Understanding the role of politics of scale and power relations in local governance of climate change adaptation: Case study from coastal Odisha, India

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DECLARATION OF ORIGINAL AUTHORSHIP

I confirm this is my own work and use of all materials from other sources has been properly and fully acknowledged.

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ABSTRACT

The governance of adaptation represents a complex policy challenge where it has to address the global and national level risks of climate change while being rooted in the local context of vulnerability and adaptation decision-making. In India, climate change adaptation is a complex socio-political process that includes different actors, their interests and the narrative outcomes of the interaction of those actors and their interests. Thus, multi-level adaptation governance has emerged as a policy instrument to address this complexity of climate change vulnerability and adaptation strategies. This thesis explores the conceptualisation of adaptation as a socio-political process within the emerging multi-governance adaptation planning context in vulnerable coastal regions of India. This research seeks to understand the social and political factors that shapes policy and adaptation strategies at the local level. This aim is achieved through three main objectives – to examine existing policy structures and process, to examine local level socio-cultural structures and political practices and to characterise the actor interactions at policy-practice interface which shapes politic outcomes of adaptation strategies at the local level. This thesis draws from the structure-agency framework, actor-oriented approach and theoretical underpinnings of politics of scale to capture the local level realties of structure–agency interaction patterns. This study involved comparison of two coastal communities in Kendrapara district within the state of Odisha by using different methodological tools ranging from objective questionnaires to in-depth case studies.

The finding suggests that multi-governance adaptation planning requires better horizontal and vertical institutional coordination, consideration of socio-cultural practices, and awareness of local political dynamics to be robust and support local level adaptation strategies. In addition, policy structures need to step up on aligning policy agendas on adaptation, development and disaster risk reduction, create resources that strengthen local institutions and develop frameworks that requires monitoring, evaluation and reiteration of policy goals. Further, as demonstrated by impact of agency of actors on shaping adaptation trajectories, multi-level governance needs to support local innovation and create platforms for socio-political mobility to address the inherent vulnerability at local level.

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List of Abbreviations

APL	Above Poverty Line
BDO	Block Development Officer
BPL	Below Poverty Line
CBO	Community Based Organisations
CCA	Climate change Adaptation
CCAP	Climate Change Action Plan
DFID	Department of International Development
DRDA	District Rural Development Agency
DRM	Disaster Risk Management
FGD	Focus Group Discussion
GoI	Government of India
GoO	Government of Odisha
HH	Household
HYV	High Yielding Variety
ICZM	Integrated Coastal Zone Management
ILGI	Informal Local Governance Institutions
IPCC	Intergovernmental Panel on Climate Change
ICZMP	Integrated Coastal Zone Management Project
KI	Key Informant
MoEF & CC	Ministry of Environment, Forest and Climate Change
NGO	Non-governmental Organisation
NDMA	National Disaster Management Agency
OLM	Odisha Livelihood Mission
OSDMA	Odisha Disaster Management Authority
OWTFWU	Odisha Traditional Fish Workers Union
PDS	Public Distribution System
SDGs	Sustainable Development Goals
SDMP	State Disaster Management Plan
SHG	Self Help Groups
SC	Scheduled Caste
ST	Scheduled Tribe
UNDP	United Nations Development Programme

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1. Introduction

1.1 Background

Climate change is one of the most pressing development and policy challenges of the 21st century. This is particularly the case for developing countries facing other development challenges, such as poverty, healthcare, infrastructure, inequality, financial uncertainties and natural disasters. Climate change is an additional complexity for the policy process (World Bank, 2010). For natural resource dependent communities, such as agricultural and coastal communities in developing countries, climate change may undermine development progress. In these communities, the impacts of climate change in addition to above mentioned challenges, will make the realization of development objectives more difficult (IPCC AR5, 2014). Moreover, increasing recognition of the uncertainty related to impacts of climate change on socio-economic development progress has lead both the development and climate change community to increasingly look for an integrated and flexible approach that could respond to complex challenges of climate change and socio-economic growth being faced by vulnerable communities in developing countries.

Adaptation as a response to climate change is well-established as emphasised in the Intergovernmental Panel on Climate Change (IPCC) third assessment report (2001) and in terms of policy has become a significant option for reduction of vulnerability to climate change (IPCC AR4, 2007). Both nationally and internationally, organizations and governments have shown growing commitment for inclusion of adaptation strategies as part of their regional climate change policy. The Kyoto protocol (Article 10) further commits parties to promote and facilitate adaptation by encouraging technological innovations to address climate change (UNFCCC, 1998). However, the concept of adaptation as promoted within climate change discourse is complex and has been approached from many perspectives. Most recent research has focussed on issues such as identifying barriers to adaptation processes (Adger et al., 2009; Nicholson-Cole and O'Riordan, 2009; Moser and Ekstrom, 2010; Marshall et al. 2012), developing impact based adaptation portfolios to the recent focus on decision-making in adaptation process (Hasnoot et al., 2013; Munaretto et al., 2014; Wise et al., 2014) and mainstreaming of adaptation into development policies (Metz and Kok, 2008; Le Blanc, 2009; Klein et al., 2010; Ayers et al., 2014). The dominant perspective in all these approaches has been the agency of actors in responding to climate change risks and the reduction of household and community vulnerability to these climate change impacts (Nelson, 2007). However, the

increasing recognition of the uncertainty associated with climate change has steered the focus of adaptation research towards decision - making approaches that are robust in light of the uncertain climatic changes and dynamic contexts in which it is happening. Nelson (2007), exploring such approaches highlighted the significance of an integrated framework to understand decision-making process of adaptation based on resilience thinking that incorporates the elements of multiple stresses, uncertainty, actor's agency and systems internal dynamics, irrespective of the scale. This approach of incorporating both system perspective and actor perspective finds resonance in the emerging *pathways approach* to adaptation decision-making (Leach et al., 2010). The pathways approach is an attempt to steer away from the closing down of the decision-making process into a narrow set of alternative options when faced with uncertain risks and challenges (Leach et al., 2010). It should also provide opportunities for 'opening up' of the policy process to more participatory and flexible decision-making process that considers the influence of diverse knowledge, values and ideas and the issues of social justice and equity in adaptation (Stirling, 2006; Hasnoot et al, 2013; Blackburn, 2014; Butler et al, 2014).

In current climate change literature, adaptation conceptualization has moved from a dominant structural/techno-centric focus to an increased recognition of adaptation as a socio-political process (Eriksen et al, 2015). This adoption of a social lens for understanding has increased attention on the local scale to better understand the contextual nature of adaptation. This emerging social focus in adaptation research has thus contributed significantly to the understanding of adaptation process at the local, national and global levels. However, the earlier social framing and investigation of adaptation did not give much attention to the political aspect of adaptation (Adger et al., 2009; Adger 2006). This apoliticisation of adaptation leads to a misunderstanding of the process that shapes the decision-making around adaptation and vulnerability reduction strategies across scale. The political nature of the adaptation as any governance process is integral to what its outcomes will be at the end. Thus, this emerging understanding of adaptation as a relational and contested process rather than a linear technological process entails new and better methodological tools, approaches and conceptual frameworks to understand the process. Addressing the nested, multiscale and hierarchical nature of adaptation decision-making is complicated but necessary to navigate the uncertain future that most fragile regions faces against climate change and multiple stressors that it interacts with.

This research is focussed on addressing the social and political dimensions of adaptation by examining the governance approach to adaptation. By using a structure-agency framework, this research intends to understand adaptation as primarily a political and institutional process (Hinkel et al., 2010; Munaretto et al., 2014). This research uses the theory of structure-agency framework to develop a conceptual framework that could account for policy and institutional structures across scale and assist in understanding role of actor interactions and agency in modifying and reproducing these structures. In addition to the structure-agency framework, this research draws from theory of politics of scale, actor-oriented approach and policy process framework to understand multi-level adaptation governance process in the Indian context. This would enable understanding of power and knowledge interactions within which these policies are operationalised. This study draws from different disciplines – political ecology, organizational studies, policy studies to develop this approach to understand and examine complexities of adaptation governance and to identify possible pathways that are robust in light of such uncertainty and complexities.

1.2 Rationale of the study and research gaps

There is an increasing realization of political aspects of adaptation in recent climate change discourses (Adger et al., 2006; Eriksen and Lind, 2009). However, in the policy arena, adaptation tend to be treated as a linear process which is realized by identifying potential risks, financial investments, technical solutions and political will (Eriksen, 2010). Such a perspective fails to take into account broader societal process and institutional dynamics that are inherent to all policy-framing or decision-making processes (O'Brien et al., 2006). In addition, Dessai and Hulme (2004) outlines a multitude of other factors, including the financial situation, social and cultural context, self-interests and group interest, power dynamics and public awareness that are crucial to policy making. They argue that in order to integrate adaptation into existing policies or developing new policies, it is important to gain an understanding of the social and political process as that are inherent to policy framing. Thus, there is now a pressing need to conceptualize climate change, and the many terminologies associated with it, like adaptation, through the interactions of knowledge, power and scale.

The current landscape of climate change literature is rich with empirical research identifying the linkages between adaptation and development (Metz and Kok, 2008; Adger et al., 2009, Huq and Reid, 2009; Le Blanc, 2009; Persson et al., 2009). These studies

recognize the need of 'mainstreaming' of climate change options as an approach for realization of development and climate change impact reduction goals. Many studies have also proposed mainstreaming approaches (Halsnaes and Traerup, 2009) but their focus on representing these linkages through indicators in order to make them quantifiable fails to capture the role of social and political processes that marks these linkages. In developing countries, particularly, where power and authority can get concentrated in the hands of a few, the process of decision-making and implementation is far from the conceptualized linear models of policy making.

As a case example this study is conducted in one of the climate change vulnerable developing country - India. India's economic growth is primarily fuelled by its natural resources, with agriculture and allied sectors (fisheries, logging, livestock) contributing 13.7 % to national GDP and employing 51% of the workforce in 2012-13 (Central Statistics Office, 2012-13). Taking into consideration the large proportion of the population that depends on natural resources to derive their livelihoods and the uncertainty over these livelihoods because of climate change, it is important to develop policies that can ensure sustainable development for these communities. Specifically, policy approaches should address the needs of vulnerable communities impacted by the changing environmental conditions and socio-economic realities. As discussed above, several decision-making approaches exist within climate change adaptation literature (Tompkins et al. 2008; Butler et al, 2014; Wise et al, 2014) to address the adaptation needs through robust policies for such communities. However, operationalization of such approaches has not progressed much beyond few studies (Australian Coastal Adaptation Decision Pathways Programme, 2011; World Fish Centre, 2012). As a result, the present governance literature lacks empirical evidences to inform novel approaches for practical applications under diverse contexts.

This study seeks to contribute to the theoretical conceptualisation of adaptation as a decision-making process in both policy and practice. By going beyond single scale approach that adaptation governance studies focus on, it will explore the underlying social and political structures and broader process that are inherent to within and across scale adaptation interventions. The study, in order to deconstruct the complexities that surrounds adaptation in practice, positions itself at the much-needed intersection of power, scale and knowledge interactions. The study explores the role of power and politics in adaptation

governance and contributes to a novel approach focussed on mapping the influence asserted by different actors at the interaction interfaces.

This thesis focuses on understanding adaptation governance through two lenses – discourse framing to explore the policy process of adaptation at the national and regional scale and contextual vulnerability framing to explore the practices at the local scale. Thus, the thesis offers a novel approach and new insights into the adaptation governance process by combing the two lenses and exploring adaptation from its policy framing to adaptation as practice at local level through the case study. The two lenses incorporated in an actor-oriented approach provides a better understanding of the structural factors and the actor responses that constrains and facilitates adaptation across the scales.

1.3 Research aim, objectives and questions

To address the gaps identified in the section above, the research seeks to answer the central thesis question – what and how socio-political factors shape adaptation interventions and practices at local level? This aim is achieved by attempting to fulfil three objectives through this study.

Objective 1: To characterise and examine the national and subnational level institutional structures and policy processes to identify the prevailing climate change discourses and its implications

Objective 2: To examine local level perceptions of climatic and non-climatic stressors and socio-cultural structures and practices that shape differential social vulnerability of the community within its broader development context

Objective 3: To characterise the interactions at the policy-practice interface of adaptation at local level and identify factors shaping these interactions and the outcomes

This thesis uses a hypothesis that governance of adaptation and its outcomes of power distribution, justice and fairness rely on the interaction of structural elements of policy and society, and the actors asserting their agency within these structural conditions. This thesis attempts to examine this statement to explore if this is the empirical reality or not. In order to do that, the thesis approaches the framing of adaptation by deconstructing the components and dynamics that define governance of adaptation. It conceptualises the governance process of adaptation by drawing from existing theoretical frameworks of good governance, a structure-agency nexus, politics of scale and an actor-oriented

approach to deconstruct the ‘reality’ of adaptation as it unfolds and is pursued in the case study sites.

1.4 Thesis overview

Chapter one, the introductory chapter, provides details on the research problem and gaps, the objectives and conceptual framing of the problem that this research has taken to carry out this study.

Chapter two presents the theoretical and empirical advances within the climate change adaptation literature. It draws from the debate about conceptualisation of adaptation in policy and practice, and from its emergence as a concept in climate change literature to its current linkages with the emerging scholarship around climate change resilience and transformation. It also presents the conceptual framework that was adopted and used to carry out the empirical research for this study.

Chapter three moves the focus to the geographical context of the study and discuss the Indian case and the Odisha state. It provides a detailed account of the two local study locations - their characteristics, demography and geography. The chapter defines the system and outlines the structure and dynamics within the system to ground the empirical findings of the study.

Chapter four presents the methodology of the study. It outlines research design, methods and tools that were employed. This chapter also discusses the positionality of the researcher with respect to the study and ethical considerations that were taken into account during the study.

Chapters five, six and seven focuses on the results and analysis of the case study to address the three research objectives, which are interlinked, but together addresses the central research aim - process and practices of governance of adaptation to climate change. The three results chapters present empirical findings, against the main research questions posed by the three research objectives – how adaptation decisions are framed at the policy levels, how the ’reality’ of contextual vulnerability is experienced at the local level and how does these interactions manifest as adaptation outcomes when policies are put into practice at the local level.

Chapter five focuses on the analysis of who, what and how adaptation is framed as a concept and approach to the risk of climate change within policies. This is carried out by

employing content analysis of policy and planning documents of the national and regional level governments and by drawing qualitative data from key informant interviews. The national and regional Climate Change Action Plans (CCAPs) and relevant policy documents from disaster risk management, agriculture sector and fisheries sector were analysed to understand the emerging integration of adaptation across other sectors as an objective and outcome. The chapter explores the actors and narratives that are dominant in the policy making arena with regards to the case study and how different interests, knowledge and power interactions lead to the dominant discourses as identified during this study.

Chapter six draws on the primary data collected during fieldwork, in the form of a questionnaire-based survey, household interviews and focus group discussions, to examine the local level perception of risk from climate change. This chapter will also explore the implications of contextual factors on the perceived risk and on the existing/innate vulnerability of this rural landscape. The evidences from the case study will show how access to resource and utilization are shaped by local social-political context.

Chapter seven examines adaptation in practice at the local level. Qualitative and quantitative data obtained from the household and key information interviews, focus group discussions and household survey are analysed in this chapter to explore how national policies in India and state policies of Odisha (examined in chapter four) interact with the contextual vulnerability (analysed in chapter five) and the role of these interactions in shaping the different adaptation responses by the households and community. This chapter explores how local norms and value, and discourses and boundaries set by the higher level, create structural conditions at the local level and how these conditions shape adaptation responses at the local level. Furthermore, the chapter will explore how despite the structural constraints within the system, local actors fix and reproduce the structures and how they navigate the constraints to pursue adaptation strategies that are deemed beneficial by them.

Chapter eight, is the conclusion chapter and brings together the empirical findings from the results and analysis chapter (five, six and seven) of the thesis and discusses them in a broader context. This chapter will contextualize the findings of this research case study within the broader adaptation literature. This chapter will explore the dynamics between the structure and agency, reflecting on the case study analysis, and how this perspective

could offer a new approach to conceptualise adaptation, and put adaptation thinking into practice more effectively. It links together the understanding around policy process, local practices and patterns, and implications of interaction between adaptation in policy and practice from the case study to answer the central research question – how power and politics across the scales of governance shapes adaptation as a process and its outcomes. The chapter then reflects on the theoretical contribution to adaptation research and how the approach and findings from the study could contribute towards an increased understanding of adaptation both in policy and practice. It ends with a short reflection on potential future research scope.

2. Literature Review

2.1 Introduction

This chapter explores the current debates linking adaptation and governance, introduced in the previous chapter, and contextualizes them with the emerging literature of hazard-risk and development. It seeks to critically analyse the relevant literature around conceptualisation and characterisation of climate change adaptation, and where it is positioned currently as both a frame and approach, to understand and reduce risks of climate change. Specifically, this chapter focuses on the debates around the governance approach to climate change adaptation and a review of the theoretical and empirical literature newly emerging from the political ecology domain of climate change and its related domains of social vulnerability and politics of structure and agency.

Furthermore, this chapter presents the different theoretical lenses that this study utilizes to frame, design and analyse the research. The theoretical frameworks drawn from the literature of risk governance, institutional organization and power and political theories are reviewed to identify how they support understanding of the governance of adaptation and highlight the shortcomings that may needed to be navigated while using them. The chapter concludes with the presentation of a conceptual framework, based on the reviewed literature, that forms the theoretical and operational foundation of this study.

2.2 Understanding adaptation: key concepts

Since its reintroduction into social sciences and climate change research after Rio Summit (1992), adaptation has evolved as a theoretical and operational approach. Although, it has become established as an important concept in climate change research, conceptualisation of adaptation varies significantly among the growing theoretical and empirical studies on climate change so far. This section reviews the different conceptualisation and characterisation of adaptation and aims to map the current position of adaptation as a concept in the emergent and growing literature of climate change and adaptation.

2.2.1 Conceptualisation of adaptation

The term adaptation has its roots in natural sciences where it is used in the context of evolution studies. In human systems context, it was first used by anthropologist Julian Steward (1972) to understand cultural adaptation. The author defined cultural adaptation as adjustments by cultural cores “regional societies” to natural environment by subsistence activities”. In climate change context, numerous definitions of adaptation have been

proposed, though bound by a common theme. A summary of different perspectives on adaptation distilled from the existing literature is presented in Table 2.1**Error! Reference source not found.**Table 2.1 : Definitions of Adaptation

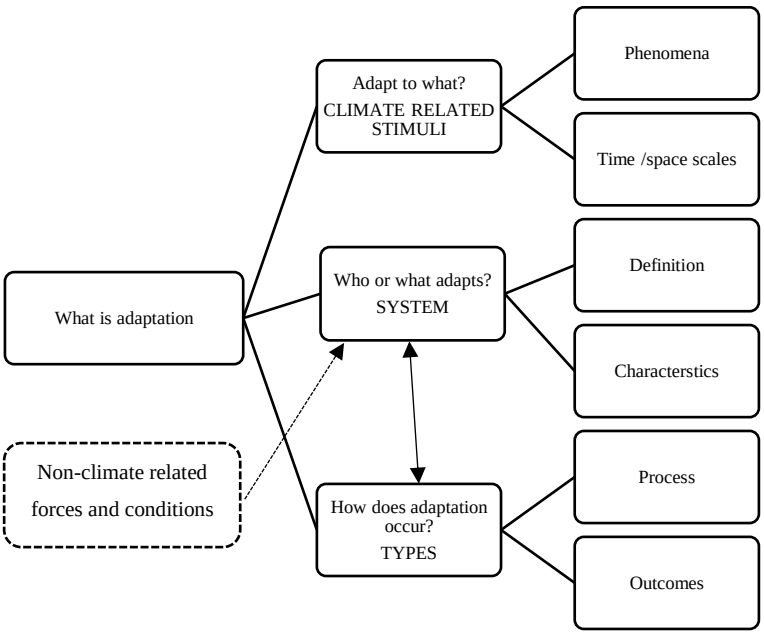
Source (Authors)	**Definition of adaptation proposed by different authors**
Burton (1992)	"The process through which people reduce the adverse effects of climate on their health and well-being and take advantage of the opportunities that their climatic environment provides."
Smit (1993:53)	"Adjustments to enhance the viability of social and economic activities and reduce their vulnerability to climate, including its current variability and extreme events as well as longer term climate change."
Stakhiv (1993)	"Any adjustment, whether passive, reactive or anticipatory, that is proposed as a means for ameliorating the anticipated adverse consequences associated with climate change."
Pielke (1998: 159),	"Adjustments in individual, group and institutional behaviour in order to reduce society's vulnerabilities to climate."
Smit et al. (2000: 225)	"Adjustments in ecological-socio-economic systems in response to climate stimuli, their effects and impacts."
Brooks (2003: 8)	"Adjustments in a system's behaviour and characteristics that enhance its ability to cope with external stresses."
IPCC (2007:6)	"The adjustments made by natural or human systems in response to actual or expected climate stimuli and/or their effects which moderates the harm or creates beneficial opportunities."
IPCC (2014:1758)	"The process of adjustment to actual or expected climate and its effects." Adaptation is further of two types – 1. Incremental adaptation – "Adaptation action where the central aim is to maintain the essence and integrity of a system or process at a given scale", and 2. Transformational Adaptation – "Adaptation that changes fundamental attributes of a system in response to climate and its effects."

The common thread that runs through all these perspectives on adaptation is an understanding that adaptation is always driven by an external stress and translates to *adjustments* by the system in response to it. However, as reflected in the definitions, these adjustments in a system would vary according to the scope, application and interpretation of adaptation.

Further, Smit et al. (1999) in their seminal work on adaptation, outlined the major element that needs to be considered to understand and analyse adaptation - adapting to what,

who/what adapts and how does adaptation take place (Figure 2.1). The 'adaptation to what' can be used to refer to climate change, climate variability or only climate. It could include responses to impacts and vulnerabilities or opportunities. It also characterizes the response as past, current or anticipated conditions or opportunities. In case of 'who or what adapts', it could be natural systems, social systems, socio-ecological systems or socio-economic activities or structures or processes of the systems that adapts. Besides the nature of the system or activities, adaptation also differ on the basis of properties of the systems, such as vulnerability, viability, sensitivity, resilience and flexibility (Smit et al, 2000). The third question on 'how adaptation happens' answers the forms and types of adaptation. It includes both process of adaptation and the outcomes or conditions of adaptation. The third question is of importance as it underpins different ways adaptation is characterised and is being carried out in practice. The characterisation, though diverse, has been extensively addressed in the literature through various typologies which are reviewed in the following section.

Figure 2.1: Model of adaptation to climate change



Source: Adapted from Smit et al., 1999

2.2.2 Characterisation of adaptation

Adaptation strategies can be characterised on the basis of its many forms and processes (Table 2.2). The most distinguishing characteristics among them are stressors, intent, scale,

spatial scope and forms (Burton et al, 1993, Carter et al, 1994; Smithers and Smit, 1997; 1994; Smit et al., 2000). Stressors are changes that the adaptation strategies are intended to address. They could be either single stressor which is focussed only on climate change or multi-stressor which involve adaptation strategies aimed at addressing the impacts of climate change as well as the impacts of interaction of climate change with socio-economic conditions.

Table 2.2: A typology of adaptation

Basis of differentiation	**Types**
Stressors	Single
	Multi
Scale	Individual
	Regional
	Global
Timing of action	Anticipatory or proactive
	Concurrent
	Reactive or responsive
Forms	Information
	Technological
	Financial
	Institutional
	Behavioural
Spatial Scope or Institutional extent	Localized
	Widespread
Temporal Scope	Short-term
	Long term
Intent/Response strategy	Autonomous (Spontaneous, automatic, natural, passive, strategic)
	Planned (Purposeful, intentional, policy, active)
Function/effects	Retreat, accommodate, protect, prevent, tolerate, change, spread, restore

Source: Adapted from Smit et al., 2000

Intent is used to distinguish between adaptations strategies that are autonomous or spontaneous, taken as part of the regular management process or planned (strategic or active) that are a product of deliberate decision-making, specifically, in response to climate change (Carter et al, 1994; Smit et al, 2000). In biophysical systems, specifically

unmanaged, the adaptations are usually autonomous. On the other hand, in socio-economic systems, it is usually a case of conscious and planned adaptation by public sector, which can be grouped based on intent, timing or actors involved (individual or government). In case of individuals or private sectors, it could be autonomous adaptations, which depends on spontaneity (in-built, routine or tactical) or planned or could be a combination of both. Smit and Skinner (2002) explains the case of a farmer, who over the years, shifts to different crops to get better results, for example productivity, in response to the changing local weather conditions. Although in this case the adaptation seems a spontaneous (autonomous) behavioural response, it is also a consciously taken decision or a planned action.

On the basis of timing of the adaptation, the responses are usually grouped as anticipatory (proactive), concurrent or reactive (responsive). It is theoretically useful but practically it is difficult to categorise the response strategies. An adaptation could be both anticipatory and reactive, as in the case of a farmer facing drought since past few years, who expecting the drought to persist in future would possibly make changes in production strategies and financial planning. The timing of the action is not helpful in identifying it as one kind of response strategy; it is both a proactive and reactive strategy. Responses are also classified, according to duration of the adaptation, into short-term (tactical) or long-term (strategic). Tactical adaptation usually includes short-term adjustments made in response to extreme climatic condition. For example, farmers selling assets like livestock, purchasing or taking loans in the face of a drought for the concerned season. While long-term adaptation in such a case could be structural change in operation or management of the farm for subsequent seasons or a longer period which might include change in land-use, cropping pattern and decisions on insurance (Smit and Skinner, 2002).

Adaptation can be also classified, based on its spatial scope, as either localized or widespread in scale. But in practice, adaptation exist in a spatial continuum and can be operating simultaneously at different scales or linking them. For example, in agriculture adaptation occur at different spatial scales, plot, field, farm, region and nation (Smithers and Smit, 1997). Adaptation can also be distinguished on the basis of the actors involved in development and implementation at these different scales (Smit et al, 2000; Smit and Skinner, 2002). As can be seen in case of crop development in response to climate change, various actors are responsible for facilitating adaptation at different scales, government in encouraging breeding research, different corporations in producing and marketing

improved seeds and producers in selecting and growing the new improved varieties. However, most adaptation decision-making process fails to distinguish the role of the stakeholders. Tompkins et al. (2008) emphasized the importance of stakeholder engagement in decision-making process, where a stakeholder analysis of the coastal management process in the context of climate change adaptation revealed contrasting viewpoints of all the stakeholders. It was noted that decision-making involving stakeholders are to a certain degree subjective. Thus, the authors propose a scenario-based stakeholder analysis which could reveal a range of preference of the shareholders which is more effective than aggregating individual stakeholders' preferences. Also, highlighted was the importance of all stakeholders being aware of the trade-offs as it requires a certain degree of support from the stakeholders to be successful, especially in case of long-term issues, like climate changes.

Adaptations are also distinguished based on forms, which includes structural, legal, technological, behavioural, financial, institutional or informational (Burton et al, 1993, Carter et al, 1994; Smithers and Smit, 1997; Smit et al, 2000). The use of form as a basis for differentiating responses to climate change provides a very useful framework to understand adaptation, especially in agricultural sector (Smit and Skinner, 2002). The authors analyses agriculture in Canada and identifies different forms of adaptation at both farm and government level, including technological management, government programs and insurance, farm production practices and farm financial management. A report by GIZ and Indian Ministry of Environment and Forests (MOE&F), (2011) on adaptation to climate change for rural India, categorises adaptation options into two forms, structural and non-structural, which need to be included in the portfolio of adaptation options for coastal India. They propose structural interventions or technological solutions, like building dykes, mangrove plantation and beach restoration, for example, the 10 ha mangrove restoration projects involving building of artificial canal systems in Tamil Nadu and the 4000 hectare of mangrove planation programme (2001-2007) in coast of Gujarat. The non-structural interventions included land-use management, risk insurance and other information dissemination schemes as seen in the case of sustainable water management programme for preventing salinization of water resources in a coastal district in Tamil Nadu, India. In this case, capacity building and knowledge transfer on sustainable water management and limits of ground water extraction was complemented with structural

interventions like construction of bunds around fresh water resources and enhancement of ground water recharge.

Similarly, several other studies (Adger et al., 2007; Osbhar et al., 2010; Pouliotte et al., 2011; Ayers et al., 2013) have identified different types of adaptation strategies, practiced by different communities, depending on their vulnerability context, such as kind of hazards and variability the community is exposed to, socio-economic status of the household, household size and structure and adaptive capacity. It is also important to differentiate the long-term purpose of adaptation actions. Adaptation strategies can be either oriented towards building of adaptive capacity or towards implementation of adaptation decisions (Adger et al., 2005). In case of former, while the repertoire will include creating communication channels and awareness platforms for information sharing on potential impacts, protecting human health and assets, maintaining the economic growth and exploiting new opportunities. The latter includes strategies for reducing the cumulative impacts of climate change, devising solution towards anticipatory impacts of climate change, ensuring minimal distributional impacts and avoiding secondary impacts of adaptation options being implemented.

2.2.3 Adaptive capacity

Irrespective of the purpose, the concept of adaptation in context of any assessment is linked to vulnerability and adaptive capacity. Adaptation are manifestations of adaptive capacity and instruments for vulnerability reduction (Smit and Wandel, 2006). As evident in literature, vulnerability is considered as a function of exposure, sensitivity and adaptive capacity of the system. These elements of vulnerability are context-specific and vary depending on the stimulus. While exposure and sensitivity are determined by interaction of environmental and social factors, adaptive capacity is shaped by socio-economic, cultural and political factors. However, the determinants are not mutually exclusive, but the drivers or sources of exposure and sensitivity overlaps with those of adaptive capacity at various points. Adaptive capacity depends on micro-level process to structural macro-level influences and hence an understanding of adaptation requires a cross-scale study of adaptive capacity. Yohe and Tol (2002) outline eight determinants to analyse adaptive capacity of a system at different scales and for different systems, sectors and regions. These include availability of technological options, availability of resources, institutional structure, derivative allocation of decision-making authority and the criteria employed for the decision-making process, stock of human capital and social capital, access to risk

spreading process, information management and public perception and awareness of stress and risks. However, it is difficult to quantify theses determinants and associated variables and hence these can be described only qualitatively. Nevertheless, the authors propose that these determinants of adaptive capacity could provide practical basis to develop indicators of coping capacity of a system. Being based on a broad scope of adaptive capacity, not limited to climate change, the methodological structure proposed could be used to assess multiple stressors. Also, the determinants can be used to develop unitless indicators and hence are useful for comparing adaptation across different regions or in same region for different stressors, even in case of lack on consistent data.

Coping capacity

Another term used to explain adaptive capacity is coping range. Every system, whether natural or social, is assumed to have certain level of coping range which help to adjust to normal climatic conditions or short-term variations in the conditions (Smit and Wandel, 2006; Fussel, 2007). IPCC (TAR, 2001) defines coping range as "variation in climatic stimuli that a system can absorb without producing significant impacts". In providing more clarity to the term, UNDP (2005) explains coping range as a range of climate within which the changes, irrespective of the whether they are positive or negative for the system, are tolerable. Beyond this range the changing climatic conditions destabilise the system and the system is considered vulnerable. Although, coping capacity and adaptive capacity gets used interchangeably sometimes, they are conceptually different (IPCC, 2001; Smit and Wandel, 2006; Adger, 2006). Coping capacity can be defined as the capacity to response and adaptive capacity as restructuring after the response (Turner et al., 2003). Further, many authors use the term coping capacity to refer to short term and most often reactive capacity (Vogel, 1998; Nelson et al., 2007) while adaptive capacity to refer to long-term or more sustainable adjustments. While coping capacity of a system can be increased by certain adaptation strategies, the adaptive capacity already encompasses coping capacity and there is a limit beyond which adaptive capacity may not be increased (OECD, 2006).

The coping ranges are characterized by the thresholds which defines their boundaries. A threshold is the level or point of the property or function of any natural or socio-economic system beyond which significant changes are experienced by the system (Australian Greenhouse office, 2003). Conditions that push the system beyond its coping range would make it difficult for the system to cope or adapt and would need greater adjustments by

the system to regain its stability. However, coping ranges are not static. They are flexible and keep evolving with the changes in socio-economic to political factors. External socio-economic or political pressures narrow the coping range. Further, coping range is also influenced by the cumulative effects of the frequency of the climatic conditions near the coping threshold. For example, if a system is already utilizing all its resources and is at its threshold of its coping range in response to a climatic event, further pressure by changing conditions could alter and lower its coping range as it will be having an increased susceptibility. Even conditions within the coping range can have unanticipated effects on the system. As Smit and Wandel (2006) explains, a wet year may be good for crops for year one, but subsequent years of such wet season may encourage pest and fungal outbreaks and to the eventuality of low crop yield.

2.2.4 Adaptation and vulnerability

Vulnerability as a concept is contested and its conceptualization varies across different knowledge domains and disciplines (IPCC, 2001; Brooks, 2003; Adger, 2006; Osbahr,2007; Ribot, 2009; Mearns and Norton,2010). However, despite this diversity of conceptualizations, intrinsic linkages between vulnerability and adaptation is well established across the climate change literature (Kelly and Adger, 2000). Understanding vulnerability is integral for identifying and supporting policy process facilitating adaptation (Kelly and Adger, 2000). In context of climate change, IPCC (2001:7) defines vulnerability as "the degree to which a system (geophysical, biological or socio-economic) is susceptible to, and unable to cope with, adverse impacts of climate change". It is a function of the exposure, sensitivity and adaptive capacity. The present understanding of vulnerability to climate change draws primarily from two research traditions, the hazard-risk based biophysical research and the political economy based social approach. The conceptualisation of vulnerability in climate change domain also varies according to the problem framing; there are two framings – the starting point or contextual vulnerability and the end point or outcome vulnerability (Kelly and Adger, 2000). While end point or outcome vulnerability adopts a scientific framing basis and views vulnerability as the net impact of climate change, i.e., impact of climate change after adaptation; the contextual or starting point vulnerability adopts a human security framing and considers vulnerability as a state of the system driven by social, economic and ecological factors and processes that weakens its ability to cope with external pressures such as climate change (Brooks, 2003; O'Brien et al, 2007). There has been also attempts to build on both framings which paved

the way for the integrated vulnerability assessment framing vulnerability through the coupled human-society system lens.

This study adopts the contextual framing of vulnerability which focuses on how social structures, cultural traditions, political and economic dynamics act as drivers of vulnerability. This framing is operationalised as *social vulnerability* which is defined as the 'ability or inability of individuals and social groupings to respond to, in the sense of cope with, recover from or adapt to, any external stress placed on their livelihoods and well-being' (Adger and Kelly,1999). Social vulnerability is considered as an inherent property of a system which is independent of any external hazard. Thus, in this approach, vulnerability is viewed as a 'state' of the system determined exclusively by internal factors present prior to any external hazard.

There is general consensus in the international arena that climate change impacts would be more pronounced for the rural communities with natural resource-based livelihoods like agriculture, fisheries and other farm-based sectors (IPCC AR5, 2014). Hence, for these communities, vulnerability will be an outcome of complex interactions of short-term and long-term climate change impacts on natural resource base that they depend on for their livelihoods and their development goals (Reed et al., 2013). Thus, given these complex and dynamic interactions, the current conceptualisation of vulnerability as a function of exposure to risks, sensitivity and adaptive capacity of the community may not be effective as an approach to understand vulnerability of these communities and the adaptation options that could serve to maintain their livelihoods in face of such uncertainty. Although a number of approaches have been developed and employed so far, to cater to divergent vulnerability assessment studies (IPCC, 2001; Fussel and Klein, 2006; Malone and Engel, 2011), only a few studies has recognized the opportunities that livelihood perspectives could offer for understanding rural development complexities and dynamics in the context of climate change (Knutsson and Ostwald, 2006; Reid and Vogel, 2006; Badjeck et al., 2010; Reed et al., 2013)

2.2.5 Adaptation and disaster risk reduction

Disaster Risk Management (DRM) is a key subset of climate change (Pelling and Schipper, 2009). O'Brien and Downing (2013) call for a transformative approach when it comes to integration of DRM and adaptation initiatives into policy. Climate change adaptation and DRM have similar objective of vulnerability reduction and hence their integration is

necessary into development planning and decision-making (Schipper, 2009). Particularly, for coastal communities which are vulnerable to natural hazards and long-term impacts of climate change (sea-level rise and coastal flooding) such integration of policies is essential (Adger et al., 2005). O'Brien and Downing (2013) argue that for the integration to succeed, the current adaptation thinking will require more than the contemporary past learning and future scenario approach. The conceptualisation of adaptation and DRM in policy arenas needs to adopt novel methods to capture the complexities and the uncertainty that marks the relationship. Further, Termeer et al. (2016) argues that transformational change will be in-depth, large scale and quick. Governing such change will entail a transformation in governing systems themselves. The central actors, to navigate these changes, will need flexibility, shift into modest roles and willingness to experiment.

2.2.6 Adaptation and development

As stated by the widely referred Stern review report on economics of climate change (2006) development is key to adaptation. Especially in developing countries, successful adaptation depends on socio-economic development of its citizens (Metz & Kok, 2008). Persson et al (2009), emphasizing the significance of development in adaption process suggests that strengthening of existing development process could lead to better planning and implementation of adaptation strategies. Further, Metz & Kok (2008) states, social and economic development are the major drivers of climate change. They suggest a two-way approach to better understand the relationship between climate change and development. First, the impact of climate change on policy or strategy making process and second, the implications of policy or strategies on climate change. However, they stress on the need of an integrated approach to address these two different perspectives on adaptation-development linkage. They point towards sustainable development as the integrated approach that needs to be taken and suggests integration or 'mainstreaming' of adaptation in development as the first and most important step in the process of developing such an approach.

Similarly, Le Blanc (2009), maintains that adaptation is critical for sustainable development and also points out current challenges for sustainable development stating the challenges posed by climate change and existing gaps in the current developmental approach. Adger et al. (2009) supports this argument of role of adaptation in sustainable development and emphasize that adaptation decisions have justice consequences that have impacts on different scales.

As reflected by the perspectives of the above authors, the close links between adaptation and development calls for an integrated approach or mainstreaming. Mainstreaming is used to refer to the integration of information, policies and strategies addressing climate change into existing development policies and decision-making (Klein et al., 2010; Ayers et al., 2014). It is considered as a way to make more sustainable, efficient and effective use of resources rather than for formulating and implementing climate policies separately from existing developmental activities. Theoretically, it aims at fostering synergies between adaptation and development for ensuring long term sustainability of investments and reducing the vulnerability of development activities to current and future changes in climate (Klein et al, 2010; Ayers et al, 2014). The focus shifted to mainstreaming as scholars and development practitioner recognized that impact driven adaptation that only focuses on certain climate risks, usually short term, would not be effective as it does not address the underlying factors that makes the communities vulnerable to those climate risks in the first place. According to them, poverty is an important cause of vulnerability and thus in such development deficit situation, good development strategies need to be the starting point for adaptation. According to Burton (2002), development of adaptation strategies for any vulnerable community must take into account its adaptation deficit, which is the coping or adaptive capacity of a community to the existing climate risks. So, to develop and implement robust adaptation strategies for future climate risks, it is necessary to reduce this adaptation deficit first. This lead to increasing stress on inclusion of sustainable livelihoods, efficient governance and increased participation of institutions as part of comprehensive adaptation plans (Sperling et al, 2003). As can be seen in a case study by Kelly and Adger (1999) on the risk of cyclones and storms in Vietnam, poverty reduction is the most important component of a potential portfolio of adaptation options for the region, which also comprises of access to resources, income diversification and addressing land and property management issues. These strategies could be a part of any development plan irrespective of taking climate risks into account. Similarly, Ansuategi (2015) asserts the role of Sustainable Development Goals (SDGs) in addressing climate change vulnerability. The authors argue that the different goals of SDGs - poverty reduction, access to education, health services, gender equality, access to energy and strengthening resilience to climate-related disasters will foster sustainable economic growth for households which would enable them to employ adaptive strategies for future climate risk. However, as explained by IPCC (2007), adaptation and development are co-dependent strategies in context of both climate change and development areas. Climate

change is also going to significantly influence the development activities. World Bank estimates reveal a 40% risk to the development funded by overseas assistance in developing countries because of climate change.

