. Second, the research demonstrates that the practical application of mainstreaming at the local scale is dependent on other scales; consequently, the actions of local governments on climate change concerns often are nested in institutional frameworks and processes at higher levels (i.e., institutional nestedness) (Corfee-Morlot et al. 2009; Measham et al. 2011). Third, this research provides empirical evidence that supports the notion that local governments are crucial in addressing the challenges in CCA (Schreurs 2008; Burch 2010; Sharma & Tomar 2010; Pasquini & Shearing 2014). Fundamentally, national and local scale actions and decisions are equally critical in mainstreaming operationalisation (Ostrom 2010; Mukheibir et al. 2013; Jordan & Huitema 2014). Finally, these inter-scalar

interactions among institutions prove that mainstreaming operationalisation involves a network of interacting institutions and institutional arrangements; therefore, addressing these challenges needs extensive institutional transformations that reach across the various institutional settings within this network. According to Cuevas et al. (2014, p. 22), the “institutional dimension of climate change adaptation involves an intricate web of relationships between and among institutions”. Results of this research support this idea and it proposes further that the network of interacting institutions in the case of mainstreaming may exist in what Cuevas et al. (2014, p. 2) refer to as the institutional environment—the “array of institutions that influence and affect climate change adaptation behaviours and decisions” (see Appendix A3 for more details).

The significance of the research extends beyond academic and scholarly fields. Its outputs help to improve understanding of the mainstreaming process at the local scale and the research provides practical contributions to planning and policy-making (Huq & Ayer 2008; Persson & Klein 2008; Tang et al. 2009; Measham et al. 2011; Ayers et al. 2014). First, knowing the magnitude of the impact of a mainstreaming challenge can assist planners and decision-makers to decide which challenges need to be prioritised. This is noteworthy because knowing the primary challenges that need intervention can help local governments use their limited resources efficiently and take advantage of the opportunities they have. Second, knowing the relationships among the mainstreaming challenges can help planners and decision-makers formulate strategies that can have maximum impacts on mainstreaming CCA. For example, in the Philippines, the national government can campaign and encourage local chief executives, both at the provincial and city/municipal scales, to champion CCA in their respective jurisdictions. Given the tripartite relationship among local leadership, local government prioritisation, and commitment to CCA, and knowing that this relationship is characterised by the local leadership’s positive influence on the other two challenges, the national government can explore the possibility that a climate change champion can improve the status of the challenges relating to local government prioritisation and commitment to CCA. Third, intensive analysis of institutions can help policy-makers design the appropriate institutional reforms needed in mainstreaming CCA, including the institutional mechanisms that can support the mainstreaming endeavour. This aspect is important given that institutional changes and concerns are among the important factors that determine the success or failure of an adaptation measure, especially at the local scale. Finally, analysing the state-of-play and the conditions surrounding the challenges and understanding how the challenges

can transcend from becoming barriers to opportunities for mainstreaming CCA can help planners and decision-makers determine how to overcome them (challenges). A thorough understanding of these concerns will help scholars, practitioners, planners, and decision-makers anticipate the types of challenges that can be encountered during the mainstreaming process and determine the severity of impacts of these challenges. Hence, they can develop strategies that will overcome the challenges.

### **8.7 Future research possibilities**

This thesis is founded on the notion that mainstreaming operationalisation requires an institutional perspective and it proved that understanding the institutional dimension of mainstreaming CCA is critical in the mainstreaming process. The research generated empirical data which suggested that each mainstreaming challenge exists and persists in another institutional setting with its own working or functioning institutions and institutional arrangements, and this (setting) is independent of either the land use planning or CCA settings. Hence, the research concluded that mainstreaming involves a network of interacting institutions and institutional arrangements that transcend across governance scales, and that the challenges in mainstreaming CCA encompass a chain of interactions or interplays within this network of institutions. These findings link mainstreaming of CCA with network analysis and related concepts such as network theory and complex systems.

Network approaches and analyses had been applied to a variety of concerns such as politics and governance (Kahler 2009; Kim 2013; Orsini et al. 2013); policies (Jordan & Schubert 1992; Weible 2005); environment and natural resources (McAllister et al. 2015); social-ecological systems (Lubell et al. 2014); information systems (Seror 1998), and many more. Some studies have started to apply network-based approaches in global environment and climate governance (Kahler 2009; Pattberg 2010; Green 2013; Pattberg et al. 2014), and the recent works of Pahl-Wostl (2009), Juhola and Westerhoff (2011), Funfgeld (2015), and Ingold and Balsiger (2015) showed that network analysis is being applied particularly in CCA research. This research corroborates this line of inquiry by providing empirical evidence that institutional networks exist and are critical to the analysis of mainstreaming operationalisation. Therefore, it encourages academics, scholars, and practitioners to explore network analysis, models and approaches in conducting future research on mainstreaming CCA.

Also, the research offered a methodology—to address a wicked problem such as CCA—that can be replicated under different conditions and circumstances. Thus, to expand and improve the knowledge on the challenges in mainstreaming CCA into local land-use

planning, the methodology can be used to conduct case studies in other local areas. Similarly, future studies can apply the methodology in other sectors—mainstreaming of CCA into infrastructure, agriculture, water, or education. Finally, other researches can modify the methodology in terms of the quality or composition of the survey respondents. Specifically, these studies can apply the extended peer community facet of the post-normal science domain to its full extent. That is, aside from key actors in the institutional setting being investigated (e.g., local land-use planning system), and the representatives of the national government, non-government agencies, and academic organisations who had experience in implementing projects CCA mainstreaming, the private stakeholders (i.e., businesses, households), and community representatives affected by the mainstreaming endeavour can be surveyed and interviewed. The results of other studies can validate the hypotheses advocated by this research, and likewise, provide additional insights that can develop further understanding of the institutional dimension of mainstreaming, in particular, and CCA, in general.

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## APPENDIX

**A1: Table A Mainstreaming indicator scores by scale**

Mainstreaming indicator	National	Provincial	City/Municipal
<b><i>Information capacity</i></b>			
<i>Availability of information</i>	2.06	2.08	2.14
<i>Access to information</i>	2.11	2.15	2.17
<i>Credibility and reliability of information</i>	2.88	2.63	3.00
<i>Communication of information</i>	1.75	2.00	2.57
<i>Translation of information</i>	2.56	2.67	2.43
<i>Knowledge and awareness</i>	2.29	2.70	2.69
<b><i>Institutional capacity</i></b>			
<i>Autonomy of local governments</i>	2.67	2.62	2.00
<i>Leadership</i>	2.38	2.67	2.57
<i>Commitment to climate change adaptation</i>	2.22	2.71	2.43
<i>Community support</i>	2.22	2.58	2.70
<i>Organisational cohesion</i>	1.33	2.30	2.29
<i>Organisational cooperation and collaboration arrangements</i>	2.00	2.38	2.14
<i>Local government prioritisation</i>	2.56	2.77	2.57
<i>Institutional issues</i>	1.00	1.46	1.36
<i>Institutional incentive</i>	2.61	2.81	2.86
<b><i>Resource capacity</i></b>			
<i>Availability of funds</i>	2.33	2.69	2.43
<i>Access to funds</i>	2.11	2.50	2.43
<i>Stability of funds</i>	2.61	2.62	2.71
<i>Availability of experts</i>	2.63	2.50	2.71
<i>Availability of human resources</i>	2.11	2.38	2.57

Note: Indicator levels = 1<sup>st</sup> -  $1.0 \leq n < 2$ ; 2<sup>nd</sup> -  $2 \leq n < 2.25$ ; 3<sup>rd</sup> -  $2.25 \leq n < 2.5$ ; 4th:  $n \geq 2.5$

## **A2: Survey on the challenges of mainstreaming climate change adaptation into land-use planning**

### **Background information**

(1) How long have you been involved in local land-use planning? \_\_\_\_ months \_\_\_\_ years

*Please put an X mark on the choice that best describes your answer. Unless specified in the question, a single answer is expected in each item.*

(2) In what capacity are you involved in local land-use planning? Please select all items that best describe your answer.

- I draft the local land-use plan
- I review the local land-use plan
- I provide technical/sectoral information used in the land-use plan
- I implement the land-use plan
- I am involved in mapping
- Others, please specify \_\_\_\_\_

### **Information capacity: Questions 3 to 11 pertain to information capacity for mainstreaming climate change adaptation into land-use planning.**

(3) What kinds of climate change related information, with specific focus on typhoons, are needed in mainstreaming climate change adaptation into land-use plans? Please select all items that best describe your answer.

- Projected changes in frequency of typhoons
- Projected changes in intensity of typhoons
- Projected areas in danger or at risk from flooding due to typhoons
- Projected extent of flooding caused by typhoons
- Projected level/height of storm surges caused by typhoons
- Projected impacts to marine and coastal ecosystems (e.g. coastal erosion)
- Others \_\_\_\_\_
- I do not know

Other comments:

---

(4) What is/are the main data source/s for the information identified in Question Item #3? Please select all items that best describe your answer.

- PAGASA
- www.Typhoon2000.ph
- Manila Observatory
- Local climate models
- Marine Science Institute
- National Institute of Geological Sciences
- Climate Change Data Portal by the World Bank
- Others, please specify \_\_\_\_\_

Other comments:

---

(5) Information identified in Question Item #3 are

- not available.
- available but limited or inadequate (e.g. not downscaled or localised).
- available and comprehensive.
- I do not know

Other comments:

---

(6) Information identified in Question Item #3 are available but/and

- inaccessible.
- partially accessible.
- completely accessible.
- I do not know.

Please cite reason/s for your answer:

---

(7) The available information identified in Question Item #3 and are provided by agencies in Question Item #4 are

- ignored because data and data source are not credible.
- accepted with doubts, hence, used but not fully optimised in the land-use planning process.
- accepted with confidence and are shared for effective use in relevant land-use decision-making and planning process.
- I do not know.

Other comments:

---

(8) Climate experts, i.e., people producing climate related data identified in Question Item #3, and land-use planners

- do not communicate with one another.
- have one way communication i.e., experts provide information to planners without planners' input.
- have two way communication or dialogue.
- I do not know.

Other comments:

---

(9) Please rate the type of communication between the climate experts and the land-use planners

- poor, i.e., planners are excluded from relevant dialogues regarding knowledge mobilisation/sharing
- fair, i.e., there is irregular dialogue between experts and planners resulting to the information shared to be outdated
- good, i.e., communication is inclusive and regular.
- I do not know.

Other comments:

---

(10) Available relevant climate information i.e., information identified in Question Item #3, as explained by climate experts (e.g., storm surge, climate change vulnerability, climate change sensitivity) are

- not useful to planners.
- partially useful to planners.
- completely useful to planners.
- I do not know.

Other comments:

---

(11) Please assess the knowledge (understanding of the implications of climate change) and awareness (familiarity or recognition of the existence of climate change) of the following regarding the climate risks related to land-use. Please put an X mark on the space provided for each category. Specifically, please rate whether the level of awareness is poor, fair, or good for each grouping (provincial development council, provincial land-use committee, etc.). Kindly do the same for the knowledge category.

	Awareness			Knowledge			I do not know
	Poor (not aware)	Fair (partially aware)	Good (completely aware)	Poor (not knowledgeable)	Fair (partially knowledgeable)	Good (completely knowledgeable)	
a) Provincial development council	_____	_____	_____	_____	_____	_____	_____
b) Provincial land-use committee	_____	_____	_____	_____	_____	_____	_____
c) Provincial land-use planners	_____	_____	_____	_____	_____	_____	_____
d) City/municipal development council	_____	_____	_____	_____	_____	_____	_____
e) City/municipal planning development office	_____	_____	_____	_____	_____	_____	_____
f) Community members	_____	_____	_____	_____	_____	_____	_____

**Institutional capacity: Questions 12 to 25 pertain to institutional issues related to mainstreaming climate change adaptation into local land-use planning.**

(12) Local government follows the climate change adaptation policies and frameworks provided by higher levels of government

- but cannot modify/change them to suit local conditions.
- and can modify/change them with approval from higher levels.
- and can completely change them to suit local conditions without approval from higher levels.
- I do not know.

Other comments:

---

(13) In devising local climate change adaptation policies, local governments have

- no autonomy i.e., need higher level approval.
- partial autonomy.
- complete autonomy.
- I do not know.

Other comments:

---

(14) A climate change adaptation champion i.e., staunch advocate, promoter, implementer, of climate change adaptation initiatives, in the locality

- does not exist.
- exists but has limited influence on the behavior of the local community.
- exists and has significant influence on the behavior of the local community.
- I do not know.

Who is/are the champion/s? Please provide name and contact information (e.g. agency and designation, address, or contact number)

---

(15) Local policies/regulations for local climate change adaptation

- do not exist.
- exist but are not sufficient to support the adaptation planning process (e.g. just provide framework/designate bodies).
- exist and provide an environment that supports adaptation initiatives (e.g. provide general guidance and good linkage to investment plans).
- I do not know.

Other comments:

---

(16) Please assess the following with regard to the support of community members on climate change adaptation initiatives of local governments. Please put an X mark on the space provided.

	Ignore them	Partially support them	Completely support them	I do not know
a) Provincial level	_____	_____	_____	_____
b) Municipal level	_____	_____	_____	_____
c) City level	_____	_____	_____	_____
d) Barangay level	_____	_____	_____	_____

(17) There are a number of local organisations engaged in climate change adaptation, and their activities related to land-use and land-use planning are

- uncoordinated or lacking coordination.
- coordinated but lacking consistency.
- coordinated, consistent, and coherent with one another.
- I do not know.

Other comments:

---



(18) Formal cooperation and collaboration mechanisms, i.e., Memorandum of Understanding (MOU), Memorandum of Agreement (MOA), between organisations engaged in climate change adaptation and land-use planning

- do not exist.
- exist but not always operational.
- exist and are effectively operating.
- I do not know.

Please provide examples:

---

(19) Informal cooperation and collaboration mechanisms between organisations engaged in climate change adaptation and land-use planning

- do not exist.
- exist but not always operational.
- exist and are effectively operating.
- I do not know.

Please provide examples:

---

(20) Climate change adaptation is

- not in the local government agenda because there are more important issues.
- in the local government agenda but underrepresented because there are more important issues.
- a priority local government agenda.
- I do not know.

Other comments:

---

(21) Unresolved institutional issues concerning land-use and land-use planning

- exist, affect, and have an impact on the adaptation approach.
- exist but do not affect the adaptation approach.
- do not exist.
- I do not know.

Other comments:

---

(22) The existing unresolved institutional issues (described in Question item #21) concerning land-use and land-use planning are

- not being addressed.
- partially being addressed.
- completely (all are) being addressed.
- I do not know.

Please provide examples:

---

(23) Other institutional issues i.e., political in nature

- exist and are affecting the adaptation approach.
- exist but are not affecting the adaptation approach.
- do not exist.
- I do not know.

Other comments:

---

(24) Local governments perceive the economic, social, and environmental advantages from integrating climate change adaptation into the land-use plans as

- not beneficial.
- somewhat beneficial.
- most beneficial.
- I do not know.

Other comments:

---

(25) The benefits from mainstreaming or integrating climate change adaptation into land-use plans

- do not encourage local government units to implement the approach.
- somewhat encourage local government units to implement the approach.
- definitely encourage local government units to implement the approach.
- I do not know.

Other comments:

---

**Resource capacity: Questions 26 to 30 pertain to financial and human resources related to mainstreaming climate change adaptation into local land-use planning.**

(26) Funds to support activities in mainstreaming climate change adaptation into land-use plans are

- not available.
- sometimes available, i.e., on project basis; depends on foreign or private funding.
- always available i.e., part of the national/local government budget.
- I do not know.

Other comments:

---

(27) The available funds for mainstreaming climate change adaptation into development efforts are

- not accessible.
- partially accessible (e.g. available but access to it is not well-explained).
- completely accessible.
- I do not know.

Please cite reason/s for your answer.

---

(28) Funds to support initiatives for mainstreaming climate change adaptation into land-use plans is/are

- a one-time occurrence.
- irregular (e.g. available when events related to climate change impacts take place).
- part of the local/national budget.
- I do not know.

Other comments:

---

(29) Experts on local climate change risks and impacts on land-use that can train local land-use planners to integrate climate change into local land-use plans are

- not available.
- available but lack skills to fully train land-use planners.
- available with skills to fully train local land-use planners.
- I do not know.

Other comments:

---

(30) The local staff (i.e., administrative personnel, research staff, etc.) to undertake tasks and responsibilities of current and future climate change adaptation and land-use planning activities are

- not available.
- available on an irregular basis.
- available on a regular basis.
- I do not know.

Other comments:

---

### **Additional information**

(31) Please include any other relevant information concerning mainstreaming climate change adaptation into local land-use planning that you would like to share.

---

(32) Can you recommend the name of anyone else who should participate in this survey? Please provide name and contact details (e.g. designation and agency, address or phone number).

---

(33) Please write your name, designation, and agency/office. This set of information is confidential and will only be used as reference for the data analysis.

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Agency/Office: \_\_\_\_\_

### **A3: Final interview schedule as revised in the field**

## **EXAMINING THE CHALLENGES OF MAINSTREAMING CLIMATE CHANGE ADAPTATION INTO LOCAL LAND-USE PLANNING: THE CASE OF ALBAY, PHILIPPINES**

### **Section 1: Climate change adaptation in the Philippines**

- (1) Compared to the other adaptation initiatives being implemented in the Philippines, how important is mainstreaming or integrating climate change adaptation into the comprehensive land-use planning process? Please rate it on a scale of 1 to 5, with 1 being the lowest priority or importance and 5 the highest. Please explain why it should be given a high, medium, or low priority.
- (2) Please describe the mind-set of the local government unit planners in terms of integrating or mainstreaming climate change adaptation into land-use planning. In your opinion, how do the planners perceive the importance of the mainstreaming endeavour? Please rate their perception on a scale of 1 to 5, with 1 being the lowest priority or importance and 5 the highest. Please explain why you gave this rating.

### **Section 2: Institutions in the land-use planning process**

- (3) In your experience, what institutional issues or challenges affect the mainstreaming endeavour? How do these issues affect the mainstreaming process?
- (4) Do you have any other additional thoughts regarding institutional issues that you would like to share?
- (5) Please identify the institutions i.e., government and civil society, that are important in the formulation of the comprehensive land-use plans and describe the role or responsibilities of these institutions in the planning process.
- (6) How do they affect the mainstreaming of climate change adaptation into the comprehensive land-use plans?

### **Section 3: Climate change champion**

- (7) Is there a climate change champion in Albay (at the national scale)?
- (8) How does the champion influence the mainstreaming of climate change adaptation into local land-use planning? Can you cite specific examples?

### **Section 4: Availability of human resources to undertake climate change adaptation tasks**

- (9) Please describe the conditions in the local government units in terms of the available personnel that undertake the responsibilities relating to climate change adaptation, specifically that of integrating adaptation into the comprehensive land-use plans.

### **Section 5: Summary**

- (10) How do you rate the overall progress of mainstreaming climate change adaptation into the comprehensive land-use plan? Please rate at a scale of 1 to 5 with 1 being the lowest and 5 the highest and please explain your rating.
- (11) In your opinion, what is the key factor needed to generate a comprehensive land-use plans with climate change components?