A multitude of approaches have been proposed to understand the linkages between climate change adaptation and development. Through a climate change mainstreaming approach, Halsnaes and Traerup (2009) attempted to assess climate change vulnerability and adaptation measures in the context of development objectives. They employed a set of sustainable development indicators to assess the social, economic and ecological dimensions of climate change adaptation. Starting with reviewing the climatic conditions, variability or change, the approach establishes links between the conditions with development policies next which is followed by identification of adaptation measures and comparing them with unmitigated climate change impacts. They illustrated their approach further by analysing case studies from Mozambique and Tanzania. In the case of Mozambique, they examined an infrastructure planning initiative where regular floods could have damaged the existing and future roads and highways causing increase in maintenance cost and traffic disruption. In this case, adaptation measures like better drainages systems, stronger structures, bridges and alternative routes could be employed. They analysed the past flooding events in Mozambique and internationally available adaptation data and concluded that climate safe road design had shown significant benefits in other places. Halsnaes and Verhagen (2007) also proposed an analytical approach which uses well-being based indicators for assessment of integrated climate change adaptation and development policies. They approach is based on policy evaluation criteria which combines sectoral and economic goal with social impacts related to health and income distribution. They compared case studies from India, China, South Africa, Brazil, Bangladesh and Senegal which establishes linkage between climate change adaptation and development. While the country studies of India assessed adaptation and mitigation policies in water, energy and transportation sector in context of development goals like employment and economic growth exploring economic benefits in greenhouse gas (GHG) emission reductions and accounting for adaptation benefits in transportation planning as in case of west coast railways. In case of China and South Africa energy efficient measures taken, like switch from coal to other sources for electricity generation, are found to be economic as well environmental benefitting option. In case of Senegal, energy being an important development priority, the focus on Liquefied Petroleum Gas (LPG) as an energy

source for both electricity and cooking would not only solve the energy supply problem but will also reduce the pressure on forest as energy source. The studies reviewed reveals the interlinking of development and climate change issues at various levels and reflects methodological challenges in assessing climate change adaptation in developing countries because of the inherent economic development issues. But well-being indicators, could be successfully used to assess the integrated pathways of climate change adaptation and development. The authors suggest that by using human wellbeing indices to evaluate policy outcomes could help it to cater to development goals. However, as wellbeing indicators would vary for each policy, it is easier to apply such an analytical approach at sectoral level. However, it is only a preliminary reflection and much needs to be explored to make this approach robust.

Also, not taking into consideration the development needs of a group or community when planning an adaptation could lead to maladaptation. Policies and practices can be maladaptive when they increase vulnerability instead of decreasing it. (Burton, 1997). Barnett and Neil (2010, pp 211), define maladaptation as "action taken towards addressing climate change vulnerability of systems, communities or groups which adversely impacts or increases vulnerability of the same or different systems, communities or groups". They identify five pathways through which maladaptation could arise which includes adaptation action that increases emission of greenhouse gases, reduces incentives to adapt, disproportionately burdens the vulnerable, have high opportunity costs and creates path dependency. The authors present the case of adaptation decisions taken towards water stress in Melbourne as an example where the multi-million desalinisation plants built to address the issue lead to emission of million tonnes of greenhouse gases, 11% increase in the water price which impacted the poorer households and social and environment impacts such as damaging the local rivers and marine environment.

According to Huq and Reid (2009) a better understanding on the linkages of adaptation and development also requires focussing on the various levels or scales at which development and adaptation interact. The linkages happen from the local to global scales. This includes focussing on vulnerable communities at local level, potential sectors like agriculture, coastal zone management that could be adversely impacted at sectoral level, and at national level considering the impacts on and also across sectors, at regional level taking actions on drought-prone or river basins regions like West Africa or South Asia as it is easier to model climate scenarios at regional scale.

2.2.7 Evaluating adaptation

Another question of importance when addressing adaptation is to how to measure the success of the adaptation initiatives. Adaptation works towards the fulfilment of three objectives – reduction of sensitivity of the system, management of the exposure of the system and increasing the resilience of the system (Pelling, 2011). The success of any adaptation strategy depends on fulfilment of these objectives. However, the success cannot be only interpreted only in terms of the objectives. According to Adger et al (2005), it is important to consider the spatial and temporal implications of the adaptation to gauge its success. Sometimes, adaptation strategies may have immediate benefits but may not be that successful in long run. Adaptation process in itself can have significant impacts on the systems, altering their sensitivity to climate change. (Smit et al., 2000). Another factor that is needed to be taken into consideration is its impacts on other systems. Adaptation focussed on strengthening of one system could have unaccounted and unintended negative effects on other related systems. In addition, the definition of adaptation not only refers to the outcome of the adaptation measures but also the process of adapting. As Pelling (2011) argues, adaptation need to be viewed as a critical *process* and not just as product. The success of an adaptation intervention hence would be also shaped by how it unfolds rather than just the outcome. These concerns are addressed by a number of studies that propose evaluation of climate change adaptation based on a more robust criteria and underline four potential factors of evaluation, namely, effectiveness, efficiency, equity and legitimacy (Fankhauser, 1999; Burton et al, 2002; Adger et al, 2005).

Adger et al. (2005), argues that even when adaptation strategies, theoretically, manages to strike a balance between all the above-mentioned criteria to be considered as successful and ideal; in practice, it is difficult to find such a balance. Nevertheless, he concludes that the relative weight of the success criteria in any decision-making process is not given but is revealed by the societal process of consent and action. This framing of successful adaptation is rooted in the understanding that the risks of climate change are context specific and depending on the social, cultural and political factors.

This conceptualisation of adaptation as a process shaped by the contextual factors underpins this study. This study looks beyond this current dominant concept of adaptation as '*adjustment*', which only reflects the understanding of adaptation that emerged from the hazard-risk literature (Basset and Fogelman, 2013). They argue that this conceptualisation fails to take into account another perspective on adaptation, rooted in political economy

critique, which views adaptation as transformation. The authors' argument stems from their appreciation of Pelling's (2011) conceptualisation of adaptation as a process and its categorisations as resilience-transition-transformation framework. This study utilizes Pelling's (2011:29) conceptualisation of adaptation 'as a multi-layered process where every adaptation intervention could be potentially concealing or denying other pathways that could lead to different social or social ecological futures".

2.3 Adaptation governance

Governance is referred to as the "process of governing that includes a whole range of institutions and their relationships, functioning as contexts within which public and private actors interacts and participate in solving societal problems and creating societal opportunities; and establishing a normative foundation for all these activities" (Huitema et al., 2016). This perspective of adaptation governance is grounded in the conceptualisation of governance of adaptation as "patterns that emerge from the governing activities [ideas, social and political beliefs and collective efforts] of social, political and administrative actors within the realm of climate change adaptation" (Kooiman 1993:4). Elsewhere, Moser (2009: 315) defines adaptation governance as a "a set of actors, processes, decisions, institutional structures and mechanisms, including the division of authority and underlying norms, involved in determining a course of action (i.e., adaptation). This study espouses this actor-oriented perspective of adaptation governance and utilizes the above definitions to understand the adaptation governance for the case study. Furthermore, Moser (2009) proposes a four-step approach for examining decision-making issues in any adaptation governance case-based research – 1) identification of adaptation decision-making arena, 2) identification of actors responsible for and initiating framing and implementation of adaptation decisions, 3) contextual factors and actor characteristics shaping adaptation decisions, and 4) the actual outcomes of the adaptation interventions and the lived experiences of the all the actors as shaped by these interventions and process. Moser's conceptualisation thus positions actors as active agents in response to contextual factors which also address the structure-agency tension of governance architecture.

In addition, as Adger et al. (2009) argues, adaptation is a multi-scalar and multi-level governance process, driven by the interactions of individual and collective actions from bottom-up and top-down in response climate change risks. Therefore, adaptation governance as a socio-political process, needs to take into account the issues of scale, context and interactions at different level (Pelling, 2011).

Vink et al. (2013) after reviewing adaptation governance literature outlines four approaches for conceptualization of adaptation governance in climate change. The approaches, categorised on the basis of knowledge and power interactions are - deliberative, politics of technology, adaptive capacity and system assessment (Table 2.3). These approaches towards studying adaptation governance also provides useful entry points to understand adaptation in both policy and practice. This research utilizes these conceptualizations of adaptation governance to examine and understand the power-knowledge interplay of adaptation planning and implementation in the case studies. The research thus attempts to integrate these different conceptualizations to develop a study approach that could facilitate understanding the complexities of power-knowledge interplay as experienced in reality across scale as power and knowledge evolves, gets reproduced and changes.

Table 2.3: Conceptualisation of adaptation governance

Approaches to Adaptation Governance Conceptualisation	**Power-knowledge interplay**	**Forms of Conceptualization**
Deliberative approach	Unorganized Power Unorganized Knowledge	Triple loop learning Boundary studies Discourse Framing
Politics of Technology approach	Unorganized Power Organized Knowledge	Hegemonies in power relations knowledge structures and power
Adaptive capacity Approach	Organized Power Unorganized Knowledge	Adaptive capacity Institutional learning Institutional resilience
System Assessment approach	Organized Power Organized Knowledge	Governance system

2.3.1 Multilevel governance

Multi-level governance refers to the negotiated and non-hierarchical relationships between the institutions at the transnational, national, regional and local level (Peters and Pierre, 2001). Multi-level governance is characterised by its two dimensions – 1) the vertical layering of governance process at the different levels or the interaction between the different vertical levels (national, regional and local) levels of government and 2) the

horizontal relationships across the same level (between the different regional institutions and local institutions). In Indian context, this multi-level governance is realised in the form of decentralized governance system where administrative powers are devolved from the national government down to the local governments of town, cities and rural administrative units. The decentralized governance system is marked by negotiation and interactions across and in between the different levels shaping the problem framing, agenda setting and implementation of policy and plans. This offers a conceptual framework to examine adaptation governance within the policy process context and explore the power and politics influence across the different level on adaptation.

2.3.2 Multilevel adaptation governance

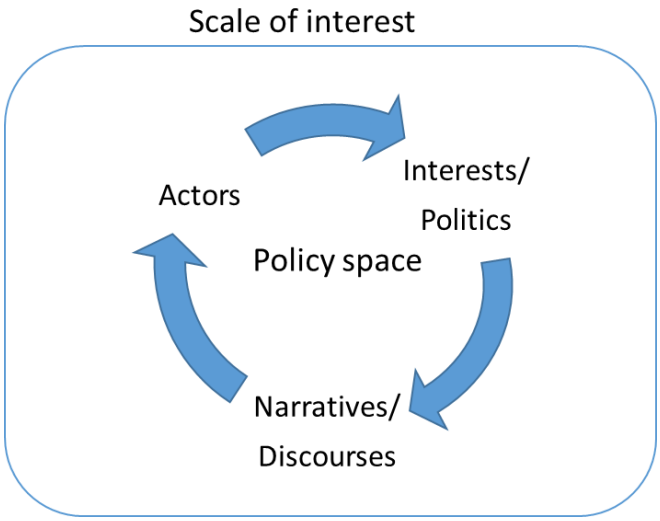
The multi-dimensional nature of climate change entails responses at multi-scale and multi-level of social and administrative system and across different policy and resource sectors to address the impacts (Termeer et al., 2010). Thus, a multi-level governance process that involves decision–making and policy planning by multi-actors and at multi-scales is integral for adaptation to succeed (Termeer at al., 2011). This conceptualisation of adaptation as a governance process unfolding at multiple scale and levels and marked by interactions of actors and institutions functioning within and across those scales and levels provides a novel approach to understand adaptation as a process within polycentric governance regimes such as that of India. As Moser (2009) argues, such an approach also offers an entry point into the structural governance context in addition to understanding of agency that such an actor-oriented perspective brings into focus. However, multi-level governance, especially in context of adaptation does have issues like complexity and fragmentation which requires careful integration and coordination to avoid limitations and maladaptation (Adger, 2005; Termeer et al., 2011). Nevertheless, multi-level adaptation governance framework could provide a useful tool to understand the policy process across scales and levels, from policy planning to the interactions across the levels and the implications of the process of social dynamics and power relations at a local scale.

This multi-level governance conceptualisation of adaptation forms the basis of the conceptual framework of the study as it attempts to understand the issues of scale and the complexities of interaction that occur within and across scale. This conceptualisation also offers the study a conceptual framework that accounts for actors, the structures within which they interact, and a means of mapping these interactions.

2.3.3 Policy framing and process

Framing of policy could be characterized as a political process as much as an analytical process. Policy formulation rarely concludes in complete consensus and is marked usually by different interests of diverse stakeholders with different perspectives and value judgements. Inherently a political process, it is a complex and iterative process of negotiation and experimentation shaped by values of involved stakeholders agreeing on policy decisions that are deemed optimal. Understanding policy process requires understanding the process of decision-making and implementation. The decision-making process involves interaction between three elements - actor/networks, narratives/discourses and politics/interests (Woolmer, 2006; Keeley and Scoones,2003). The implementation process is also integral to policy process and play an important role in determining effectiveness of policies. It depends on and is shaped by the front-line workers or staff who are responsible for its operationalization.

Figure 2.2: Policy process framework (adapted from Woolmer, 2006)



The conceptual framework for this study draws from the policy process framework (Woolmer, 2006) to capture the components and complexities of the decision-making in policy process involved in formulation and implementation of adaptation and development goals (Figure 2.2). The framework developed for this study applies the actor-oriented approach (Long, 1992) to examine various components and their interactions within the dynamic societal contexts which shapes policy.

Actors

The actors or the stakeholders are the individuals involved in the process of decision-making and implementation in policy framing which encompasses the government decision-making body, scientific organizations, non-governmental organizations, bureaucrats, street level bureaucrats or frontline workers (Lipsky, 1979), community and interest groups (McGee,2004). Latour (1986) defines actors as 'actants' which refers to human or non-human entities which act, either on their own or being granted with activity by others. These actants are defined and named by the networks they associate with and gain substance, action, intention and subjectivity through these associations (Ritzer, 2004). Keeley and Scoones (1999) points out that it is through these networks that knowledge is established, and the strength of knowledge depends on the networks upholding it.

Politics/Interest

Political interests of actors and regimes play an important role in policy-making. Although, policy is considered to be technical and neutral, policy-making is inherently political and contested. Different interest groups exert their influence to maintain their power and push their vested interests within the policy frames. Narratives are the frames through which actors at policy level (government, bureaucrats, and donor agencies) pursue their interests (Woolmer, 2006). Thus, vested interest and agendas are perpetuated through policy narratives and hence a careful consideration of language of policies can provide insights into these hidden actor interests and agendas.

Discourse

Discourse is defined as 'a specific ensemble of ideas, concepts and categories that are produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social realities (Hajer 1997, p 44). Keeley and Scoones (1999) drawing from Foucault's (1980) work argues that these 'ideas, concepts and categories' are the medium through which power and knowledge are expressed and different definitions of the world are shaped. Discourses thus becomes frames through which the world is interpreted in one particular way rather than other ways available (Apthorpe and Gasper, 1996). Discourses thus are not derived from individuals or institutions only but are reflected in them (Hajer, 1997; Keeley and Scoones, 1999). As Hajer (1997) argues, individuals are constituted of discursive practices and power of institutions can only exist as long as they are being constantly reproduced by discourses.

Exploring linkages between discourse and policy is important to understand the relationship between knowledge and power and the dynamics behind acceptance and spread of certain versions of knowledge in policy in preference to others and how they survive and spread in a social and historical context. The conceptualisation of discourse in this study is through its form as frame and social practice. A number of studies in theorization of discourse has taken different approaches – conceptualization discourse as text from its semiotics origin to the more operational approach to discourse as social practices. The study here takes a more holistic approach to discourse and uses it reflect on policy and plans of formal governance regime in form of how discourse is both a frame and outcome of the process. It acknowledges that discourse as an outcome has the main intention of shaping social practice so from discourse as text and frames to underpinning social practices is used at different parts of the study to shed light on the power relation that focus on discourse could unearth. Particularly important in study of governance adaptation and hence integral to the study is *Foucalt* and *Hajers* conceptualization of discourse as power.

Policy space

The policy space is defined as the space within which influence, and power could be exerted, and reforms or policies could be introduced or modified, without disturbing the peace in the society or generating pressure for abandonment of policies (Grindle and Thomas, 1991). Policy space thus consists of a range of options that decision-makers can choose without affecting the stability of socio-economic structure or creating political disturbances. According to McGee et al. (2004), these spaces are opportunities and moments where decision makers and citizens come together, and consequent interactions and actions may result in significant influence on power dynamics. One of the dominant concept of space, as drawn from the theories of Bourdieu, Foucault and Lefebvre, is the inherent linkage between the concept of power and concept of space. As stated by Lefebvre (1991, p 24) 'space is a social product….. a dynamic humanly constructed means of control, and hence domination of power'. Cornwall (2002) building on the work of these theories, refers to the policy spaces as dynamic spaces that are shaped by the actors and their power relations which create and maintain these spaces. Also emerges from the concept of space, the concept of boundary. Hayward (1988) explains the concept boundary through the context of power by defining power as the 'social network of boundaries that delimits possible action'. Thus, equity in participation not only depends on the ability to

enter the space but also having the right to define and shape the boundary. According to Grindle and Thomas (1991), shape of boundary of the space depends upon the ability of the policy makers to tap into the social, economic, technical and bureaucratic resources that is available to them. The size of these policy space differs depending on the issue in context as every issue would have different impacts on socio-economic groups which again differs in the capacity of defending and promoting their interests. Thus, it is of vital importance to again explore how these spaces are created and maintained and whose interests are addressed and who controls these spaces to understand the concept of boundaries and hence conceptualise space.

Policy process is not only driven by the actors and their interactions but also shaped by the context within which it is taking place. This includes historical, cultural, social, and political and most importantly power dynamics which drives and influences all aspects of context and components of policy process (Brock et al., 2001). Gaventa (2005) argues that to facilitate any policy change requires an understanding of the power dynamics that is inherent to all policy process. Further, he suggests that to make the development process pro-poor and participatory, it is not enough to establish institutional mechanisms, such equity and justice could be achieved only by addressing the 'how', 'by whom' and to 'what extent' the power is being exercised.

2.3.4 Adaptation as a policy process

Mills and Snook (2013) argue for a similar approach, stemming from the conceptualisation of uncertainty in the future, not only from climate change but also due to the inevitable and rapid changes in the place-based factors and the at-risk groups. They stress the scalar link of adaptation at local level and how changes in national and international policy could have ripple effect on local vulnerability is shaping and how planned adaptation may really unfold.

Botterill and Dover (2013) proposed a novel approach to governance for addressing the future uncertainty around climate change adaptation. They promote working towards 'normalising' climate change adaptation, where the risks of climate change and natural hazards are expected in the 'business as usual 'case and policy across different sectors are tailored to address climate variability and change. This approach resonates with the emerging thinking of a system approach to adaptation which attempts to reduce the

unintended consequences of short term and sectoral adaptation approaches (Pelling et al., 2015)

This research adopts the system perspective to look at the research problem – current state and gaps in adaptation governance. This helps by providing a broader framework for analysis of the research problem– understanding and examining the influence of different adaptation pathways in a social, political, economic and institutional context where risk is created and experienced (O'Brien and Downing, 2013). Adopting this perspective also helps to capture the dynamic and complex interrelationship of structure and agency within a system across scale.

As Barnett et al. (2013) argue adaptation is more than just interventions. Adaptation is a process, so a successful adaptation could also be judged by the inclusiveness, fairness and social justice it fosters. A factor to consider about success is to reflect on the legitimacy and sustainability of the process in the long run. This approach to adaptation complements the system perspective as it focuses on the entirety of functions within which the adaptation process unfolds. Furthermore, Barnett et al. (2013) consider adaptation as an imperfect process that would always encounters barriers to its best practice, limits to the results that could be achieved and the inadvertent consequences on groups or sectors it could have because of interlinking within components of a system. Stemming from these adaptation experiences, concerns also arises regarding long term decision-making such as settlement patterns, infrastructure, mobility and economic investments. Thus, Barnett et al. (2013), conclusion in response to such future and broader consequences resonates with that of 'normalising' adaptation – in this case recognizing the inescapable risks and striving to live with them, by making cross sectoral reforms aiming at learning and adjusting and taking into account the social and political responses and norms. This, as the author deduces, have the potential to make adaptation successful – just, fair and less maladaptive.

2.3.5 Addressing the issue of power and politics

Power is a widely contested and debatable concept. Power has been conceptualised in different disciplines and by different theoretical and empirical studies and through a multitude of approaches (Parson, 1967; Luke, 1974; Giddens, 1976, 1977, 1984; Foucault, 1977, 1979, 1980, 1982). The foundational conceptualisation of power is from the works of Foucault where power is conceptualised as a strategic situation within a society which exists within and is reproduced by the social practices. Giddens conceptualisation of power

in his theory of structuration reflects this positioning to certain extent but the strong theorization of agency as an important dimension of power makes it a suitable theoretical lens to address practical issues and socio-ecological process. This study is grounded in conceptualisation of power and adopts a definition put forth by Arts and Tatenhove (2004:347) which argues "power is the organisational and discursive capacities of agencies, either in competition with one another or jointly, to achieve outcomes in social practices, a capacity which is however co determined by the structural power of those social institutions in which these agencies are embedded". This study seeks to dissect the social practices and the institutional arrangements that reproduce these practices to understand the socio-political relationships through which power is manifested.

2.4 Theoretical underpinnings and conceptual framework

The study is underpinned by two main theoretical frameworks – theory of structuration and the theory and politics of scale. It also draws from the actor-oriented approach and policy process framework to account for actors influence and role of agency on structural reproductions and scalar processes. The conceptual framework draws from the ideas of these theories to provide an approach that can be useful in investigating adaptation governance through the lens of power and politics. This section details the main theoretical ideas that the conceptual framework utilizes for the research study.

2.4.1 Structuration theory

The primary theoretical lens underpinning this study is the social theory from Giddens (1984) - Structuration Theory. Structuration theory has several significant tenets that grounds this study and hence helpful to be used as an analytical lens too. The basic tenet that structuration theory revolves around is the duality of structures or dualism. In its attempt to bring together the structuralism and the realist part of the social theory, the theory conceptualises structure and agency being intertwined. The structure in the theory refers to the rules and the resources that agents are embedded in and which marks their functioning within a system. The rules could be further refined as the norms, beliefs and the code of signification within the society that frames the decision-making ability of the agents. The resources could be conceptualised as authoritative resources which refers to the power and control over system dynamics and allocative resources which refers to the actual resources that the agents have access to and modify for their own purpose. The study takes these theoretical principles of Giddens duality of structures and utilise them to analyse the governance process across scale in a system.

Giddens in his structuration theory attempts to provide a new perspective to the structure-agency debate in between the social objectivist and the subjectivist. While the social objectivist argued that social reality exist is concrete and exist independent of the human actions and which is generally responsible for shaping those action, the subjectivist argued that existence of social reality in its entirety depends upon the interpretations and perceptions of the individual actors and there is no social reality beyond those interactions. Structuration theory bridges both the perspectives and proposes the duality of structure which means that structure and human agency are recursively linked and coevolve. According to Giddens (1984: 7), structuration can be defined as the 'structuring of social relations across time and space, in virtue of the duality of structure'. The theory explains the interaction of action and structure through deconstructing the human agency

The aim to understand the agency of the actors and how they assert themselves is to shift the focus of the conceptualization of power as authority to negotiation and contestation that is shaped by plurality of interests and hence needs to move beyond the elitism rhetoric regarding shaping of adaptation pathways. This brings into view the significance of looking at actor interactions and the power and politics inherent to it. This knowledge could open up spaces to bring about change in the system, encourage sharing of perspectives and initiate change in thinking which could eventually lead to transformation. Climate change vulnerability and adaptation responses to it are relational and hinge on the structure and agency interactions across the scale. Structure as has been discussed by previous studies are dynamic and change when actors and networks within the system assert their agency against the status quo. However, agency of the actors could tend to align with the structure over time and rather contribute to strengthening the structures. This happens when actors within the system internalizes their positions within the system and embrace the system dynamics in order not to create chaos within a system by bringing about a disruption. This could happen at any scale and as in nested system its impacts shape the entire system though the hierarchical trickling. Adaptation decision-making is complex and hierarchal that involves interactions within and across the scale with a multitude of actors and networks.

Structuration theory also lays the foundation for an approach that is flexible enough to look within a scale and move across the scale while deconstructing scalar interactions. The structuration theory used in conjunction with a scalar perspective thus provides a robust framework to understand complexities of adaptation governance.

However, it is important to acknowledge the critiques of the structuration theory in current literature to reflect on how it forwards the study and/or may limit it. Gidden's framing of structure and agency centralizes the role of agency wherein the agents/actors are actively drawing on structures and producing the system. As Clegg (1979) argues, the conceptualization of power in Giddens framework thus inclines towards the dominance of agency which hinges on the individualist and voluntarist side of dualism.

2.4.2 Theory of Scale

The theoretical underpinning of politics of scale has been discussed by a number of studies in human geography (Brenner, 2001; Marston, 2000; Smith 1993). The major tenets of the scale theory focus on the social construction of scale. Scale is relational and is constructed through interactions and social process of negotiation and contestation. Nested and hierarchical governance process like that of adaptation requires an understanding of the scale as the decision-making points would tend to lie at different scale. Also, particularly, in Indian context where the governance has shifted towards decentralization bestowing more powers on the local administration, a focus on scale of impact and action is important to understand the process. Scale here also of importance because of the politics that is inherent to such hierarchical systems. In maintaining a scalar perspective while looking at the process ensures that scales are not relegated as fixed and preordained category. An explicit focus on scale will also provide greater engagement with the relational nature of the scales and would help deepen the understanding that scales, from local to global are inextricably linked (Brenner, 2001). Hence, any given social and ecological process operates at different scales simultaneously and a holistic understanding of the process requires an understanding of the scale construction and as well as the scalar arrangements (Brown and Purcell, 2005). This study adopts this theorization of scales and utilises it as an analytical lens to understand the interrelationship between the scales and how the social-political interactions within and between the scales drives the adaptation governance process.

Politics of Scale

Scale as a focus of inquiry, particularly in political ecology, is still underdeveloped and undertheorized (Brown and Purcell, 2005). In recent times, the political ecological research has started to focus on the 'scale as an object of inquiry' building from research and understanding of scale from the field of political economy where scale and politics of

scale has a significant body of literature and empirical research (Brenner, 2001; Swyngedouw, 1997; Smith 1993). Scale as a theoretical lens could be of significant use in understanding governance of adaptation. The concept of scalar arrangements and the scalar configuration could offer a better analytical lens to understand the process of adaptation governance. In this research the utility of scale theory offered a route to build a practical framework to identify the cross-scale interactions and the process of scale structuration that results from it. This study integrated the four main principles of scale theory into its conceptual framework - 1) Scale is socially constructed 2) Scale is relation, 2) scale is fixed and fluid, 3) scale is political. In conjunction with the structuration theory, the theory of scale was used to develop a conceptual framework that could capture the intricacies of the process of adaptation governance. The scale theory in the framework helped to capture the components of interactions and structural conditions across the scale that shapes the outcomes of the adaptation strategizing and implementation at local level. It also provides a clear political lens to this study which helps to understand the political conditions that leads to scaled governance and the structures that results from the scaled governance. It also allows to evaluate actions by national governments and their impacts on the regional and local implementation and practices. It brings into fore the necessity of multi scale studies – that this study followed – and how a focus on external conditions and structural factors could be a step forward in understanding unfolding of adaptation, autonomous or planned, by using the conceptual framework. This could provide insights into what constrains adaptations at local level, internal and external, to gather a better picture of the adaptation process and the enabling and constraining factors shaping the process at local level. The use of scale theory offers a nuanced understanding of the possible causes and mechanisms for the external conditions causing a strong influence on the local conditions. It also shows how just of focussing on local scale and then planning for scaling up may not lead to desired outcomes. Scale theory is particularly applied to this study because of the grounding it provides through its fourth principle – scale is political. The social construction of scale and the political nature scale means that the actor at various levels contest for their positions and through this contestation and reproduction scale becomes entrenched in the system. The point of interest in this contestation and negotiation is the power relations and how the reproduced, sustained and ruptured within and across the scale as the actors negotiate their relative positions and hence access to resources over time. The utility of structuration on understanding scale has been explored by studies from which has evolved the concept of scale structuration – which refers to the

fixing, unfixing and refixing of scalar structures. The conceptual underpinning of using both the scale and structuration theory is thus in exploring the structural conditions across scales that shape the local process and what leads to this scale structuration. Also, the study explores what makes the structures so persistent and when and how the structures are reproduced or contested by the local level actors and networks.

The policy ramifications of using scale as an analytical lens also relates to its relational nature. The need for the social construction of a scale is important to the socio-ecological studies but so is the understanding of the social constructions of relation in between the scale. This emphasizes the importance of viewing scales not in isolation – but keeping in centre that the scale construction is a product of its relational nature to other scales. A holistic picture of the process of adaptation as it translates from policy to practices or from local level strategies to policy components could provide important insights to how and why the adaptation outcomes are as they are and what may be required to bring a long-term change. The conceptualisation of scale in this study utilizes the theoretical tools offered by it and also attempts to provide empirical evidences to the growing body of literature on how scale as an object of inquiry could help to understand the power and politics inherent in adaptation process.

The major debate about scale theory was its inability to provide insights into the dynamics within a scale. The structuration theory integrated with the theory of scale offers a route to address the issue. The structuration theory focus on structure and actor interactions provides is the ability to give an in-depth understanding of how local scale dynamics work. Structuration theory provides a framework to study the agent's role and hence shifts the focus of analysis to the interests and actions of actors within the structures who interact within themselves and the structures to reproduce and redefine the structures. This builds a better foundation to look at adaptation governance through the scale perspective by taking an actor-oriented approach.

The research used the integrative approach to look across the scales – outlining the discourses around climate change, adaptation DRM at national scale through policy analysis, process of vulnerability at the local scale and the adaptation strategies and process at the local level by reviewing how the discourses at the national and regional scale are shaping the process at local scale through looking at scalar arrangements and interaction evidences. The structuration theory provides an in-depth understanding of the dynamics

within the local scale and external factors or structural conditions shaping those dynamics. By adopting an actor-oriented approach, the research looked at the structures of domination, legitimization and signification at the local level as informed by the structuration theory. Structuration theory has a growing body of literature in business organization studies but has recently gained prominence in climate change studies too owing to its application on understanding power relations. The recent shift into the role of power and politics in adaptation research and the taking up of social justice and fairness approach of the adaptation researchers makes structuration theory a relevant analytical lens to understand these complexities and flux.

2.4.3 Conceptual framework

This section details the development of the conceptual framework that underpins this study (Figure 2.3). The conceptual framework draws from relevant literature discussed in the sections above in this chapter. The conceptual framework was used as a conceptual guide to develop the methodology and methods for the study and orient the investigation of the study during analysis to address the objectives of the study. The conceptual framework outline and its different components are discussed below.

Defining the system

The coastal community is represented here as a nested system with a multi-level governance arrangement at household, local, regional and national level. Viewing it as a nested system will provide insights on cross-scale dependency of adaptation and its role in decision-making process (Adger et al., 2005; Park et al., 2012). The units of observation will be households, community, region (state) while the units of analysis will be community. Thus, adaptation process will be analysed at the community level and the role of households and region/ state in shaping the adaptation strategies will be taken into account. Taking into consideration the knowledge from social vulnerability literature that vulnerability and responses towards risks emerging in the system would differ according to the livelihood and socio-economic development status (Bohle et al., 1994; Adger, 1999; Vincent, 2004), the study will not have a particular sectoral focus but would focus on understanding the system at different spatial levels and across it.

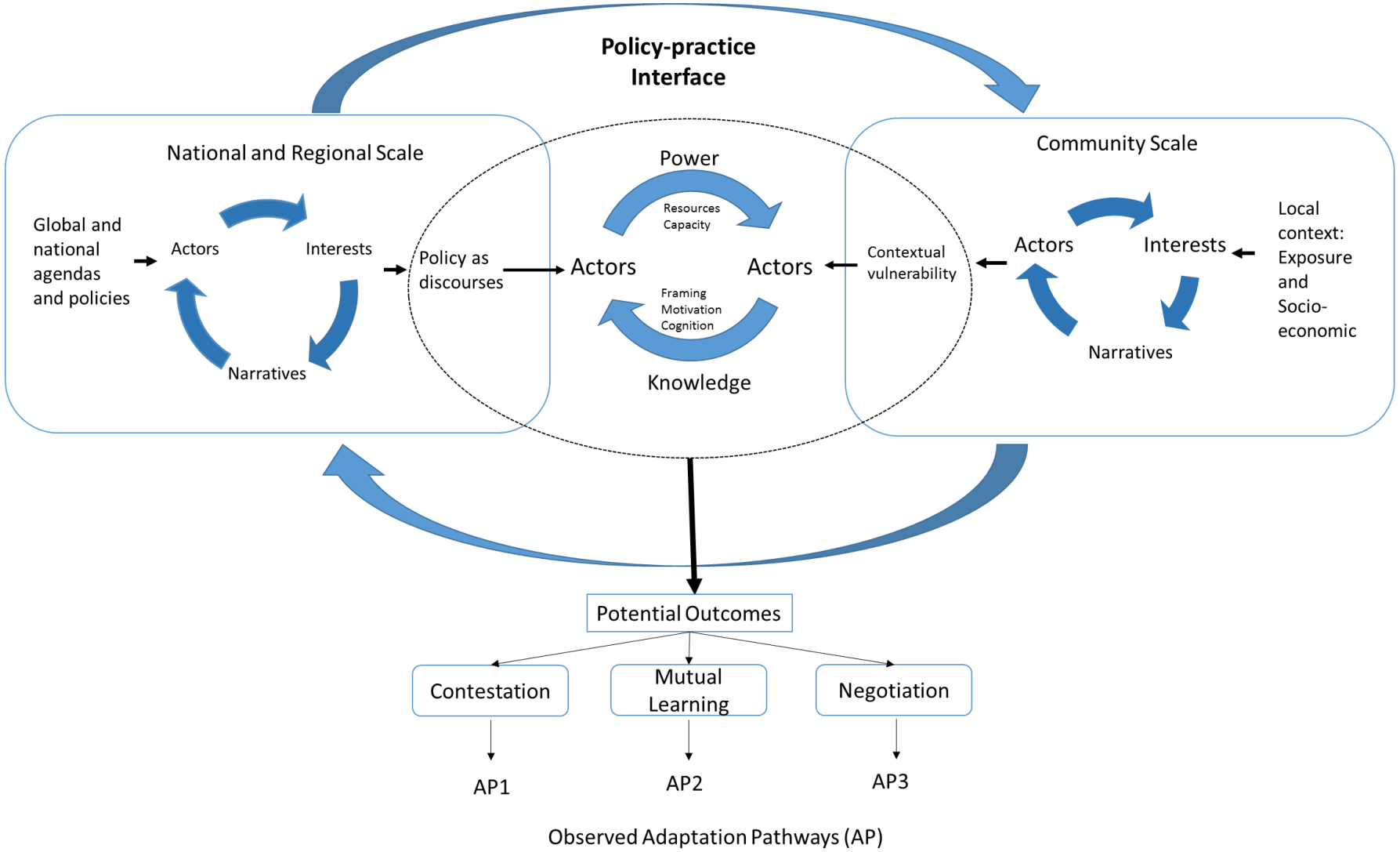
Coastal ecosystems are fragile and populated landscapes which also makes them vulnerable. Most often they are the most vulnerable ecological systems owing to the system sensitivity and exposure to natural hazards. Particularly, in case of climate change

there has been a number of critical studies on coastal ecosystem and their vulnerability to climate change. Coastal landscape however has not received the same amount of attention on the governance of adaptation at these complex adaptive systems. The complexity of these systems added with the vulnerability and uncertainty of climate change makes them some of the most difficult landscape when it comes to governance and managing future sustainability. The system perspectives afford the study to analyse the interactions across the scale that affect the system while maintain the integrity of the system boundaries. The coastal landscape constitutes the diverse agricultural, fishery and livelihood dependent livelihood system interacting in the system and land-sea dependence of the communities under climatic and non-climatic stressors. The multiple stressors of coastal landscapes also make them interesting as they reveal the complex and dynamic interaction patterns between a diversity of actors with a range of interests and narratives within the context of experiencing multiple stressors.

Outlining the system components

The conceptual framework of the study approaches the coastal ecosystem by outlining three spatial components within its adaptation governance framework. The three main components of interest are the local level, the regional and national level and the interaction interface where the local and national level interests and narratives interacts

Figure 2.3: Conceptual framework



i. National and Regional level

The national and regional level component focuses on the policies that represents the national and state government interests and narratives. It includes the multitude of actors that influence the framing of those narratives and are integral to the policy planning and formulation. This include the national and state government agencies, international organizations and civil society organisations. Any policy is the product of the interaction between the different actors at the national and sub-national level. Adaptation decision-making, specifically within climate change context, is a multi-actor process. The national and state government, drawing from the expertise of their range of agencies, are central to the decision-making at this level. However, international donor agencies and national non-governmental organisations also shape the process with varying level of influence.

ii. Community scale

The other central component of the conceptual framework is the community scale. The community scale or the local level here refers to the community and regional level institutions and dynamics. This component focuses on understanding the governance process at the more well-defined district to village level formal institutions and the complexities of the local or community level socio-political dynamics. The actors thus at this level are much more diverse and the interacting narratives and interests more complex and dynamic. The study of local level dynamics reveals the contextual factors at individual and collective level within which the policies are implemented, contested, negotiated and reproduced as actual practices of adaptation. The community scale dynamics is explored through the contextual vulnerability of the community to identify the external stressors and internal (community specific) socio-economic factors that shapes the perceptions and narratives of households and hence influences the coping and adaptive strategies that a household pursue or avoid.

iii. The Interface

The interface in this study is approached as a scale at which policy and practice interaction patterns can be captured. The policy-practice interface represents the complexity of interaction among different actors across the local and national and subnational scale. The interface approach attempts to map out the different interaction patterns of adaptation decision-making that emerges at the research location within the given structural context of dominant policy discourses and the specific socio-political local vulnerability. These components focus on the actor interests and the resulting personal or collective narrative

that is shaped at the individual level informed by individual cognition, motivation and worldview and by the household capacity to access and own resources.

Conclusion

This chapter provides a critical review of the key literature shaping the research debate about – adaptation, adaptation governance and power and politics within adaptation governance. This chapter also introduced a conceptual framework that this study has adopted to understand the research problem. The key components of the conceptual framework and the theoretical lens underpinning the study were also explained to provide a detailed description of the theoretical and conceptual understanding that informed this research. This is followed by the context chapter which provides a detailed account of the location-specific context focussing on the broad Indian context and specifically on the geographical, demographic, social and livelihood profile of the research location Jamboo and Rajnagar block in the Kendrapara district of the state of Odisha.