## **Section 6: Closing**

Thank you very much for participating in this interview. Before we conclude it:

- (12) Do you have any other thoughts regarding the mainstreaming approach or land-use planning processes that you would like to share that were not covered by the interview?
- (13) Can you think of any other person/organisations which would be significant to this research that I could interview?

Thank you very much. You have been a very valuable part of my research.

## **A4: An Analytical Framework for Investigating Complex Institutions in Climate Change Adaptation: The Institutional Environment Matrix**

Cuevas, S., Peterson, A., & Morrison, T. (2014). An Analytical Framework for Investigating Complex Institutions in Climate Change Adaptation: The Institutional Environment Matrix. In W. Leal Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 1-22). Berlin: Springer Berlin Heidelberg.

### **Abstract**

This Chapter introduces the Institutional Environment Matrix (IEM), a diagnostic and planning framework designed to analyze complex institutional environments and determine the institutional fit of climate adaptation responses. The framework argues that the institutional environment is comprised of rules, social structures, and organizations. It establishes the vital role of institutional arrangements in characterizing the functions and functional interdependencies of institutions. The IEM framework has a dual layer design that allows complex institutional relationships to be examined across scales. The institutional environment layer is a comprehensive inventory of institutions that outlines institutional complexities. The institutional matrix layer is the system of institutional arrangements that determines the functional interdependencies of institutions. The matrix explores institutional interplay in relation to several general institutional functions: reducing uncertainty, connecting individuals to society, fostering adaptive capacity, and mobilizing resource utilization. By providing a structure to examine complex institutional relationships, the IEM is a significant innovation for assessing the institutional fit of and interplay between existing and planned climate change adaptation responses. This framework may also be used as an analytical tool in adaptation planning and evaluation.

### **Keywords**

Institutions; Institutional environment; Climate change adaptation; Analytical framework

### **Introduction**

Urban and rural systems are increasingly subject to complex and uncertain problems such as climate change, biodiversity loss, land-use conflict, pandemic disease, and rapid market fluctuations. These problems challenge the abilities of societies to manage change in traditional ways. Subjective perceptions, cross-sectoral misunderstandings, and technological contingencies only increase this challenge (Gunderson and Holling 2002, Crowder et al. 2006). Institutions play a critical role in ensuring successful adaptation to rapid and unpredictable change, yet are one of the least examined and ambiguous aspects of climate adaptation (O'Riordan and Jordan 1999; Adger 2000a, Adger et al. 2005a, 2005b).

Following the works of North (1990) and Ostrom (1990), several facets of institutions have been examined in the literature (Young 2002, Sabatier 2007, Oberthür and Stokke 2011). Recently, of particular interest to scholars is the linkages between institutions, climate change, and adaptation with studies addressing the effects of institutional barriers and constraints on adaptation (Inderberg and Eikeland 2009), the fundamental functions of institutions in facilitating climate adaptation (Rodima-Taylor 2012), and the institutional requirements for adaptation (Adger et al. 2005). Yet, despite these works, the research area is still in its infancy, as evidenced by a number of competing frameworks.

To analyze these institutional concerns more effectively, scholars have developed a variety of frameworks to examine the role of institutions in the context of climate change adaptation. These analytical frameworks are differentiated by how they define institutions—

in essence, whether they consider institutions as rules, social patterns of behaviors, or organizations. In other words, the types of analysis that can be performed using these frameworks are bound by the frameworks' institutional perceptions.

For example, one framework that focuses on organizational institutions examines the institutional linkages between and among public, private, and civil society institutions and the significance of institutional partnerships in enabling adaptation. It provides a tool to analyze organizational partnerships and the impacts of these associations on the access of vulnerable social groups to resources (Agrawal 2008). Another framework that defines institutions in terms of rules, customs, and norms concentrates on the intrinsic characteristics of institutions in influencing the behaviors of individuals and in fostering collective action. Essentially, this framework deals with understanding and assessing the ability of institutions to raise the adaptive capacity of society (Gupta et al. 2010).

This raises two significant issues. First is the disharmony in defining institutions in the context of climate change. Research has focused on institutions as rules and social-structures (O'Riordan and Jordan 1999, Eriksen and Selboe 2012), and also as organizations (Agrawal et al. 2008, Vallejo 2011). Therefore, as climate change research advances, there is a discrepancy on how the concept of institutions is founded. Second is the inability of the frameworks to simultaneously analyze the various facets of institutions. If these gaps are not addressed, it can lead to a divergence in institutional concepts and the direction of research.

To address the first concern a conceptual framework was developed that defines institutions as a triad of rules, social structures, and organizations in the context of climate change adaptation. Thus, institutions are the commonly known and acknowledged rules, social structures, and organizations founded on common belief systems that transform individual acts and expectations into collective actions; convert personal values into social norms and shared beliefs; and define the formal and informal behavioral systems of human existence. As an extension of this endeavor, this Chapter develops an analytical framework that helps to examine the complexity of the triad institutions in climate change adaptation responses.

Institutional interventions formulated and implemented to adapt to climate change bring either conflict or harmony into existing institutions and arrangements (Young 2002, Nilsson et al. 2012). A framework that can be utilized to examine the relationships between and among rule-based, social structure-based, and organizational institutions is useful in planning for and evaluating the effects of these institutional changes. Moreover, the efficiency and success of adaptation responses rest on how they fit in the institutional environment and institutional arrangements that are in place (Theesfeld et al. 2010). Every case has a unique institutional environment or *array of institutions that influence and affect climate change adaptation behaviors and decisions*. Therefore, the institutional fit of the adaptation measures, i.e., *whether adaptive institutional interventions are synchronized or in harmony with the existing institutions*, is vital to effectively implement an adaptation response. The more fitting the adaptive institutions are with the other institutions in the system, the better each institution performs, and thus, the more relevant each one becomes.

This Chapter is divided into two major parts. The first establishes the theoretical foundations of the framework by presenting the concept of institutions as rules, social structures, and organizations in the context of climate change adaptation (Section 2); examining the concepts of institutional arrangements (Section 3); and classifying institutional functions (Section 4). The second part synthesizes these concepts (Section 5) to form a framework termed the Institutional Environment Matrix (IEM). In developing the IEM, this

paper adopts the definitions established by other authors and develops some new definitions befitting the context in which they are used (Table 1).

Table 1 Definition of key terms

Term	Definition
Rule-based institutions	Constraints that structure political, economic and social interactions, and determine decisions, actions, information, pay-offs and actors in various conditions and situations (North 1990, Ostrom 1990)
Social structure-based institutions	Self-sustaining, salient patterns of social interactions (Aoki 2007) that form individual and social expectations, relations, conduct, interactions, and behavior (Agrawal 2008)
Organizational institutions	Structures of power that form the social, economic, legal, and political organizations of a society (O’Riordan and Jordan 1999, Acemoglu and Johnson 2005)
Institutional arrangements	Structure of the rules that govern human decisions (Tang 1991) or the specific guidelines designed to facilitate social interactions (Klein 2000)
Institutional fit	State where the adaptive institutional interventions are synchronized or in harmony with the existing triad of institutions – rules, social structures, and organizations
Institutional interplay	Interactions and reactions between and among institutions that build institutional linkages, relationships, and interdependencies
Functional interdependencies	Relationships built resulting from the interactions among the arrangements that allow institutions to perform their functions
Institutional Environment (IE)	Comprehensive inventory of the differing institutions—rules, social-structures, and organizations—that may influence adaptation responses
Institutional Matrix (IM)	System of institutional arrangements that determines the functional interdependencies of institutions
Institutional Environment Matrix (IEM) Framework	A planning and diagnostic framework designed to analyze institutional environments and determine the institutional fit of climate adaptation responses

Sources: North (1990), Ostrom (1990), Tang (1991), O’Riordan and Jordan (1999), Klein (2000), Acemoglu and Johnson (2005), Aoki (2007), Agrawal (2008)

## Institutions in Climate Change Adaptation Planning

There are varying notions of what constitutes an institution. Institutions are rules, procedures, conventions, and protocols in rational choice, economics, and game theory; moral templates, cognitive scripts, and frames of meaning in sociology and anthropology; and organizations in comparative politics and state theory (North 1990, Jordan and O’Riordan 1997, O’Riordan and Jordan 1999, Markvart 2009).

In climate change adaptation, institutions should have a synthesis of definition that has cross-disciplinary relevance. Therefore, institutions are the commonly known and acknowledged rules, social structures, and organizations founded on common belief systems that transform individual acts and expectations into collective actions; convert personal values into social norms and shared beliefs; and define the formal and informal behavioral systems of human existence. Hence, rules, social structures, and organizations are all institutions.



The core relationships among the three forms of institutions are illustrated in the Venn diagram (Figure 1). Rules, social structures, and organizations are linked through a system of beliefs that allow them to exist and continue to persist as institutions. The beliefs associated with rules and organizations are significant components shaping the self-enforcing expectations, which consequently affect behavior and motivate individual actions (Greif and Kinston 2011). The belief system itself is a part of what constitutes social structure-based institutions (Nelson and Sampat 2001, Nelson and Nelson 2002).