3. Context

3.1 Introduction

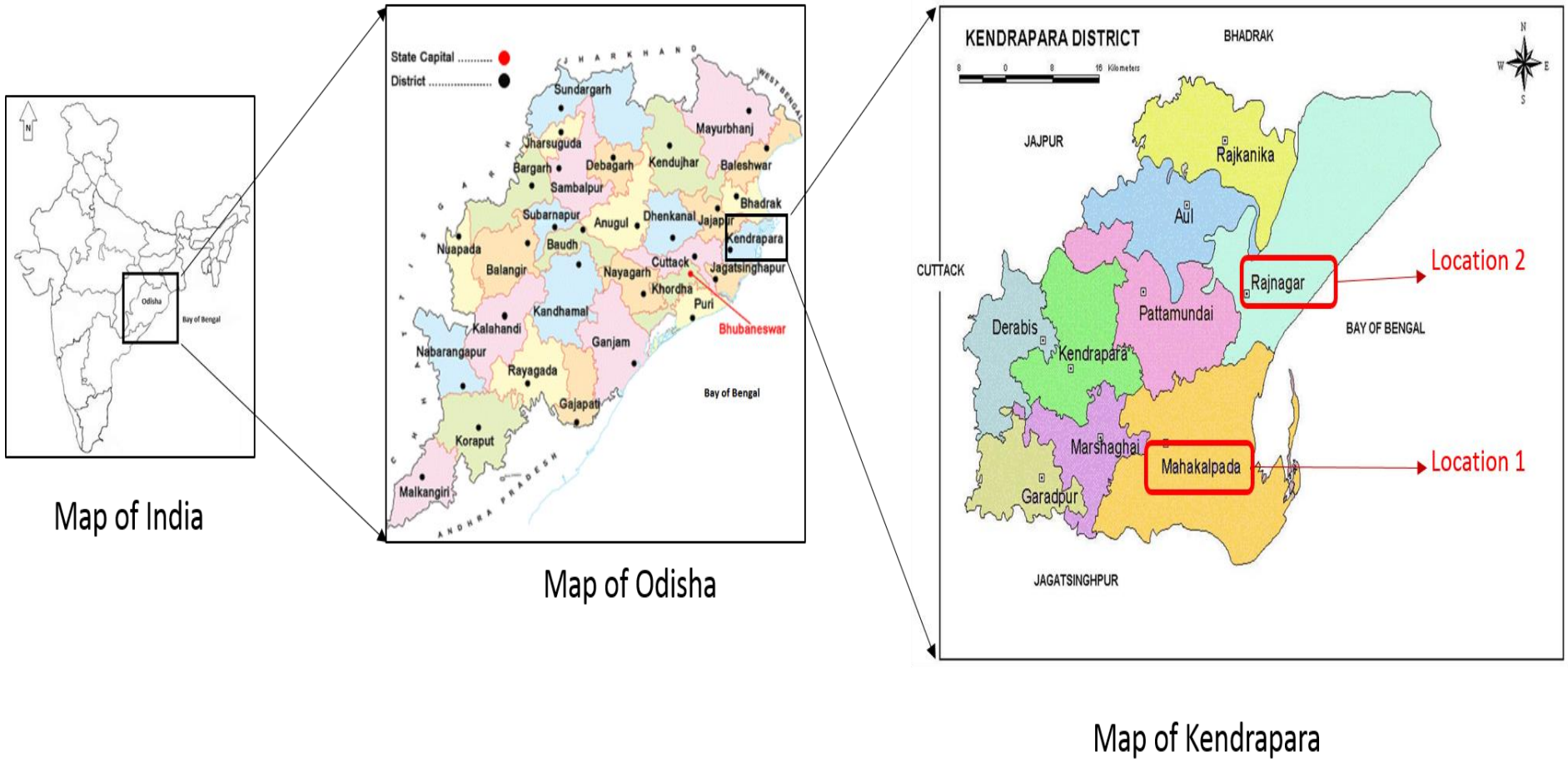
The study is carried out in Kendrapara, one of the five coastal districts of Odisha, situated on the eastern coast of India. The study focuses on two locations along the coastline in Kendrapara district, chosen on the basis of the state cyclone vulnerability map[1], livelihood diversification and socio-cultural profile/makeup of the community (Narayan, 2011). This chapter uses secondary data to present a physiographic-demographic, socio-economic, cultural, livelihood, political profile of two research locations. It examines the social and historical context of the region to facilitate understanding of power and agency dynamics in the communities as it is now being played out.

3.2 Research Location

The state of Odisha, located on the eastern coast of India, is the ninth largest state and covers 4.7% of land mass of India. It is the 11th most populated state of India, with 41.95 million people accounting for 3.47 % of total population of India[2]. Odisha consists of 30 districts which are grouped into 3 revenue divisions - central, southern and northern. These divisions consist of 58 sub-divisions and 314 blocks (Odisha Reference Annual, 2011, Government of Odisha). The study focuses on Kendrapara, which is one of the six districts that forms the state's coastline (Fig. 3.1). Kendrapara, carved out of Cuttack district (erstwhile State Capital) in 1993, has 230 Gram Panchayats formed of 1591 villages which constitutes one sub-division (Kendrapara town) and 9 blocks of the district covering an area of 2644sq.km of which 10.74% is under forest (State of India's Forest, 2015). The districts cover 1.7 % of the area of the state and supports 3.43% of the population of the state. Two administrative blocks along the coastline were selected for conducting this research and one village cluster, comprising of three villages each, was delineated in each block as a research location.

[1] See Appendix IV for the cyclone vulnerability of Odisha and the research locations
[2] See Section 3.2.1 and Table 3.3 for demographic details comparison

Figure 3.1: Map depicting the two study locations



Source: District Rural Development Agency (DRDA), Kendrapara

Mahakalpada block, with a total of three villages, under Jamboo gram panchayat was selected as the research location 1 (Figure 3.2). Location 1 has a diversified livelihood base with fisheries as the primary livelihood followed by agriculture, livestock rearing, horticulture crops, daily wage labour, and small business as other livelihood strategies. The community is predominantly of Bengali ethnicity, internal refugees from the neighbouring district of West Bengal settled in the region since 1950s (Table 3.1). The gram panchayat is around 50 km from the district headquarters, Kendrapara and all the three villages are within 5 km from the coastline.

Figure 3.2: Map depicting the three study sites (villages) in location 1

Source: Odisha Space Applications Centre (ORSAC), Government of Odisha, 2015

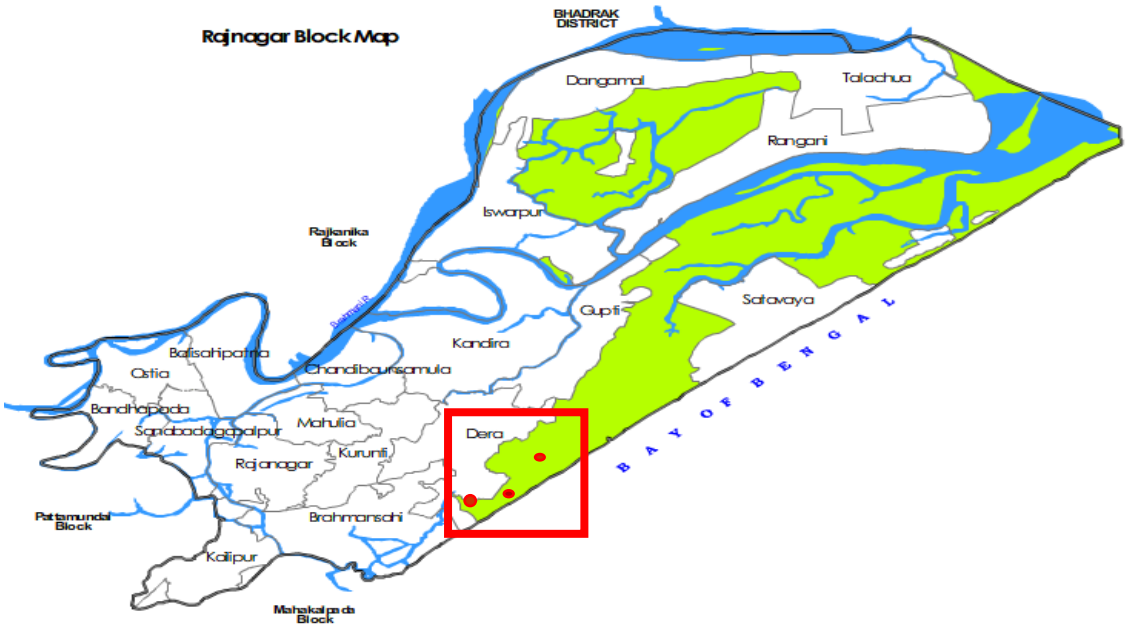
Table 3.1: Demographic details of location 1

Village	Area (ha)	Total Population	SC (Scheduled Caste) population	ST (Scheduled Tribe) population	Total households	Cultural composition
Jamboo	894	7061	1715	159	1588	Bengali ethnicity
Bhateni	528	1444	38	90	280	
Kandrapatia	116	292	91	0	63	

Source: Census, 2011, Government of India

In research location 2, also three villages were selected as a cluster with two villages under Dera Panchayat and 1 under Brahmanasahi Panchayat (Table 3.2). This is predominantly an agricultural community constituted of native language speaking Odia households. The other livelihoods practiced in this cluster includes livestock rearing, basket weaving and daily wage labour. Similar to cluster 1, the gram panchayat is around 50 km from the district headquarters, Kendrapara. All the three villages in research location 1 are also located within 5 km from the coastline (Figure 3.3).

Figure 3.3 : Map of Research location 2 – Rajnagar Block



Source: Odisha Space Applications Centre (ORSAC), Government of Odisha, 2015

Table 3.2: Demographic details of location 2

Village	**Area (ha)**	**Total Population**	**SC (Scheduled Caste) population**	**ST (Scheduled Tribe) population**	**Total households**	**Cultural composition**
Kaitha	195	971	372	0	196	Oriya ethnicity
Chinchiri	121	306	0	0	67	
Pentha	192	402	0	0	103	

Source: Census, 2011, Government of India

3.2.1 Demographic Profile

Kendrapara is the 26th district in terms of size and 14th in terms of population size and 7th in population density in the state (Table 3.3). The population stands at 1.44 million with 94.2% of its population residing in rural areas (Census, 2011). Its population is predominantly rural at 94.2 % similar to the state's majority rural population at 83.32%. The overwhelming rural population of the district reflects the dependence on natural resource-based livelihoods of communities in this region.

Table 3.3: Comparison of Demographic Profile of India, Odisha and Kendrapara

Parameters	**India**	**Odisha**	**Kendrapara**
Total Area (sq.km)	2,973,190	155,707	2644
Total Population	1,210,193,422	41,947,358	1,439,891
Decadal growth rate (%)	17.64	14	10.59
Population Density (per sq. km)	382	270	545
Male Population (%)	51.54	50.54	49.84
Female population (%)	48.46	49.46	50.16
Gender Ratio	943	979	1006
Urban population (%)	31.96	16.68	5.8
Rural population (%)	68.84	83.32	94.2
Literacy rate (%)	73.0	72.9	85.93
Urban literacy rate (%)	84.1	85.7	92.45
Rural literacy rate (%)	67.8	70.2	79.51
Male literacy rate (%)	80.9	81.6	92.45
Female literacy rate (%)	64.6	64.0	79.51

Source: Census, 2011; Government of India, World Bank, 2014

Odisha, also, ranks as one of the poorest state in India. Although it has shown rapid decline in abject poverty levels over the years, it still has one of the highest poverty rate (32.59%) as compared to the national average of 21.92% (RBI, 2012). Although Kendrapara is relatively better in per capita income in comparison to western districts but with its disaster prone agricultural economy, its poverty level remains high.

Although, at a very good position in literacy rate (85.4%), it lags in progress in other development sectors. The literacy rate is 73.45 % against the national average of 74.04%. Socio-culturally, majority of the population is Hindu with minority population of Muslims, Christians and Sikhs. Caste-wise, nearly a quarter (22.2%) of its population belongs to scheduled caste and tribes (Census, 2011). The scheduled castes (21.5%) is dominated by three major castes Kandra, Dewar and Dhoba while scheduled tribes (0.7%) is primarily composed of Santal, Shabar, Munda (Orissa Review, 2010, Government of Odisha).

3.2.2 Physiographic and Climate Profile

Geographically, the state is bounded by four states on three sides while the eastern part is surrounded by the Bay of Bengal, owing to which it has a coastline of 470 km (Fig.4). Physiographically, it is divided into five regions, the eastern coastal plains, the middle mountainous and upland region, the central plateaus, the western rolling uplands and the flood plains. Its five physiographic regions are further sub grouped into ten agro-climatic regions. It has 11 rivers, of which the six major rivers draining the land are Subarnarekha, Budhabalanga, Baitarani, Brahmani, Mahanadi, and Rushikulya. The coastal plains stretch from Subarnarekha River in north to the Rushikulya River in south. They are primarily deltaic coasts with northern coastal plains formed by delta of Subarnarekha River, middle coastal plains formed by combined deltas of Bhrahmani, Baitarani and Mahanadi and southern end of this deltaic coast formed of Rushikulya plains. Both research locations are part of middle coastal plains and have extensive networks of distributaries and tidal channel criss-crossing the topography. Kendrapara district has a coastline of 48 km stretching from Dhamra *muhana* (river mouth) to Batighar.

Research location 1 is flanked by the distributaries of the river Brahmani on the northern side and Mahanadi on its western and eastern side and on the northern side of river Brahmani lies the research location 2. The distributaries of the rivers opening into the sea also act as tidal channels ranging from 30-45 km inward and hence the saline content of the river water and the ground water shows seasonal fluctuations.

The coastal plains of Odisha extend to 27-72 km inwards from the coast and covers 15% of its geographical area. The soil of coastal plains is alluvial, both deltaic and saline. The deltaic alluvial soils though highly fertile lacks in Nitrogen (N) and Phosphorus (P) (IRRI, 2012). The soil type within 25 km inwards from the coast is coastal/saline alluvial and is marked by high soluble salts of chloride and sulphate occurring with magnesium and calcium. Hence, the soil of Kendrapara ranges from deltaic alluvial and black soil to saline/coastal alluvial as we move towards the coast. The saline alluvial soil is only suitable for paddy as the Kharif crop. However, a variety of salt tolerant Rabi crops like barley, cucurbits, chilli, tomato and green leafy vegetables also grow well on upland farms (Orissa Review, 2005). Both the research location lie on the coastal alluvial soil belt and shows a seasonal fluctuation in saline content of the soil and water.

The climate of Odisha is classified as *tropical sub-humid* characterised by a hot and humid summer and a short and mild winter with medium to high rainfall which holds true for Kendrapara too. As rest of the India, Odisha receives most of its rainfall (75-80%) from the south-west Monsoons that extends from June to September. The annual normal rainfall is 1451.2 mm for Odisha while the normal annual rainfall of Kendrapara is slightly higher and pegged at 1582 mm. However, the rainfall patterns show high intra-season and inter-season variability and the annual rainfall varies from 1000-2000mm. The rainfall also shows spatial and temporal variability with fluctuating rainfall frequency and intensity in different districts and uneven distribution periods during the monsoons. The monsoons are hence marked by cyclones, floods and often drought. While the deltaic and coastal plains experiences floods and cyclones, western Odisha is vulnerable to periods of drought. In the period from 1951- 2010, the state has experienced flood for 35 years, 22 years of drought for 22 years and cyclone for 8 years (2004,2011), with these extreme events sometimes occurring in the same year. Kendrapara, with its deltaic coastal topography, has experienced 17 cyclonic storms during the period of 1891-2008, of which 6 were severe cyclones. The entire district is classified as cyclone vulnerable while 35.5 % of the land area is vulnerable to floods.

The district is ranked as one of the most vulnerable districts to natural hazards, especially to tropical cyclones. (Patwardhan et al., 2003; Sharma and Patwardhan, 2008). Nevertheless, after the Supercyclone of 1999, the state government is increasingly focussed on reducing vulnerability to natural hazards and climate variability in its development agenda. The government of Odisha has now different sectoral plans that

includes natural disaster and climate variability concerns (Climate Change Action Plan, Odisha State Disaster Management Policy, and Agriculture Contingency Plan, Integrated Coastal Zone Management Plan).

3.2.3 Livelihoods Profile

Agriculture is the mainstay of Odisha's economy with 41.2% of its geographical area under cultivation. Although only 15.4 % of Gross State Domestic Product comes from agriculture (Orissa Economic Survey, 2014-15), about 60% of workforce in the state is engaged directly or indirectly in agriculture for employment and livelihood (Table 4.4). The major proportion of agriculture workers (83%) are small or marginal holders with an average landholding of size 1.54 ha which accounts for 53% of the total land holdings. Out of the 6.44 million hectares of land, 34% have access to irrigation facilities while 66% is rainfed, depending particularly on monsoons for irrigation (State Agricultural Policy, 2013). However, an agrarian economy means that the state is highly vulnerable to natural disaster or climate variability. Further, owing to its geographical location and drainage, the state, particularly, the coastal plains are vulnerably to water logging. Out of its 6.05 million hectares of cultivable land, 0.3 million hectares is vulnerable to water logging while 0.4 million hectares is vulnerable to salinity (Odisha Agriculture Statistics, 2011-12). However, the government of Odisha has tried to encourage a move towards more industry and service-based sectors to reduce its economic vulnerability to extreme events that it nearly experiences in one form or other annually.

As Odisha, Kendrapara has also a highly agriculture dependent economy. Out of its 0.26 mha of land, 0.14 mha is under crop cultivation. The dominant crop is paddy accounting for 90% of the food grain production. However, a gradual shift towards cash crops has been noted in past decade (ES, 2014-15). Paddy is grown both as a Kharif and Rabi crop in Odisha, depending on the local soil characteristics and irrigation facilities.

Geographically, two distinct types of landscape are dominant in this district, the marshy tract of land along the coast and the fertile deltaic plains which are prone to frequent flooding. It is these fertile deltaic plains that the majority of the population depends on as a source of livelihood. Agriculture is the main means of livelihood in the district with 66.3% of workers directly or indirectly engaged in agriculture (Table 3.4). Majority of the farmers are smallholders (74.2%) with landholdings less than 2 hectares (Table 3.5). About 68.9 % of its 0.264 million hectares geographical area is cultivable of which 86.75% of

area is sown with crops, primarily paddy. Within this district, 53.44 % of net sown area depends on rains and rest 45.6 % under different sources of irrigation. Paddy is the main crop accounting for 77% of total cultivated area and as both a Kharif crop and as a Rabi crop[3] with other major crops like green gram, black gram, jute, groundnut and sunflower.

Odisha ranks ninth in fish production in India an accounted for 4.5 % of total fish produced in India in 2012-13. The fishery sector has shown growth over the past decade fuelled by increase in fish production value and hence increase in production and export of fishes within and outside the country. Odisha is fourth largest shrimp exporter in India, with Kendrapara being one of the major contributors. It also has significant livelihood dependence on fisheries, which includes inland, brackish water, freshwater and marine fisheries. Among the six coastal districts, it is home to 9% of the fishery dependent population and currently accounts for around 6% of the state marine catch (2012-13) (Fisheries Statistics, 2014, Government of Odisha). Also, located in the district, is the second largest mangrove of India, Bhitarkanika, which is a significant source of fishery dependent and forestry dependent livelihoods for the communities in and around it.

Table 3.4: Work participation details of Kendrapara district

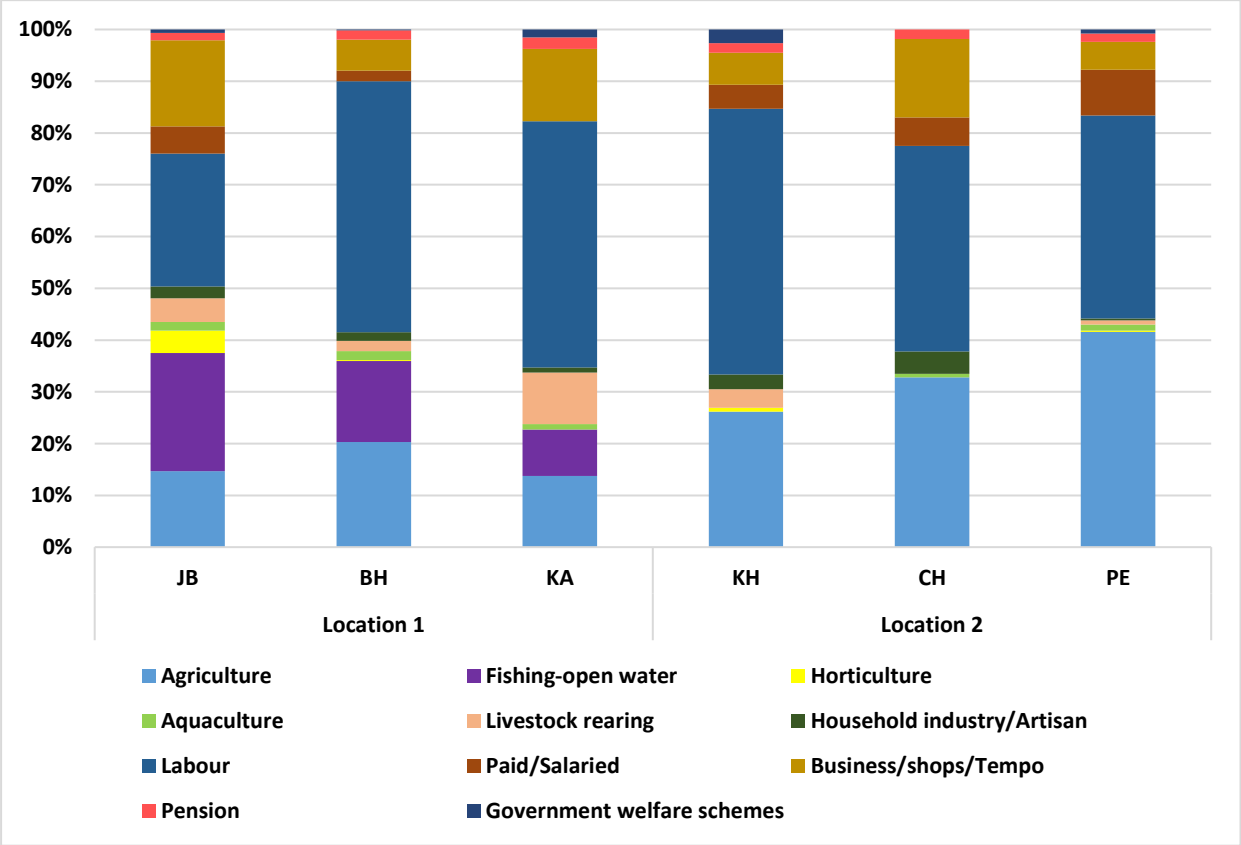
Worker Groups	**Total**	**Rural**		**Urban**	
		Male	**Female**	**Male**	**Female**
Total workers	466,890	363,357	76,341	23,025	4,167
Main workers (%)	69	75.7	31.5	90.2	55.1
Marginal workers (%)	31	24.3	68.5	9.8	44.9
Cultivators (% to total workers)	32	36.7	17.6	8.8	11.5
Agricultural labourers (% to total workers)	30.8	31.1	36.4	8.5	22.0
Household industry workers (% to total workers)	3.5	3.0	6.4	2.4	6.3
Other workers (%)	33.7	29.2	39.6	80.2	60.2

Source: Census, 2011; Government of India

[3] Kharif crops are harvested during winter season (June to October) and Rabi crops are harvested during summer season (October-March). Pre-kharif crops are also known as autumn crops and are harvested during monsoons (May-August)

The livelihood profile in both location 1 and location 2 show a similar composition (Table 3.5). Although location 1 and location 2 differs in having fishing and agriculture and the primary livelihood respectively. Both location 1 and 2, has households practicing casual or permanent labour as a livelihood alternative and views it as a significant contributor to their livelihood basket. Labour activities, in both clusters, includes agricultural labourers, daily wage labourers working mostly in construction and infrastructure related activities and those employed on a daily wage basis in factories like textile and heavy machinery across the country and few households with family members in Middle East Asia. Livestock also is more important as a livelihood alternative in location 1 as compared to location 2.

Graph 3.1: Sources of income generation in the study locations



Source: Household survey (January-September, 2015)

Farming systems

Paddy is a major crop in Odisha grown in all its ten distinct agro climatic zones. It is the fifth largest producer of paddy in India contributing to 7.12% to total rice production in India in 2013-14 (Agriculture Statistic at Glance, 2014; GoI). In 1950s, Odisha used to be

the leading producer of rice in the country but after introduction of HYVs the state is lagging. Although the state reports of having 88.9 % of total area cropped for rice being covered by HYV but the productivity continued to be significantly lower than the national average (Agriculture Statistic, 2013-14; GoO). In 2013-14, the state rice yield is reported to be 1815 kg/ha as compared to the national productivity rate of 2424 kg/ha (Agriculture Statistic at Glance, 2014; GoI). Paddy is cultivated in 46.1 % of the total cultivable land in Odisha and is mainly a rainfed crop like most crops in state. Agriculture in Odisha is significantly rainfed with only around 41.3 % of cultivable cropland under any irrigation measures (Agriculture Statistic, 2013-14; GoO). Rice accounts for around 62% of the total area dedicated to food grains cultivation and paddy is a staple diet of the region. Paddy is the primary crop in Kharif season while pulses and oilseeds are important crops of Rabi season.

Kendrapara with its fertile flood plain and extensive rivers is a major paddy growing region. Paddy is grown both as both a Kharif (winter rice) and Rabi crop (summer rice) in the flood plains and sometimes the farm lands also supports a pre-Kharif paddy crop (autumn rice). However, moving towards the coast, the soil and river channels becomes increasingly saline. These coastal tracts are marked by low-lying topography, poor drainage, high water table of saline water and poor soil texture. These topographical features in addition to lack of irrigation facilities and lack of accessibility to high yielding salt tolerant rice varieties has led to single crop practice in the farmlands along the coastline. Paddy is grown only as Kharif crop in these regions during monsoons as the salinity remains low due to dilution and leaching. Further, salt tolerant rice varieties grown in these regions have low productivity (500-700 kg/ha) (FAO, 2012). However, importance of paddy as a dietary necessity as well as its socio-cultural importance has contributed to lack of diversification to other major crops by the farmers.

Farming system has remained markedly unchanged in the coastal regions. The paddy cultivation has shown a gradual shift to HYV (High Yield Varieties) throughout Kendrapara. However, HYVs has meant an increase in initial investments as they require more fertilizers, pesticides and timely irrigation. However, HYV are mostly dwarf varieties which is not suitable for the primarily lowlands of the coastal tracts. So, although most paddy farmers have made the transition to HYVs those with lowland farms have to depend on shorter indigenous varieties which could stand deep to semi-deep saline water even though the yield of these varieties remain low.

Table 3.5: Comparison of Land holding patterns of Odisha and Kendrapara

	Kendrapara (District)	**Odisha (State)**
Total no. of land holdings	162140	4667466
Average land holding size (ha)	0.78	1.02
Social Groups (in %)		
Marginal (<1 ha.)	74.2	72.2
Small (1-2 ha.)	19.02	19.7
Semi-medium (2-5 ha.)	5.95	6.67
Medium (5-10 ha)	0.8	1.4
Large (>10ha)	0.007	0.12

Source: Agriculture Statistics 2012-13, Government of Odisha

The average land holding size in the district is significantly less than the state average and the land holding size comparatively small as well (Table 3.5). This indicates the higher population and a higher land fragmentation and hence a lower return for farming households.

Table 3.6: Landholding Pattern in Research Location

Villages		**Land owners (%)**	**Landless (%)**	**Average land holding size (ha)**
Jamboo	Cluster 1	58.5	41.4	0.76
Bhateni		57.4	42.6	0.64
Kandrapatia		55	45	0.51
Kaitha	Cluster 2	50	50	0.41
Chinchiri		66.7	33.3	0.68
Pentha		36	64	1.1

Source: Data from household survey, January - August 2015

Farm land ownership shows a similar pattern in both location. Nearly half of the respondents' own farm lands, except village PE (Table 3.6). The lack of land ownership in village PE could be attributed to coastal erosion. The village PE is located along the

10% stretch of Odisha coastline that is highly vulnerable coastal erosion[4]. This was also reflected in the interviews with farmers, where they perceived a significant loss of farm land to coastal erosion and its impacts like increased soil salinity along the coastline and storm surges.

The landholding size of farmlands in both the locations is found close to the official land holding size data of the State. The farmers in both location are small holder farmers with all the villages with landholding size less than one ha, except village PE. The land ownership and landholding size difference of village PE from rest of the communities, could be attributed to the composition of the village. Unlike, other villages in location 2, although village PE is an Odia-speaking community, it has a significant population of Bengali community with no land tenure rights. The Oriya community is the only landholding population in the village which reflects the larger landholding size and skewed land ownership ratio.

Both the location 1 and 2, are situated on the coastal belt which is marked by poor soil quality and lack of irrigation. Hence, paddy (rice) is the only crop that farmers cultivate as a livelihood strategy in both the locations. The land supports one cropping season of paddy annually which is sown at the start of monsoon (June) and harvested as winter arrives (December) (Picture 3.2). The farmlands, in most cases, remains fallow rest of the year (February – June) and acts as grazing land for livestock (Picture 3.1).

Photograph 3.1: Paddy farms in Jamboo (location 1) during the fallow period

Source: Fieldwork, Jamboo [Photograph taken by researcher on 12.02.2015]

[4] http://cwc.gov.in/CPDAC-website/CPDAC%20Meeting/12th%20Meeting/Presentation/Coastal%20Erosion%20in%20Orissa.pdf [Accessed on 12.07.2014]

Photograph 3.2: Paddy farms in Kaitha (location 2) during sowing season

Source: Fieldwork, Kaitha [Photograph taken by researcher on 25.07.2015]

However, a number of farm lands, if they are upland areas and are closer to irrigation sources like pond, well or tube well are used by farmers to grow vegetables like potato, cucurbits, okra and green leafy vegetables during summer season (March – June). In addition, most households do have vegetable gardens in backyards growing a range of vegetables like tomatoes, okras, aubergines, gourds, pumpkins and different green leafy vegetables over winters and monsoons for household consumption. The availability of irrigation sources in most household backyards like ponds or sometimes tube wells and good soil quality maintains salinity levels in backyards gardens and the ability to better protect the gardens from cattle and wild animals are major factors encouraging household backyards gardens in the region. Backyard vegetable gardens are essential for food security in these regions as remoteness and topography has meant that households have limited option to grow vegetables or access fresh vegetables at affordable prices from other vegetable growing regions in the district. The Odisha Livelihood Mission, a Government of Odisha Scheme for diversifying rural livelihood has also contributed in encouraging farmers to take up backyard gardens. Since, its inception in 2010, the scheme has distributed free vegetable seeds to many households under its 'Mo Badi' (*my backyard garden*) scheme. The scheme also provides financial and technical assistance for building biogas plant to encourage organic farming which maintains a steady supply of organic fertilizer rather than depending upon external supply of chemical fertilizer. The scheme particularly focuses on women farmer's as mostly backyard gardens are taken care of by female household members in the region. The scheme utilizing the networks of its women

SHG groups, that had been formed for credit and financial schemes, have been able to encourage female members of households to focus on backyard gardens.

Horticulture

The presence of fertile sandy loam soil along the coast of Odisha also supports different vegetable and cash crop farming at small scale. Farmers in Location 1, taking advantage of the topographic factors, have been cultivating betel vines since past few decades (Photograph 3.3). Also, per household, most farmers have much larger backyards to support such plantation. Betel vine farming is cost intensive in its first few years as it requires artificial greenhouse and supporting structures and high demand for irrigation to maintain its humidity. Although the initial inputs and maintenance can cost a lot of resources, it is a high-return farming option too. However, post 1999 cyclones huge losses were suffered by the farmers who usually take a loan for initial inputs and maintenance. Following that for few years, betel vine cultivation was dropped by farmers. However, without any major cyclonic experience in last 15 years, farmers have gained confidence and in the last 2- 3 years many farmers have returned to betel vine cultivation. Location 1 also has cashew nut farms and other fruit trees like coconut, sapota, lemon etc grown on small scale and sold in local markets. Government has made plans to provide assistance upto 50% during the first year of betel vine cropping under its new 'Specific crop plan scheme – betel vine' (Economic Survey 2014-15).

Photograph 3.3: A betel-vine farmer in location 1

Source: Fieldwork, Jamboo [Photograph taken by researcher on 01.02.2015]

Fishing

About 1.7 million people in Odisha depends upon fisheries as a source of livelihood, which accounts for 4% of its total population (Economic survey, 2014-15). While around 0.89 million depend on inland fishing, marine fishing dependent population is about 0.81. Out of this, the six coastal districts of Orissa have 114,238 fishermen families, mostly concentrated along its coastline and along its numerous river mouth and along rivers. Kendrapara district accounts for 13% of this population. It has 117 fishing villages housing 13,257 fishing households of which 41.1 % of households are below poverty Line (BPL). The fishing household could be engaged in a number of fishing and allied activities. The activities include fish seed collection, fish marketing, peeling, processing and curing, making/repairing nets and working as a labourer. In coastal Odisha, about 52% of the fishing population is engaged in active fishing and it is primarily male dominated. The rest of the population engaged in fishing related activities is, however, represented mostly with women (54%). Women play a very important role in post-harvest and shore-based activities like processing/curing and even selling the dried fish. In Kendrapara, out of the 38962 individuals working in fishing and allied activities, 48% are active fishermen followed by 25.7 % working as labourers, 15% in fish marketing and rest 21.3 % in other allied activities. In Kendrapara, about 36% of the fishing population in the allied sector are

labourers, which is highest among the six coastal districts. The fishing fleet and crafts are also diverse along the coast and depends upon the fishing requirement and affordability. While in the six districts of coastal Odisha mechanized, motorized and non-motorized boats are used, in Kendrapara the fleets are mainly motorized or non-motorized boats like dinghy or danga, built-plank motorized or non-motorized boats. Trawlers are mostly used for deep sea fishing

Location 1 is predominantly a fishing community (Table 3.7). All the households in the location 1 are thus involved in the fishing trade at different levels and to different extent. The practicing fishers are involved mostly in inland and onshore fishing. A small proportion of the households are also employed in off shore fishing and work in commercial mechanised trawlers in the nearest port (Paradip National Port). Also, few households who have moved to other business or formal sector or have invested in allied sectors like fish trading and aquaculture like shrimp, crab and fish farming. Women in many fishing households are actively engaged in catching and selling of crabs and shrimps, and preparation and selling of dry fish in local markets (Photograph 3.4)

Table 3.7: Details of fishing households in location - 1

Villages	Fishing dependent households	Traditional Fishing-dependent households	BPL families	Fisherfolk Population
Jamboo	859	849	437	3721
Bhateni	165	159	69	764
Kandrapatia	79	77	56	327

(Source: Marine Fisheries Census, 2010 (II), Odisha)

Fishers in location 1, predominantly, belong to poor households and mostly work as daily labourers in a traditional wooden plank boat (*dinghy*) or a small motorized boat (*bhutbhuti*) (Photograph 3.4). Fishing practice is still primarily traditional and is characterised by small scale fishing methods (Table 3.8). The fishers with traditional *dinghy* usually fish within the backwaters and employ their family members as help. These boats usually have 2-3 members taking care of the fishing process. In case of the motorized boats, the fisher owning the boat usually employs a small team of fishermen (6-7 labourers) on the boat for catching fish. The fishing days normally are 15 days in a month depending upon wave and wind conditions. Each fisherman on the boat get their wage as a share depending upon the

catch on the day. This makes the fishing livelihood extremely unpredictable and vulnerable to climatic and non-climatic factors.

Photograph 3.4: Fishing boat (left) and women preparing dry fish (right) at location 1

Source: Fieldwork, Location 1[Photograph taken by researcher on 12.02.2015]

Table 3.8: Characterising fishing practice in location 1

Fishing grounds	Inshore (coastal and estuaries) Offshore (beyond
Fishing season	May - September
Fishing duration	6-7hrs and 15days/month
Type of boat	Mechanised wooden boat (*Dinghy*); 6-9m Danga (non-mechanised)
No. of fishers per boat	1-2 (non-mechanised)
	4-6 (mechanised)
Cost-estimate of a boat with engine	0.4-0.5 million INR
Fish species harvested	Sardines, croakers, pompfrets, catfish, Hilsa, prawns
Marine fishing grounds (distance from shore in km)	2-20 km
Fishing bans under conservation regulations	15th April-14th June for breeding season (offshore and open sea banned) 1st November – 31st May (offshore banned)

Source: FGDs and key informant interviews with fishers (January- September, 2015)

The fishing practice is also highly unstable financially. A wooden plank boat usually coasts around 0.4 – 0.5 million INR and to own a boat, fishermen usually take a loan from one of the fish traders. These traders serve as middlemen and are usually fish marketers/exporters. The traders provide loans for buying boats to the fishermen on lieu of contracts that the catch they get will be only sold to them at a fixed price. The fishermen as they continue to pay off debts and are bound to supply their catch to the traders who takes care of storage and marketing the fish. The fishermen also depend upon loans from the traders to buy/mend fishnets and maintenance of boats. This practice has proved both beneficial and harmful to the fishermen. The lack of a regulated fish market nearby has meant that fishermen find it difficult to market their fish and get the right price as it rises or falls in national markets. There are also no cold storage facilities for fish and shrimps within the gram panchayat. The ability to quickly offload the catch to the trader protect the fishermen against losses due to storage issue and market accessibility. However, this also has led to the fishermen not being able to fully profit from the increase in catch prices as and when they change, since the prices are determined and already fixed by the trader beforehand.

Location 2 has a small fishing population confined to inland fishing. The fishing is along the tidal channels and rivers. The fishing is mainly manual and at a small scale and caters to the local market.

Kendrapara coastline is one of the eco sensitive zone. The coastline covers the Bhitarkanika National Park, a mangrove forest region with rich biodiversity. In addition, the coastline attracts thousands of Olive Ridley Turtle annually and serves as their nesting sites. The turtles nesting season is January – February and the hatchlings return to sea in April-May.

Artisans

The village clusters under study are mostly dependent on farm-based livelihoods. However, Location 2 has a sizeable population of artisans (basket-weavers) who collect reeds and fibrous grasses from river and estuarine swamps for basket weaving, mats or other storage utilities. All the households involved in this livelihood belongs to a scheduled caste group and it has been the traditional livelihood of these households.

Photograph 3.5: Basket-weaving households in location 2

Source: Fieldwork, Kaitha [Photograph taken by researcher on 30.06.2015]

Livestock

The major livestock in coastal Orissa includes cow, buffalo, goats and poultry. Out of this 58% of the livestock is cattle – which includes cow and buffalo (19th Odisha Livestock Census, 2012). According to the 19th Livestock Census, livestock population has decreased by 5.59% between the inter-census period of 2007-2012 and this decline is reflected similarly across all the different livestock. Especially, notable in the census was the decline in population of buffalo by 39% and swine population by 54.7%.

Livestock not only is part of livelihood but is also part of the socio-cultural practices. Many households have cows because, in addition to milk for home consumption, they are integral to their religious life. Location 1 has a significant population of goats and poultry like chickens and ducks. A number of households are doing good business rearing livestock. Especially, women headed households or women family members are involved in rearing and selling livestock.

In location 2, livestock is dominated by cow and buffalo primarily reared for dairy purpose. Socio-culturally the village clusters have been home to buffalo herders and hence dairy has always been a significant livelihood option (Photograph 3.6). Goat-rearing and poultry is also practised by few households but not necessarily with a focus on selling in case of most of them.