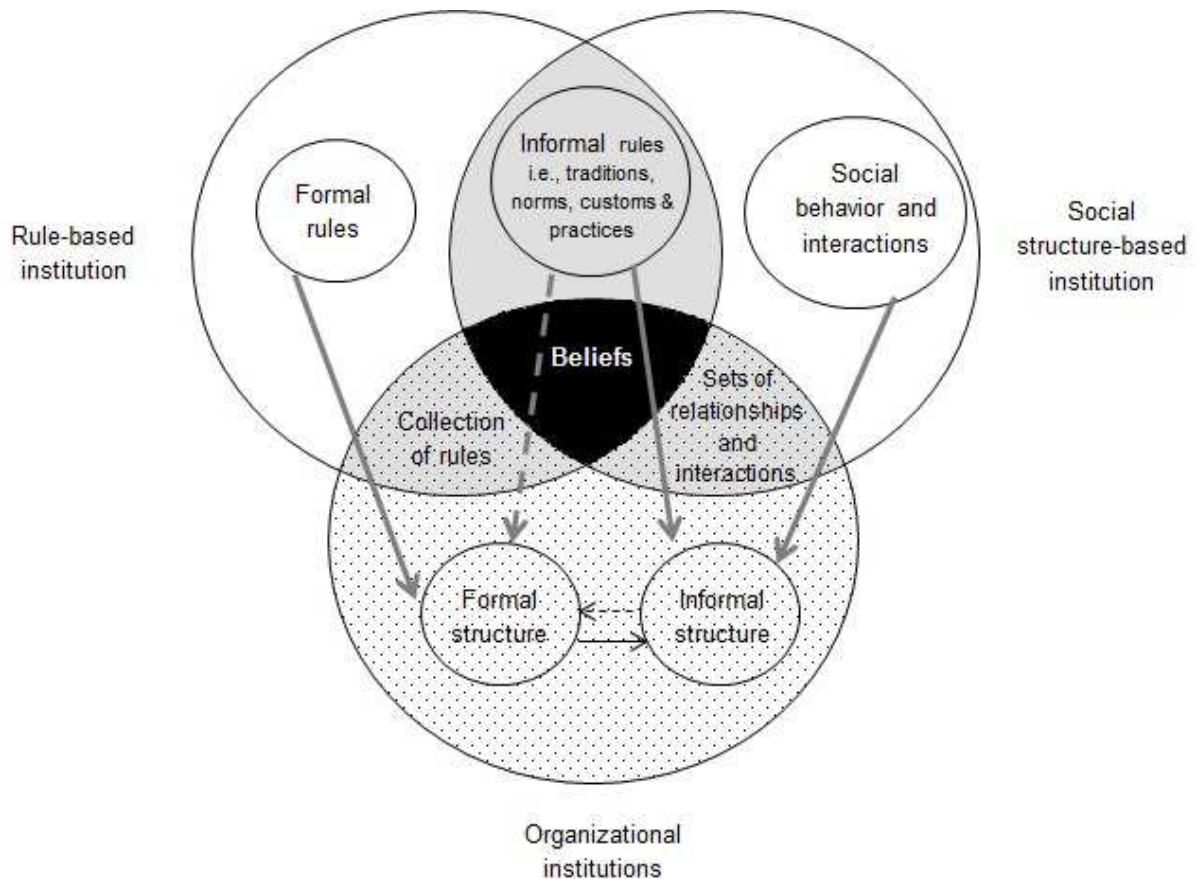


Figure 1 A conceptual framework for institutions in the context of climate change adaptation (Source: Authors)

Rule-based and social structure-based institutions are further linked through informal rules. This linkage is shown in the overlap between the spheres representing rule-based and social structure-based institutions (Figure 1). Together with formal rules, informal rules such as practices, norms, and traditions comprise part of the rule-based institutions. Formal rules define the hierarchical structure, decision-making powers, contracts and property rights allocation in the political and economic systems (Pejovich 1995). Meanwhile, informal rules determine individual interactions and are engraved in society’s culture and heritage (North 1990, Hasan 2000, Hodgson 2006). These same social patterns of behaviors are the elements that form social structure-based institutions (Nelson and Sampat 2001, Aoki 2007).

The conceptual framework considers organizations as an assembly of rules and contracts that operate through some type of relationship among individuals. This perception interlaces organizations—perceived as a “collection of rules” (March et al. 2011: 239)—with the rule-based institutions. Organizations rely on the norms and patterns of behaviors to be implemented (Hodgson 2006), which ties organizations to the social structure-based institutions.

The formal and informal structures of organizational institutions are rationalized by the formal rules and social customs, values, and beliefs, respectively (Meyer and Rowan 1977, Shafritz et al. 2005). Formal rules are the written and legally sanctioned rules, whereas informal rules are represented by the unwritten social patterns of interactions and behaviors (Nabli and Nugent 1989). Formal rules are usually applied, managed, observed, and monitored by formal political, legal, and government institutions. Conversely, informal institutions fall under the private realm (Williamson 2009).

Formal structures are particularly associated with informal rules (illustrated by the broken arrow linking the two factors) (Figure 1). Formal organizations are created and legitimized by formal rules, whereas the relationships among the members of formal organizations are typically governed by informal rules. Hence, “in every formal organization, there arise informal organizations” (Shafritz et al. 2005: 205), thereby forming an additional linkage between formal and informal organizations (indicated by the broken arrow between the two entities). This relationship denotes that informal organizations do not directly affect the structure, composition, or creation of formal organizations. However, informal organizations are defined as collective behaviors (in the form of organized groups of people) that influence the choices and decisions of the formal organizations’ members. Meanwhile, formal organizations directly affect informal organizations through the formal rules they implement or the actions they perform (solid arrow in Figure 1). In essence, “the root of informal systems are imbedded in the formal organization itself and nurtured by the very formality of its arrangements” (Shafritz et al. 2005: 205). For example, a formal organization that funds the activities of an informal organization may influence the latter to become formal itself, especially if formality is a requirement to gain further financial assistance. Alternatively, the funds provided may have allowed the informal organization to expand its operations, with the transition to a formal structure being essential to continue these new activities.

This unified definition of institutions is vital in analyzing linkages among climate adaptive institutions. Climate change impacts include extensive aspects of human existence (i.e., social, economic, political, ecological, and environmental). Hence an amalgam of ideas from various disciplines befits the concept of institution in the climate change adaptation context. This synthesized definition should be further investigated, particularly in relation to how rules, social structures, and organizational institutions function together in systems where adaptation responses are applied.

### **Institutional Analysis and Institutional Arrangements**

Institutional arrangements are critical to address the climate change challenge as adaptation “never occurs in an institutional vacuum” (Agrawal et al. 2008: 2). The success of adaptation practices rests on specific institutional arrangements, such as well-defined property rights that address resource access and risk exposure (Agrawal 2008). For example, building a seawall would not depend only on the physical construction of the structure itself, the costs associated with it, or the science that projects the rate of sea level rise. It also would be affected by the rules governing property (Caldwell and Segall 2007), including agreements on the allowable height, thickness, and length of the structure; the social norms of the communities affected by the predicted sea level rise and storm surge; and the rights of private property owners. Therefore, developing suitable adaptation responses entails institutional arrangements that enable these measures to be implemented (Rodima-Taylor et al. 2012).

## Arrangements in rule-based and social structure-based institutions

Institutional analysis assumes that institutional change will affect some areas of reality that already are exposed to existing institutions. Therefore, the environment where the institutional changes (e.g., the creation of new policies or amendments in prevailing regulations) are to be implemented must be understood first before the possible consequences of such changes can be determined (Theesfeld et al. 2010). More importantly, intensive institutional analysis involves understanding the detailed working rules<sup>4</sup> and norms that influence people's decisions (Ostrom 2011).

In **rule-based** and **social structure-based** institutions, these rules exist at three levels, namely, operational rules, collective-choice rules, and constitutional-choice rules (Ostrom 1990). Among the three, constitutional-choice rules are the most extensive. They are the basis of all rules—the set which determines who and what (specific rules) are authorized to create the other levels of rules. Next in the hierarchy are the collective-choice rules—the rules created to resolve conflicts, impose decisions, and formulate or transform operational rules (Ostrom 1990). Essentially, they are the rules which underpin operational rules (Tang 1991). Lastly, operational rules are those that directly influence the daily decisions about who oversees the actions of others and how or who takes part in which situation, what information must be given, what are the participants allowed to do, and what rewards or penalties will be designated to various sets of acts and consequences. Operational rules are typically known as policies (Ostrom 1990).

Ostrom's (1990) classic text, "Governing the Commons", identified specific processes at each level of rules. Operational rules cover appropriation, provision, monitoring, and enforcement; the collective-choice level encompasses policy-making, management, and mediation of policy decisions; and the constitutional level includes formulation, governance, adjudication, and modification of constitutional decisions. Through these rules, institutions are able to affect and influence individual and collective actions. For instance, operational rules, such as those that specify fishing technologies permitted at a particular fishing ground, constrain and predict operational actions. Similarly, collective-choice rules are translated into collective-choice actions, and constitutional rules into constitutional-choice actions (Schlager and Ostrom 1992). These levels of rules form the categories of institutions (Feder and Feeny 1991). The constitutional-choice rules comprise the constitutional order, whereas the *collective-choice rules and operational rules constitute institutional arrangements* (Figure 2) (Feder and Feeny 1991, Tang 1991).

Institutional arrangements are the structure of rules governing human decisions (Tang 1991) or the specific guidelines which facilitate social interactions (Klein 2000). Institutional arrangements are also sets of rules or agreements with a common objective (e.g., contract) that preside over the activities of people. For instance, a group of farmers may enter into an agreement to jointly purchase agricultural inputs or supply products to buyers, thus forming a producer's organization (Eaton et al. 2008). Institutional arrangements likewise identify an individual in relation to others within the group that s/he belongs to, as well as with those outside the group. For example, in property regimes, the property relation between individuals is defined by the interest of one that is protected by virtue of the right and the duty of others to follow the arrangement (Bromley and Cernea 1989). Institutional arrangements, therefore, guide individual behaviors towards collective actions.

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<sup>4</sup> Working rules are the set of rules that rationalize and justify the decisions and actions of people.