Photograph 3.6: Buffalo herder in location 2

Source: Fieldwork, Kaitha [Photograph taken by researcher on 15.07.2015]

Migration and Labour

The two communities under study are marked by a single annual crop season and fishing activities in the region are highly regulated and banned for seven months owing to wildlife conservation and marine resource protection laws and policies. This translates to both the fishermen and farmers being left with a significant period without any means of livelihoods. Although, as mentioned above, livestock rearing, basket weaving, and small business are practiced by many but most often these livelihood alternatives prove to be not enough as a main source of income. These factors have driven a surge migration from these areas to urban areas outside the district and state in search of temporary and sometimes permanent labour. The migration to labour forces from the both communities can be mainly categorised to temporary migration and permanent migration. Temporary migrants usually have fishing or farming or being farm labour as the main livelihood and in the off-season migrates to cities/towns within the state and sometimes outside the state to work as daily wage labour in construction or infrastructure sector. Permanent migrants usually depend upon labour work as main source of income and who may or may not come back during agricultural season to work as farm labour. As noted in the household interviews and case studies, permanent migrants are mostly employed as labour force in textile factories, heavy manufacturing sector or small business.

3.2.4 Political economy of Odisha

Odisha was part of the Bengal province until 1936. On 1st April 1936, Orissa became a separate province with its capital as Cuttack. It was in 1949, following the merger of princely states in and around Orissa, that this province became twice its size and the current boundaries of Odisha were drawn. The erstwhile capital Cuttack was replaced by Bhubaneswar as the new administrative and government centre. Finally, in 1993, the number of districts in the state increased from 13 to 30 and the state of Odisha, as it is known now, came into being. Kendrapara is one of the districts that was given a separate district status in 1993, being carved out of Cuttack district.

Orissa was one of the first province in India to be formed on linguistic basis. While the coastal Odisha and central Odisha is populated by the native Odia-speaking population. The northern end and parts of coastal Odisha has a substantial Bengali-speaking population and the southern end districts has significant Telugu-speaking population. The tribal population of Odisha is 22.85 % of its total population which is concentrated mostly in its western districts along the hilly tracts. According to the 2011 Census, it ranks third on the tribal population presence among all the states of India and 11th in the scheduled caste presence rank. The scheduled caste population is 17.13 % of its total population and is distributed throughout the state. Although, with predominantly natural resource-based livelihoods, Kendrapara fares relatively better on development indicators like economic security, health, education as compared to Odisha's geographically dry, mountainous and tribal population dominated western regions.

Politically, Odisha has been governed by the regional socialist party BJD (Biju Janata Dal) since last 18 years (2000-present). The BJD led government is currently in its fourth term in the state. Since, India is a federal system where State often depend on central budget for state services, the presence of a regional party in Odisha and the rival national party BJP (Bhartiya Janata Party) at the Centre has been a source on contention for the state government. The state has been relying on its mining resources and industrial progress for driving state growth (Kale,2013). However, Odisha still is second lowest in rank among the states of India in the Human Development Index Report (Planning Commission of India, 2011). The poor socio-economic condition is not worse throughout the state but concentrated in western Odisha. In contrast, Coastal Odisha has better socio-economic mobility and wealth distribution. (Kale,2013).

Political history of coastal Odisha

Coastal Odisha because of its extensive networks of mangroves and long coastline has been one of the landing coasts for Bangladeshi refugees. After the Bengal famine of 1942, inter-state migration between Odisha and West Bengal surged and many families migrated along the coast and settled along the coastline of Odisha by clearing huge tracts of forests to build houses and create farmlands. The, then state government granted these households lands to settle on a temporary basis. However, after 1971, there has been a steady increase in migrants from the neighbouring country, Bangladesh. Bangladesh formerly known as East Pakistan, separated from Pakistan and became a new independent country in 1971. It has been a growing cause of contention among the coastal residents and the government, as land which the Bengalis population from the neighbouring province is legally entitled to, are being taken over by the refugees. The similarity in language and general appearance has proven the task of identifying the illegal migrants for the government agencies difficult. In addition, the political patronage and vote bank politics in the region that has made the situation worse. In 2005, the Union government under the migration Act, 1956 put forth a notice known as 'Quit India' and asked the refugees to leave within a month. However, the political sensitive issue could not be executed, and the judicial system put a stay on it to under the issue could be discussed further.

Hence, the northern coastal districts of Odisha, at present, are a densely populated region with native Odia and Bengali-speaking households drawn from West Bengal and Bangladesh with diverse livelihoods like agriculture, fishing and livestock rearing. This diversity in demographic, socio-economic and topographical factors also makes these coastal belts not only complex when it comes to implementation of policies but also important to the political set up of the state.

3.3 Governance in Coastal Odisha: Institutions and Policies

3.3.1 Coastal zone and rural development: Institutions and policies

The existing institutional landscape of Kendrapara with regards to rural development and social welfare is similar as at the state level. A number of poverty reduction, financial security, livelihood security and food security policies and programmes are outlined at the state level and are being implement at the village level in the district (Table 3.9). The State has a number of its own rural development policies and programmes in addition to Central governments rural development and social welfare schemes.

Table 3.9: Details of State-funded development schemes and projects at research location

Schemes	Operational from Year	Aim
Public Distribution System, Annapurna Yojana (Senior citizen), Antodaya Yojana (Poorest of poor households)	2000	Ensuring household food security
Indira Awaas Yojana (Housing Scheme)	1985	Subsidised housing to poor households in rural areas
Bijju Pucca Ghar Yojana (Brick Housing Scheme)	2014	Subsidised brick houses to all rural households, especially, those not enlisted under Indira Awaas Yojana.
Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS)	2006	Employment security to rural household during off season
Pradhan Mantri Jan Dhan Yojana (Public Financial Scheme)	2015	Ensuring access to financial services like banking, savings, remittances etc.
Kisan Credit Card (KCC) (Farmer Credit Scheme)	1998	Farm credit scheme including agricultural loans and crop insurance
Biju Krushak Kalyan Yojana (Farmer Welfare Scheme)	2013	Health insurance cover for farmers and their families in rural Odisha
Mamata Yojana (Maternity Benefit Scheme)	2011	Financial assistance during pregnancy and nursing for poor women to ensure access to nutrition, medical care and as a partial wage compensation
Anganwadi	1975	Child day care centres for child nutrition and medical care
Madhu Babu Pension Yojana	2011	Pension scheme for Old age, Widows and Disable

Source: Developed by researcher after document analysis of policies

3.3.2 Coastal zone conservation management: Institutions and policies in Kendrapara

Kendrapara is home to rich biodiversity. The Bhitarkanika National Park is the largest and most diverse mangrove forest in the country and is a conservation area governed by the National Forest Act (1927). The mangroves forests along the coastline of Kendrapara is also regulated under the national forest laws which prohibits human activity in the forests to protect the depleting forest vegetation and the wildlife. Although, households along the coastline have now reduced dependence on forests for raw materials but an increase in wildlife (wild boars) and intrusion into farmlands is a growing concern and cause of

conflict between the community and law enforcers. In addition, the artisan community, which depended on the reeds and grasses from the forest floors to weave baskets as their livelihood, have now been stripped of their traditional livelihood.

The coastline along Kendrapara is also famous for mass-nesting of Olive Ridley turtles called 'arribada'. They annually nest, particularly along three stretches, Gahirmatha beach in Kendrapara and Devi river mouth in Puri and Rushikulya river mouth in Ganjam. However, increased fishing along the coast and poaching became a threat to the Olive Ridley Turtles and so to ensure a safe breeding season for the turtles and prevent poaching, about 1456 sq.km of Gahirmatha beach and coastal waters around it were declared marine sanctuary and fishing was banned. This was followed by banning fishing from November to May along the coastline using motorized boats. However, starting from November 2015, the State Government under the Odisha Marine Fishing Regulation Act (OMFRA), 1982, Wildlife Protection Act, 1972 and Odisha Marine Fishing Rules, 1983, imposed a seven-month ban (1st November to 31st May) on fishing along the coastline of five coastal districts from Rushikulya to Dhamra. This ban prevents fishing in the region of 20 km from the coast. This comes as an addition to the existing central government-imposed ban that restricts fishing along the coast for 60 days from 15th April to 15th June for fish spawning season.

3.3.3 Post Supercyclone Odisha: Institutional and policy change on climate change and disaster risk reduction

One of the disastrous cyclone of Odisha as well as of India is the super cyclone of 1999, named Cyclone 05B, which battered the eastern coast of India, particularly Odisha, with high winds and relentless rains for two days (29-30 October, 1999) in addition to tidal surges. The cyclone affected 128 blocks in 14 districts washing away six villages completely and damaging 59 villages partially. About 260km/hr winds accompanied the cyclone damaging infrastructure and powerlines with 7.5 m high tidal surges destroying villages 20km inland. About 2 million households and were affected and according to official estimate around 10,000 human lives were lost (NIDM). About 4.5 million livestock were killed and around 18.43 mha of standing crops was damaged. Combing it with infrastructural damage total losses were around 62.43 billion INR (Orissa Review, 2009). The massive loss of life and infrastructure brought a shift in the attitude and approach of National and State governments towards natural disasters and the growing threats and emerging narratives of climate change. This fostered creation and growth of a

number of National and state government supported organisation and programmes focussed on climate change impacts and disaster risk management (Table 3.10).

Table 3.10: Climate Change and Disaster Risk Reduction Institutions and Policies

Schemes	Organisation	Aim
Integrated Coastal Zone Management Project (2010-2015)	World-bank funded project executed by the State government	Coastline protection: Construction of geo-synthetic tube embankment along the eroding coastline of Odisha Livelihoods: Providing alternative livelihood opportunities for fishermen Human Security: Infrastructure-based coastal adaptation projects like cyclone shelters
State Climate Change Action Plan (CCAP) (2010-2015)	State government multi-sector focussed plan according to Central government mandate	Identifying vulnerable regions and sectors and potential state level plans for adaptation and resilience across sectors
State Disaster Management Plan (Annual)	State Disaster Management Authority (Since 1999)	Mitigation, capacity building and preparedness. Infrastructure-based interventions Early warning System Disaster awareness and evacuation training
National Cyclone Risk Management Project (2010-17)		Construction of disaster risk mitigation infrastructure like multipurpose cyclone shelter and saline embankments Early warning system

The Odisha Disaster Management Authority (OSDMA) was formed the following year. It was the first state agency in the country dedicated specifically to make plans and policies and execute and monitor disaster management schemes at state level. Odisha is also a pioneer in its drafting of the first Climate Change Action Plan (CCAP) at the state level after the Ministry of Environment and Forest (MoEF), Government of India made it mandatory for state government to submit five-year climate change plans. The state submitted its first CCAP in 2010 and currently in the process to submit its second CCAP to the centre. The CCAP covered different sectors from agriculture to infrastructure and

the state government's recognition of issues that climate change could pose for the coastal state and long-term plans and solutions that could be implemented in the state.

The state is also a part of the Integrated Coastal Zone Management (ICZM) plan being implemented along the coastline of three states of India since 2010. The 5-year plan funded by World Bank through the Ministry of Environment and Forests, GoI, is focussed on sustainable development of coasts and coastal livelihood security by adopting a multisectoral approach. It is being implemented along two stretches of coastal Odisha and involves schemes focussed on strengthening and diversifying coastal livelihoods, preservation of biodiversity and infrastructural development along the coasts. It is also instrumental in addressing the issues of coastal erosion and infrastructure interventions as adaptation measures

The state also has implemented a National Cyclone Risk Management Project with the support of World Bank under which projects on improving early warning systems, infrastructure projects like shelters, coastal embankments and canals and better communication channels like roads and bridges are being implemented (World Bank, 2013). The project is operational since 2011 and has about 28 multipurpose cyclone shelters already built while 148 more multipurpose cyclone shelters (photograph 3.7) are proposed for construction throughout coastal Orissa (Singh, 2013).

Photograph 3.7: Multi-purpose cyclone shelters at Kaitha (left) and Pentha (right) in location 2

Source: Fieldwork, location 1 [Photograph taken by researcher on 12.06.2015(left) and 04.07.2015 (right)]

3.4 Conclusion

This chapters contextualizes the research location and the research issues that are taken up in the study. The chapter provides an overview of the different physiographic, climatic, socio-economic features that shapes the dynamics of the region. It also details the different institutions and policies that are functioning at the local level and how these came into being and their current status in the community development narratives. This chapter offers a picture of highly natural resource dependent communities in a disaster vulnerable region grappling with issues of poverty, increased threats of climate change related events and changing political and socio-economic situations.

4. Methodology

4.1 Introduction

This chapter presents the research design and methodological approach adopted to achieve the aims and objectives of this study as stated in Chapter 2. Understanding vulnerability and adaptation as a socio-political process across different spatial level entails methods that could assist in capturing adaptation strategies at different spatial and temporal levels and also the dynamic decision-making process that leads to implementable adaptation strategies at different levels. Hence, a mixed methods approach will be used to collect data on vulnerability, adaptation and development policies that impacts the communities. Furthermore, to understand the concepts across and within different scales a single and embedded case study approach was adopted.

4.2 Research approach and epistemology

This research draws from different strands of epistemological underpinnings to achieve the primary research objectives. The research objectives were categorised into three components for ease of data collection. The first component (objective 1) involved examining the policy process of adaptation governance at the regional and national scale. The second component (objective 2) addressed examining the perception and social construction of vulnerability at the household and community level. The third and last component of the research (Objective 3) focuses on understanding the role of power relations and policy spaces during decision-making through an actor-oriented approach. Thus, the second component examines the contextual drivers of the vulnerability to multiple stressors on the basis of household perspectives and framing while the third component examines the adaptation practices contextualized in the broader policy and local socio-political context. The underlying epistemology of the second component and third component in this research is constructivism. The constructivism stance recognizes the importance of contextualizing respondents' views in order to understand their perspectives. This approach also acknowledges that vulnerability for a household to climatic factors or/and natural hazards cannot be constructed in isolation from the socio-economic and political context. Thus, this epistemological underpinning of this research reaffirms the conceptualisation of vulnerability as it views reality as multiple, complex, constructed and stratified (Robson, 2002).

People are shaped by their social, historical, cultural interactions as much as by the norms. Hence, the researcher through the constructivism lens, focuses on the interactions among various actors through which power is expressed (Crotty, 1998; Creswell, 2014). It also reminds the researcher that the interpretations within this research are also a product of the researchers own socio-cultural and personal interactions (Creswell, 2014). The importance of these interactions is further elaborated in the discussion on positionality in Section 4.5.2.

The primarily qualitative methods that the researcher used stem from this epistemological underpinning as the researcher realises that respondents' views are socio-cultural constructs and contextualizing the respondents' position is imperative for holistic understanding of their views (Crotty, 1998). This epistemological underpinning of my research informs the use of mixed methods to better address the research problems and meet the research goals.

4.3 Research design

A research design is a set of logical statements (Yin, 2014) that acts as a framework for the collection and analysis of data (Bryman, 2012). The research design adopted for the study comprised of flexible components, to allow the design to emerge during data collection and to take advantage of the practicality of mixed methods for the data collection. The flexible design was also chosen with the view that it facilitates understanding of a process rather than outcomes. This caters to the theoretical lens of this research which explores adaptation and policy-making as processes rather than goals. Quantitative methods were used to collect comprehensive meteorological and socio-economic data on community characteristics and dynamics to set the context while qualitative methods through in-depth case studies explored the drivers, processes and outcomes of the characteristics and dynamics.

The study also involved examining structural drivers of vulnerability and decision-making processes that shape adaptation strategies. Hence a single-case embedded design was adopted to understand the 'how' and 'why' questions that arises during the governance process of adaptation in a representative and potential revelatory case (Yin, 2014). The embedded case study design helped to represent the different sub-unit, households, community, district and state agency of analysis that came together to form the main unit of study, the coastal socio-ecological system. At the local level, the research attempted a comparative study of the different local cases of community and household adaptation. A

case study based approach in this research thus "allows the distinguishing characteristics of two or more cases to act as a springboard for theoretical reflections about contrasting findings" (Brymann, 2012:75). The study took an actor-oriented approach (Long, 1992) to identify the actors (stakeholders in policy framing and adaptation decision-making) and networks (direct and indirect interactions between the stakeholders) and the process of decision-making in adaptation and development context.

4.3.1 Research location

The research location for the study selected was Kendrapara, one of the five coastal districts of the state of Odisha, situated along the east coast of India. It is a natural-resource based (agriculture and fisheries) economy which experiences frequent natural hazards. Floods are an annual occurrence while tropical cyclones frequently trigger heavy rainfall with storm surge which increases the risk to lives and livelihoods in this region. Drought is also of regular occurrence here, triggered by fluctuation in monsoon rainfall (Agriculture Contingency plan for Kendrapara, 2011; Government of India). This district is therefore considered as one of the most vulnerable districts along the eastern coast of India to natural disasters, especially to tropical cyclones (Patwardhan et al., 2003; Sharma and Patwardhan, 2008). Nevertheless, after the Super cyclone of 1999, the state government has shown concerted efforts in mapping out plans and policies for reducing vulnerability to natural hazards and climate variability in its development agenda. The government of Odisha has now different sectoral plans that includes natural disaster and climate variability concerns such as Climate Change Action Plan, Odisha State Disaster Management Policy, and Agriculture Contingency Plan, Integrated Coastal Zone Management Plan to lay out policies regarding climate change and natural disaster management.

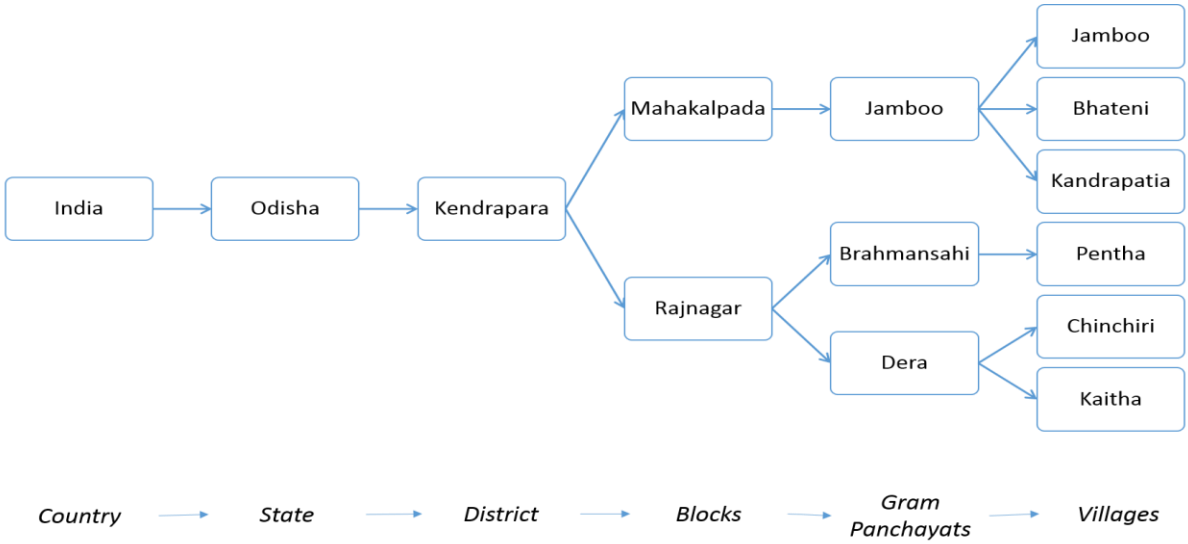
Kendrapara was selected as a study site for a multitude of reasons. The major reasons being its frequent exposure to multiple natural hazards, sensitivity to climatic factors due to its geographical location, and socio-economic status of its population. A high agriculture and fishery dependent population along a cyclone and coastal erosion prone coast mean that the region is very vulnerable to such extreme events. Moreover, Odisha has been consistently ranked at the bottom on poverty level in national poverty level indexes of India (Government of India Planning Commission, 2014). These multiple stressors of natural hazards and socio-economic challenges on a natural resource dependent community provides an interesting case study for this research. The case study provides

an opportunity to explore how adaptation strategies and responses to development challenges are emerging in a vulnerable community and what are the barriers and enablers of existing and emerging local adaptation strategies. Furthermore, a decade of existing state policies and plans and international and national projects, following the Super cyclone of 1999, focussing on climate variability and natural disaster in this region, provides unique opportunity to understand and examine the emergence of institutions and policies shaping decision-making process at different governance levels. The existing policies and plans towards adaptation enabled an evaluation of the strengths and gaps in the policy process to be investigated together with how the adaptation decision-making is being shaped, implemented and interpreted at different levels of governance. The access to and availability of policy documents facilitated the understanding of decision-making process across all administrative levels, from the national government to the local community.

4.3.2 Sampling strategy

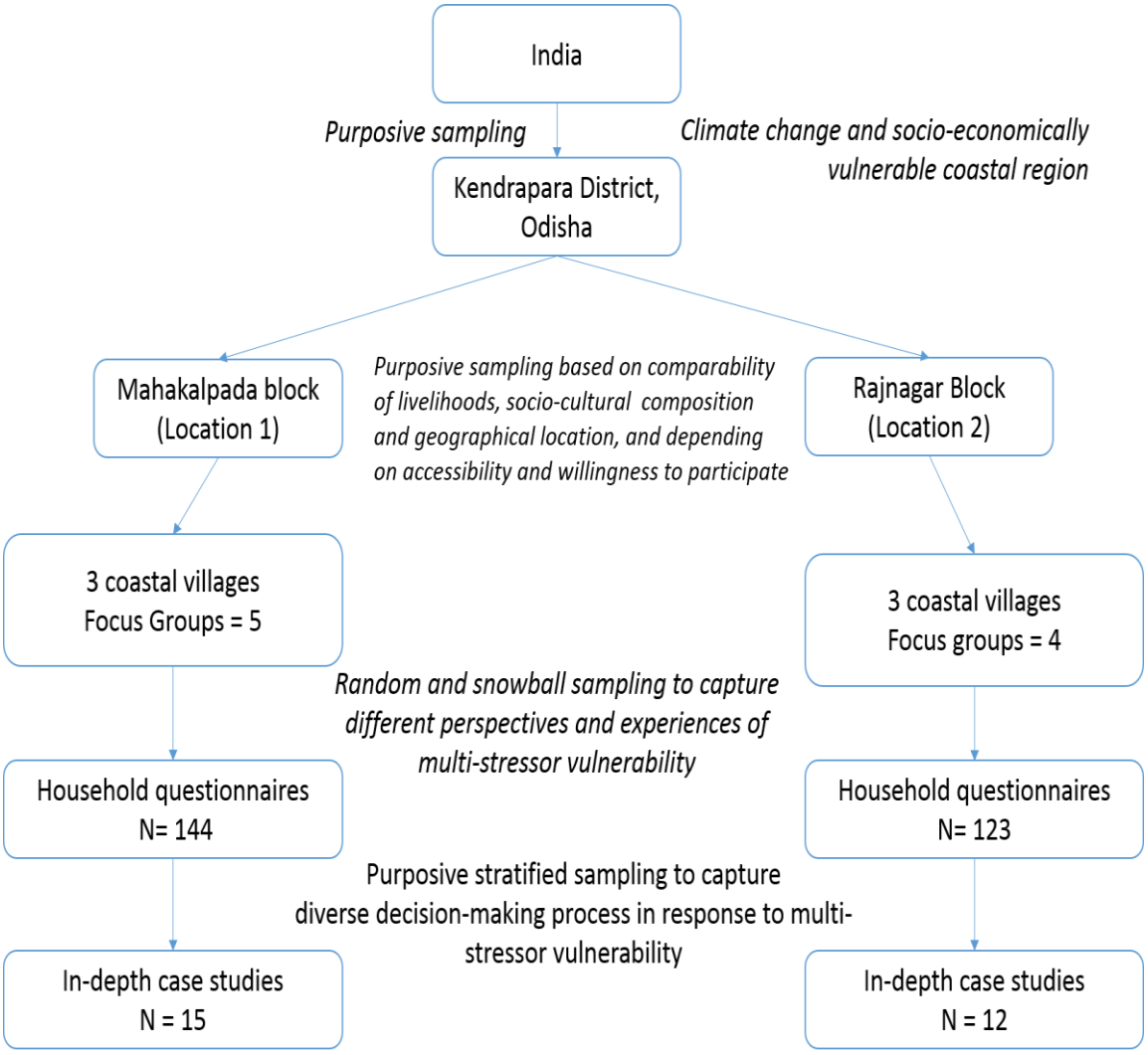
The research was focussed on examining and understanding the socio-political factors shaping adaptation at different governance level (Figure 4.1). The national and subnational studies were desk-based where different national and subnational policy and planning documents pertaining to climate change were selected and reviewed. At the local level, specific coastal communities were chosen as representative samples to carry out the community-focussed part of the study to understand adaptation practices and socio-political factors enabling and constraining the adaptive capacity through a socio-political lens.

Figure 4.1: Representation of research locations as administrative units



After conducting literature review and content analysis of the national and regional government documents and discussion with regional government and non-government organisations during the pilot phase, two communities, across three villages were selected. These two village clusters are located on the eastern coast of India in Kendrapara district of the state of Odisha (Figure 4.2). The communities were identified based on the risk exposure, demographic characteristics and livelihoods differences data drawn from key informant interviews and document analysis. It allowed to explore the diverse perceptions, attitudes, behaviours and other attributes contributing to decision-making process at local level and then comparing how the socio-political structures are shaping vulnerability and adaptation in both the communities. The livelihoods profile of the two communities was an important criterion in selection of villages, with one community, Dera panchayat, have agriculture as a dominant source of livelihood and the other community, Jamboo have diversified combination of livelihoods which includes fishing, agriculture, aquaculture, and livestock rearing. Another important criterion was the land tenure in both the research locations. Since, a significant of proportion of the households have no secure land tenure or are landless, the study villages were selected based on diversity of livelihoods, irrespective of land holdings.

Figure 4.2: Selection of research locations and sampling procedure



During the pilot phase of the study[5], informal discussions with different government and non-government organizations working in the sectors of rural development, livelihoods and climate change to select the study villages were carried out. This was followed by initial visits to the selected villages and one focus group was conducted at each village, each formed of around 6-8 members (male and female) of village heads and elderly, to garner data on collective decision-making with regards to social welfare issues, climate change and variability, natural hazards and collective framing of risks from these social and climatic issues. These focus groups also included stakeholder and social network mapping and institutional mapping exercises to identify stakeholders, networks and institutions involved in decision-making process from local to the state level. This informed an initial understanding of the community composition, livelihood and various

[5] See Section 4.4.1 and Figure 4.3 for data collection process details and timeline

socio-economic and climatic issues. This was followed by household level semi-structured survey and interviews. The households for the survey were selected so as to include households of different socio-economic status in the village and the selection was supported by snowballing. During the household selection for semi structured interviews, due considerations were taken to have representations of male and female respondents and cover diverse wealth groups, livelihood groups and social groups. As informed by the stakeholder and institutional mapping from focus groups, various key informants were contacted and depending on availability were interviewed. On the basis of the semi-structured interviews, household belonging to different socio-economic strata were identified and were chosen for case studies. Households selected for case studies were then interviewed over a period of 2-3 days to gain an in-depth understanding of risk and hazard framing, vulnerability and decision-making process at household level.

Table 4.1: Details of data collection methods and sample numbers

Name of the community / Village	**Total number of Households**	**Total Population**	**Semi Structured Household interviews**	**Case studies**	**Focus Groups**	**Number of Key Informant interviews**
Mahakalpada (Location 1)						
North Jamboo	1588	7061	70	6	2	5
Bhateni	280	1444	54	6	2	
Kandrapatia	63	292	20	3	1	
Rajnagar (Location – 2)						
Chinchiri	67	306	30	3	1	***7***
Kaitha	196	971	68	6	2	
Pentha	103	403	25	3	1	
Total			**267**	**27**	**9**	***13***

4.3.3 Unit of analysis

The study adopted a single case embedded design as a potential revelatory case. [6]To address the issue of multiple spatial level that policy making for complex process like adaptation entails, different units of analyses were adopted. The smallest unit of analysis was the household. Although, it is acknowledged, a family as a unit could have individuals

[6] A revelatory case study refers to novel empirical evidences that was previously unavailable to the scientific community

with different socially granted roles and hence will function differently in the decision-making of a household, for the ease of research, a household is recognised as a single decision-making component. A focus on individual requires considering issues like cognition process that is outside the purview of the study. Individual perception is not the focus of this study and nor looking at family dynamics, but a gendered lens has been used to look at a household decision-making process. The household is the most important social unit in any rural area and hence even though it has shortcomings being taken as a unit of analysis, given the resources and boundaries of studies household or a family is chosen as a sub unit of the study. The household in for this study is defined 'as a family sharing a house or compound'. Although, for the pilot phase households were selected on the basis of a ration card[7] but that proved to be unhelpful as brothers may share a ration card passed down from father and still living in different compounds and function as a different family. Hence, as the study progressed, it was realised, from pilot surveys, inputs from key informant interviews, the issues and inconsistency of using ration card as the basis and hence a household was delineated as a family sharing the living space in one compound for the main data collection.

The next unit in the hierarchy of the analysis is the village. The village as a unit includes all the households residing in the village according to the government records. Further, moving up in the hierarchy, the unit of analysis has been framed at different spatial levels. The different actors at a spatial level that are involved in the decision-making are taken as the different units of analysis. So, actors are grouped into operational entities that play a role in the governance process and holds a decision-making power or are central to the decision-making process.

4.4 Data Collection

The data collection process for the study took nine months and took place between January-September 2015. The data collection period was divided into two phases – pilot/scoping phase and actual data collection phase. The pilot phase was carried out between January-February, 2015 followed by the actual data collection over the next seven

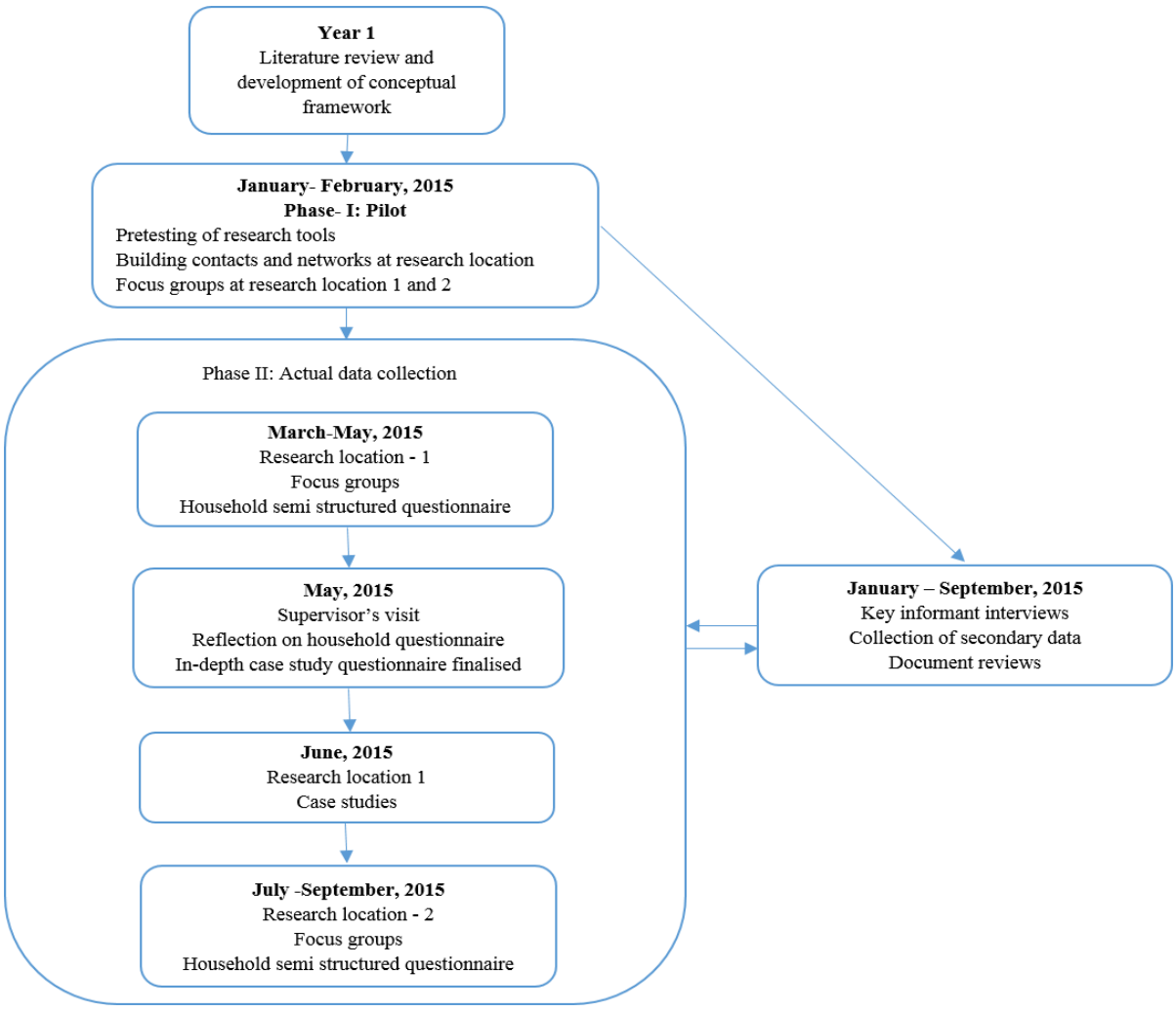
[7] A ration card is an identity card provided by the Public Distribution System of the state to each household. It includes the number of household members and their names. Depending upon wealth category (BPL/APL) and number of household members, each household receive a specific type and amount of dry food (rice, sugar cooking oil, etc) at a subsidized rate. This card also provides access to other social schemes like senior citizen and widow support.

months covering the period March – September, 2015. A range of data collection methods and tools were used to best address the research objectives and questions in the study.

4.4.1 Research methods and tools

This research adopted a mixed methods strategy and both qualitative and quantitative tools were employed to best address the research objectives. The data collection process included quantitative data methods like semi-structured interviews to provide a snapshot of the context and qualitative data methods like focus groups, key informant interview and case studies to present detailed and contextually grounded data (Nightingale, 2003). The adoption of multi-method strategies in this research serves to address the different but complementary research questions of the study, in addition to permitting data triangulation. The range of primary data collected is supported by secondary data maintaining triangulation and enhancing validity and reliability of data. The study was carried out in two phases which are detailed below (Figure 4.3).

Figure 4.3: Timeline and data collection details of fieldwork



Phase I: Pilot Phase – Reconnaissance and Pretesting

The fieldwork for this research started in January and the first two months (Jan-Feb, 2015) were dedicated to scoping, pretesting and building networks and trust in the community for paving the path for the main fieldwork. The pilot study phase involved focus groups with village heads and elders, key informant interviews and informal discussions with the community members and officials of different government and non-governmental organisations working in these regions. It involved researcher introducing herself and making the community members familiar and acquainted with her research objectives and her plans for carrying out the study in the community in informal settings. This facilitated not only a smoother entry into the community but also opportunity to build a good social network with the community. The pilot study helped to identify contact points within the community who assisted in the main fieldwork later by facilitating introduction to different households and providing rich narratives over the course of many informal discussion and friendly chats. The researcher was also able look for and get familiar with host families with whom the researcher stayed for the study period to have a better understanding of the daily lives and decision-making process in the community.

The pilot phase also involved pretesting the research methods and tools. A number of household interviews were carried out by using the semi-structured questionnaire as a pre-testing process. The questionnaire was later modified and refined based on the pre-testing results, to make the questionnaire focussed and relevant to address the ground social realities and reframed questions to elicit answers and information more effectively but pertinent to the study. The researcher dropped or reworded questions which were uncomfortable to the respondents or were not appropriate for the local socio-cultural framework.

Phase II: Main data collection

Focus group discussion

Focus groups could reveal not only how individuals collectively construct meanings around a phenomenon but also the process of construction (Bryman, 2012). Focus groups were used as an entry point of interacting with the community. Focus groups included village heads, elderly, village residents with diverse livelihood activities to understand the socio-economic and historical context, perceptions of vulnerability, decision-making

process in response to changing socio-economic conditions, climate related events and development challenges.

Focus groups were held in each of the research community/village and the groups were male-only, female-only and mixed groups depending on issues being focussed and availability of participants. The number of participants varied from 5-8 for the focus groups. Focus groups were also used as a platform to use various mapping methods for understanding other aspects of the community and elicit responses on other focal points like identification of stakeholders and institution integral to the decision-making in the community and the networks and interactions that shape the process and its outcomes. The different tools and techniques used were stakeholder analysis, social network analysis and institution perception mapping as detailed below.

Photograph 4.1: A focus group discussion in progress at location 1

Source: Fieldwork, Kandrapatia [Photograph taken on 31.01.2015]

Stakeholder Analysis

Stakeholder analysis is one of the most widely used approaches towards policy formulation and analysis. It is a powerful tool used for generation of information on relevant actors including their behaviour, intentions, interrelations, agendas and interests and influence or

resources that underpins the decision–making process (Brugha and Varvasovszky, 2000). It includes a range of methods to select from depending on the requirements of study undertaken. Using the stakeholder network analysis typology provided by Hermans and Thissen (2009) and Reed et al (2009) as a guide, stakeholder maps were drawn based on inputs of the focus group participants. In addition, focus groups also served as a space to gather in-depth understanding of interests, influence and relationship among a small group of stakeholders. Interest-influence matrices and actor linkage matrices were drawn by the participants which were used to understand the relative interest, influence and interactions of the stakeholders and thus the power dynamics of the stakeholders involved in the decision-making process. The stakeholders included local state and non-state actors working on livelihood and climate change projects, village leaders and different households like farmers, fishers and landless.

Institution Mapping

Institutions are defined as a 'system of rules, formal or informal, that structures the social interactions' (Hodgson, 2006). Institutions also refers organizations or the physical representation of an organisation i.e, people who shapes the organization. The researcher used institutional mapping as a tool to understand power distribution in a network as this mapping technique focuses mainly on the key actors and their interactions exploring questions to determine where power is held and who has the capacity to influence decisions and how the decision-making process is influenced. Venn diagrams as a visual mapping technique help to identify different institutions and stakeholder integral to the decision-making in the community and how their role is perceived by the community members. Institution mapping, in conjunction with stakeholder mapping helped in understanding the institutional context within which the relative power, attributes and attitudes of stakeholders involve in policy process is shaped as they interact (Aligica, 2006).

Key Informant interviews

Key informants are persons who are considered as the representatives of organizations/groups and are interviewed to get an understanding` about a particular social problem, program or the organization and groups (Lavrakas, 2008). The key informants were identified through the facilitating government organisation and subsequently during the stakeholder analysis and supported by snowballing. The key informants were interviewed with open ended questions-based questionnaire on topics covering their role,

perceptions and experiences in the community to gain an in-depth understanding of these institutions and stakeholders in policy framing and implementation and climate change, particularly adaptation discourses. The questions also included livelihoods, socio-economic structure and environmental challenges and disaster events in the community. The particular key informants focussed in this research were agriculture and fisheries extension agents, community level worker of the government welfare and livelihood schemes, village heads and members of different organizations involved in programmes and projects being run in the communities. This provided 'outsider' perspective and more in-depth information on topics from an 'experts' experience. The key informant interview questionnaire (Appendix I) was developed as a template and was tailor made for each key informant interview depending on their role, expertise and issues to be discussed.

Semi-structured questionnaires

Interviews can be very effective in understanding people's perceptions, meanings, definition of situations and construction of reality (Punch, 2005). Since, the research focusses on exploring contextual vulnerability and process of decision-making through the lens of power relations, semi-structured questionnaires were used to understand perceptions, attitudes and behaviour of community members that shapes the decision-making process. This semi-structured method of questioning involved a set of pre-structured questions in a flexible interview interaction, depending on the interviewer's judgement of what will benefit the research (Robson, 2002). The semi-structured method of interview ensures that each individual's construction of reality and perspective is taken into account and the researcher could address relevant themes that may arise during the interview itself (Berg, 2014). The questionnaire was a combination of closed and open-ended questions for collection of qualitative and quantitative data to elicit best possible responses/data from the interviews. The questionnaire includes –

a. Standardized questions for collection of data on household size and structure, age, gender, level of education and livelihoods practised, household assets and resources, perception of weather and natural hazards as scores and ranks

b. Open ended questions on experiences of climate variability and natural hazards, impacts of weather variability and natural hazards on households and their livelihoods, to understand drivers and construction of contextual vulnerability to multiple stressors.

c. Open ended questions on responses and adaptation strategies to climate variability, natural hazards and development challenges and access and participation in decision-making process and community level.

The interviews were held in respondent's households with an emphasis on equal gender participation. However, at the time of interview, the available member of the household, male or female head, was interviewed. A detailed semi-structured questionnaire was prepared for the interviews (Appendix II). Each interview took ~1-1.5 hour. Inputs from other household members, who were present at the time of main interview were also included in the notes. During interviews at location 2, a voice recorder was used but at location 1, due to respondent's reluctance towards voice recording most interviews were hand transcribed on the spot. This included detailed notes in addition to filling their responses to the closed ended questions.

Photograph 4.2: Household survey in progress at location 2

Source: Fieldwork, Kaitha [Photograph taken on 10.06.2015]

In-depth oral histories

The household level semi-structured interviews were followed by a period of reflection and shaping of the next phase – in-depth oral histories. The households for the oral

histories were selected by a purposeful stratified sampling. The households were selected to have a fair representation of various vulnerability groups, income groups and livelihoods range present in the community. The members of these households were then interviewed by using open ended questions to understand the household construction of vulnerability, responses to adaptation and development challenges and perception and role in community decision-making. The case studies were carried out in respondent's house and involved all interested family members present at the time of interviews. Oral histories were recorded over 2- 3 visits to each household to capture a holistic picture of dynamics at the household level.

Observation

Direct and participant observation was followed to be used as a supplementary and supportive method to triangulate data obtained through other methods. Bryman (2012; 383), explains participant observation as 'relative prolonged immersion of a researcher in a social setting in order to listen and view the behaviour of the members of the setting and gaining an appreciation of the culture of the social group. This researcher contacted a host family at both study sites during the pilot phase, where she stayed during the data collection period. This not only provided an opportunity to share life experiences of the community members but also made community members comfortable with her physical presence as an observer in their midst. Throughout the data collection phase detailed notes about the behaviour, attitudes and interactions of community members were made. The researcher carefully observed and recorded existing structures (community infrastructure, facilities and programmes) and situations in the community. Those notes offered a useful account of the perception and perspectives of key actors and networks that play an important role in decision-making both in policy framing and in adaptation process.

Secondary Data

The secondary data included quantitative data on meteorological parameters like rainfall, temperature, evapotranspiration which were collected from the state and district level agencies. The secondary data on rainfall and evapotranspiration were collected for the nearest meteorological station and the monthly temperature data was collected at the district level. Different state and district documents regarding policy and plan for agriculture, fisheries, disaster management and climate change were also collected over the last decade.

Document Reviews

Documents are repositories of vast amount of data (Denscombe, 2010) which could be utilized at different stages of research and for different purposes to make research investigation robust (May, 2011). Content analysis of different reports, plans and policies of various state agencies was carried out. Robson (2011; 349) explains content analysis as an unobtrusive research technique for making replicable and valid inferences from the contents of a documents to the context they are produced. The analysis of various policies and reports informs the third objective of trying to understand how the current policies and planning by state government agencies and different donor and funding agencies is relevant to the climate sensitive economy of Odisha. This understanding of the policy process, framing and implementation of development decisions and various other data, figures in conjunction with data collected through other research methods used helps to draw a holistic picture of the power and policy environment of the local to regional environment of the communities under study. The documents include state policy documents on agriculture, climate change, disasters, water, rural development and reports from different state and central non-governmental organizations and development organizations (UNDP), International funding agencies (World Bank, DFID) relevant to the study site[8]. The documents were also analysed as a tool to identify the development and adaptation priorities of government or non-government organizations and actions taken by them so far crucial to the process of policy framing, implementation and those which are active in adaptation planning.

4.4.2 Positionality, Reflexivity and Bias

The researcher is an upper caste female in mid-twenties which makes her a distinct and unfamiliar identity in the rural landscape. This unique position had led to a number of beneficial and difficult situations which have been detailed below as and when they arose during the fieldwork and the ways the researcher had tried to work around them, to best of her capabilities.

[8] See section 5.2.1 for the list of policy documents analysed

Being a female researcher

*"No, please don't go alone anywhere. Let us know where you want to go, and we will arrange someone to accompany you. It is not safe for girls to roam around alone in a village.***"**

Head of host family (male), Location 1

As a young and unmarried female researcher, in a rural setting in India, the researcher found herself in a unique position within the community which sometimes led to interesting and tricky situations. Although, the researcher experienced mixed reactions ranging from amusement to dismissal, a major challenge was to get male community members as respondents. Inadvertently, during the pilot phase of the study, the researcher had to interview female household members as the male members would direct the researcher to speak to a female in the household. The researcher noticed a hesitance in many male respondents as she tried to interview them. However, over time, as the community got used to researcher's presence in the villages and as researcher discussed her topic of research with the village heads and community members, her position as a researcher gained more acceptance and male members became willing respondents for the interviews. More often than not stressing her 'foreign university' studentship helped the researcher being taken seriously.

Being an 'insider/outsider'

"You are a daughter of our region, so what will I explain to you, you must have knowledge of everything beforehand." KI_3 (Location 2)

"The women of our culture are different from your culture. Our women learn household activities and marry early while your culture promotes education of girls."

KI_5 (Location 1)

The researcher belongs to the 'native' Oriya population of the region which positions the researcher differently in relation to the Oriya-speaking as well as the Bengali speaking migrant population. The researcher experienced being perceived as both an 'insider' and 'outsider' during the study (Dwyer and Buckle, 2009). While interviewing Bengali-speaking population the researcher was perceived an 'outsider', but with Oriya-speaking regional population, she was considered as an 'insider'.

Although, being an 'insider' in the community has its advantages, as researcher gathered rich data owing to the comfort of the community members in discussing wide range of

topics and get into informal discussions, it had some disadvantages too. For instance, sometimes communities would assume that some things are not interesting for the study and that the researcher may already be aware of 'those certain things'. Sometimes, this situation prevented detailed discussion on certain topics and probably missing out on possible helpful information that respondents deemed not interesting enough to share (Chavez, 2008). On number of questions, like on agriculture patterns or socio-cultural norms, respondents were often amazed that the researcher is asking trivial questions and she might already know the answers because she was a local. The researcher, in such situations, tried to make them understand that it is essential to clarify every detail as the 'foreign university' that she is a student of are not aware of the nuances of this region and she need the information to clearly articulate the study to such audiences. In contrast, being culturally different from the Bengali speaking population in the community, the researcher was perceived as an 'outsider'. This 'outsider' position actually benefitted the researcher as it not only provided a fresh perspective but also elicited detailed explanation and answers from the community members as they were more articulate to researcher's questions in response to her 'outsider' position and hence limited understanding.

Being a female researcher proved advantageous while interviewing women, irrespective of the insider/outsider identity. The researcher found women respondents opening to her in many situations, sharing their perspectives and issues in detail. The researcher was allowed into households, female social groups and activities where she was able to listen and understand the 'lived' reality of the community and subtle ways power works within household or community in much more depth than could have been possible during an interview. Hence, the researcher acknowledges that her position influences the respondent's perception of her and their interaction with her. Moreover, being a solitary female interviewing households without accompanied by a male, has led to social situations that the researcher acknowledges might have influenced the representation of data.

Managing respondents' expectation

"What will you gain from this work?"

FGD participants (*FG1_JB)*

This has been one of the most common query that all respondents have when interviewed. The prospect of carrying out an intensive research for a long period at each location (3-4

months) by staying in village just for a study purpose was puzzling to many respondents. It did mean that many assumed that the researcher must be part of some bigger project for the community and may be of influential capacity at government level. Moreover, the researcher had taken help of a government agency that is working in rural development and livelihoods sector to select the community and get information about the community projects and plans. This helped the researcher as she was able to access to community welfare workers and gain acceptance of community members associated with the government agency projects. However, this also led to expectations from respondents, in some cases, that the researcher might help them for getting access to government schemes. As the researchers went on asking questions on experiences of natural hazards and socio-economic challenges, respondents hoped she might understand their plight and bring economic help to the household. As some households described their poverty and plight, researcher had to balance empathy towards the respondents and being objective to her research questions. At times, explaining her research and possible future outcomes and distancing herself from the government agency helped and at times it didn't.

Researcher's Bias and Perspective

The researcher is aware of her own positionality too. The researcher is a local and has knowledge of the local culture and traditions which though offers a better understanding of the local situation, may also lead to unintended personal bias (Johnson, 1997). The researcher acknowledges that the data collection, observation and interpretation are shaped by the perspectives that the researcher possess as an individual. Although, the researcher has tried to maintain objectivity throughout the data collection and interpretation, but it would be fair to note that this research is shaped by the researcher's worldview, her research skills and the knowledge she holds about the study region prior to the beginning of this study. The research has relied on triangulation of the data, validity and reliability of data to maintain the integrity of data collection and analysis.

4.4.3 Ethical considerations

This study was approved by University of Reading Ethics Committee prior to data collection phase. Ethical considerations before and during conducting research plays an important role in ensuring a just research process, safeguarding respondents' rights and maintaining credibility of the research. The main ethical issues considered by the researcher during and after the field work were – informed consent of the participants and

maintaining confidentiality of the data. All the research participants were informed about the researcher's affiliation and objectives and were assured complete anonymity in the study, before beginning any interview or research method. They had freedom to withdraw from the study at any point if they wished and no coercion was used for any participant in the study. Further, to maintain confidentiality of data, a code number was given to every respondent for identification during data transcription and analysis and for use in future usage of raw data. For maintaining anonymity of the respondents, raw data was being stored by the researcher in secured hard drives and storage devices.

4.5 Data Analysis

The data collection phase is followed by a preparing a database for the collected data before data analysis began. The quantitative data present in the questionnaires were transferred to the quantitative data management software *Qualtrics* for maintaining a database. After everyday fieldwork, the data from household semi-structured questionnaires were inputted to *Qualtrics*. Similarly, the qualitative data ranging from interviews to timelines and visual maps were transcribed or transferred to digital formats to maintain a database of the qualitative data (Appendix III). The interviews were transcribed, along with accompanied notes by researcher, the same day if possible or within a week to maintain integrity of the data. The database cleaned and arranged was then analysed through a number of techniques for presenting results and interpretation. The various data analysis techniques employed for this study are described below

4.5.1 Quantitative data analysis

Semi-structured questionnaires were used at household level to collect quantitative data for this research. The semi-structured questionnaire has closed ended questions covering themes of socio-economic status, household assets, livelihood strategies and perception of climate and community policies which were of quantitative nature. This kind of data was initially arranged in Qualtrics software followed by cleaning and coding in SPSS for further statistical analysis. Qualitative data gathered from questionnaire, like ranking and scoring, were quantized and were categorized into nominal and ordinal variable for analysis in SPSS. The quantitative data were then analysed by using descriptive statistics, graphs and visual displays.

4.5.2 Qualitative data analysis

Qualitative data in this research was gathered through multiple research methods, namely, semi structured questionnaire, focus groups, key informant interviews and case studies. The interviews were, in most cases, recorded and then transcribed followed by thematic and narrative analysis using NVIVO software. The qualitative data was analysed, first, for themes and patterns emerging from the research and then to provide depth to the themes and patterns to present rich narratives on contextual vulnerability, decision-making process within households and community and adaptation responses to multiple stressors at household and community level. Visual data generated from focus groups were also analysed qualitatively. This included seasonal calendars, social network maps, stakeholder maps, hazard timelines and actor-network linkage maps were interpreted, and notes were made for qualitative analysis

One of the objective of the study (objective 1) is to review decision-making at policy level. This entailed reviewing of government policies, plans and reports in the sectors like agriculture, fisheries, climate change, disaster and other community welfare programmes. A hermeneutic approach was taken for content analysis the different policy documents and reports collected. This approach views interpretation of documents as a product of engagement of the investigators and influenced by construction of meanings by the investigator (May, 2011). The document was analysed not only for the process of its production but also its social context. In addition, a semiotic approach was taken to understand the deeper meaning of the development and adaptation in the texts and the process of the meaning production that resides in signs or symbols embedded in the text (Brymann, 2012). Policies are complex documents which can be treated as platforms for expression of power and hence by following a content analysis approach, efforts were made to uncover how language is used in construction of development and adaptation process rather than just understanding the process (May, 2011; Bryman, 2012).

4.5.3 Data reliability and validity

Data reliability and validity are tests to ensure and establish quality of a research (Yin, 2014). While reliability reflects the dependability of data, validity reflects the credibility of data collected (Punch, 2005). In this research, reliability of the research instrument was ensured by continuously reviewing the internal consistency between the data collected from multiple sources and by maintaining a detailed database of the research process. Since, mixed methods were used for this study, the data collected for this study were

subjected to triangulation by using multiple sources of evidence. i.e., observation and document analysis to verify interviews conducted for collecting primary data.

4.6 Limitations of study

The researcher acknowledges that one of the major limitations of the study is that it looked at decision-making at one temporal point and hence could not take into account the ways temporal factors influences decision-making. Furthermore, decision-making is looked at from household level to higher governance level. Although, the researcher acknowledges the role of different factors, including power relations, at an individual level shapes decision-making but given the time and resource constraint it was not possible to provide that depth to this study.

One of the study site (village PH, Location 2) has been frequently on the disaster related research map after 1999 super cyclone. The researcher found it either difficult to recruit respondents or respondents getting disinterested halfway through the interview for the study at this location. This kind of behaviour can be attributed to 'respondent fatigue' where participants show unwillingness to continue with interviews. In this case, the fatigue is from being interviewed numerous times in the past 15 years by multiple government agencies, NGOs and academic investigators. The researcher made efforts to explain her research and its objectives to engage the respondents in the interview and in cases where respondents expressed their disinterest, the researcher recruited other willing respondents. This might have influenced gathering rich data on diverse perspectives which the researcher acknowledges

4.7 Conclusion

This chapter described the epistemological approach and the research design and methodology informed by the approach which were used to undertake the research. Research methods and tools along with sampling strategy used to implement them were outlined. The selection of Kendrapara, Odisha as the research location was discussed followed by description of the research sites. The issue of positionality and research ethics were also discussed. Finally, various data analysis techniques as well as data validity and reliability were discussed. The next chapter presents results from the study on Objective 1 - addressing issues of contextual vulnerability of households and community to multiple stressors.

5. The policy structures of adaptation governance

5.1 Introduction

Climate change is a multi-faceted and cross-sectoral phenomenon and hence adaptation governance at the policy-making arena brings together different actors with competing and conflicting interest (Pelling, 2011). This chapter examines the policy process at the national and subnational level to identify the different actors, their distinct narratives and the plural and competing discourses which are the outcomes of this process.

This chapter takes an actor-oriented approach to understand the adaptation policy process and focuses on identifying the existing dominant narratives, major actor-networks and their interests that are driving the process. Furthermore, the actor-oriented approach adopted for this chapter utilizes the analytical framework of the policy process (Long, 2001) to analyse policy as a political process. The chapter uses a combination of content analysis[9] and discourse analysis of policy documents to examine the policy process within the context of climate change at the case study locations. The content analysis takes a semiotic approach to the policy documents reviewed to understand how the policy is used as a narrative by the actors at the national and subnational level to legitimise certain discourses of climate change adaptation. Further, employing discourse analysis of policy documents, reveals the power relations embedded in those narratives and helps to understand actors' position and influence shaping those narratives. A combination of qualitative document analysis and statistical analysis of the number of times a relevant text has appeared in the document ensured triangulation of the data. The outcomes were further tested during focus group discussions and key informant interviews to ensure their relevance and validity at the local level.

The policy and strategy documents for the content analysis were selected on the basis of their significance to the subnational/state disaster risk management, climate change planning and those concerning agriculture and fisheries sectors. The content analysis of the policy documents thus specifically looked at the narratives and actor-networks pertaining to climate change and disaster risk management and focussed on agriculture and fishery sector plans. Furthermore, a special focus on sensitivity of gender, poor and minority groups is also a part of the content analysis to understand the structural

[9] See Section 4.4 for document review process and content analysis details

inequalities within the policies and if and how these policies reflect and/or contribute to such existing inequalities. The policies were analysed and compared for- 1. Framing of climate change within the concerned sectoral plans 2. The positions taken by the Government (national/subnational) in the policies 3. The position of 'community' in the policies 4. The role of different stakeholders and their linkages 5. The 'inclusivity'- focus on gender and minorities

Section 5.2 begins by identifying the dominant narratives of adaptation at the national and subnational policy level. This section examines the relevant policy documents to understand the prevailing narratives of climate change that shape adaptation decision-making. Section 5.2 identifies the actors of significance within the adaptation policy-making arena and explores their politics and interests. Section 5.3 examines and outlines the dominant discourses that emerges from these narratives and actor network interactions. Section 5.4 outlines the practical outcomes of this existing plurality of discourses at the policy level on adaptation planning and programmes. Thus, this chapter, by identifying the prevailing discourses, attempts to deconstruct the existing social and political structures – formal rules, norms and practices maintained by the political society that forms the context and hence shapes the enabling or constricting environment within which communities and individuals operate, negotiate and implement their climate and development strategies.

Table 5.1 : List of policy documents content analysed for the study

Focus Sectors	**Policy documents analysed**
Climate change	National climate change action plan (NAPCC), 2008
	Odisha state climate change action plan (OCCAP), 2010
Disaster risk management	National disaster Management policy of India, 2009
	Odisha State disaster management action plan (ODMP)
	Odisha State disaster management plan for agriculture sector (DMP, 2013)
Agriculture and fisheries sector	State Agriculture Policy of Odisha (SAP,2013)
	State Fisheries Policy of Odisha (SFP, 2015)
Coast-focussed Development plans/programmes	Odisha Livelihood Mission (OLM, 2010-15)
	Integrated Coastal Zone Management Project (ICZMP, 2010-15)

5.2 Policies and Narratives

As discussed in Chapter 2, policies are complex process of deliberation, negotiation and legitimization of ideas which then frames the context within which 'actionable plans' are developed and implemented at ground level[10] (McGee,2004). The communicative discourse of the process by which the actionable plans are created and negotiated are shaped by different stakeholders participating in the process.

This chapter utilizes the conceptualisation of policy as discourse (Hajer 2005, 1993) and ideas from post-structural framings of policy process (Giddens 1994, 1990; Derrida, 1981) to understand power dynamics within policy process through the lens of inclusion and exclusion of narratives and actor networks. This also provides a better understanding of the practices that maintains and reproduces these pluralities of discourses around a policy issue. At the subnational level (state-level) four management plans – ODMP, DMP (2013), OLM (2010-15), ICZMP (2010-15) are also analysed to understand their compatibility with national and regional policies and how policies are shaped into management plans by the state implementation agencies. The management plans at subnational level act as linkages between the policies and the programmes and a reflection of the state's own interpretation of its policies. The analysis thus looks at two scales - the policies at the national and subnational level and the management plans at the subnational and district level. Thus, this analysis of the policies through the Hajerian discourse lens supported by post structural framings provides an in-depth picture of the power relations and positions that influence policy processes.

5.2.1 What are the prevailing policy narratives of climate change?

This section focuses on the analysis of the national level/India and State-Level/Odisha policy documents and regional key informant interviews to understand the narratives shaping the climate change discourses at the national and subnational level respectively. A critical analysis of the India's National Action Plan on Climate Change (NAPCC) and Odisha State Climate Change Action Plan (OCCAP) reveals the prevailing narratives around the 'problems' and the 'solutions' of climate change, particularly focussing on different and potentially conflicting agendas of national and state policy on climate change. This narrative analysis of policy documents provides useful entry points to understand how and why current climate change policy discourses are dominant.

[10] See Section 2.3.3 for a critical review of policy process

National level: National Action Plan on Climate Change of India

In 2007, under the leadership of then Prime Minister Manmohan Singh, a National Advisory Panel for climate change was constituted by the Government of India (GoI). This Panel, called as the Prime Minister Council of Climate Change, released the National Climate Change Action Plan (NAPCC) in 2008. This first national policy on climate change, released as a run up to the Conference of Parties in Copenhagen, 2009 (CoP 15) outlined India's position in the international negotiations. Its main objective was to ensure economic growth of India while actively contributing to the international community's endeavours to address climate change. It was a stance based on 'equity' and 'community responsibility' which has been consistent position of India during all the climate change negotiations (COPs) so far. At the domestic level, the aim of the plan was to develop a national strategy for climate change adaptation and mitigation while ensuring sustainable development of the nation. The policy outlined the sectoral climate change risk and national priorities to address the climate change issue.

The NAPCC proposed eight *'National Missions'* to achieve the goal of addressing climate change (Table 5.2). The NAPCC defines the Missions as "dynamic policy documents which are open to review and flexible to incorporate as more knowledge is created and priorities shifts" (NAPCC, 2010:20). Each Mission outlines a priority area and is undertaken by a national ministry which has the responsibility of drawing out detailed implementation plans according to the Mission guidelines. The NAPCC also acts as a detailed framework for different Indian states for developing state specific plans. Further, in the upcoming revised NAPCC version, the steering committee is also planning to increase the number of National Missions to 11 to broaden the measures needed for addressing climate change and ensuring sustainable development of India.

Table 5.2 : List of NAPCC National Missions

List of NAPCC National Missions – Priority Sectors	
1	National Solar Mission
2	National Mission for Enhanced Energy Efficiency
3	National Mission on Sustainable Habitat
4	National Water Mission
5	National Mission for Sustaining the Himalayan Ecosystem
6	National Mission for Green India

7	National Mission for Sustainable Agriculture
8	National Mission on Strategic Knowledge for Climate Change

NAPCC frames the issue of climate change as a part of the nation's development challenges. It reiterates the need for addressing the climate change issue within its development objectives. It stresses on the 'developing country' status of India and its need for economic growth and the necessity of mainstreaming climate change into its development plans and programmes. The NAPCC also recognizes uncertainty around future climate change impacts which makes it imperative to invest resources in climate change adaptation and mitigation plans that will have development co-benefits. The NAPCC draws significantly from the contemporary narrative of 'integrated' and 'sustainable development' based climate change from the international and popular development rhetoric. It stresses the need for inclusive plans and community engagement to succeed. This priority is underlined in the introductory section of NAPCC,

"*It is imperative to identify measures that promote our development objectives, while also yielding co-benefits for addressing climate change benefits*" (Pp 13, NAPCC)

However, like other national policies, it blames poor investment and lack of capacity on slow addressing of climate change impacts. The solutions are heavily leaned towards techno-centric approaches although the report clearly states that GoI has shifted its management approach from relief to preparedness. Nevertheless, the shift in approach has not translated to holistic plans that addresses root causes like social and political obstacles. Another important position of GoI as reflected in the NAPCC is that of 'being part of an international community'. Its policies are positioned as much looking inwards as focussing outwards. The policy positions on climate change is thus of an issue which needs to be addressed in an inclusive way – duty towards community engagement as well as its own responsibility as part of an international community. The national policy is influenced by the international rhetoric to maintain its position and meet international agreements.

The report also has a specific mission for sustainable coastal livelihoods which underlines the vulnerability of coastal ecosystems against the increasing uncertainty of climate change. The policy prioritises economic growth and development as central to the mission over climate change vulnerability reduction. Thus, the most important position of the government as reflected thought the report is that of 'co-benefits' from integrated

development and climate change solutions and 'equity' in engagement and responsibility. The action plan is also supported by climate data and climate projections to frame the seriousness of the issue of climate change for India. However, the exclusive framing of climate change through its physical impacts shifts the solutions to climate change vulnerability into the techno-infrastructure domain. The social and cultural impacts of climate change are not clearly outlined in the action plan and hence the measures are not adequate to address the contextual obstacles like – socio-economic inequality and political disenfranchisement. The NAPCC also underlines the importance of 'mainstreaming' climate change into development and disaster risk management policies and draws attention to the success that such integrated approach could bring to addressing climate change without compromising the development and economic growth of the nation.

Although, the NAPCC recognizes the uncertainty around climate change impacts and considers it as a reason for its co-benefit approach towards climate change, the NAPCC is seemingly silent about long-term transformational measures. The Mission plans consists of highly infrastructure and technical capacity-building measures. The focus is on knowledge creation for better forecasting and prediction of climate variability and extreme events and pre-disaster preparedness like infrastructure development and capacity building for emergency responses.

The NAPCC is cognizant of the need of gender sensitivity in addressing climate change in India. The report outlines the heightened vulnerability of women to climate change and stresses on making climate change plans and programmes gender-sensitive and inclusive. A focus on understanding vulnerability of women and planning adaptation and mitigation initiatives that reflects different gender needs is made clear in the policy. However, the gender and community engagement, although repeatedly stressed in the policy as part of its 'inclusive' and 'equity' principles, is not clear. It does not shed any light on the shape of the engagement it will take other than some awareness generating actions. Moreover, the policy does not address the issue of social differentiation or how the plans will meet the diversified needs of a heterogeneous and socio-culturally diverse community, which is the predominant structure of most of the rural communities in India.

Subnational level: Odisha Climate Change Action Plan

The Odisha Climate Change Action Plan (OCCAP) proposed by the Government of Odisha (GoO) for the period 2010-15 was a first of its kind report by the state outlining

the sectoral climate risks, key priorities and action plans as short term and long-term measures. The report was drafted according to the National Climate Change Action Plan (2008) by the Government of India which was provided as a guideline for all the states of India to assess the vulnerabilities of the state and lay out their key priorities as part of national vulnerability assessment.

The action plan covers 11 sectors, including agriculture, fisheries, and coasts and disasters. It provides a detailed description of the sectoral climate change risks and key priorities. The OCCAP being a climate change focussed report has 'climate change' as its core issue and the primary risk framing lens. Throughout the report the importance of climate change as a threat to Odisha is established through its linkage to poverty and the state economy. This economic disaster-based framing of climate change risks is made clear at the outset, and is stressed in the opening statement of the report

"....Orissa is relatively more vulnerable to climate change. Indeed, climate change has the potential to derail the economic growth of the state and deepen poverty' (Pg XI, OCCAP 2010)

This statement sets the tone for rest of the action plan where climate change is repeatedly linked to economic growth of the state and the importance of addressing it to maintain development of the state. The OCCAP emphasizes on differential vulnerability of Odisha to climate change in comparison to other states and its potential to undermine other sectoral initiatives by the state. Since, OCCAP is not only a vulnerability mapping document but also outlines future action plans for the vulnerability reduction, it serves as a statement of the climate change budget requirement of the state. The OCCAP reflects the economic positioning of the climate change within the state policy and planning.

In the report, framing of climate change vulnerability of the state is rooted in its geography and livelihood dependence structure which is directly affected by natural factors or disasters. The report and the statements of the ruling party leaders reiterates this framing of the climate change vulnerability for the state, the one based on 'coastal geography, rain-fed agro-economy and being disaster prone'. The policies, thus stressing on these factors, seems to take the focus away from other pressing causal factors behind the poverty and struggling economy of the state. The OCCAP though takes into consideration the need to have stronger institutional mechanisms in place for implementing and monitoring the programmes but it falls short of acknowledging the failure of existing policies and a need

for reform. The key priorities thus proposed in the report have a techno-centric approach to address climate change. The key priorities across the sectors revolves around - capacity building, knowledge building, disaster risk assessment, better mapping and modelling for prediction and forecasting, impact assessment research and studies, sectoral innovation studies, improving/strengthening existing management practices, infrastructure building and integration of climate change into sectoral policy and processes. The action plan also underlines the need for more accurate data and studies for better forecasting and modelling of future scenarios. Nevertheless, most of its future action plans proposed are still short-term interventions based on infrastructure and innovation like embankments, agriculture productivity increase, irrigation facilities and introduction of other livelihood-based programs. However, OCCAP is a transformative policy by the GoO with its focus on strategies for encouraging public-private partnerships and strengthening cross-sectoral linkages. Also, though the 'sustainability' as a goal has not been explicitly mentioned in the report, the report stresses on the need for better environment conservation programs and responsible environmental decision-making.

The State government, as stated in the report, clearly acknowledges the immediacy of climate change and shows a heightened commitment to deal with the issues of climate change by recognizing its responsibility of demonstrating leadership in adapting and mitigating the emerging but serious impacts of climate change (OCCAP, 2010:2). The report also reflects the pride that the state government takes in the inter-sectoral coordination and cooperation and civil society engagement that drafting of the OCCAP achieved.

However, as pointed out by MoEFCC and by NGOs, lack of scientific climate data and future models/scenarios in OCCAP is one of its drawbacks (Jogesh and Dubash, 2014). It also needs to be mentioned that, as Odisha was one of the first state to draft its CCAP, even before the national framework for the CCAP were provided, the state plan did not get the MoEFCC endorsement till 2014, although the action plan came out in 2010. That did delay the GoO plans to start drawing out plans and projects to implement its action plan. The state has continuously strived to project itself as a pro-environment government which played a very important role in the drafting of the OCCAP at such a fast pace. Similarly, even though the report recognizes the linkages of development interventions with climate change, the policy does not provide any specific plan or go beyond prescribing integration of climate change risks to sectoral planning process. Another important narrative the report

reflects is the 'climate change' framed as economic problem. The report repeatedly stresses the economic impacts of climate change and the necessity of addressing climate change so that it do not undermine the economic growth of the state. The socio-cultural implications of climate change are not addressed as a priority in any sector. The policy does not include complexities of gender, economic and class differential impacts of the policies which are to be considered for effective implementation. Although, the policy mentions importance of inclusion of women in capacity building and training, there is no specific plans or policies that are tailored towards women.

Further, the Odisha CCAP draws from the national policies but as reflected from the state policy it is more focussed and address state priorities like disaster management and poverty reduction. Thus, the policies and plans at the subnational level though is drawn based on the core principles from the national policy framework but it evidently focuses on state priorities.

5.2.2 What are the prevailing narratives of climate change within disaster risk management policy?

The disaster management policies, as in case of other sectors in Indian context, includes the national policy that addresses the broader national issues and the state policies which are tailor-made to the state needs. Thus, how the disaster management is framed, vary based on the scale it is perceived at, which is discussed in this section. This section reveals the prevailing narratives of disaster management at different scale and shows how focal point of policies and implementation are shaped by the narratives dominant at the scale they are framed at.

National level: National Disaster Management Policy of India

In 2005, India passed its first Disaster Management Act which was followed by creation of National Disaster Management Authority (NDMA, headed by the Prime Minister and State Disaster Management Authorities (SDMA) headed by the State Chief Ministers. Also, District Disaster Management Authorities (DDMA) headed by the District Collector were created with a mandate to coordinate disaster planning and implementation at the district level. This was followed by the passing of National Disaster Management Policy (NDMP) in 2009 to manage different authorities and provide policy guidelines for the authorities to follow and frame their own disaster management plans relevant to the administrative level. The creation of the disaster management authorities at different

administrative level and the drafting of NDMP, 2009 were hailed by the National Government as a shift in the existing disaster management approach from being aid/relief oriented to a management-based preparedness, prevention and mitigation. The disaster management policy framed as a "proactive and integrated approach built on multi-sectoral synergies" by the National Government that will ensure reduction in loss of life and property and reduction in vulnerability of communities. This is clearly stated in the vision of the document that introduces the policy

"*To build a safe and disaster-resilient India by developing a holistic, proactive, multi-disaster oriented and technology driven strategy through a culture of prevention, mitigation, preparedness and response*" (NDMP,2009:7)

Thus, the policy projects the 'conviction' of the national leadership in shifting the disaster management policy outline from a response-oriented approach to a more effective, holistic and proactive planning process.

The National Disaster Management Policy has it very clear that disaster management in India is a very top down approach. The NDMA is the apex body and all the management plans developed by the SDMA and DDMA must comply with the NDMA guidelines. The policy presents itself as giving 'direction and strength' to the lower administrative levels in charge of implementation and creating a disaster management structure that will empower and make a community resilient. The 'responsibility' of disaster management is thus vested with or concentrated at the national level. As the policy states

"*The disaster management authorities (SDMA and DDMA) at different administrative levels are not parallel organizations and will function in coordination with each other"*

(NDMP, 2009:18)

The policy clearly outlines the responsibility of the national and subnational organization. While the policy planning and decision-making is carried out at national level, organizations at the subnational level are primarily concerned with implementation. Although, the policy outlines a collaborative relationship within and across different governance level dealing with natural disaster management, the responsibilities of framing lie on the national and sub-national government while implementation is meant to be carried out by the local organizations and communities.

The policy recognizes climate change as one of the reasons that could lead to increased vulnerabilities of communities to disasters. However, it recognizes the role of other socio-

economic issues like population growth and environmental degradation as being integral in turning natural hazards into disasters. The policy also shows a perspective shift by framing disaster management as a good governance issue rather than a natural event that the government has no control over. Climate change is only twice mentioned in the policy, once as a causal factor in accelerating frequency and intensity of natural disaster (pg 18) and in a section for the need of climate change adaptation to deal with additional impacts of climate change (pg 19). This reflects an ambiguous position of the NDMA which though recognizes climate change, there is lack of conviction in dealing with climate change. It only stresses on adaptation to climate change as an action that needs to be 'promoted'. The policy could be considered climate change neutral given the positions the NDMA has regarding climate change role and impacts in disaster management planning

The policy asserts being a novel approach based on preparedness and mitigation, but the policy mandates do not suggest any long-term solutions. The measures suggested are techno-legal, financial and regulatory that focusses on institutional reforms and effective administrative management and response to disasters. The focus of the policy as repeatedly stated in its mandates is 'mitigation' which is impact-oriented rather than vulnerability reduction oriented. Moreover, the need for long term strategies are proposed to be based on expert driven data and simulation studies like scenario building, with no mention of community participation. On one hand, the policy stresses on the need for community engagement for disaster management plans to succeed and proposes a bottom up approach to promote community ownership in disaster management planning and process. In the other hand, policy presents no scope for community involvement in the decision-making process of disaster management planning and community engagement is focussed only on capacity building through awareness, training and education to build efficient response system to disasters. The policy even mentions the need for incorporating indigenous knowledge in disaster management plan but with a caveat of 'due weightage' that puts it within the disaster management authorities' decision to include what and how much of community inputs in the planning processes. The communities are never viewed as stakeholders in the disaster management process event though the policy stresses on its vision of creating 'disaster resilient communities'.

The policy is cognizant of differential capacity of women headed households and marginalised communities in coping and responding to disasters and proposes framing of disaster management plans by the SDMA and DDMA in the light of such considerations.

Thus, the policy is gender sensitive and is conscious of the focus and assistance women and marginalised communities requires in recovering and restructuring their livelihoods after a disaster.

The policy also adds to the narrative of the need for an integrated planning process coordination with other supporting agencies, media and private sector. However, unlike the NAPCC, this policy brings in an independent institutional mechanism and as discussed above has created separate agencies – the disaster management authorities at National, State and District level. Hence, the integration is more on efficient handling of this hierarchical management system and coordination with other government agencies during disaster emergencies. Further, the narrative of 'mainstreaming' is also central to the NDMP as that of NAPCC, although no detailed plans were suggested to drive this process other than infrastructure projects or financial allocations by Planning Commission of India. As the policy states, it attempts to draw from both international and local practices which probably reflects the inclusion of narratives of international disaster community but a commitment of translating them into national and state level action plans is lacking in the policy mandates.

Odisha State Disaster Management Plan, 2013

The Odisha State Disaster Management Plan was first proposed by the Odisha Disaster Management Authority in 2000 and was most recently revised in 2013. It details the Odisha's disaster management policy and plans and is outlined in accordance with the National Disaster Management Act 2005 and complies with the guidelines of National Disaster Management Policy, 2009. The core principle of the plan are reflected by the phrases 'resilient' and 'mainstreaming' and it aims to ensuring a resilient community by mainstreaming disaster management plan into development planning process. The thrust of the focus in the plan is on prevention, coping and recovery with respect to infrastructural interventions and awareness/training measures. The primary aims that underlines the entire plan are to reduce the risk of loss of lives, properties and infrastructural damage. Although, the plan incorporates the international and national disaster risk management narratives like resilient communities and mainstreaming but the detailed plan is more a nod to these priorities rather than being central to the plan. A major focus is disaster preparedness that includes activities like evacuation and safety mock drill with communities and local government and non-government agencies, awareness sessions with the communities and

aid distribution plans at governance level. The contingent and action plan covers a maintenance and monitoring plan for infrastructures, evacuation plans, rapid responses team creation and training and aid distribution. Also, as stated in the plan, the major disaster management initiative by the State so far is capacity building and setting up of effective preparedness and response mechanism. The OSDMA focuses on the immediate emergency response to any disasters. The plan outlines the emergency plans and rescue and aid post-disasters. The pre-disaster plans mostly involve early warning system, mock drill for rescue and administrative planning to deal with disasters. The techno-centric focus of the OSDMP clearly aligns with that of the NDMP, 2009. Also, similar to NDMP, the concept of disaster management is top-down, and the focus is on putting on administrative controls on place and appoint workers at the local to regional level. The management plans do not factor in community engagement in the planning process. The only involvement of the community is to be trained and assisted in mock drill process as outlined by the responsible state agencies.

The policy demonstrates a commitment to address differential impact of disasters on women-led households, marginalised communities and poor households. The plan discusses the socio-economic vulnerability of certain groups like women, children, disabled and marginalized communities (Scheduled Caste and Scheduled Tribes) and stresses on the need for special focus on these groups during pre and post disaster phase to address their vulnerabilities. The plan lays down specific measures for these households which get disproportionately affected by disasters. The plan also attributes socio-economic vulnerability of households to poverty and lack of education which are social issues that needs to be addressed in the Disaster Management Plan. However, the plan does not suggest any measures regarding the issues other than identifying factors that shape vulnerability of the households. Hence, although the policy addresses gender issues and issues of socio-economic differentiation in the plan but it falls behind in proposing any potential mitigating measures regarding these issues.

The ODMP do not attribute any disaster risk to climate change. Although, the linkage of climate change and disaster risk reduction is completely absent from the plan, one of the projects discussed in the plan called DRR project (2009-12) has had climate change concern as its core objective. The project implemented by the OSDMA in collaboration with UNDP aimed at institutional and infrastructure investments to strengthen preparedness towards increase in disasters due to climate change. However, as reflected

above, this initiative was also techno-centric like other OSDMA initiatives and focussed on building cyclone shelters and capacity building programmes like training and awareness. The state plan does not include climate change concerns or measures to address it. Further, out of the 22 different department disaster management plans that are part of the SDMP, only one state agency, namely, Public Health and Family Welfare Department, mentions climate change as a cause of concern for public health. The plan could thus be considered as having a narrow focus without much scope to shed light on wider environmental issues and is a neutral policy in respect to climate change. Moreover, even though the SDMP's main objectives revolves around better cross-sectoral linkages and mainstreaming disaster risk management to development planning, the individual department disaster management plans do not show any tentative steps towards increased mainstreaming or inter department cooperation.

Thus, the narrative built around disaster management in the OSDMP reinforces the 'saviour' nature of the State. The government agencies collaborate and cooperate to form committees that plans for the pre and post disaster measures that needs to be taken. The community is the 'taker' receiving aid, assistance and training from the government agencies to deal with disasters. The disaster management plan is predominantly technocratic, and expertise driven. The policy outlines that the community needs to be made aware of and taught the skills to deal with disasters and this responsibility lies with the state agencies. In laying out the roles and responsibility of the stakeholders, the plan entrusts community groups with the responsibility of being active participant in rescue and response training provided by the State and facilitating the State Disaster Management Plan. The SDMP thus disenfranchises the community of any power and do not give them any stake in the decision-making. The rhetoric of community inclusion and a resilient community thus do not move beyond the objectives or goals of the plan. The preparedness and social-economic vulnerability assessment do not lead to any substantial steps being taken and the pre-disaster plans are confined to planning for responses to impacts. The important metaphors of 'mainstreaming', 'community participation', and 'resilient communities' that tie it to the NDMP and makes it relevant in the contemporary disaster management community debates do not translates into actionable plans. The SDMP do not proposes or discusses any long-term plans or long-term vulnerability assessment to ensure the resilience of the communities that is one of its objective. The plans are still essentially

rescue, and response focussed except the preparedness through infrastructure projects like multi-purpose cyclone shelters.