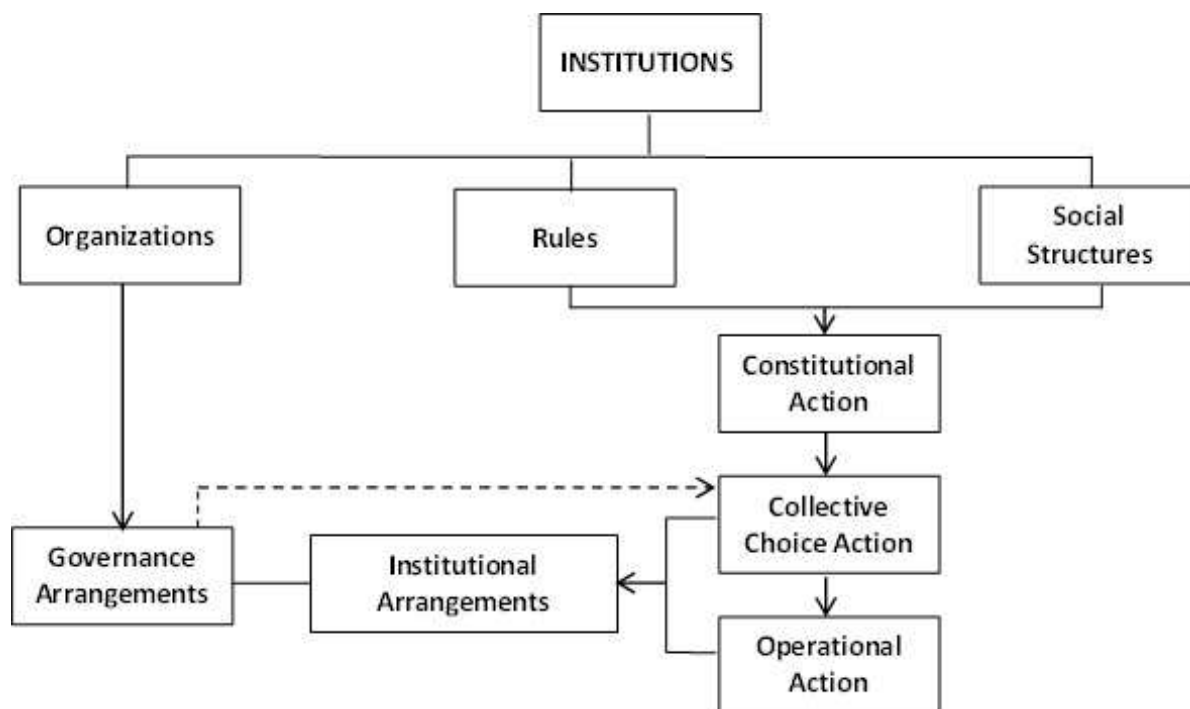


Figure 2 Institutions and institutional arrangements (Source: Authors)

### Arrangements in organizational institutions

In terms of **institutional organizations**, institutional arrangements involve the system of (organizational) units that plan, support, and/or implement programs, practices, and actions. These arrangements include the linkages between and among organizations at different administrative scales (national, regional, state, provincial and local) or sectors (economic, political, legal, social). They also represent relationships between government and non-government units such as households, communities, and civic organizations (Mattingly 2002). As institutions, organizations are governing structures that motivate collective behaviors and actions (Nelson and Sampat 2001, Williamson 2009), while institutional arrangements are the **governance arrangements** (Klein 2000, Kooiman 2008). Institutional arrangements oversee the relationships and interactions between, among, and within groups of individuals, and thus, influence the variability of commitments of institutions to governance (Klein 2000, Andersson and Ostrom 2008). These ideas are significant because they link organizational arrangements to the rule-based and social structure-based arrangements<sup>5</sup> (Fig. 2). To illustrate, policy goals depend on the set of dominant actors and ideas in the area, and when these policy debates and decision-making occur. Governance arrangements then determine the aims and the general implementation preferences of policies, regulations, and state-society interactions (Howlett 2009).

Institutional arrangements allow multiple types of linkages between and among institutions (Heikkila et al. 2011). As guidelines, they are the means by which institutional interplay (i.e., in the form of functional interdependencies or consequences of institutional design and management) is implemented (Young 2002). Accordingly, institutional interplay refers to the interactions among institutions that build institutional relationships (Young 2002). Institutional interaction is determined by the impact of one institution on another,

<sup>5</sup> This relationship is represented by the broken arrow in Fig. 2, linking governance arrangements with the collective-choice actions.

thereby exhibiting causation (Gehring and Oberthur 2009, Oberthur and Stokke 2011). Thus, the effect or interaction will not be observed without a stimulus and a receiver. The stimulus is the source institution (independent variable) and the receiver is the target institution or system (dependent variable) (Gehring and Oberthur 2009). For example, an introduced institutional adaptive measure (the independent variable) will interact with the existing institutions in the system (the dependent variable). Institutional interplay, however, is not one-directional. Interplay involves functional interdependencies (Young 2002, Linner 2006), and thus include mutual influences or effects. Although the interaction may be triggered by a stimulus, the outcomes or institutional linkages are the result of the institutional integration. Therefore, the interplay exists in the institutional environment comprised of the adaptive institution and the other existing institutions.

Institutional interactions may be complementary, neutral or co-existing, counterproductive, conflicting, or overlapping (Gunningham and Grabosky 1998, Young 2002, Nilsson et al. 2012). In relation to the triad institutional concept introduced in this chapter, institutional linkages encompass relationships within, between, and among laws, policies, regulations, traditions, norms, practices, government units, civic organizations, and community groups, among others. Institutional linkages must be understood to determine how institutions influence adaptation practices and responses (Agrawal 2008). Consequently, institutional functions in the context of this institutional definition should be determined to understand the institutional fit of adaptation responses.

### **Institutional Functions**

Institutions are crucial in promoting successful adaptation to climate change. They influence key decisions in the system, shape the direction of adaptation efforts, frame the adaptive capacities of systems, and enable collective action toward attaining the adaptation goals (Naess et al. 2005, Agrawal et al. 2008, Eriksen and Selboe 2012). Institutions accomplish these tasks through their innate characteristics and the functions they perform.

Institutions, as rules, social structures, and organizations serve the same functions, thus they are interdependent. These institutional functions can be classified into four main types, namely, reducing uncertainty (by forming individual and social expectations), connecting individuals to society, fostering adaptive capacity, and mobilizing resource utilization. These functions are performed by all institutional types, thereby, strengthening the interconnections among these institutions (Figure 3).

The different characteristics of rules, social structures, and organizations limit their respective capabilities to perform some of these functions. For example, organizations (as a collection of rules and bundles of relationships and interactions) can establish systems of power and authority, and identify the people included and excluded from the organization. However, the entirety of organizations, including their characteristic as “actors” (Gupta et al. 2010), constrains the organizations’ ability to create rights and entitlements, but promotes their capacity to deliver external resources into the system (Table 1).

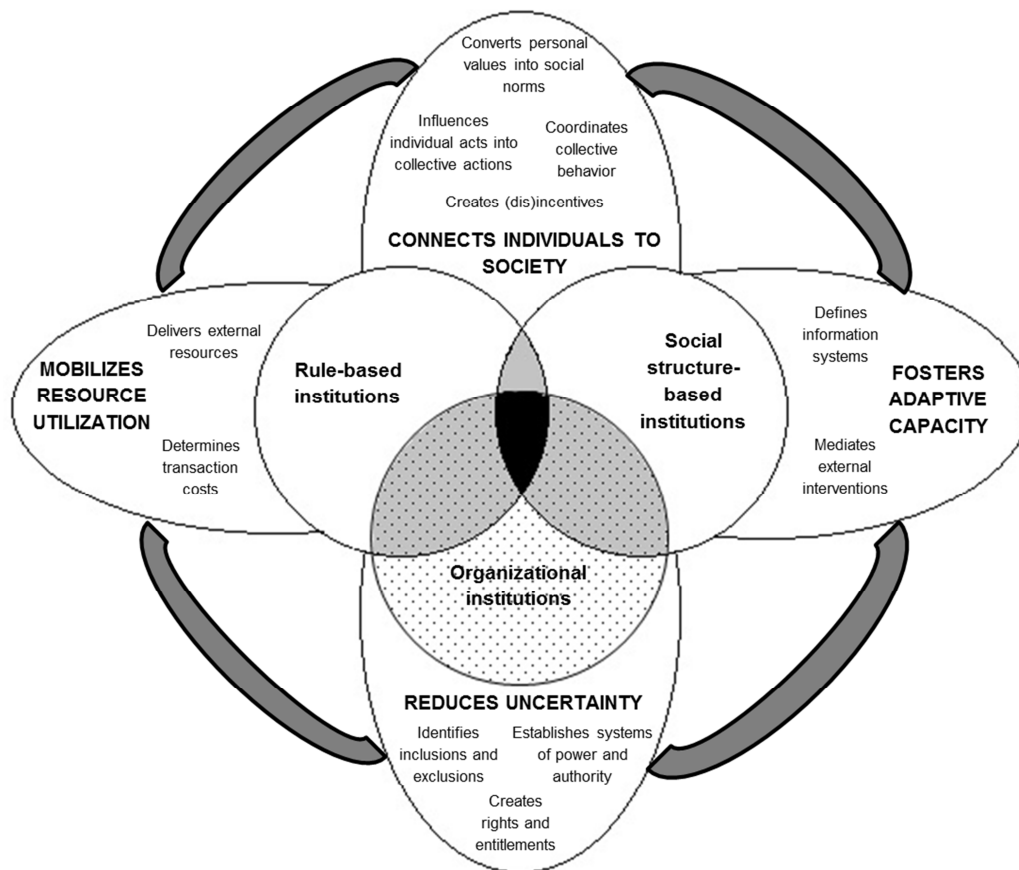


Figure 3 Functions of institutions (Source: Authors)

### Reduce uncertainty

Institutions **reduce uncertainty** by forming individual and collective expectations and by developing a constant structure of social interactions (North 1990, Ostrom 1990, Kirsten et al. 2009, Brousseau et al. 2011). They also provide stability and predictability by *establishing the power and authority systems* (O’Riordan and Jordan 1999, Acemoglu and Johnson 2005, Berman et al., 2012), and *creating rights and entitlements* (Ostrom 1990). Institutions also *identify inclusions and exclusions* by determining which actions are permissible and the conditions by which to undertake certain activities (North 1990, Ostrom 1990, and Klein 2000). By outlining constraints, institutions set up the boundaries for each individual and society as a whole (Ostrom, 1990). For example, as an institution, property rights form expectations that the claims to the property would be respected and be abided by all, thereby reducing the uncertainty associated to these claims (Bromley and Cernea 1989).