Disaster Management Plan for Agriculture Sector, 2013

The agriculture sector disaster management plan takes a similar position in term of measures planned and prepared for any disaster. The plan covers crop insurance, watershed management, subsidised seed supply and providing drought/flood resistant crops and cropping systems. The plans do not account for any long-term crop loss impacts on farmers and or community led initiatives to cope with disasters. The policies do not take into account the complications of land holdings at the community level. Specifically, rural communities tend to have farming population who do not have proper documentation to land holdings, the policy do not offer any measures. There are no measures on assistance to include farmers without land tenure or shareholding farmers. The agriculture disaster management plan has no provisions of receiving feedback or having discussion with the community/farmers pre or post disasters. The extension workers at the community have the responsibility to act as facilitator at the community.

5.2.3 What are the prevailing narratives of climate change within development policy subnational level?

In Odisha, sectors like agriculture and fisheries, which are of importance to the coastal regions, has also started incorporating climate change initiatives at the policy level. The state policies are framed based on the outlines and objectives in OCCAP. The major narratives running through the development policies and plans show their unique positioning on issues of climate change and to address it within sectoral priorities and challenges.

State Agriculture Policy of Odisha

The State Agriculture Policy of Odisha (SAP), 2013 the recent policy document drafted by the State Agriculture Department to outline the State's agriculture plans and programmes. The current SAP, 2013 is the revised version of the SAP, 2008 which was in place before and was revised to broaden the scope of agriculture growth strategies. The main objectives of the SAP, 2013 is stated as to increase investment and technological innovation in farming sector to enable farmers to meet the challenges of future. The focus of the SAP is to drive growth in agriculture for which it focuses on sectors like off farm activities, increasing market linkages, accessibility to farm inputs and institutional

reformation to make agriculture assistance more extension driven. The farming sector of Odisha has not shown growth as reflected in the overall growth of the state GDP. It is a cause of concern given that 70% of the state population depends on agriculture. The policy thus stresses on investment as necessary and immediate requirement to manage agriculture productivity. However, it doesn't detail any steps that needs to be taken to attract such investments. The private sector is a strong focus in the policy and the state shows interest in encouraging private partners for different agriculture sectors, from enhancing farm productivity to raising awareness for modern farming process. The policy also has a strong focus on entrepreneurship and encourages individual farmers to act as agents of change and awareness.

In the SAP, 2013, climate change though acknowledged as a risk factor for agriculture sector but is not followed by any specific plan to address the issue. The policy states that proactive measures will be taken to reduce the vulnerability of the agro-climatic zones. Thus, report could be considered climate neutral as although the threat of climate change is acknowledged on the agriculture sector, but it is not considered as a pressing issue and has just broad measures recommended. The policy also reckons the need for mapping disaster risks on agriculture and the necessity of measures to make agriculture adapted to such sudden changes. However, both disaster and climate change as risk management did not seem to evoke any urgency in the policy and thus are not covered under any substantial programme or project. The policy thus downplays the role of climate change and the shift in agriculture that it may bring in for the State in future.

The policy strives to address the gender issue with special policies for women to encourage their involvement in on-farm and off-farm activities and providing platform for entrepreneurial women. There are significant mandates in the policies towards achieving this goal with a focus on equity and empowerment. The policy also proposes a bottom up approach for making the SAP more community oriented. It outlines the process for framing of district level agriculture plans drafted by the farmers and the extension workers which can then be integrated into SAP. However, the glaring omission is the issue of land tenure in farming which may act as obstacle to many of the programmes and plans that the SAP intends to promote. The digitization and ushering of technological innovation is a boon for poor farmers, however this jeopardizes the farmers without land tenure and women farmers who do not necessarily receive the legal land tenure rights to farms. Also, the role of subsidies is debatable, particularly in case of farm machinery, as even when subsidised

to 75%, farm machinery is difficult to the marginal and small farmers, which constitutes the majority of farmer in Odisha.

The Agriculture department have several other policies that separately deals with disasters – the state level disaster management plan and the district level agriculture contingency plan. Both policies are neutral which focuses only on annual weather variability without any future scenario planning. The contingency plan at the district level are more focussed and look at the farm level. It however addresses issues that may arise due to the annual variability of temperature and rainfall. However, for sudden and unexpected disasters there is no contingency plans. The contingency plans are focussed on the farmers and extension workers. The agriculture contingency plan is detailed report that focuses at farm level and at different farm type and cropping pattern. It covers the measures that the farmers need to follow in case of weather variability. However, provided that it is a government document, there is no outline of how farmers will be able to access it. It is also an expert driven report on measures need to be taken, without any space for new comments to add and community concerns to be included.

State Fisheries Policy of Odisha

The Fishery Policy 2015, drafted by the Fisheries Department of Odisha, is a comprehensive long-term policy for the fishery sector of the State in addition to the existing operational policies - Marine Fisheries Regulation Act 2005 for marine fishing sector and Reservoir Fisheries Policy, 2012 for inland fishing sector. As stated in the policy, the State now faces new challenges and uncertainties like limited resources, unabated exploitation, marketing challenges and threats like climate change. So, to address these challenges, this new flexible and long-term policy is enforced which has built-in monitoring and review measures. The policy covers the current status of the fisheries sector, future priorities and the institutional and legal framework for implementing these priorities. The key objectives of the policy are thus responsible and sustainable development of fishery sector in the current context of global impacts which were not covered by the existing fishery policies. However, the vision statement of the policy outlines a very community centric focus – "to ensure livelihood security, food security, income security and welfare of fishers". The policy underlines the importance of the social capital and social mobility as a necessary step to the development and growth of fishery sector. Although, the policy focuses on stricter regulation to maintain the 'ecological

balance' and reduce the over exploitation of the resource. The policy in an affirmative way also supports co-management and increased participation and responsibility of the fishers. The policy positions itself within the current discourses of sustainable development and responsible natural resource conservation. The policy also stresses on capacity building, training, co-management, technological innovation and marketing and financial assistance. Particularly, of interest is the focus of the policy to encourage public private partnership and entrepreneurship for the growth of fishery sector. The ecological and social consciousness of the policy is reflected in the repeated mention of metaphors like' precautionary principle', co-management and efficient value chain to enhance and develop the fishery sector.

The policy addresses climate change as one of the threats that could affect the development of the fishery sector. However, climate change is categorised by the policy as a global issue and only steps outlined for dealing with this challenge is to bring timely reform in the fishing sector. Again, like other policies, even when climate change is acknowledged as an important threat, no concrete plans were proposed to address its impacts. Similarly, climate change does not feature in the policy even though the policy addresses the current issues of conservation and co-management. However, throughout the policy runs a consciousness of ecological uncertainty and the need for flexibility and monitoring at policy level to be able to deal with future uncertainty. In case of disaster risk, the policy outlines the impacts that natural hazards could have on fishery sector and fishery dependent livelihood. It also stresses on the vulnerability of coastal regions to disasters, particularly coastal fisher households but to tackle such vulnerability the policy do not proposes no solution beyond response and preparedness or any long-term plans. The policy does not confront the gender issue directly, but it covers plans to encourage inclusion of women in fishery sector and provide them more opportunities. However, there is no detailed plan for gender equity and engagement in fishing sector specifically for the women in the informal post-harvest processing sector.

The policy, like the other state policies, also aims to foster cross-sectoral linkages. And, given that fishery sector in the State, encompasses both inland and marine areas with policies of their own, the number of organisations involved in the planning and regulation of fishery sector is numerous and diverse. The policy aims at creating efficient institutional mechanism for ensuring better coordination and communication with different organisations within and allied to the sector. The role of the State in the policy is reflected

through the metaphors of providing ‘enabling environment’ and being a ‘catalytic change maker’. Thus, the policy positions the state itself as both the prime decision-maker but also a facilitator. Sustainability and responsible management is the major driving theme in the new fishery policy which it aims to establish a successful fishery sector with stricter regulation, better monitoring and co-management of the resources with the fishing communities. The policy also frames over exploitation is the major problem with education and awareness of the community the possible solution. However, like the other State polices, it doesn’t differentiate between different social categories of fishermen and differential impacts and roles they play in the fishery sector. It talks about social implications of the policy, but it is more in context of building a human capital rather than addressing already existing social issues So, even though socio-economic development and welfare of poor and disadvantaged fishers is a focus of the policy, it does not outline any concrete plans to tackle the issue of differential access and profitability art local scale.

It could be considered as one of the most ‘globally conscious’ policy by the State government so far. The policy is framed with the understanding of national and international compliance and is built to fit into the current rhetoric of sustainable development and ecological balance. The policy has a greater focus on attracting international investments and access to international markets while ensuring equity and employment opportunities at the local level. The policy thus has a greater business-oriented approach but strives to balance it with social welfare at the community level. Also, the framing of the solutions as ‘appropriate’ measures and plans recommended for various issues provides a flexibility to the policy as well as makes the policy open to interpretation.

State Level/led Development Programmes

Climate change-oriented narratives have also found their way into the state development and livelihood related initiatives and interventions. The two significant projects that need to be discussed in this regard are the – Odisha Livelihood Mission (2008) and Integrated Coastal Zone Management Project (2015). Both projects have climate change impacts as one of their objectives. An investigation of both the projects also provides important insights into how national and subnational programmes are being developed from the policy positioning of the government. This also provides an understanding of the existing

development policy and programmes and how climate change as an emerging issue is shaping the outcomes of these long-term development plans at subnational level.

Odisha Livelihood Mission

Odisha Livelihood Mission, a 60:40 funded partnership between the state and central government, is the major rural initiative by the GoO since 2008. It is housed under the Panchayati Raj Department of the State and is the primary organisation working on rural development and covers the development thematic areas of livelihoods, gender mobilization, financial and social inclusion and hence household economic and social security in rural areas. This mission is important to the state because of its advanced focus and stance on rural development. The guiding principles of the mission states the terms 'social mobilization' and 'stronger institutional capacity' as the necessity for rural development. The position that the State takes, as reflected from the guiding principles, is not that of a provider or decision-maker but a facilitator. The recognition of poor households as 'capable' and with entrepreneurial ability shows the shift in the State focus from providing just aid and welfare support to as an agency to support and strengthen social and economic mobilization of the households through opportunity platforms. The 'paradigm shift' in the State perspective of agency and decision-making process that the mission represents is a shift from the roles and responsibility the state has vested itself with in other policies so far. However, the government here still focuses on the linkages of economic security to social mobilization. The metaphors 'self-reliance' and 'self – dependence' although is intended as a much more inclusive role to the community but the context here referred to is that of economic support. The state's development position is articulated as that of economic independence which will translate to social mobilization and hence well-being of the poor. The mission's goal also includes institutional capacity building of Self Help Groups and local governing bodies below the district level which could be run by communities autonomously and hence could empower the community socially and economically and place the decision-making powers at the local level, within the community.

The mission focuses on 'poor' households which is reiterated throughout its guiding principles, values and goals. However, in a country where poverty is measured by state-sponsored identification process, the possibility of other disadvantages groups, particularly social disadvantaged groups, being still get left out is a factor that has not been taken into

account at any step. The narrative thus drawn by the policy is that of 'capable' poor who requires economic opportunities, skill development platforms and institutional access and rights to mobilize themselves out of poverty and social exclusion.

Integrated Coastal Zone Management Project, 2010-15

The Integrated Coastal Zone Management Project (ICZMP) is a World Bank funded project and State led project that focuses on the integrated management of the coastline of India. As stated by the ICZMP state project management unit. It's main goal to protect and conserve the vulnerable coastline and improve the livelihoods of coastal fishers and farmers. The project is built on the principle of 'integrated approach' to management of coasts as defined by the international coastal communities. The Project, under direct state leadership and managed by Ministry of Environment and Forest, is headed by a State Project Unit that coordinates the 10 different state agencies like Department of Fisheries Water Resources, Environment and Wildlife, Tourism among others which play their different roles and contributes to different goals of the project. The problem framing as reflected in the mission statement of the project is to stop the 'over exploitation' and ensure conservation of the marine resources and wildlife.

One of the current projects that ICZM is implementing along the coast of Odisha is the laying of geotubes along the coast of Pentha, Kendrapara district of the State to stall coastal erosion. The project funded again by World Bank has been hailed by the state government as an important step towards protecting the coastline against coastal erosion and rising storm surges in event of cyclones. Although the project has been delayed and has met several roadblocks including its possible impacts on mangroves and wildlife and hence also had been stalled by other state departments. The ICZM however presents it as one of its most important project and has been consequently investing it despite the delay and conflicts on knowledge inputs and management of the project. The ICZM also stresses on the importance of providing livelihood alternatives to the fishers who would not have access to the sea because of marine conservation rules and regulations. The ICZM as a plan has repeatedly stressed on its aim of assisting the fishers in improving the livelihood, however, the assistance so far has been only providing alternative livelihoods only during off season. The project is time bound and would be over by end of 2017 after two-year extension past the finishing date of 2015 and it has not implemented any long-term programmes in the concerned areas yet. The planning of ICZM thus comes more as techno-

centric plans to fix the problem rather than working on long term solutions that addresses the causes. However, the plan does adopt the stance of 'sustainability' like the other fishery sector policies although there is no detailed pointers on what the sustainability it wants to achieve or how it is going to achieve that. Consequently, the mission statement does not translate to the actionable plans that has been implemented or proposed by the project.

As discussed above, one of the important initiative of the project is ensuring sectoral coordination and collaboration and as stated in the project 'to work towards the integrity of the coastal ecosystem'. The project thus depends highly on the cross sectoral linkages and coordination to successfully implement its plans that encompasses infrastructure, livelihoods and business opportunities.

Climate change is outlined as a concern in increasing risks to coastal livelihoods through sea level rise and increase in occurrence and intensity of extreme events. So, it is clearly recognized in the report that climate change is a danger to the coastline because of its existing 'vulnerabilities' and the need for actions to address the future dangers but any concrete measures to deal with climate change risks is not a part of its aims or objective. However, reduction of coastal vulnerability to disasters and coastal erosion is one of the main goal of the projects. Thus, the plan though does not consider climate change an urgent issue with regard to vulnerability of coastal livelihoods and ecology but is cognizant of the accelerating role it could play in increasing those vulnerabilities.

5.2.4 Summary

Policy documents can be an important source of understanding structural forms of power at the higher governance level. The content analysis of the policy document in the Section 5.2 reveals different narratives around climate change impacts and adaptation as an opportunity to address those impacts. It also provides insights into the role of community, specifically, women and minorities in understanding and planning of adaptation by the government. The framing of climate change is perceived in the policies more as an economic threat rather than social and hence the management plans are more focussed on physical and technical interventions. The document also reveals an increased recognition of the role of communities – women and minorities as significant in the adaptation planning and implementation. However, the roles these communities would play in planning and implementation adaptation is not clearly outlined in policy documents. The next section reviews the stakeholders who are key to the adaptation governance at the

national and subnational level and the role they play in shaping - maintaining, reproducing or fixing the policies.

5.3 The Actor and Networks in Policy

Discourses are produced, contested and negotiated by the stakeholders and the networks they form. The actors and networks are thus integral to the policy process. As Keeley and Scoones (2003) states – if the key individuals (actors) withdraw their support from a network then the discourse supported by the network weakens[11]. This section identifies and examines the actors and networks that were instrumental in shaping the diverse narratives at the national and subnational level and the contestation and negotiation within and among these networks that shaped the prevailing discourses which will be discussed in next section. A relevant analytical lens to understand the complexities and dynamics of actor and networks is through structuration theory (Giddens, 1984). In any policy network, it is the actors who are part of that network that ensures the existence of the network and are the building blocks of networks and it's the interests and knowledge of the actors that shapes the discourses, but discourses also influence the 'interests' of the actor-networks and their position within the discourse frame. However, an important aspect is that the actor and networks lay vertically and laterally, and this nesting and linkages of knowledge and interests shapes the dynamic discourses across different governance level. The section thus examines both the hierarchical and horizontal assemblage of actor networks. The key individuals or actors as represented in policy analysis are integral and it is essential for these individuals to form networks to keep their discourse to prevail over others. And, it is such networks that are framed as epistemic communities in the policy process. The 'epistemic communities' are the networks that have key individual that share the same outcomes even though they have different worldviews. Moreover, the epistemic communities are important at higher governance level – where the framing and main contestation take place or as discussed here it is where the political society exists and decides.

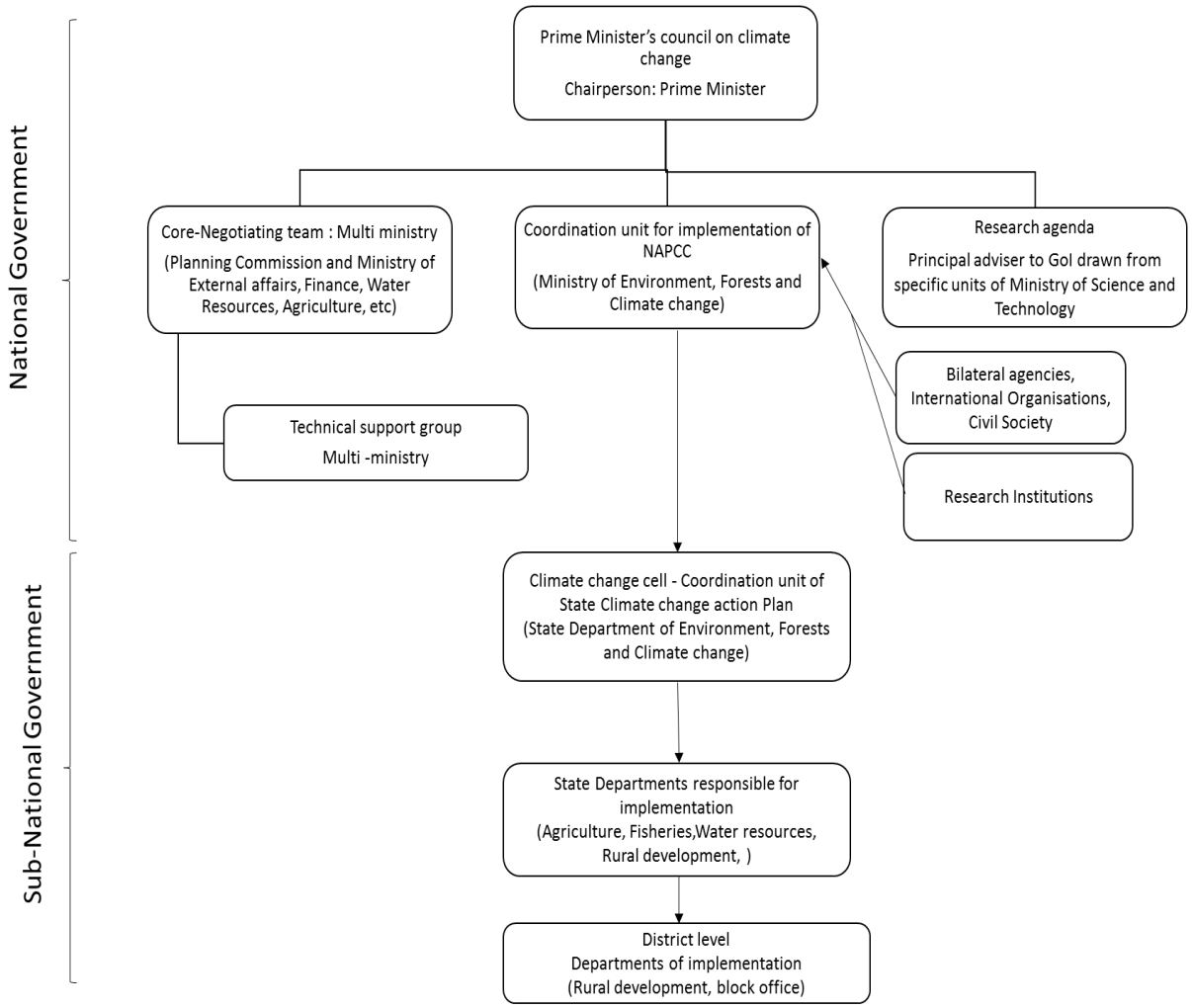
5.3.1 Actor and Networks at national level climate change policy process

The most important actors at the national level climate change decision-making are the Government of India (GoI) Ministries or sectoral departments that focus on climate change, environment and forestry sector. The previously named Ministry of Environment

[11] See Section 2.3.3 for a critical review of significance of discourses in policy process

and Forest was renamed as Ministry of Environment, Forest and Climate Change (MoEFCC) in May, 2014. Through this progressive reform, the National ruling party made it clear that it recognizes the impacts of climate change on India and would prioritise climate change as an important part in its environment policies. The renaming of the ministry makes the position of the government clear on climate change issue at both international and domestic level (Figure 5.1). The Ministry is the nodal agency that handles climate change related global negotiations and cooperation. It was followed by a separate climate change division carved out within the ministry overseeing the National Action Plan on Climate Change (NAPCC) that coordinates the state policies on climate change. The position of the MoEFCC at international platform is based on equity and cooperation which is reflected in the NAPCC. The central government, through the ministry, is the primary decision maker in the national climate change policies and plans. The NAPCC had developed guidelines which provides a framework for states to formulate their individual climate change action plans. As reflected through its international negotiations positions on climate change issues, it could be concluded that India considers itself as a responsible member of international community and hence understands its obligations and duties as part of this community. However, as has been reiterated in the NAPCC and other position papers of MoEF&CC, it clarifies that its interests will always lie in its national economic growth and being a 'developing country' the nation's own development agendas will always take priority over its international obligations. Consequently, the NAPCC policies are built around improving energy security for ensuring economic growth and sustainable development and this is reflected in its eight National Missions.

Figure 5.1 : Organization chart of climate change action plan for India



Source: Document analysis by researcher

The most important actors at the national level climate change decision-making are the Government of India (GoI) Ministries or sectoral departments that focus on climate change, environment and forestry sector. The previously named Ministry of Environment and Forest was renamed as Ministry of Environment, Forest and Climate Change (MoEFCC) in May, 2014. Through this progressive reform, the National ruling party made it clear that it recognizes the impacts of climate change on India and would prioritise climate change as an important part in its environment policies. The renaming of the ministry makes the position of the government clear on climate change issue at both international and domestic level. The Ministry is the nodal agency that handles climate change related global negotiations and cooperation. It was followed by a separate climate change division carved out within the ministry overseeing the National Action Plan on

Climate Change (NAPCC) that coordinates the state policies on climate change. The position of the MoEFCC at international platform is based on equity and cooperation which is reflected in the NAPCC. The central government, through the ministry, is the primary decision maker in the national climate change policies and plans. Further, the NAPCC evaluates state climate change action plans to ensure they comply with National Missions and follow unified national climate change strategy. The NAPCC policies are built around measures promoting economic growth and sustainable development and this is reflected in its eight National Missions.

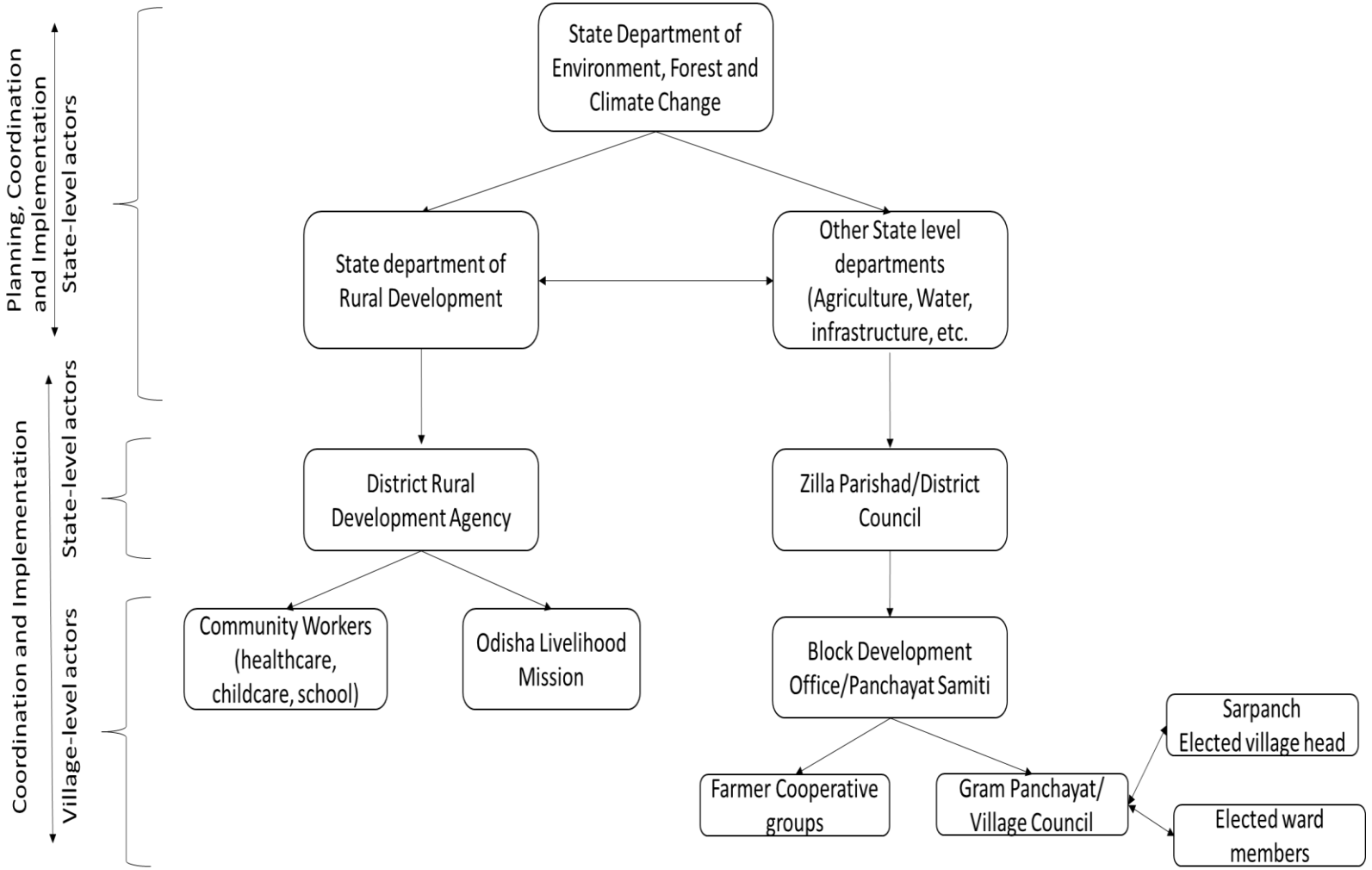
Other than the Ministry, the national policy arena is populated with national and international Non- Governmental Organizations which in this case has an important role in co-production and domination of certain discourses over others. International donor agencies like World Bank and DFID have so far played a key role in shaping the national policies which were framed to maintain compatibility with the international narratives of climate change. These international agencies have become the 'epistemic communities' that are the knowledge contributors to the national and state policies. The NAPCC also gives significance to the scientific data and includes meteorological data and future scenario models of potential sea level rise and extreme events from international research to support the climate change urgency and risk narrative for India. However, the lack of socio-economic understanding of climate change impacts and also any mentions of disaster-related to climate change is apparent in the action plan. The Ministry as a network, in this climate change policy process, thus reflects a techno-inclined arrangement driven by data and models and hence are the technical knowledge resources/ institutes which are part of the national network that represents the climate policy making at national level. Also, significant as knowledge communities are the research-based national NGOs which has pushed for more social-cultural understanding of the impact of climate change and hence has contributed to maintain the discourse of sustainable development as the solution to the environment and climate change issue. Nevertheless, the Ministry interests differs from other networks in its approach to the issue. While the Ministry has economic growth as the starting point and climate change as a threat to manage in this process, the international donors and NGOs has climate change concerns as the starting point and hence the approach of this issue by both parties varies significantly. The interests of these *epistemic communities* in this case have different priorities but no conflict because of the complementing and unifying 'sustainable development' discourse that both actors have

framed as the goal. While both actors have adopted mitigation and adaptation as the necessities to deal with the climate change impacts, the government position is more mitigation-inclined while the NGOs and donor agency have taken a more adaptation friendly stance.

5.3.2 Actors and networks at subnational level climate change policy process

The actors and network around the climate change policy-making at the subnational level comprise of government and civil society organizations and stakeholders at the state, district, block/sub-district level. The subnational actors and networks as identified from the national and state level reports are mapped out below (Figure 5.2)

Figure 5.2: Actors at different governance level involved in climate change planning and implementation in Odisha



Source: Document analysis by researcher

This section explains the role of these actors and networks in the climate change policy process and attempts to understand the power and political dynamics within and across these actor groups and networks at the subnational level.

State level: Government and non-government agencies

The State of Odisha, was one of the first states devise the Climate Change Action Plan (CCAP) when the National notification on climate change preparation came out. So, even before the national guidelines were provided for the states to frame their state plans, Odisha State has already framed its own climate change action plan. This, as the State has suggested, shows the awareness of the State government towards the issue of climate change. As the CCAP shows, state government recognizes the impacts of climate change and the priority to address. The state plan however shows a very different focus as compared to national plan which is based on 'mainstreaming' and inter-sectoral linkages. For Odisha, the CCAP was drafted by the Ministry of Environment and Forests. However, an extensive cross sectoral planning and contribution went into the drafting of CCAP with different departments from agriculture to public works department contributing to the report. Therefore, the report covers all important sectors that the historic data and studies so far has shown to be impacted from climate change. Subsequently, the CCAP drafting committee (MoEF) also at the later stage, invited civil society members to address any gaps or offer new contributions to make the action plan inclusive and community focussed. Thus, state as an actor mobilised other actors who it considered has a stake in this process. As a result, only those civil society actors are brought to the platform that the State chose and hence it can be concluded that the state interests or the political society interests here had the priority. The context was already set in before the civil society was invited for the contributions and the community concerns invited thus were shaped by the outline that was set for them, so it is not a debatable issue that actually whose interests are represented in the action plan and who was the decision-maker. Nevertheless, the framing of the CCAP is an important step forward as it was a multi-stakeholder process that did established cross-sectoral linkages and strives for increased coordination and communication between different State agencies. Also, at the State level different NGOs and donors have played a key role is shaping policies and plans. The State Ministry of Environment, Forest and Climate Change, for the socio-economic vulnerability part of the action plan, depended

upon a local NGO and used Department for International Development (DFID)[12] assessment studies to support the vulnerability assessment. So, even though the state agencies were the sole decision-maker in the drafting the action plan, the knowledge contribution of these organizations or 'networks' significantly influenced the narrative of the action plan. While DFID and CTRAN collaborated for conducting scoping studies for the state, CTRAN was also involved in conducting vulnerability studies, preparing GHG inventory and drafting first synthesis of OCCAP for the state government. CTRAN also played an important role in prioritising action plans in the final OCCAP report (Jogesh and Dubash,2014)

Moreover, the state is part of the top-down approach and the action plan was shaped according to the NAPCC guidelines. Nevertheless, the narratives in the action plan were consciously state-tailored even though the discourses of climate change were shaped by the national framing. The State governments are central to the formal policies and has positioned themselves as negotiators of national as well as local priorities linking the top down and bottom up decision-making. As was the case for national government, the state has been an important recipient of major international donor funding and lending over the years[13]. The reports of those international agencies also shaped the interests of the state government which is indicated in the number of references to DFID and other international NGO reports. At the state level, thus a multitude of actors and their networks interacted and contested and negotiated the climate change policy. However, it is clear from the pending endorsement of the State's OCCAP by the union MoEF & CC that the state government did not necessarily followed the NAPCC guidelines. There does exist a conflict of interest between the State and the National government on climate change priorities. However, the clash of interests could be seen in the context of already existing grievances by the State government for not being provided adequate funding by the National government to invest in the development of the state. In addition, the CCAP has a large annual budget of 72 million INR (Indian Rupees) to implement its plans which cannot be taken out of the State annual budget. So, the state government has taken a strong stance that being one of the poorest and climate change vulnerable state in India, it will need more investment and action plans to maintain the development of the state. Although

[12] The state had hired CTRAN consulting to support the state department in drafting the OCCAP. (OCCAP,2010)

[13] The state has received major funding from World Bank, DFID, ADB and other international donors for livelihoods and climate change projects

the state has taken a clear position on climate change, given the clash of interests with the National government, the CCAP which was proposed in 2010 has not received any funding from the National government as of 2016. The action plans were designed as part of already existing sectoral priorities for integration into sectoral plans, the cross sectoral linkage is carried from the problem framing to the implementation of solutions. However, the state has not taken or proposed any separate climate change programme yet. Climate change however has been increasingly included as problem statement in other sectoral programmes and plans.

Other important actors emerging at state level are the NGOs funded by international donor agencies with a focus on climate change vulnerability and adaptation. Odisha has been getting increased attention due to its vulnerability to climate change because it is a coastal state with agricultural dependent community. This has opened up a space for development agencies and other research agencies to fund and work on climate change vulnerability and livelihood projects[14]. The agencies have thus created awareness around climate change at the community level and facilitated livelihood improvement and adaptation-based projects along coastal Odisha. However, even with a number of agencies working on climate change and disaster vulnerability in the State, the linkages between these NGOs and government is non-existent. There is a presence of diverse group of actors and networks, but the lack of synergy and concerted efforts have created major roadblocks in bringing any substantial change in the climate change sector.

District level: Kendrapara District

The actors and networks at the district level are predominantly the bureaucracy and the community representatives. The district level agencies significant to this study is the District Rural Development Agency (DRDA) which act as implementation agency of state plans and programs. The DRDA is primarily an implementation agency for development and poverty alleviation programs at the village level through the administrative unit under it. Since, DRDA is also responsible for agriculture and fishery programs which are under the livelihood poverty alleviation programs umbrella, the sectoral climate change plans are also implemented by this agency. However, climate change awareness is not very visible

[14] There are number of projects being implemented in the research areas – DECCMA (Delta, Vulnerability and Climate Change: Mitigation and Adaptation) by CARIAA programme (University of Southampton, UK) since 2015. There are also climate change projects run by DFID, TERI and Practical Action (Source: Focus Group Discussions and Key informant interviews conducted by researcher, Feb – Sept 2015)

at the district level. The interests of district agency largely are in maintaining livelihood security which closely aligns with disaster management too. The DRDA is an implementation agency and is not an important stakeholder in the policy framing process. It sits within the top-down governance framework and follows the State-framed policies and plans. The district management plans, except being district priorities oriented, stay well within the state context and priorities as outlined by the State policies.

Block/sub-district level: Rajnagar and Mahakalpada Blocks

The block/sub-district level is an important governance level which although is primarily composed of implementation unit of state agencies is integral to shaping of the community access to governance process. The block level bureaucracy, with the community representatives like the members of the 'Gram Panchayat' are the major actors at this level. The respected 'village heads also play an important role at the block level being able to coordinate with the bureaucracy. The sub-district level discourse and actor network is as much shaped by the community as it is from the top-down discourse of the government. The block level agency, although is an administrative unit to oversee implementation of state plans, is an important actor as it shapes how the civil society interacts with the government, particularly in rural areas. The block level bureaucracy is not only integral to the functioning of the state plans and programmes but is also the interface where most conflicts and contestation during implementation happens. The discourse of climate change, formally, have not percolated to the block level yet. In both the study sites, Rajnagar and Mahakalpada block, the focus is on welfare programs. Although block level officials are aware about the concept of climate change because of private organisations working in the area, their actions so far have not been influenced or shaped by this new conceptual thinking. The major role and interest of the block administration is still agriculture, fisheries and social welfare programme without any direct influence of the narrative of climate change or disaster management understanding shaping it. At this level, the actors and networks have little influence on the framing process of policy, but it is at this level the implementation of policy is shaped and which in return shapes the outcome and consequently the perspective of the state level 'epistemic communities'

As an extension worker in the study location 2 (Dera GP) states,

"I know about climate variability, you see the rains are unpredictable and the sea is swallowing the village slowly, it is because of climate change I came to know about it from

the NGO that is working in this gram panchayat here since past 2-3 years. They have a project for this block under which the talk about the issue of climate change and sea level rise to the village residents and provide them opportunities and resources to deal with this problem." (KI3_KH)

The block thus becomes the channel of the state interests and without much power in hand do not influence the planning processes. However, they are integral to the decision-making in the implementation process which could throw light on how climate change policy process would not be linear.

5.3.3 Summary

The mapping of actors in Section 5.3 reveal the position and positionality of the actors on the issue of climate change adaptation in the policy-making process. It provides important insights on which actors has the most influence on debates over adaptation, whose framing of adaptation is reflected in the policy domain and how these framings are shaping the narratives around climate change adaptation at the national and subnational policy arena. It is revealed that while state government narratives of adaptation are significant, the national government is the most important actor in the policy-making process. The state policies and projects are dependent upon national approval and funding grants as detailed in section 5.2.2 and section 5.2.3. The narratives at national level shape policies and programmes and act as structural boundary within which sub-national and regional narratives emerge.

5.4 Discourses: Plural framings of climate change

As revealed in section 5.2 and 5.3, there are certain narratives which are more dominant in the various national and subnational government policies and plans than others while certain actors and networks hold more influence over the narratives than others. This analysis reveals the prevailing significant discourses around climate change in Odisha and India that has emerged from the interaction of the dominant actors and narratives detailed in section 5.2 and section 5.3. The discourses underline the language that is used for framing climate change within policy arenas. The four current discourses that has emerged at the national and sub-national level in India and Odisha respectively and their implication on adaptation planning are discussed below.

Discourse 1: The economic 'risks' of climate change

One of the prominent and probably significant narrative of climate change that is central to all the national and sub-national climate change related policies is the future economic

'threat' of climate change. The state and national agencies recognize the significance of climate change as a significant socio-economic issue. Thus, climate change has become a looming spectre that the society needs to prevent and escape from to survive which as the OCCAP (2010) emphasizes,

'Indeed, climate change has the potential to derail economic growth of the state ….and nullify the effectiveness of macroeconomic policies and pro-poor initiatives. (OCCAP, 2010:1)

The GoO thus emphasizes on the importance of climate change on its economy and its possible threats. However, a disadvantage of the narrative has been the 'negative' positioning of climate change in society. This has led to all the solutions that emerges from the policies so far being techno-centric and focussing on preventive measures, capacity building and emergency responses. Consequently, the dominant discourses in the policy arena currently is based on mitigating climate change impacts rather than adapting to the changing climate.

Discourse 2: Uncertainty and complexity of climate change impacts

The climate change policies of the state have so far underlined the future impacts of climate change in uncertain terms. The most frequent words being used are 'likely impacts', increase in frequency and intensity. The policies and hence the policy environment shows a recognition of the climate change risk, but the uncertainty caveat has also been made clear by the policies. This uncertainty is reflected in the sectoral key priorities of State agencies in response to climate change. The focus is on preventive measures, contingency plans, and emergency plans and programmes. However, the policy also shows consciousness on the need of future projections but emphasizes that the existing knowledge and information is uncertain of long-term impacts on coastal environment. Also, most of the agencies are unsure of how to frame the climate change issue due to this uncertainty issue and there is a lack of long term measures. Most of the policies that aims to address the climate change issue actually could be framed as actually disaster reduction measures which are short term and are based on specific disasters. So, even if the climate change narrative is part of the policy, it is more a borrowed concept from the international community to maintain compliance and alignment with international issues that allow a donor relevance of the issues. Especially, for an agriculture-based economy of Odisha which has grappled with poverty and accelerating its economic growth for decades, donor funding is very significant part of the state investment that it attracts. Even though, it is

debt-based funding, but most of the state development funding comes from the international agencies and donors apart from the national government fund to state infrastructure.