Table 1 Institutional functions by type of institution

Functions of an Institution	Types of Institutions					Features/ Descriptions
	Rules		Social Structures	Organizations		
	Formal	Informal		Formal	Informal	
<b>Reduces uncertainty</b>						
Establishes systems of power and authority	✓	✓	✓	✓	✓	Actors and actions involved in decision-making; who has the authority and what kind of authority
Identifies inclusions and exclusions	✓	✓	✓	✓	✓	Scope and jurisdiction of actors (who) and actions (what) allowed and constrained
Creates rights and entitlements	✓	✓	✓	✗	✗	Claims, privileges, etc., to resources, i.e., access rights, management rights
<b>Connects individuals to society</b>						
Converts personal values into social norms and shared beliefs	✓	✓	✓	✓	✓	Social principles, beliefs, and philosophies
Influences and transforms individual acts and expectations into collective actions	✓	✓	✓	✓	✓	Plans and programs for collective efforts and actions
Creates (dis)incentives for individual and collective actions	✓	✓	✓	✓	✓	Rewards and penalties; pay-offs on actions
Coordinates individual or collective behaviors	✓	✓	✓	✓	✓	Management of multiple efforts
<b>Foster adaptive capacity</b>						
Defines information systems	✓	✓	✓	✓	✓	Provision of information (who, what, when, where, and for whom)
Mediates external interventions	✓	✓	✓	✓	✓	Access to and management of outside resources (how, what, when, where)
<b>Mobilizes resource utilization</b>						
Means of delivery of external resources	✗	✗	✗	✓	✓	Actors facilitating access to outside resources (who and for whom)
Determines transaction costs of activities and decisions	✓	✓	✓	✓	✓	Integration of multiple efforts; internal costs (financial or otherwise)

Sources: North (1990, 1994), Ostrom (1990), O’Riordan and Jordan (1999), Jentoft (2004), Acemoglu and Johnson (2005), Pfahl (2005), Agrawal (2008), Adkisson (2009), Dorward and Omamo (2009), Kirsten et al. (2009), Gupta et al. (2010), Greif and Kingston (2011), and Berman et al. (2012)

## **Connects individuals to society**

Institutions **connect individuals to society** by giving everyone a shared identity (Jentoft 2004). They *convert personal values into social norms and shared beliefs* as individuals get emotionally attached and identify with the institutions. This function is specifically attributed to social structures, informal rules, and informal organizations. Thus, institutions become the social standard for understanding and reacting to circumstances, which accordingly become the source of people's compliance and submission to institutions. As such, institutions *influence and transform individual acts and expectations into collective actions* (Kirsten et al. 2009).

Institutions also *create the incentive structure* that determines the actions of people as individuals and as a society (Agrawal 2008). Incentive structures incorporate behavioral patterns that encourage actors to change norms and practices, implement the changes, uphold the changes, and stand by the decisions to change (Biermann 2007, Gupta et al. 2010). Thus, incentive mechanisms enable individuals to choose how to respond efficiently to goals and objectives such as those of climate change adaptation (Young 2002). Conversely, institutions also influence behaviors by providing disincentives or penalties to various actions and consequences (Ostrom 1990). Thus, choosing to conform to institutional arrangements becomes attractive.

Institutions are also the *means by which people coordinate their beliefs, interactions, and activities*, thereby affecting how individuals and society make decisions (Pfahl 2005, Adkisson 2009, Greif and Kingston 2011). For instance, the local governing body in the Carteret Island in Papua New Guinea (i.e., the Council of Elders) organized the voluntary relocation of community households to the main island of Bougainville (Rakova 2009). Labeled as one of the first climate change refugees, the Carteret people were forced to leave their homes due to the accelerated sea level rise and the worsening extreme coastal events in the area (Boano et al. 2008). The Council formed a non-government organization, named Tulele Peisa, which designed and administered the Carterets Integrated Relocation Programme (CIRP) (Rakova 2009, Boege 2011). In this case, the organizational institutions such as the Council of Elders and the Tulele Peisa were vital in planning and mobilizing the relocation efforts. The community's norms and traditions authorized the organizations (specifically the Council of Elders) to make decisions for the whole community. Meanwhile, the CIRP guided the people on how to follow through with the community resettlement. Thus, the social and cultural norms, organizations, and formal policies all affect how an individual, a household, and/or a community responds to climatic and other stressors (Young 2002).

## **Fosters adaptive capacity**

Institutions are critical in **building the adaptive capacities of systems** (Berman et al. 2012, Pradhan et al. 2012). They *affect information systems* (Dorward and Omamo 2009) and strengthen the ability of vulnerable communities to prepare for the impacts of climate change. They influence the flow of information, the types of studies undertaken, and the interpretations made from the research results (March and Olsen 1996). Moreover, they influence the kind of information to be disseminated (Ostrom 1990) and how this knowledge is disseminated (Agrawal 2008).

Institutions are *mediators of external interventions* that affect how individuals, communities, and social groups utilize assets and resources (Agrawal 2008). Institutions provide leadership, facilitate negotiations, and create networks with other institutions such



that external interventions can be systematically filtered, effectively absorbed, accepted, or refused (Agrawal 2008, Rodima-Taylor 2012). For example, a culture of solid community ties suggests an accommodating attitude for external interventions promoting community-based management; but the reverse can be expected if individualism is the norm.

### **Mobilizes resource utilization**

In mediating external interventions, organizational institutions are the *means by which the external resources that facilitate adaptation are delivered*, and they accordingly administer access to such resources. These resources may be information, technical inputs, and/or financial support. Institutions “mediate the extent to which climate change affects communities” (Pradhan et al. 2012: 9); therefore, they are crucial to the successful implementation of externally facilitated adaptation strategies (Agrawal 2008).

Institutions matter because they *determine the cost of transacting* activities (North 1994) and are comprised of “transaction-cost-reducing arrangements” (Kirsten et al. 2009: 43). Transaction costs pertain to the costs incurred from the activities that lessen the risk of transaction failure such as planning, negotiating, creating, monitoring, and enforcement of an agreement. These also include the costs of maladaptation, bargaining and other operations related to governance, and securing the commitment of actors to the contracts (Kirsten et al. 2009). Institutions will fail to reduce transaction costs if the institutional context where the transactions take place are in disarray (Theesfeld et al. 2010).

Similarly, a weak institutional environment, specifically in terms of legal frameworks, makes it difficult to enforce contracts and agreements that exchange goods and services, and to coordinate activities (Eaton et al. 2008). The norms and practices existing in the system also affect the cost of transactions. For example, if bribery is the custom, then people may bribe corrupt law enforcers to accomplish their goals. Costs would include resources (e.g., money, time, and people) in bribing transactions plus the regular expenses incurred in undertaking such tasks. If the rule of law is upheld, then bribing will be useless and the associated costs will not exist. Likewise, if cheating is the norm, then there will be additional costs to prevent other parties from cheating. The effectiveness and efficiency of actions and activities depend on the institutional environment and arrangements in place.

Interdependencies and linkages among institutions occur through these functions. These associations are the product of the interactions between and among institutional arrangements (Young 2002). In this sense, functional interdependencies can be defined *as the relationships between institutions resulting from the interactions among arrangements that allow institutions to perform their functions*. These linkages are explored in the IEM framework that analyzes the institutional environment in adaptation responses.

### **Institutional Environment Matrix Framework**

The proposed framework incorporates two layers, the **institutional environment (IE) and institutional matrix (IM)** (Figure 4). The institutional environment focuses on a specific type of system, a particular adaptation goal or a type of adaptation strategy. It is a *comprehensive inventory of the differing institutions—rules, social-structures, and organizations—that may influence adaptation responses*. This layer assumes that examining the institutional environment in assessing and planning for climate change adaptation responses is a significant feat. For instance, the coastal management and governance arrangements in East of England showed that there exist:

three central government departments, four regional bodies, five statutory agencies, four ad-hoc groupings, seventeen local authorities, and four forums with an interest in coastal planning, but not necessarily working together.... five sets of overlapping plans, fourteen designations of coastal sites and landscapes, a mix of management bodies, many organizational cultures, un-coordinated organizational activity at different scales, and overlapping jurisdictions, responsibilities and functions (Nicolson-Cole and O’Riordan 2009: 373)

Analyzing or planning for adaptation responses incorporates an exhaustive assessment of the institutional environment in which these responses have been or will be applied. This is important in institutional analysis because the number of institutions in a given system is directly related to the rate and complexity of the institutional linkages (Young 2002).

The institutional matrix (IM) can analyze the interactions among the arrangements. It is defined as the *system of institutional arrangements—including operational and collective-choice rules and governance arrangements—that determines the functional interdependencies of institutions*. This layer examines the various relationships among the institutions, and assumes that institutions affect an adaptation response via the institutional arrangements that enable institutions to perform their functions.

The IE and the IM stages are closely linked, such that the IM is dependent on the information provided by the IE. This relationship, however, is one directional. Significant IE analyses can be done even without proceeding to the IM level, but the reverse is not possible.

Various institutional interactions, like complementary, neutral, and counterproductive relationships, are realized from the IM layer. Complementary interaction indicates beneficial associations such that institutions perform better because of the creation or existence of the other (Gunningham and Grabosky 1998). Conversely, counterproductive interactions result when institutional arrangements either destabilize or weaken one another, thus impeding the ability of institutions to perform their functions effectively. Neutral interaction suggests that institutions just simultaneously exist in the institutional environment without interacting with each other. The institutions neither improve nor worsen each other.

Contradicting relationships arise when institutions are mismatched, thereby creating situations in which institutional arrangements are not attuned with each other. This institutional linkage forms tensions and conflicts among institutions and the corresponding elements that function within these institutions (Nicholson-Cole and O’Riordan 2009). Overlapping associations involve disputes in jurisdictions (Davis 2006), especially when institutions have similar mandates (Aggarwal 2005). Institutional overlaps are common and more significant in a high frequency institutional environment where there is a high density of institutional arrangements operating in a single system (Young 2002). Lastly, redundancy signifies complete duplication of all institutional functions (Fig. 3).

All the relationships, except redundancy, may exist in a single or multiple types of institutional functions. Policy 1 may be counterproductive with Policy 2 in establishing systems of power and authority, but may be complementary in creating incentives for individual and collective actions. Likewise, there might not be any connection (neutral) between the two on defining information systems on climate change and adaptation. These linkages can be thoroughly examined using the institutional matrix analysis, which is further explained in the succeeding sections.

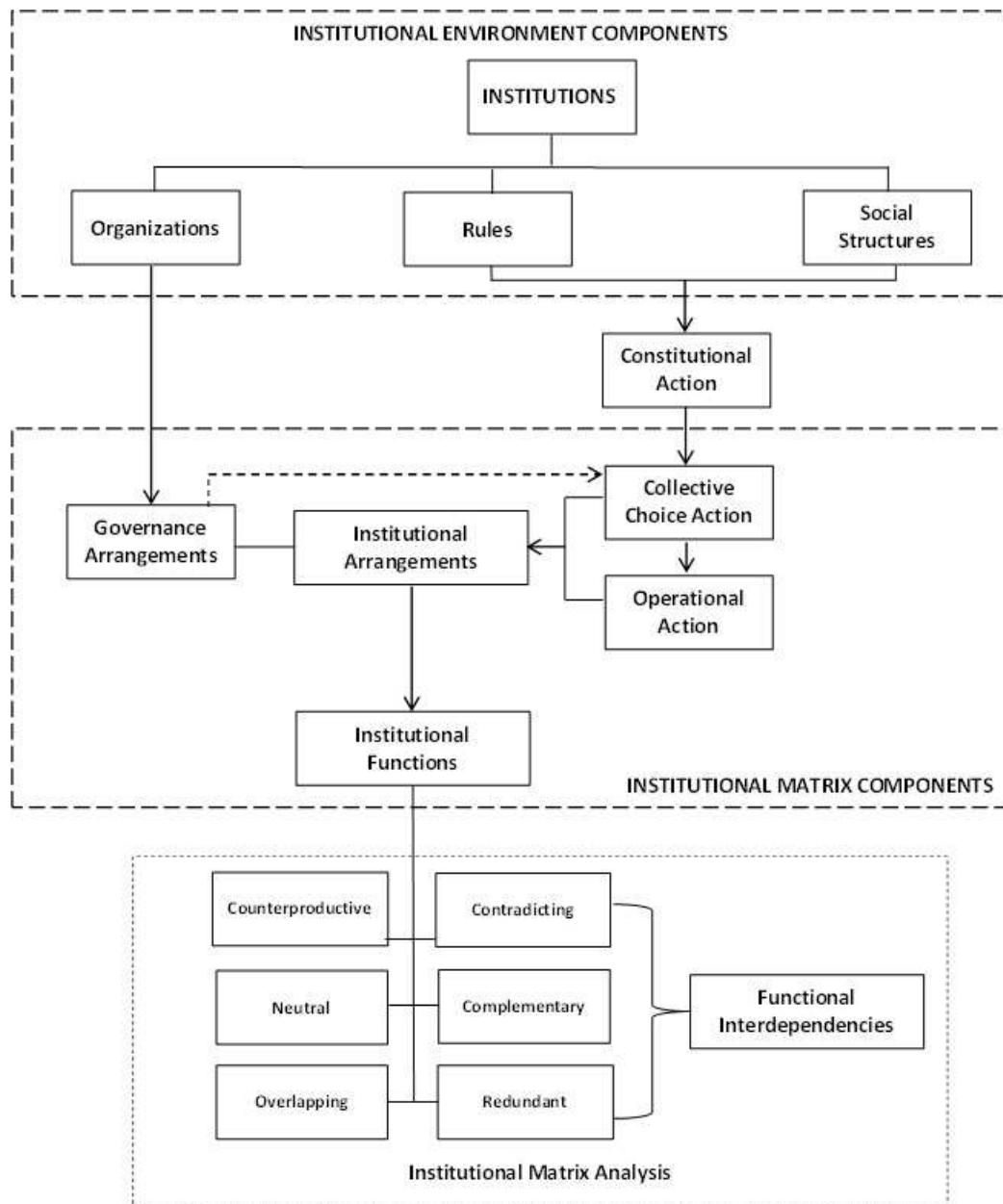


Figure 4 Institutional Environment Matrix (IEM) Framework (Source: Authors)

### Institutional environment

The IE layer (Table 2) is comprised of formal rules (FR), social structures (SS), formal organization (FO), and informal organization (IO). Formal rules represent the written laws, policies, and regulations, whereas social structures are the traditions, norms, and practices affecting social collective behaviors. This framework incorporates informal rules in the social structure-based institutions, following the notion that they are linked. Formal organizations are the groups legitimized by the formal rules, whereas the informal organizations are those sanctioned by informal rules. The institutions comprising the IE may have been created to address a variety of issues, some of which may not be related to climate change. These rules, social structures, and organizations have particular arrangements that can affect climate change adaptation decisions, hence their inclusion in the IE. Take the case

of Carteret climate change refugees<sup>6</sup>. The adaptation response—community relocation—involves property institutions and property rights arrangements, both of which have been existing and working in the systems long before climate change concerns emerged.

Table 2 Institutional environment framework lay-out

Institutional Systems: Complex System/ Adaptation Response	Institutional Environment			
	Formal Rules (FR)	Social Structures (SS)	Formal Organizations (FO)	Informal Organizations (IO)
	FR1	SS1	FO1	IO1
	FR2	SS2	FO2	IO2
	FR3	SS3	FO3	
	FR4			

In this hypothetical case (Table 2), the institutional framework identifies four formal rules (FR1, FR2, FR3, FR4); three social structures (SS1, SS2, SS3); three formal organizations (FO1, FO2, FO3); and two informal organizations (IO1 IO2) that affect the adaptation response. All types of institutions are included in this layer regardless of scale. For example, FR1 may be a national program; FR2, a regional regulation; and FR3 and FR4, local policies. This is possible because the IE layer assumes that the institutions existing in various scales may simultaneously affect (or be affected) by the same adaptation response(s) through their arrangements. These institutional arrangements cut across differing scales, and they structure the relationships and functional interdependencies of institutions. The arrangements associated with each institution are critical in determining the extent of the institution’s influence in the decision-making process (Figure 5).

For instance, the Environmental Protection Act 1994 (EP Act)—an act primarily concerned with environmental pollution in the state of Queensland, Australia—can influence local authorities’ responsibilities and decisions. Though a state law, the EP Act specifies the responsibilities of local governments in notifying administering authorities of violations at the local level (EP Act, Part 8 [2]).

Thus, the IE layer is composed of all institutions that may affect climate change adaptation, regardless of the scale at which the institution primarily operates. In contrast, the institutional matrix layer is limited to a single scale analysis—only those institutional arrangements that cover the scale (federal/national, state/regional/territory, provincial/local) being analyzed will be examined. In the previous hypothetical case (Table 1), while FR1 is a national program and FR2 is a regional regulation, only those arrangements affecting the local scale will be included in the matrix if the scale of analysis is local. These notions are further elaborated below.

<sup>6</sup> People were forced to leave their homes and resettle elsewhere because of climate change related events.

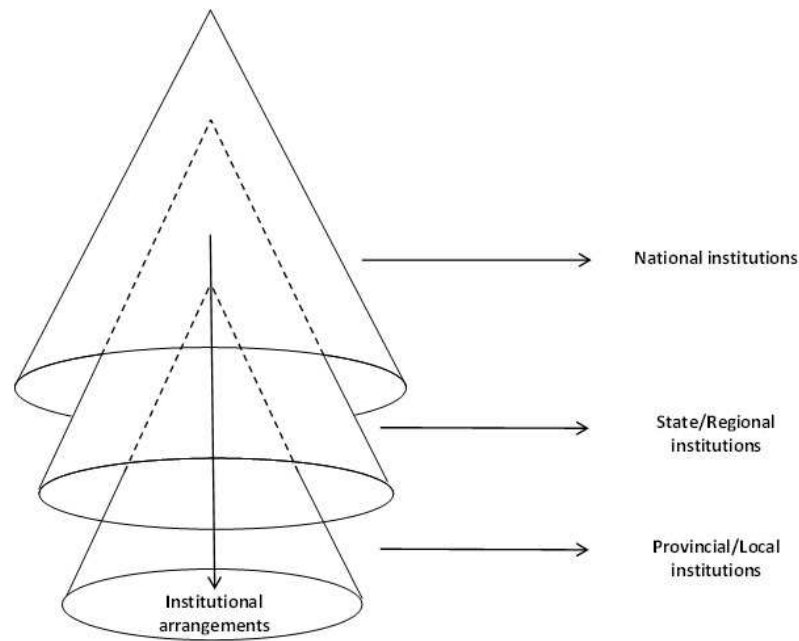


Figure 5 Multi-layered institutional linkages (Source: Authors)

### **Institutional Matrix (IM)**

From the IE, the analysis progresses to the individual institutional arrangements in the institutional matrix (IM). The IM is dependent on the set of information provided by the IE stage, and those institutions identified in the environment are incorporated in the matrix (Table 3). In this hypothetical case, the IM analysis focuses on the local scale.