Discourse 3: Integration of climate change risks, disaster risk management and development policies

The metaphor of 'integration' is dominant in all the policies at different levels – ranging from improving inter-state departmental communication to cross-sectoral planning. Particularly, significant is the state program of integration of climate change plans and disaster risk reduction measures. The policies suggest this integration as their objectives, goals as well as their future priorities. However, the integration reflects only DRR measures. There is no differentiation in the approach to climate change and disaster risk reduction which reflects in the solutions set by the policies which are in entirety specific disaster focussed. This has led to climate change being framed as only causal factor behind disaster risks shifting the focus from other impacts of climate change that community may face in long term. This focus on integration through incremental steps and impact mitigation as primary focus of policies indicates more a potential 'maladaptive' future.

Discourse 4: Mitigation of climate change

Another significant narrative both the National and State government has framed through all its policies is the significance of economic growth for the welfare of all and the role of techno-centric measures and investment/development of infrastructure. The state policies on climate change even though acknowledges socio-economic vulnerability as a concern in making communities resilient to climate change and disaster risks but goes forward without outlining any specific plans to address these concerns. The future priorities are techno-centric across all policies focussing in increased investment in infrastructure, technical facilities, better data and scenario modelling. However, the policies do not draw any social welfare measures or long-term planning to support these technical measures. Further, capacity building is one of the important goal of all the policies, but again capacity building is confined only to awareness and training of the community to deal with specific disasters. So, even when the state asserts that there has been a paradigm shift in its perspective on climate change and disaster management but as reflected by the solutions proposed, it is still heavily top-down and a response mechanism to ensure economic growth by reducing immediate impacts of disasters.

And as the media and the popular rhetoric reflects, the new agriculture policy reflects a renewed focus on improving the agriculture sector which even though implement 70% of the population just contributes 15.5% to the state GDP. The focus areas became irrigation, insurance, subsidies for community irrigation, storage and marketing and organic farming. The ruling party when first came to power tried to popularise the narrative of shifting from an agro economy to an industrialised economy but continuous struggle with communities over mega projects meant that the industrialised economy narrative never got embedded into practices or popular narratives.

The agriculture policies and plan show a less flexibility and adaptability to the current changing condition or the future uncertainties. Although the agriculture policies cover the fisheries sector to some extent but the fishery policy 2015 presents a flexible policy that is addressing the contemporary issues and shows the flexibility to adjust to the future uncertainties. The policies reviewed except the OCCAP which is specifically for the climate change issue, none of the policies show any clear commitments towards climate change issues or addressing future impacts that it will have over different sectors.

The most important initiative of the ICZM has been the coastal embankment building project. Coastal erosion has become the metaphor around which the discourse of climate change is taking shape at the state level. It aligns with the international narrative of climate change and sea level rise and helped the state government to reinforce the narrative of being a '*highly vulnerable state to climate change*'. The dominant discourse of the imminent threat of climate change on the state and the need for a climate change action plan that does not slow down economic growth became the central focus of the government policies. Consequently, the metaphors of mainstreaming and co-benefits found its way into other sectoral policies at the state level.

5.5 The interactions of plural discourses: Operational outcomes

The discourses around climate change across and within different governance levels within the existing policy domains has resulted in conflicting outcomes. From the scalar mismatch of planning and implementation to the lack of knowledge, and hence confusion around climate change agenda has been challenging to the efficacy of the climate change adaptation interventions. This section discusses four significant outcomes and their implications as the emerging climate change discourses clash with the existing policy discourses of India and Odisha.

Outcome 1: Disjunction across scale

The national structure of Indian government brings its own set of difficulties to the process of planning and implementation of climate change plan. Although the NAPCC intend that the state plans of climate change will bring in some level of synergy among climate change programmes across India, in addition to the regional focus. However, the sectoral concern of State and National jurisdiction makes it challenging for the plans and programmes to be synchronised and managed. It could be noted that the National Missions and the sector plans of OCCAP overlap on certain sectors which creates space for jurisdiction conflicts. The already complex and sprawling national and subnational governance structure makes it more difficult to navigate with the national and local climate change priorities clashing. For Odisha, this reflects in its increased concern with coastal security and development which has not been a national priority until recently, after the reframing of the National Missions in 2015. Also, OCCAP is a highly livelihood-oriented plan in contrast to the energy-security focussed NAPCC. The focus on 'integration' is notable in the OCCAP and all other state policies but it intends to bring a coherence at a lateral level. The across scale integration has not been addressed by the National policy or by State policy given that climate change calls for increased coordination between the National and State government.

Similarly, in case of DRM in Odisha, there exists a confusion on the responsibility of the disaster management responsibilities across scale. As pointed in the stakeholder map of the climate change actors and networks, disaster risk management is a multi-stakeholder process. Although, the States are required by the National government to have their own independent agencies called DRA which draws out DRM plans for the State. Often the States, as in case of Odisha, when faced with disasters of immense scale do not have the required resources to cope. Also, long term response plans which required more substantial resources are not part of state DRM plans as they need to be integrated with development and livelihood programmes to be successful, which are primarily funded by the National government. Both climate change and disaster risk management are controlled by the national level agencies and as stated by the national level policies of both these sectors, the subnational and further down agencies are required to work in accordance to the national directive.

Outcome 2: Conflicts in financial governance

One of the reason that the NAPCC called for State Plans is to encourage integrated sectoral based policies regarding climate change that could be taken care by the State Budget and with national funding wherever the National Plans overlap. However, the financial practicalities seemed to get more contentious as the State plans grew. In case of Odisha, which has been over the past decade governed by a regional ruling party with a different part at the national level, the case of federal funding has always been contentious. The state grievance of being neglected by the ruling party at the national level has become an essential part of the State politics. Consequently, when the OCCAP presented a budget of significant amount (72 Million INR) to address climate change impacts in the state, there has not been much enthusiasm from the national government.[15] The state has pressed for its case with the narrative of being a 'coastal agro-based economy that is vulnerable to natural hazards and pressing development issues' and the difficulty of allocating its already stretched State Budget for this issue (OCCAP, 2010:21) The issue of funding climate change at the state level has been a case of debate and cause of conflict between the state and national government. Odisha government recently planning for its second draft of the CCAP has stated that it will go ahead with its climate change plans irrespective of the national funding. A way forward being adopted by the GoO and proposed to be part of the second OCCAP, is an increased integration of climate change mitigation goals into sectoral policies. Thus, this take further the 'co-benefits' approach that has been key to the National and State policy since the framing of the climate change narrative and also emerging as a major focus area.

Outcome 3: The local level disenfranchisement and scepticism

At the local level, the governance structure has institutions at place to make the community more inclusive in the government decision-making. However, this new issue of climate change, is a complex issue for the local agencies to tackle and most of the local level agencies are under- prepared to frame this issue while aligning it with the national or subnational policies. The National and Sub-national policies thus have used this narrative of 'novelty' of this issue to frame a top down approach which is expert-driven to introduce programmes for the benefit of the community. Thus, at the community level this has led

[15] The budget estimate that the Odisha state included in the OCCAP which the MoEFCC rejected in 2010 and Odisha has still not received any funding from the national government as of 2017. (KI_3)

to the confusion in framing ‘climate change’ which is an external framing introduced to the community. The awareness and training of the community has added to the confusion, particularly the difference between disaster risk management and climate change mitigation and adaptation. The local agencies, like that the district and block level organisation, which are primarily implementation agencies struggling to conceptualise the issue of climate change within the already existing DRM context. The narrative of climate change programmes and DRM programmes have been too merged particularly, in case of coastal Odisha, for the local authorities to separately it conceptually. “Integration’ of CC and DRM is actually a progressive and efficient step but being essentially driven by the sub-national and national policies without understanding community perspectives has meant that local authorities have struggled to place it within the local development context. Although, the perception of climate change and its long-term impact exists at the local level to some extent, but this top down directive has discouraged autonomous adaptation by community or autonomous solution framing by the local authorities.

Outcome 4: Mainstreaming Climate Change or disaster risk management?

The sectoral policies reiterate the need for integration of ‘disaster planning into development plans/projects’. However, the planning is confined only to infrastructure-based development programmes like public buildings that could be used as disaster-safe shelters. All the State policies discussed in the section above, shows a clear existence of the narrative of potential slowdown of economic growth if climate change impacts are not addressed. Especially, State agriculture which is predominantly rain-fed and with majority of the population depending upon agriculture or allied sectors as livelihood, the threat of climate change is serious for this significant sector. Nevertheless, the solutions that are outlined by the policy reflects only short –term measures that very much resembles disaster risk management rather than being focussed on climate change. The vulnerability reduction measures outline also provides only guidelines and plans for response to specific disaster and their impacts. The narrative of ‘mainstreaming’ dominates the national and sub-national policy making process – but who is driving the narrative when at the implementation level it has been nothing more than a theoretical cooperation? Undoubtedly, there has been a stronger call for cross-sectoral linkages both at National and State level, particularly, as reflected by the disaster management and climate change

policies. However, the policy does not differentiate between mainstreaming and cross-sectoral linkage building – the concept of 'mainstreaming' has been reshaped by the State policies to encourage more cross-sectoral linkage and coordination/communication.

5.6 Summary

This chapter explores the structural forms of power and politics at the national and subnational level which is expressed in the policy and planning documents. The review of the policies and the study of actor-networks shaping the adaptation governance and different role they play in creating the existing governance system is essential to understand and frame the broad context within which the local implementation and agency evolves and function with regards to adaptation. The main findings from this chapter thus can be summarised as detailed below.

- The policy climate and politics of the state of Odisha is significantly shaped by the National priorities like other States of India because of the federal structure of governance in India. This holds true, especially, for the climate change and disaster management sectors, which are shaped on the basis of NAPCC and NDMP respectively. Although, GoO prioritises the State interests in both the policies but still the state policies are drawn around the discourse of National government. Thus, in both climate change and disaster risk management sector the approach is very much top-down, as the case used to be pre-NAPCC period. Call for bottom-up approach has been strong in recent years, particularly in environmental and conservation decision-making, but the newly independent sectors of climate change and DRM has not adopted that perspective yet.
- The dominant discourse around response to climate change is focussed on preventive measures and efficient aid delivery and distribution. The preventive measures prioritised are better weather-related data availability and infrastructure and institutional interventions. The aid delivery interventions focus on creating efficient rescue and rehabilitation channels through training of locals and agencies involved. Although, climate change adaptation is indicated to be inclusive and community oriented, but the plans and programmes suggested reflects a top-down approach that engages community rather than having them as active participant. The community thus is 'included' in the action plans as 'receiver' of training, subsidies and benefits rather than being decision makers. The prevailing discourses thus reinforces the responsibility of the government agencies to take the decisions

along with expert inputs to plans programmes and projects that would benefit the community and would facilitate better coping response to climate change impacts.

- The current political and institutional landscape of climate change and DRM policies is populated by multiple actors with both state and non-state actors competing with their diverse narratives. The narratives also show variation across the national and subnational scales. There is a visible lack of agreement in the decision-making process around climate change. Climate change policy process has been a restricted decision-making so far controlled by the government at the National and State level. The informal networks like NGOs and grass roots organizations have criticised this elite decision-making driven by 'elite' and 'experts' which fails to recognize community perspectives and knowledge. The involvement of NGOs and local communities in adaptation decision-making has been limited so far. Furthermore, the political landscape has been unstable with different political parties at national level and state level with different policy focus and political interests[16]. One contentious issue has been the opposition of mega projects in Odisha by the residents on environment and human rights ground. These oppositions were supported by the national ruling party and caused delay in industrialisation progressed in Odisha. The state has blamed the Central Ministry of Environment (MoEFCC) over this issue and hold it responsible for blocking the economic growth of state by ruling against State government interests. A different ruling party at the national level and at the state level has meant that there has been continuous contestation and disagreements of policies.
- In the case of climate change, the state interests have been more donor-driven. The government loans/debt from multi-lateral and bilateral donors like World Bank has been invested so far in technical advancement and capacity building which are primarily the donor objectives. However, these large infrastructure projects that the state has proposed and implemented with the help of such donors have only met the interests of the state elites. The regional elites and their interests have been integral to the start of many important infrastructure projects and the failure of

[16] The current central government (2014-present) in India is formed by NDA (National Democratic Alliance) led by the national party – Bharatiya Janata Party (BJP). However, at the state level in Odisha, the regional party BJD (Biju Janata Dal) has been in power since last four terms (2000-2004, 2004-2008, 2009-2013, 2014-present). The national level political parties have lost all general elections in Odisha so far since the year 2000 resulting in government in Odisha being controlled by a single regional party (BJD) since last 17 years.

many state interventions. The sea level rise and climate change linkages hold true, but the constant refurbishing of the embankments and the growing investments does not reflect well on state's strategies. The embankment project already has run beyond its finish data and initial budget. In contrast, these projects have either affected the rights of the community or have had no impact on improving their life. However, the state legitimizes its position, advocating the need of a progressive development agenda, that is compatible with the international community.

- The conceptualisation of mainstreaming has been conflicting across scales. The national and state policies on climate change calls for its mainstreaming into disaster risk management and development/livelihood policies and programmes. However, at the operational level, this mainstreaming is shown by only institutional integration and sectoral coordination. Furthermore, most of the State policies that have advocated mainstreaming climate change into the concerned sectors have translated the concept of adaptation integration as including disaster management programs into sectoral plans rather than focussing on long-term adaptation planning. Thus, the focus on mainstreaming of climate change into other policies have negatively impacted climate change related programmes in the State. The focus on climate change has been reduced to a tokenism to meet national policy guidelines or donor agency objectives. This is well evidenced by lack of any long-term planning, particularly the absence of 'adaptation' concept in the State policies and programmes.

The next chapter (Chapter – 6) focuses at the local level part of the conceptual framework and explores the local level structures and dynamics that shapes adaptation at the community level. While this chapter investigated the how and why of adaptation policy and planning at the national and subnational level and identified the policy structures at play, the next chapter shifts the focus to the what and how local level structures shape household and community vulnerability. The chapter seeks to understand social vulnerability and identify its role in local adaptation planning and practices. Thus, Chapter 6 will aim to provide insights into the local narratives of climate change vulnerability with existing and emerging adaptation practices of the local communities and the role of power and politics in these framings and actions that follows.

6. Differential social vulnerability of the coastal communities: Context, perception and practices

6.1 Introduction

This chapter focuses on the second component of the conceptual framework and aims to address the second research objective – the role of actor narratives of risks and the socio-economic structures in shaping contextual vulnerability of a community. As discussed in review of literature in Chapter 2, the dominant discourses around any policy, as much they are shaped by the interest of the political society (the state or political elites), needs the consent of the civil society (local organizations and community) to exist and continue to be reproduced in the broader context[17]. Thus, local level practices, the interpretations, negotiation and consent that accompanies the process of implementation of policies, and the local context within which the policies operate, are integral to understand governance of adaptation at the local level. While in Chapter 5, institutional structures and policy frames at national and subnational level was explored, this chapter explores the socio-economic and institutional structures at local level to draw a complete picture of the structural factors shaping the multi-level adaptation governance regime of the research location. This chapter focuses at the local scale and explores household and community level perceptions and dynamics to understand differential vulnerability among households. Household and community level perceptions of risk are explored to capture the individual and collective narratives through which households make sense of their lived realities of risks from climate change and natural hazards. The household perceptions are then compared and contrasted with observed data of rainfall, temperature and extreme events of the region to show if and how perceptions of households' risk align with the observed scientific data. Furthermore, this chapter examines the socio-economic and institutional structures, and political process at the community level to understand the role of power and agency in shaping social vulnerability of a community.

This chapter adopts the actor-oriented approach, particularly drawing from the understanding of works on power and agency - structuration theory (Giddens, 1984). This approach is utilised in this chapter to understand differential social vulnerability within a community at the household level and the social, political and cultural factors existing in the community that shapes social vulnerability and how actors and interests strengthens

[17] See Section 2.3.3 for a critical review of policy process

and/or weakens these factors. The chapter concludes with an overview of the actors and networks, institutions and socio-political interactions which shapes the knowledge and narratives within a community and hence drives the understanding and responses to address climate change and disaster risk management.

Section 6.1 outlines the chapter aims and outlines which then moves to section 6.2 that explores the household perceptions of risk to climatic stressors and changes over perceived impacts of the stressors over the last decade. Further, the perceptions are compared with scientific evidence of change in frequency and strength of climatic stressors to understand how differentiated risk perception could be shaped by different contextual factors. The next section 6.3 examines different contextual factors that are shaping the perception of risk and hence the outcome of contextual vulnerability. An investigation of the socio-economic structures and institutional structure at the community level reveals their role in the existing differential social vulnerability among and across the study villages. Section 6.4 discusses the implications of the prevailing social and institutional structures and their interactions on the shaping of differential social vulnerability across and within different study villages. It outlines the reality of community vulnerability by identifying community norms and practices. The chapter concludes with section 6.5 that provides a summary of the chapter and lists its contribution in addressing the research objective 2 of this study. It also provides a better understanding of chapter 7 that comes next in this thesis.

6.2 Household vulnerability to climatic stressors: Perceptions and Evidence

At the local level, households and communities construct their own narratives of vulnerability to stressors. An important first step in this process, is the risk that households perceive to the stressors. Household perception of risk from different climatic and non-climatic stressors is integral to understanding of its own vulnerability and hence shapes their responses or steps to address the stressor (Burton et al., 1993, Dolan and Walker, 2004, Maddison 2006). As well evidenced by a number of studies, perceptions are shaped by an individual's cognitive factors (values, beliefs and norms) (Grothmann and Patt, 2005), geographical and climatological conditions (Christmann and Mahlkow, 2014) and socio-cultural context (Weber, 2002). Thus, capturing and examining of household perceptions enables understanding of factors that promotes certain coping and adaptation strategies and drives recognition and prioritization of addressing vulnerability to one stressor over others (Gbetibuou, 2007; Adger et al, 2009).

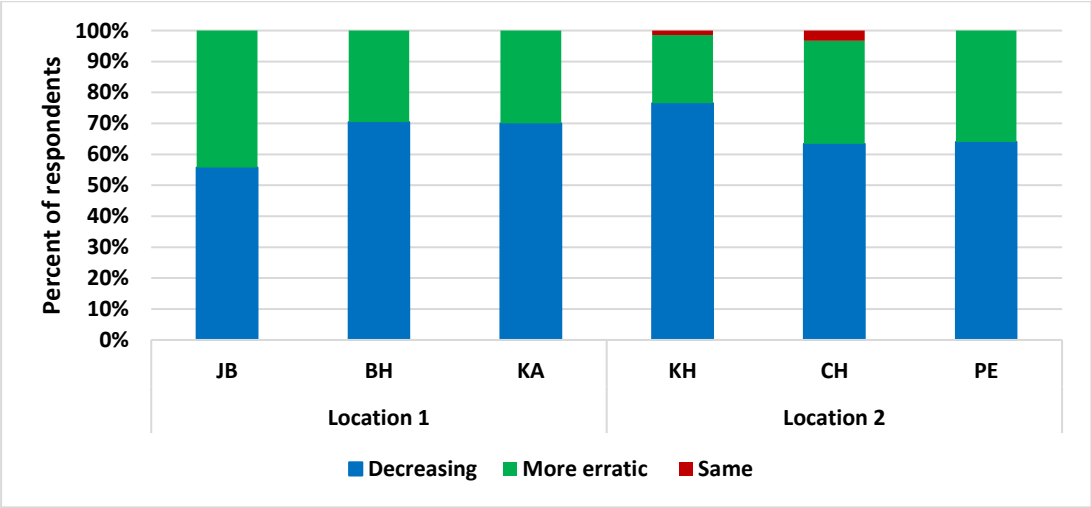
This section seeks to examine the perception of risk and vulnerability of households towards climate variability and extreme events and provides insights into the household attributes that influences risk perception. The household perceptions data compared with evidences from meteorological data of the region and historical records of extreme events is then used to assess and understand the perception of the coastal households and the factors shaping those perceptions. This contributes to the understanding of the narratives of vulnerability intrinsic to the lives and livelihoods of coastal communities.

6.2.1 Perceptions of variability in weather patterns

The change in weather pattern or climate variability is a slowly unfolding phenomenon and hence the risk perception to such gradual events differs from the risk perception to extreme events. Household risk perception of climate variability (rainfall amount and extreme events) has been used by a number of studies to understand if households, particularly, farmers perceive change to metrological conditions over time and how it influences their response or adaptation to such situations. In this study, perceptions analysis helps to understand household vulnerability to climatic factors. The households were asked about their perception of the change in temperature and rainfall amount over the past decade. The households in both the study sites showed a high perception of gradual change in climate (93% and 85% in location 1 and 2 respectively). Households reported changes in annual and monsoon rainfall and annual temperature which is presented in detail in the sub-sections below.

Changing rainfall patterns: Too little, too unpredictable

Graph 6.1: Village level household perception of rainfall pattern



Source: Household Survey (January-September, 2015)

The dominant perception regarding rainfall amount among the respondents across both locations is that the total amount of annual rainfall has decreased in the past decade (Graph 6.1). In addition, a significant number of respondents also believes that that it has rather become more erratic. The term 'erratic' here encompasses perception like increased frequency of or longer dry spells, heavy or too light rainfall events and consequently the unpredictability of the rainfall amount to expect. In both location 1 and 2, similar perceptions are recorded with a majority perceiving a decrease in rainfall while still a significant population considering rainfall has become more erratic.

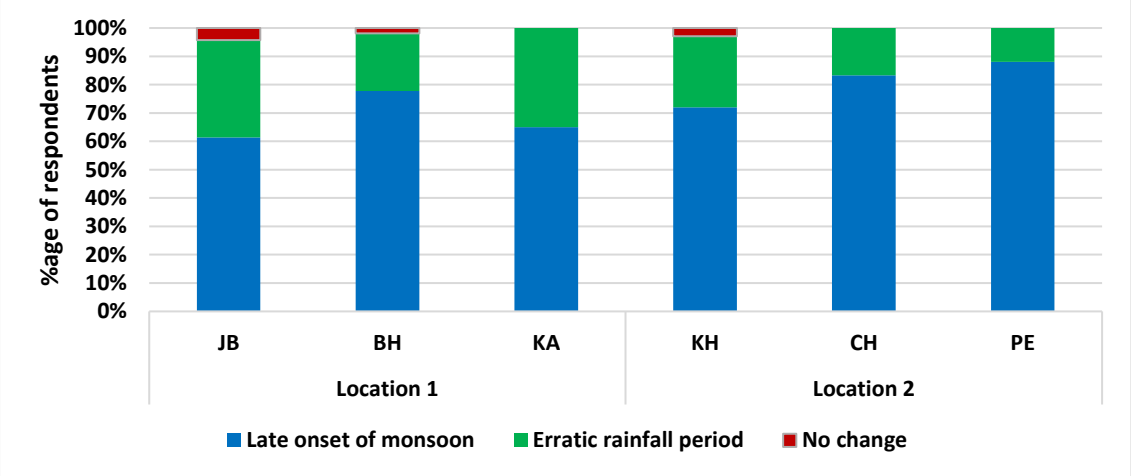
"I am not sure of any trend in rainfall variability, it is so unpredictable since last few years, some years it is more and some years it is less, most of the time there is no certainty on the amount of rainfall we will receive……This was not the case 10-15 years before" (HH10_JB)

However, a few households in location 2 did not perceive any change in rainfall which point towards households in non-farming occupation like basket weaving and daily wage labour having not such a strong perception of changes in rainfall amount. As one basket weaver respondent states,

"I think rainfall varies every year. I do not see any noticeable change in the rainfall levels over the last decade. Anyway, I am not a farmer and maybe I don't have a good understanding of the annual rainfall variations like those who farms" (HH23_KH)

Thus, possibly depending on the primary livelihood of the household, respondent's perception of changes in rainfall amount varies. This could be because of changes in rainfall amount being considered a livelihood risk factor.

Graph 6.2: Village level household perception of variation in monsoon over last 10 years



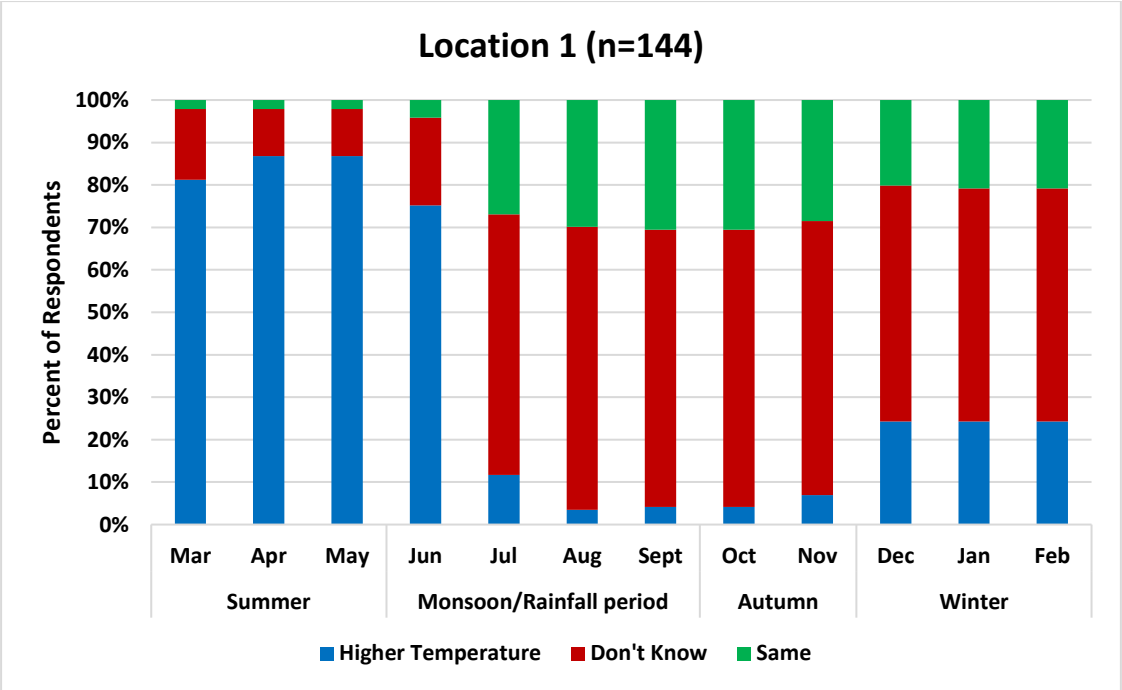
Source: Household Survey (January-September, 2015)

Respondent's perception of changes in monsoon pattern also didn't show any strong variation between the location 1 and 2 communities (Graph 6.2). More than 60% of the households perceive a delay in onset of monsoon-related rainfall. This perception of shift in onset of monsoon (rainfall period) among households varies between a delay of couple of weeks to more than a month. About 20-30% of the households across both the locations perceive the rainfall periodicity as more erratic and the onset thus unpredictable. The perception of erratic rainfall periods also includes unexpected frequency or length of dry spells or intense heavy rainfall events. The households thus perceive not only a delay in onset but also a change in the distribution pattern of rainfall as compared to before.

"Mausaumi (monsoon) arrives late since last few years. Sometimes, it doesn't even arrive until August when normally we do our broadcasting (of paddy saplings) by June end with pre monsoon showers ensuring few good spells of rain. It now doesn't rain in June at all and without the pre-monsoon spells we will not get any saplings. So, when it starts raining heavily after August, we do not have any saplings surviving to transplant in our fields, as either they die due to the heat or increased soil salinization without any irrigation facilities available." (HH18_KH)

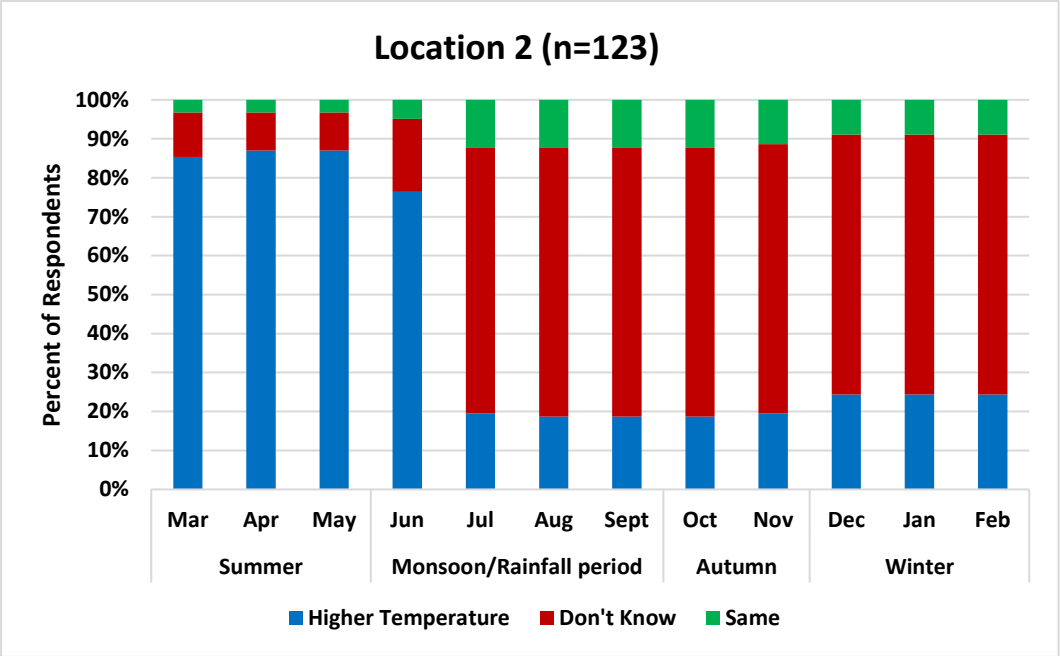
Changing temperature patterns: Hotter summers, uncertain winters

Graph 6.3: Perception of variability in temperature at location 1



Source: Household Survey (January-September, 2015)

Graph 6.4: Perception of variability in temperature at location 2



Source: Household Survey (January-September, 2015)

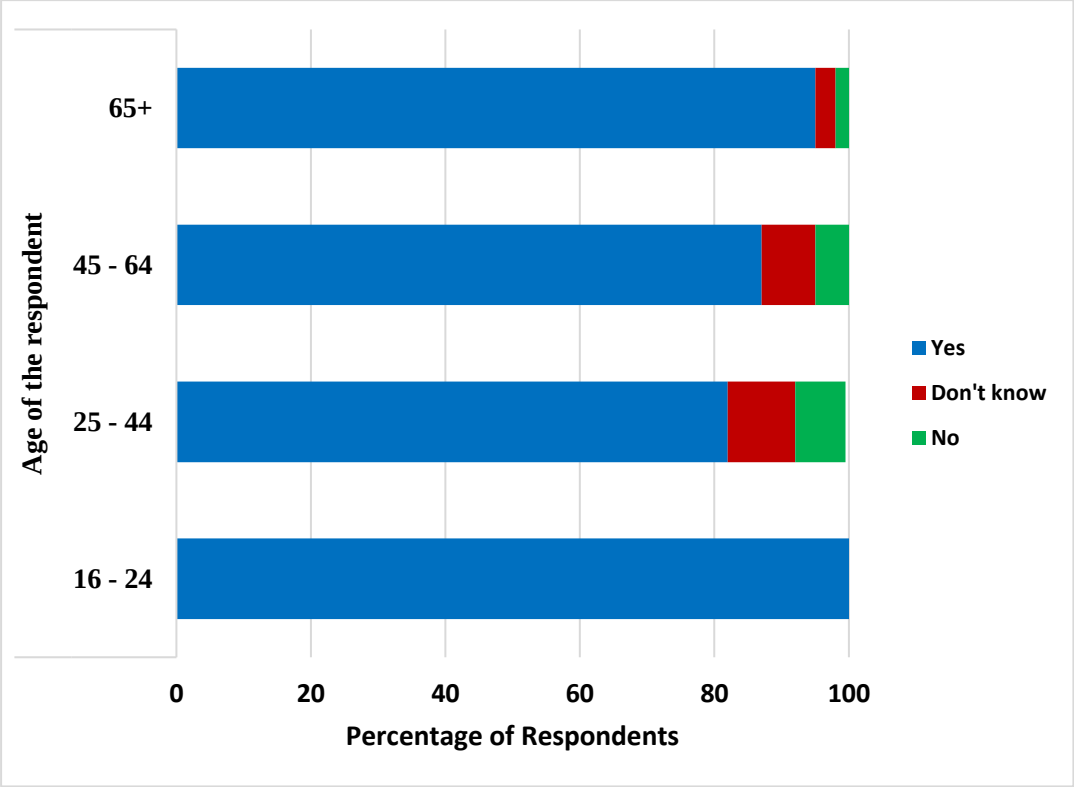
Respondents reported not a very strong perception of variability in temperature. Although, more than 80% of the household perceive an increase in temperature during the summer months (March-June), in case of rest of the year, including winter months, nearly 80% of the household perceives no change in temperature or view it as an expected variability. So, both location 1 and 2 households have similar perception of temperature pattern with a slightly 85% of households perceiving hotter summer temperatures. Also, in location 2 (Graph 6.4), around 20% of households perceive higher temperatures during monsoon which is in sharp contrast to location 1 (Graph 6.3). This could be attributed to the higher percentage of population working as farmers in location 1 during those months, as compared to fishers who have their activities suspended during that period (June-August) and work on mending their fishing tools or are working away as migrants.

Do perceptions vary across a community?

Household perception of climate change are shaped by various factors ranging from values, and attributes to socio-cultural context and geographical conditions. This sub-section details the variations observed in perceptions of change in weather patterns among households in both locations based on their personal and household attributes. The analysis covers a handful of household and individual level factors that is of interest to the study – age, gender, economic status, education and landholding status (farm size).

1. **Age**

Graph 6.5: Respondents perception of variability in weather patterns based on age



Source: Household Survey (January-September, 2015)

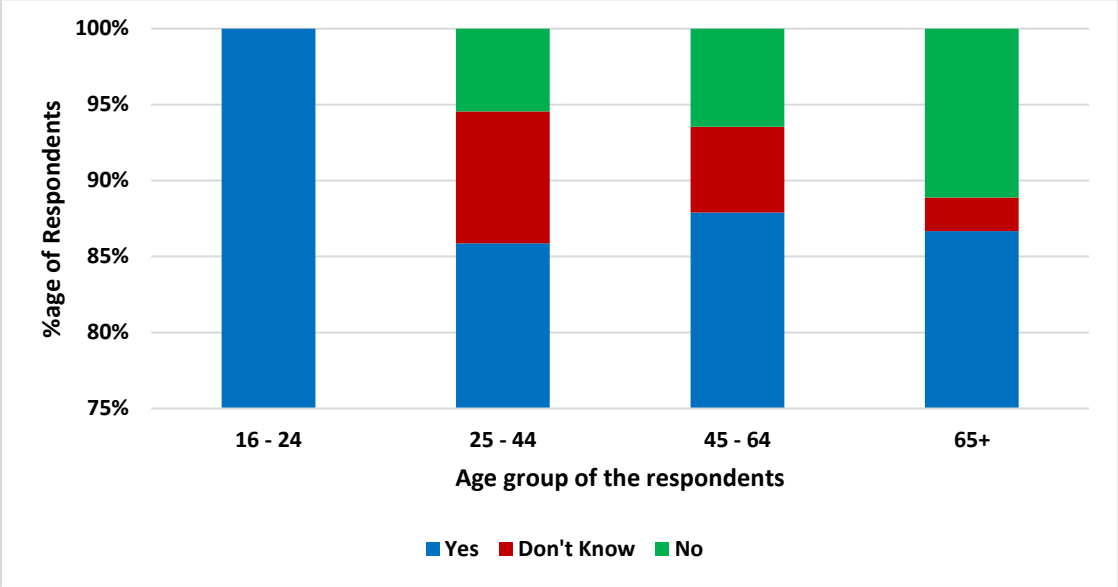
The younger generation (<25 years) and the older respondents (>65+) in both the communities perceive a stronger climate variability over the last decade (Graph 6.5). Although, young respondents don't have necessary past experience to compare with the recent status of rainfall or temperature, they are aware of the current narrative around weather patterns. Their knowledge is mostly borrowed from stories of their previous generation and the current narrative of 'climate change' that is prevalent among welfare workers and extension agents working at grass root levels. A young respondent shares his experience,

"*It is hot now and no rainfall, you hear about it news (TV and newspaper) all the time. Our grandparents and parents used to say that it didn't used to be so hot during their time. When we were kids it was not so bad either. Now it's so hot that you cannot step outside*." (HH12_KA)

Older respondents also reported a stronger perception of climate change. This could be due to longer experience of farming and more past reference points to compare the current

conditions as was also found in other studies (Deressa et al., 2009, Mertz et al., 2009; Maddison, 2007).

Graph 6.6: Younger respondents perceive stronger change in rainfall events



Source: Household Survey (January-September, 2015)

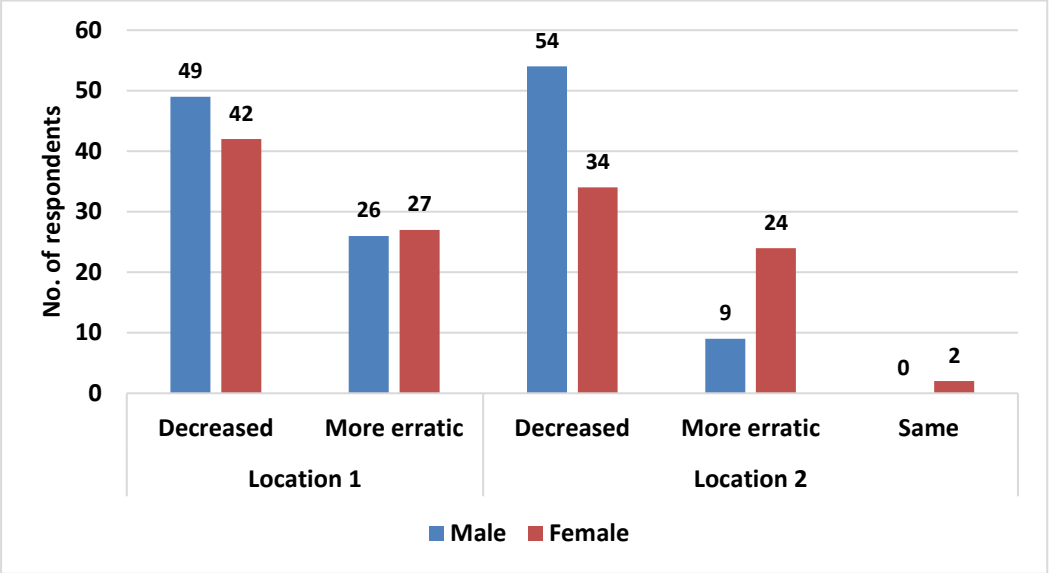
In terms of age, younger farmers/fishers perceived a greater change in rainfall events as compared to the older population (Graph 6.6). Older respondents have more divisive opinions on rainfall variability while the younger generation has a stronger perception of shift in monsoon. Those >30 years have agriculture experience and have better past experiences to compare the present rainfall events and variability but reported being unsure of change in rainfall amount over the last decade. However, most >30-year respondents reported perceiving rainfall events being erratic or monsoon being certainly delayed. The elderly (65+>) also perceived higher variability in rainfall events which could also be attributed to longer experience in agriculture and general life experience.

2. Gendered perceptions

Perception of rainfall shows a slight variation between male and female respondents (Graph 6.7). In both the locations, and in most cases, the male is the breadwinner of the household and hence the decision maker of the household. The higher percentage of perception of decreased rainfall among male respondents shows a greater involvement in on-farm agricultural practices as compared to females. Although, women led households are exceptions, many female respondents in both locations stated their uncertainty over rainfall or not perceiving any trend in rainfall with their lack of involvement in agriculture.