The functions are the source of interdependencies among institutions, which are vital elements of the IM layer. Institutional interplay is observed by analyzing the institutional arrangements that shape these functions. With this, the institutional functions compose the row headings, and they are the categories by which the institutional arrangements are organized in the IM cells.

### **Framework analyses: vertical and horizontal**

The framework offers two types of analyses—vertical and horizontal. Vertical analysis (Table 4) shows the influence of individual institutions on the adaptation response by examining each institution’s function. As the hypothetical case has a local scale, only local arrangements will be included in the matrix. The vertical analysis of the formal rules indicates that the national program (FR1) incorporates local arrangements that establish systems of power and authority, identifies inclusions and exclusions, influence and transforms individual acts and expectations into collective actions, coordinates individual or collective behaviors, and defines information systems. The regional regulation (FR2) performs the same tasks in addition to determining transaction costs of activities and decisions. The IM vertical analysis also outlines the dominant institution in the institutional environment. In the example, the local policy FR3 is the most influential among all four formal rules (Table 4).

Table 3 Institutional Matrix (IM): An institutional framework for adaptation analysis

FUNCTIONS OF AN INSTITUTION	TYPES OF INSTITUTIONS											
	Formal Rules (FR)				Social Structures (SS)			Formal Organizations (FO)			Informal Organizations (IO)	
	FR1	FR2	FR3	FR4	SS1	SS2	SS3	FO1	FO2	FO3	IO1	IO2
Reduces uncertainty												
Establishes systems of power and authority												
Identifies inclusions and exclusions												
Creates rights and entitlements												
Connects individuals to society												
Converts personal values into social norms and shared beliefs												
Influence and transforms individual acts and expectations into collective actions												
Creates (dis)incentives for individual and collective actions												
Coordinates individual or collective behaviors												
Fosters adaptive capacity												
Defines information systems												
Mediates influence of external interventions												
Mobilizes resource utilization												
Means of delivery of external resources												
Determines transaction costs of activities and decisions												

Notes: The function “creates rights and entitlements” does not apply to organizations, while the function “means of delivery of external resources” does not relate to formal rules and social structures. The cells are shaded accordingly.

Table 4 Vertical analysis for formal rules

FUNCTIONS OF AN INSTITUTION	TYPE OF INSTITUTION			
	Formal Rules			
	FR1	FR2	FR3	FR4
<b>Reduces uncertainty</b>				
Establishes systems of power and authority	✓	✓	✓	✓
Identifies inclusions and exclusions	✓	✓	✓	
Creates rights and entitlements			✓	
<b>Connects individuals to society</b>				
Converts personal values into social norms and shared beliefs				
Influence and transforms individual acts and expectations into collective actions	✓	✓	✓	✓
Creates (dis)incentives for individual and collective actions			✓	✓
Coordinates individual or collective behaviors	✓	✓	✓	✓
<b>Fosters adaptive capacity</b>				
Defines information systems	✓	✓	✓	✓
Mediates external interventions			✓	
<b>Mobilizes resource utilization</b>				
Means of delivery of external resources				
Determines transaction costs of activities and decisions		✓	✓	

An empty cell signifies that the institution does not perform the associated function at the specific scale in question. However, this does not imply that the institution does not implement the function at all. For example, FR1 may not create rights and entitlements at the local scale, but may have such arrangements in either the national or regional scales. This aspect is the major difference between the IE and IM layers. Although cross-scale investigation is possible in the IE, this cannot be done in the IM. Overall, the vertical analysis shows the extent of the institution’s influence on the adaptation response. It also compares its functions across institutions in a specific scale.

The horizontal analysis is more complicated as it studies the functional interdependencies of institutions and assesses the relationships across various institutions based on their functions. In the hypothetical case (Table 5) the institutional linkages of all 12 institutions are illustrated in relation to the function “establishes systems of power and authority”. The cells in red are negative relationships, specifically counterproductive and contradicting. Conversely, the green cells are positive associations, particularly the complementary type. Neutral and overlapping relationships are white and yellow, respectively. With regard to structuring power and authority systems, some of the possible interpretations of the matrix are as follows:

1. Formal rules generally have negative relationships with informal organizations.
2. Informal organizations are in harmony with the social structures.
3. Formal organizations typically have overlapping jurisdictions with one another.
4. Informal organizations typically have overlapping jurisdictions with one another.
5. Formal rules are generally counterproductive or contradictory to social structures.
6. The national program, FR1, has relationships only with social structures and other formal rules. It does not affect organizations, whether formal or informal.
7. The national program, FR1, contradicts with the regional regulation, FR2.

8. The national program, FR1, complements the local policy, FR3. As the national program and the regional regulation have a negative relationship, it is consistent that FR2 and FR3 are also contradicting each other. Thus, the regional regulation has a negative linkage with all other formal rules.
9. Local policies FR3 and FR4 overlap.
10. Both local policies are not attuned with the existing local norms, SS2, but are neutral to the local practices, SS1 and SS3.

Other assessments can be gleaned from this example. This type of analysis can be duplicated to the other functional classifications, thereby creating the overall assessment of the linkages between and among institutions. The matrix, thus, enables a planner or analyst to structurally examine complex institutional relationships, thus, possibly effectively evaluate and plan adaptation responses to climate change.



Table 5 Horizontal analysis for structure power and authority systems function

Establishes Systems of Power and Authority		Formal Rules				Social Structures			Formal Organizations			Informal Organizations	
		FR1	FR2	FR3	FR4	SS1	SS2	SS3	FO1	FO2	FO3	IO1	IO2
Formal Rules	FR1		Contradicting	Complementary	Neutral	Complementary	Counter-productive	Counter-productive	Neutral	Neutral	Neutral	Neutral	Neutral
	FR2	Contradicting		Counter-productive	Contradicting	Complementary	Contradicting	Neutral	Complementary	Contradicting	Complementary	Counter-productive	Counter-productive
	FR3	Complementary	Counter-productive		Overlapping	Neutral	Counter-productive	Neutral	Complementary	Complementary	Complementary	Counter-productive	Contradicting
	FR4	Neutral	Contradicting	Overlapping		Neutral	Contradicting	Neutral	Contradicting	Contradicting	Neutral	Contradicting	Contradicting
Social Structures	SS1	Complementary	Complementary	Neutral	Neutral		Complementary	Complementary	Complementary	Neutral	Contradicting	Complementary	Complementary
	SS2	Counter-productive	Contradicting	Counter-productive	Contradicting	Complementary		Complementary	Contradicting	Contradicting	Contradicting	Complementary	Complementary
	SS3	Counter-productive	Neutral	Neutral	Neutral	Complementary	Complementary		Neutral	Neutral	Neutral	Complementary	Complementary
Formal Organizations	FO1	Neutral	Complementary	Complementary	Contradicting	Complementary	Contradicting	Neutral		Overlapping	Overlapping	Counter-productive	Complementary
	FO2	Neutral	Contradicting	Complementary	Contradicting	Neutral	Contradicting	Neutral	Overlapping		Overlapping	Complementary	Neutral
	FO3	Neutral	Complementary	Complementary	Neutral	Contradicting	Contradicting	Neutral	Overlapping	Overlapping		Counter-productive	Counter-productive
Informal Organizations	IO1	Neutral	Counter-productive	Counter-productive	Contradicting	Complementary	Complementary	Complementary	Counter-productive	Complementary	Counter-productive		Overlapping
	IO2	Neutral	Counter-productive	Contradicting	Contradicting	Complementary	Complementary	Complementary	Complementary	Neutral	Counter-productive	Overlapping	

## **Conclusion**

Institutions in climate change encompass rules, social structures, and organizations. The institutional dimension of climate change adaptation involves an intricate web of relationships between and among these institutions. In analyzing the complexity of institutions, a number of factors need to be considered such as institutional functions and interplay, as well as issues of scale (national, state, regional and local) and jurisdiction. Thus, a purpose built framework that can perform these kinds of analysis, such as the Institutional Environment Matrix (IEM) framework, is needed.

The IEM adopts a dual-layered approach in examining the various institutions that directly or indirectly influence adaptation decisions and responses in a particular system. Institutions are intrinsically complex, hence a single layer analysis cannot cover the intricacies involved in an institutional analysis. Furthermore, this design allows institutions to be examined across scales and provides an easy transition toward a single scale analysis.

The dual layer design of the IEM allows the institutional environment and arrangements to be extensively studied. The IE layer includes all kinds of institutions in the environment regardless of scale, identifies the dominant institutions in the system affecting adaptation responses, and outlines the complexity of institutions in the institutional environment. Meanwhile, the IM layer enables a scale-focused analysis by dealing with particular institutional arrangements. The matrix allows for complex analysis of institutional linkages and interactions through the vertical and horizontal analytical approaches. By using these techniques, the functional interdependencies of institutions can be identified and institutional interplay can be explored.

The institutional dimension of climate change adaptation is motivated by the need to design or re-design arrangements to address the risks and impacts of climate change (Young 2002). Accordingly, the IEM framework helps identify whether the existing institutions hinder effective adaptation, especially when there are negative relationships among the institutional arrangements. This condition may warrant modifying or replacing the arrangements such that institutions will fit more effectively in the institutional environment. When new institutions need to be introduced into the system, the IEM framework may be useful in developing arrangements that will be compatible with the existing ones. This will help avoid mismatches among institutions, and thus minimize conflicts.

This Chapter has outlined a theoretical tool that can be used in adaptation planning and evaluation. However, the real value of the framework lies in its applicability in empirical cases. The need for further research in this area is vital.