Especially, in case of location 2, where culturally, women are less involved in on-farm activities, the female respondents perceived either erratic rainfall or no change in rainfall amount.

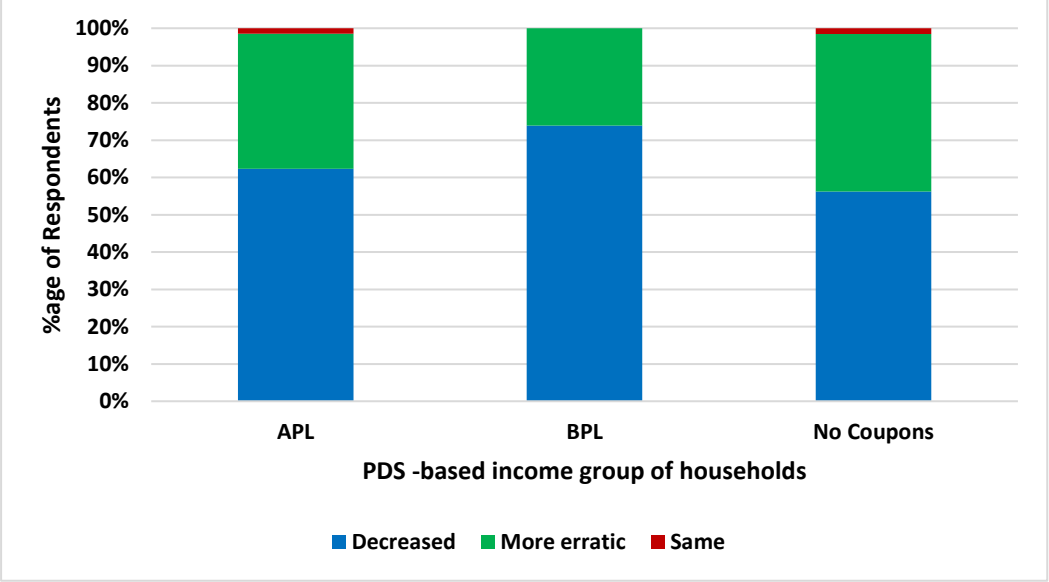
Graph 6.7: Gendered differentiation of perception of change in rainfall amount



Source: Household Survey (January-September, 2015)

3. Income

Graph 6.8: Perception of rainfall amount by households of different income groups



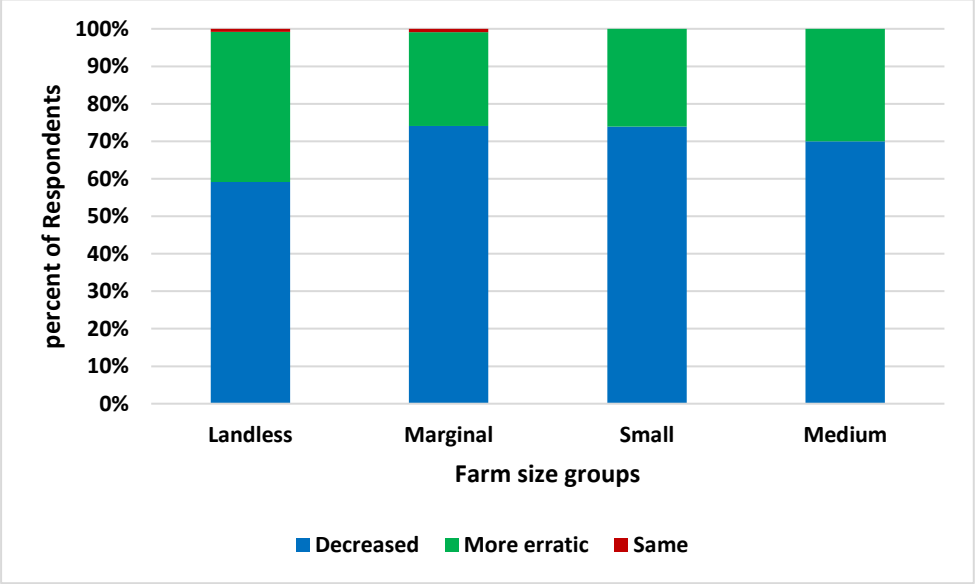
Source: Household Survey (January-September, 2015)

To capture if wealth plays a role in shaping perceptions to climate variability, the economic classification of the State government was taken as a basis. Since, households move in and

out of poverty, which is not a stable categorisation, the classification was done according to the State's economic classification for Public Distribution System (PDS)[18] – households below poverty line (BPL), above poverty line (APL) and those that do not receive any subsidies. The families without the coupons are usually young families broken off from larger joint families, poor households lacking representation or economically well-off. The perceptions do not show much difference between APL households or households with no coupons. This could be attributed to livelihood practices of the two groups. Those with no coupons usually were the migrants or those doing daily wage labourer while those within the APL in general have bigger farms and diversified livelihoods. This reduces the perception of the rainfall variability as that does not have as much a bigger impact on livelihoods of those who are in BPL and could be considered as the small holder's farmer or subsistence fishers. However, it could be noted, that in many cases the categorisation does not seem compatible with the actual economic conditions of the household and has contributed to the existing disparities.

4. Farm size

Graph 6.9: Perceptions of change in rainfall amount based on household farm size



Source: Household Survey (January-September, 2015)

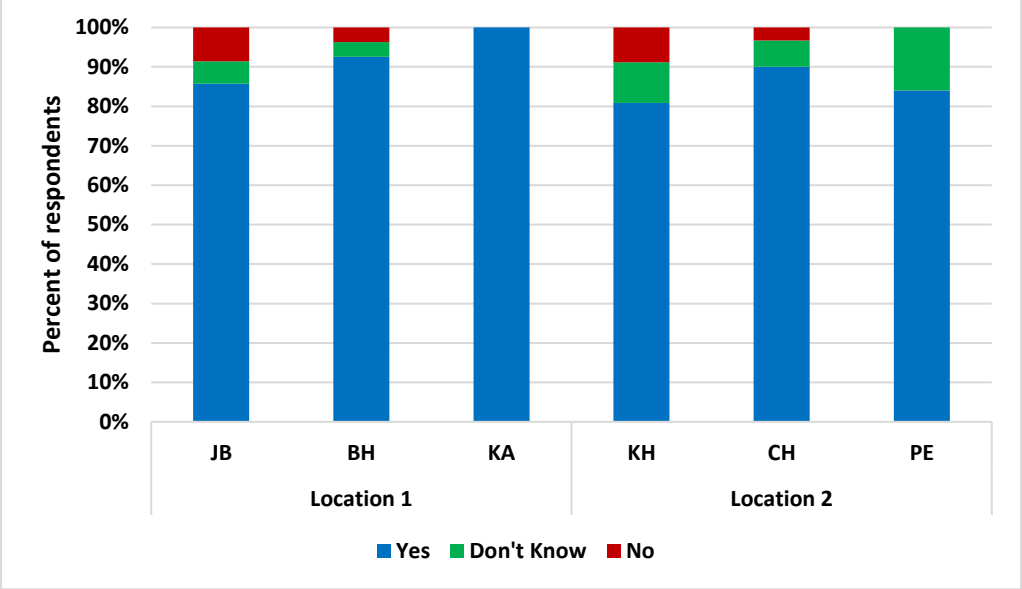
Land tenure do not appear to play any role in shaping the perception of climate variability among farmers. Graph 6.9 shows that irrespective of the farm size, the landholders do not

[18] Public Distribution System (PDS) refers to the subsidized food distribution system managed jointly by state governments and Government of India to ensure household food security and welfare allocation.

report much variation in their perception of the rainfall amount change. The landless, both shared croppers and daily wage labourers, in contrast perceive more erratic rainfall periodicity than decrease in rainfall amount or decrease in periods of rain.

Household perception of change in overall climatic conditions

Graph 6.10: Village level perception of climate variability over past 10 years



Source: Household Survey (January-September, 2015)

In both location 1 and 2, households have a stronger perception that climate variability is happening now as compared to a decade ago (Graph 6.10). Although, respondents reported variable perception of temperature and rainfall variability for earlier questions in household survey, when asked at the end, if they perceive any 'climate variability' over the past decades, the perception is stronger. This could be because of the increased exposure to media and projects being implemented in the region which reinforces the narrative of 'climate change' into the local discourses. The term 'climate change' though didn't originate organically in the local narrative but has become a part of the local rhetoric which shows the impact of policy-making at higher governance level. The climate vulnerability of the coastal plains of the Odisha as identified by the national and regional plans and as prioritised by the state government has a significant role in introduction of the concept of climate change into the communities.

Although communities notice a change in weather patterns, particularly, in the case of rainfall, but concepts like 'climate change' which refers to long-term change is difficult to be retained as a reliable event in human memory. Further, as seen in the interviews,

extreme meteorological events like unusual rainfall or extreme temperatures are perceived by the farming and fishing communities through the impacts they have on their livelihoods. Location 2 has a stronger perception of temperature than location 1 while perception of rainfall is similar in both the communities. This could be attributed to the composition of livelihoods in both the locations. While location 2 has a higher dependence on agriculture which is more susceptible to fluctuations in temperature as compared to the predominant fishery dependent livelihood of location 1. While rainfall at both locations is vital to the livelihood. Since, communities at location 1 depends on mostly fishing in tidal channels and onshore, rainfall is significant to ensure the salinity balance of the channels and hence availability of fish population.

Comparing household perceptions with evidences from observed climate data

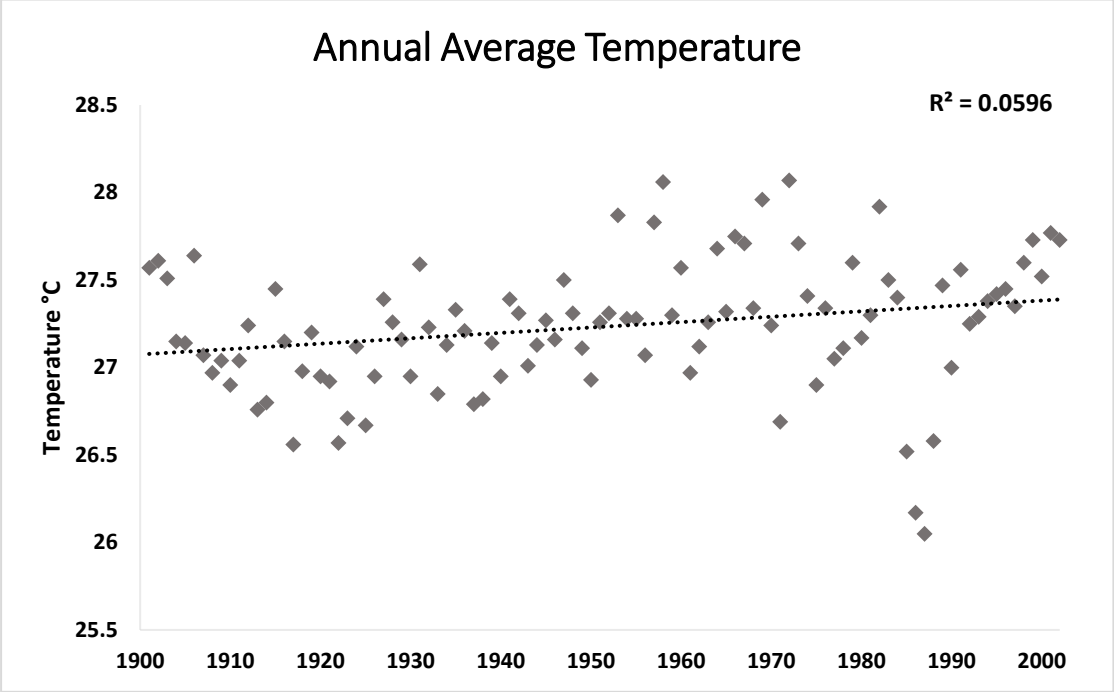
The household-level perception data, when compared with the meteorological data, provides a more detailed understanding of the differentiated perceptions of households and its relation to the reality of climate change. The sub-section compares recorded rainfall and temperature data with perceptions of the households and provides insights into does or not household perceptions align with observed climate data and factors that creates alignment or mismatches.

i. Observed temperature data vs perceived temperature

The temperature data, collected from the nearest weather station[19], was used to understand any temperature variability for the study locations. The decadal annual average temperature data from 1900-2002, was used to run trend analysis on MS Excel.

[19] The nearest weather station was at the port town of Paradip, around 20 KM from location 1 and 30 KM from location 2. More information on http://www.imdorissa.gov.in/ [Accessed 30.12.2015]

Graph 6.11: Scatter plot of average annual temperature of Kendrapara district



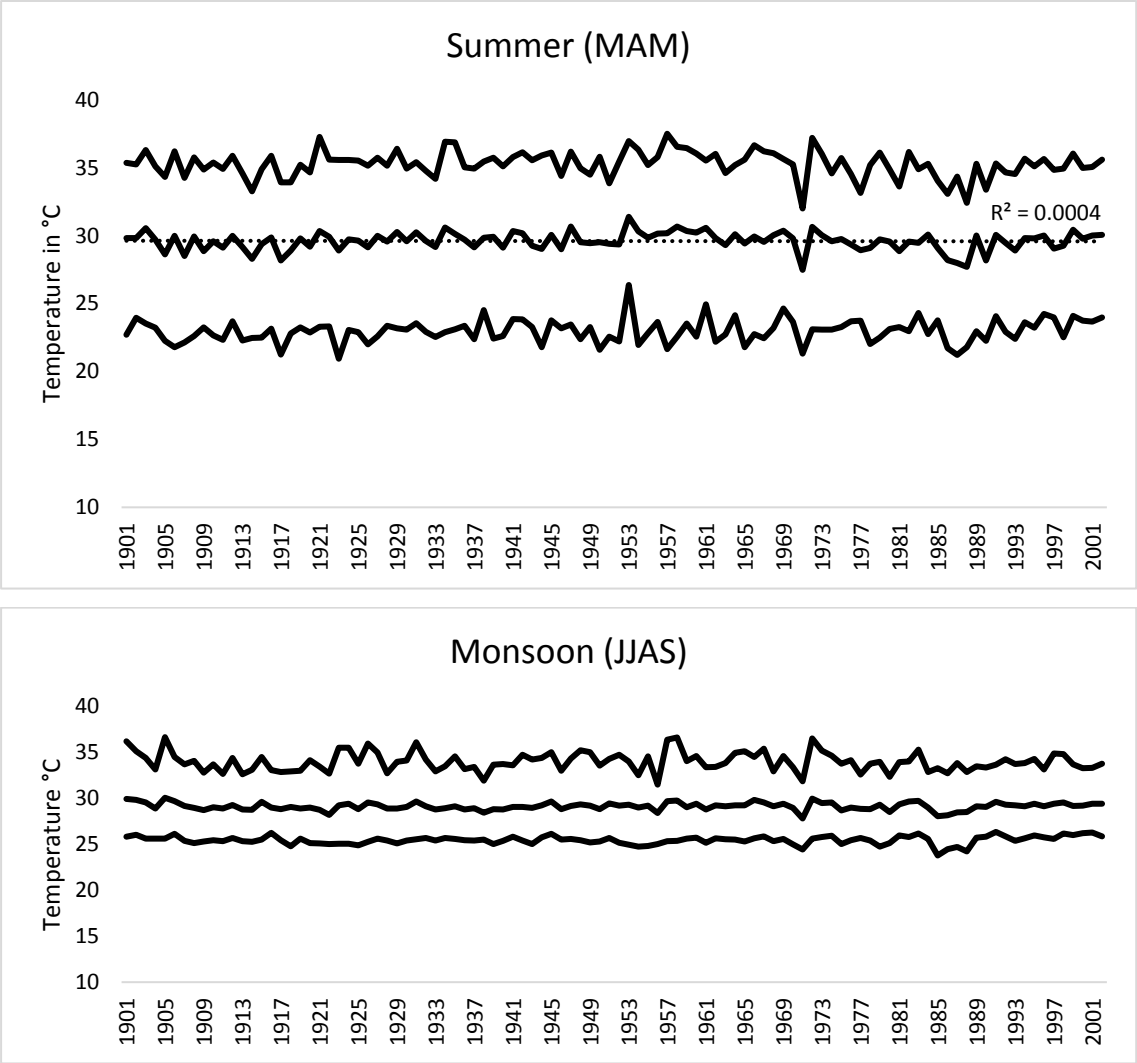
The data (Graph 6.11) shows a weak increasing trend of 0.03°C annually over the last century. The perception of the households is consistent with this trend, however, given only the slight increase of temperature and what the respondents perceived as a clear increase in temperature over last decade there is a mismatch of the perceptions and empirical data. The perceptions of the households revealed a more acute experience of higher average temperatures than meteorological data indicates. This could be attributed to the increase in number of extreme high temperature days as reported by the recent meteorological data from the last five years. As a number of studies (Maddison. 2006, Gbetibou, 2009) have observed, farmers' perception of the climatic variability hinges more on the recent events than on an overall trend. Thus, the recent five years which were warmest in the past century may have contributed to the increased reporting of higher temperatures by the farmers.

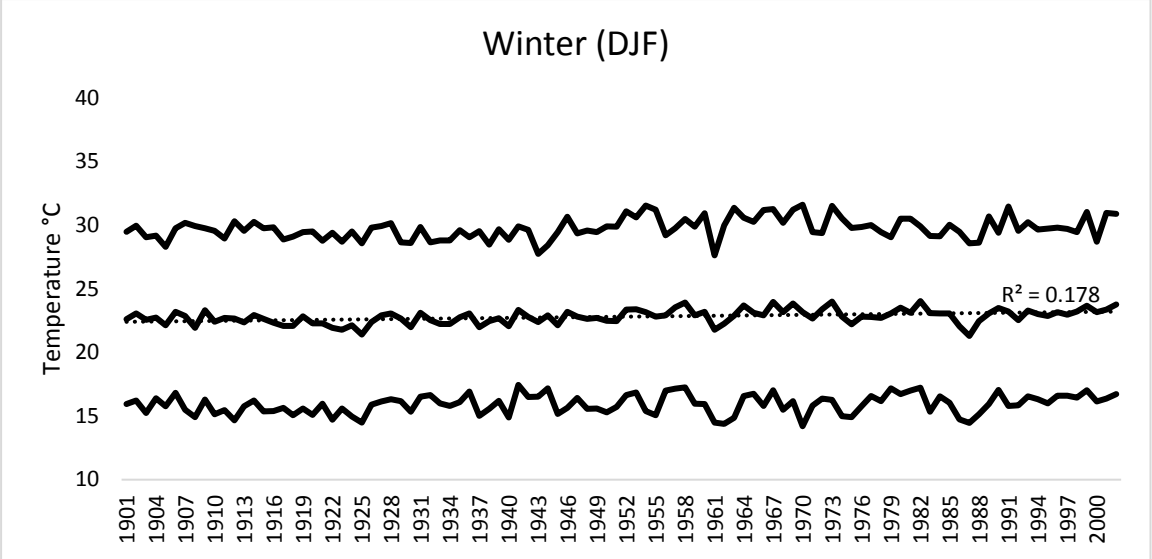
This is further evidenced by the seasonal temperature data analysis. The monthly average temperature data for the three seasons, summer, monsoon and winter, were also run for to find out if there is any trend in temperature change at seasonal level.

The seasonal temperature data analysis (Graph 6.12) shows similar results as the annual average temperature trend. In winter season there is a slight increase in temperature annually as shown by the trend line but both monsoon and summer trend line are

negligible. This particularly reveals the mismatch of household perceptions of change in temperatures. While most households perceived increasing summer temperatures, meteorological data reveals consistent summer temperatures over last 10 years. In contrast, the winter season temperature analysis shows an increase which is consistent with most household perceptions of increasing temperatures in winter season.

Graph 6.12: Trends in seasonal temperature





(Top line- Mean of maximums, Middle line – Mean of means, bottom line – Mean of minimums, dotted line – Trend line)

A possible reason behind the mismatch between observed data and household perceptions could be the increase in extreme high temperatures reached during summer in the region and the resulting 'heat waves'[20] during the summer season in Odisha. There has been a steady rise in number of 'heat wave' in Odisha during summer season since 1998 (Heat wave Action Plan, OSDMA, 2015; Akhtar, 2007) leading to human mortality every year. As stated by the HAP (2015), although the increase in temperature has been less in the coastal districts as compared to the other districts of Odisha but the death related due to heat wave conditions are higher in the coastal regions. Although the increase in temperature has not been notable in the study location, when combined with the prevailing relative humidity conditions, households experience higher heat conditions. The state of Odisha considers 'heat wave conditions' as disasters and has focussed on spreading awareness as an important tool for reducing heat wave related causalities. As a result, communities are well-informed on summer heat wave conditions and resulting human mortality. Also, the heatwave incidences has started receiving higher coverage on print and visual media. This increase in information from government and communication networks on 'heat wave' events could be linked to perception of households on increase in temperatures. Since, local narratives and language does not cover the concept of 'heat

[20] Heat wave in India, as defined by Indian Meteorological Department, is referred to days or a period when atmospheric temperature of a station goes above 40°C in plains and 30°C in hilly regions (*http://www.imd.gov.in/section/nhac/dynamic/Met_Glossary.htm*)

wave', household understanding could be simplifying the experienced heat conditions in summers to be a result of increased temperatures.

Table 6.1: Heat wave related causalities during summers in Odisha

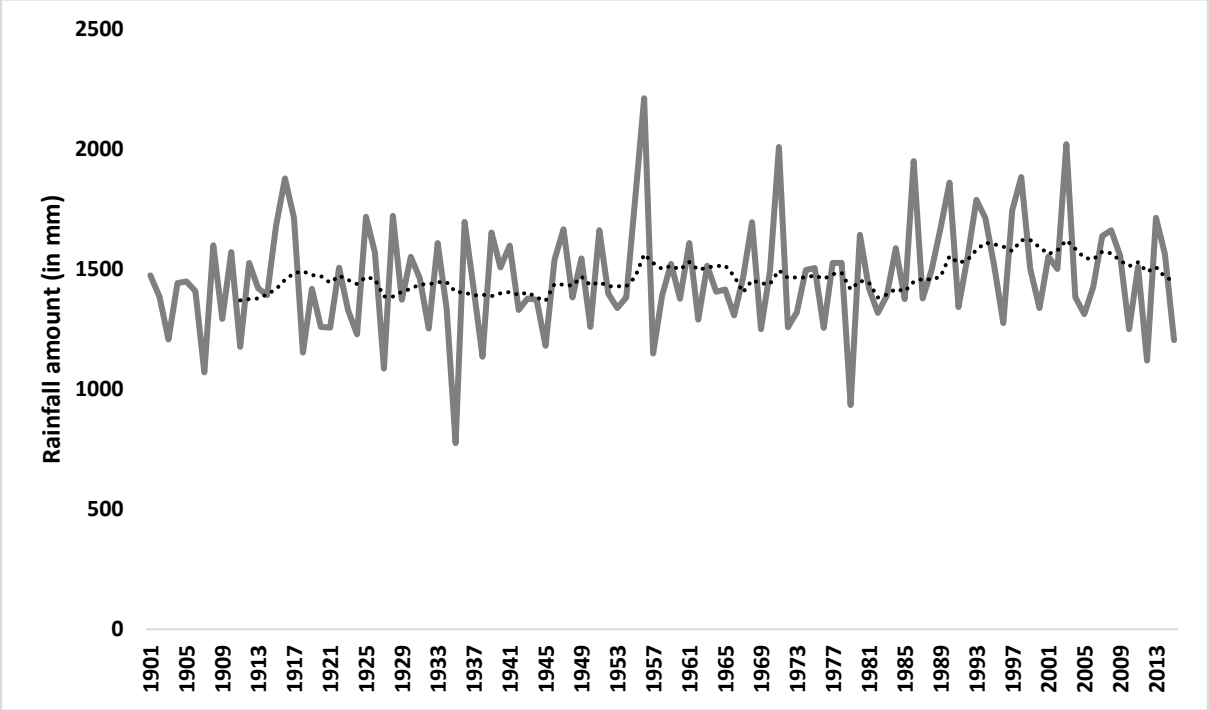
Year	**No. of causalities**	**Year**	**No. of causalities**
1998	2042	*2008*	68
1999	91	*2009*	87
2000	29	*2010*	100
2001	25	*2011*	22
2002	41	*2012*	86
2003	68	*2013*	NA
2004	45	*2014*	~ 63
2005	236	*2015*	~ 35
2006	21	*2016*	~ 79
2007	47		

(Source- Special Relief Commissioner, Odisha)

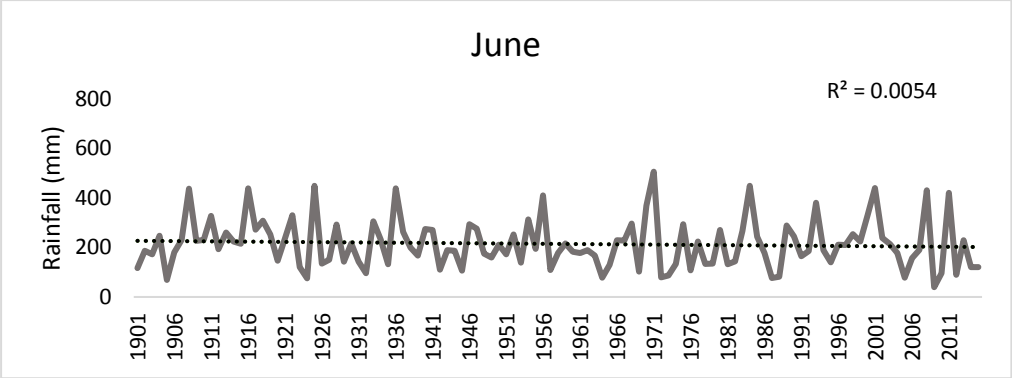
Comparing rainfall data to household perception

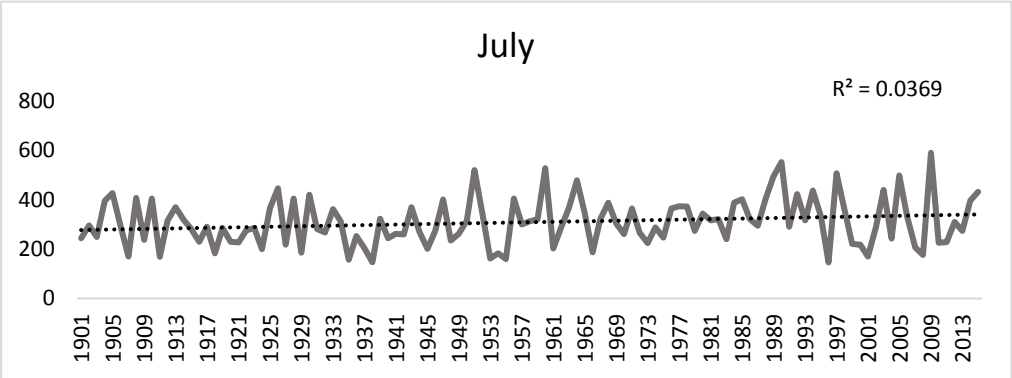
Similar to temperature data analysis, rainfall data was collected from 1901-2015 from the IMD and Odisha SRC website. The rainfall data were then extracted and analysed on MS Excel. First, the annual average rainfall data was analysed to look for any long-term trend for annual total rainfall. Next, monthly rainfall averages were analysed, specifically for monsoon period, to look for any trend.

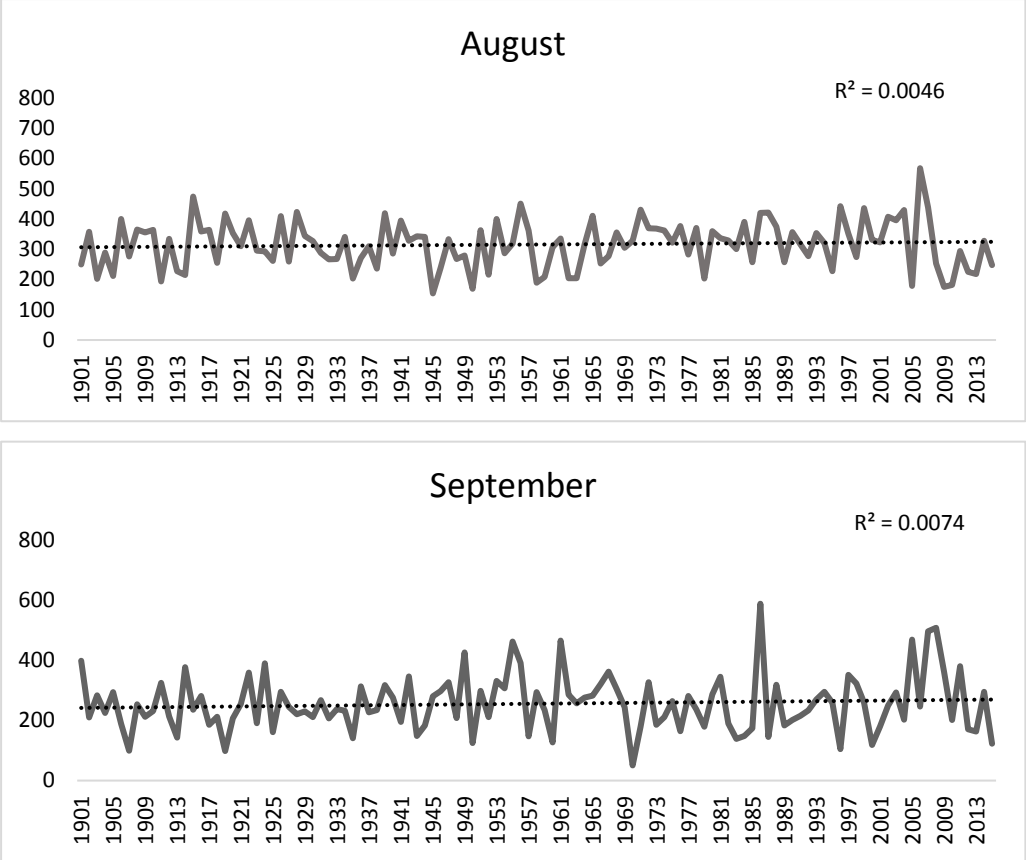
Graph 6.13: Total annual rainfall trend over last century (1900-2015)



Graph 6.14: Trend in total rainfall for Monsoon period (June –September)







From Graph 6.14, it can be inferred that the annual rainfall was highly variable from the mean. Although the inter-annual variability in rainfall is high for the research location, a weak decreasing trend can be noted from year 200 onwards. Furthermore, average rainfall for the month of June shows a weak decreasing trend (Graph 6.15) which resonates with farmers' perception of delay in onset of rains or less rain in June since past decade.

Climate trends for Odisha

The State Level Climate Change Trends in India report by IMD in 2013, shows a slightly different picture for the state of Odisha. The report, analysing data from 1951-2010, was drawn by the IMD to serve as an input to understand climate trends over different states and hence to assist planners and practitioners in planning climate change adaptation and mitigation strategies at the State level. The report observes a slight increasing annual trend of 0.01/year for the state of Odisha which is 0.02/year for the summer season. However, the annual average temperature shows no trend for the state of Odisha and in contrast the winter temperatures show a decreasing trend of -0.02/year. Also, even though, the households in the study regions and the State reports a decrease in rainfall, the reports observe no such decreasing trend in the average annual rainfall amount.

Table 6.2: Climate trends for Odisha (1951-2010)

	Temperature (in °C)				**Rainfall (in mm)**
	Mean Maximum	**Mean average**	**Mean minimum**	**Diurnal Temperature Range (DTR)**	
Summer (Mar-May)	+0.01	-0.01	-0.02	+0.02	+0.65
Monsoon (Jun-Sept)	No trend	-0.01	-0.02	+0.03	-0.23
Post monsoon (Oct-Nov)	+0.02	+0.01	-0.01	+0.03	-0.83
Winter (Dec-Feb)	+0.01	No trend	-0.01	+0.02	+0.06
Annual	+0.01	No trend	-0.02	+0.02	+0.69

Source**:** State Level Climate Change Trends in India, Indian Meteorological Department, 2013

Although, the mean temperature does not show any significant trend, there is a significant increase in mean maximum temperature across all seasons which agree with increasing annual temperature trends reported by households. In case of rainfall, although the total rainfall is reported to have actually increased, there is a steady decrease in rainfall amount over the monsoon and post monsoon seasons.

Diurnal Temperature Range (DTR), which indicates a difference between the maximum and minimum temperature of the day, is an important indicator of climate change (Karl et al, 1993). The DTR for all the seasons shows a weak increasing trend, particularly monsoon and post monsoon period.

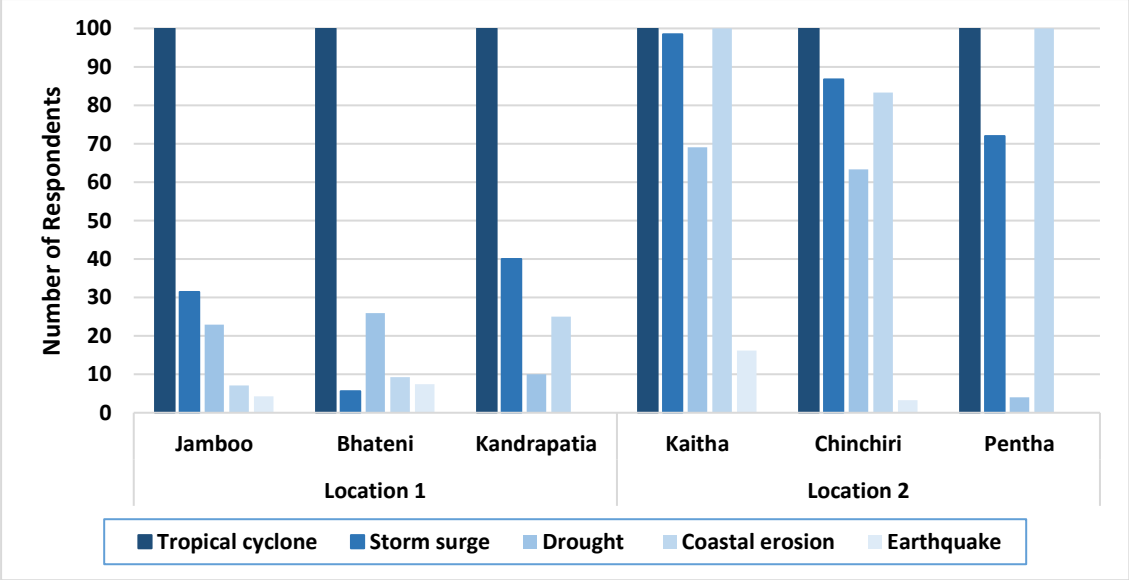
6.2.2 Household perceptions of risk from extreme events

Climate change impacts on coastal communities will be complex. Coastal regions like the study sites are vulnerable to climate change not only because of the change in temperature and rainfall, but other impacts of this long-term change in weather patterns like increased in tropical cyclone, tidal flooding, storm surge, coastal erosion and droughts. Both the study locations, being along the coastline of Bay of Bengal, experience frequent tropical cyclones, coastal erosion and storm surges which leads to tidal flooding and ensuing drought. Thus, dealing with natural hazards is an integral part of the lives and livelihood of this coastal population. This section aims to understand the household perceptions of these natural hazards by categorising them according to household and individual level

variables like age, gender, social category/caste. It takes first step of understanding which households or respondents perceive the risks of disasters and which do not and how it impacts their decision-making towards coping and adaptation strategies which is detailed later in the chapter.

As Wisner (2003) observed, the recovery and resettlement process of households after any disaster depends on its ability to access resources like information, cash, utilities, rights to means of products and social networks to fall upon and mobilize resources. The access to resources is in turn shaped by socio-economic relations of the household within the community, such as gender, ethnicity, age, socio-economic status, etc which indicates differential vulnerability that exist in a pre-disaster phase and shapes that impact of a disaster on the community. Thus, distribution of wealth and power are important indicators of differential vulnerability profiles of households to any disasters as they drive the trajectory of their post disaster recovery process.

Graph 6.15: Percentage of households perceiving risks to different extreme events



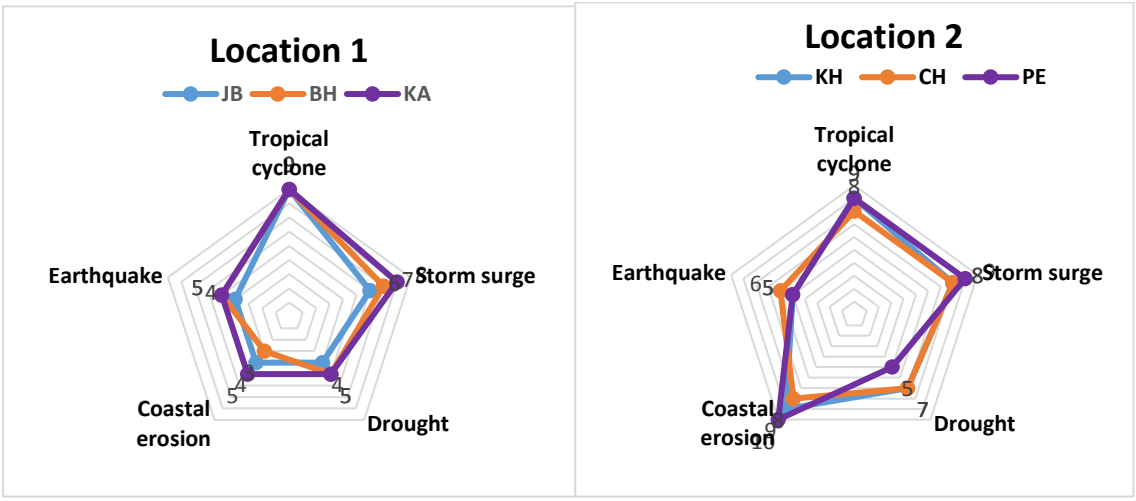
Source: Household Surveys (January – September, 2015)

The communities reported a number of natural hazards as threat to their households and livelihoods when asked about different natural hazards they had experienced in the past (Graph 6.16). Almost, every household reported tropical cyclones as a major natural disaster that impacted the region and the community. Tidal flooding was another disaster that the households perceived as a risk. Especially, the tidal flooding due to storm surges caused by the cyclones and high wind activity. A high number of respondents perceived

cyclones and tidal flooding as risk to their livelihoods by reflecting on personal life experience of coastal communities.

The perception of drought occurrence and impacts varied between location 1 and 2. At location 1, less than 25% of the respondents perceived drought as a risk compared to more than 60% of the respondents in villages of KH and CH of location 2. The inter-location difference in perception is indicative of different livelihoods of the two communities. Location 2 being primarily agriculture-dependent perceives drought as a more important risk than location 1 which has primarily fishers or household with both fishing and agriculture in their livelihood portfolio which reduces the perception of risk from drought. The intra-location perception difference in location 2, could be attributed to higher number of households in village PH dependent on migration remittances and/or are large landholder have rented their land for shared cropping. Thus, agriculture in many cases is not the primary livelihood which reduces the risk perception of drought and its impacts on agriculture for these households. However, it may be case of other pressing natural hazards like tropical cyclone and costal erosion, compared to which drought do not seem to be a major threat to livelihood. Storm surge is perceived as significant threat by communities in location 2 as compared location 1, because of the problem of coastal erosion in location 2 which according to respondents has led to more storm surges impacting the low-lying farmlands.

Figure 6.1: Scoring of perceived risk to extreme events experienced by households



Source: Household Surveys (January – September, 2015)

Another disaster perceived as risk is coastal erosion, particularly in location 2. In location 2, more than 80% of the respondents perceived coastal erosion as a risk compared to less

than 30% of respondents in location 1. It is because of the already eroding coastline along location 2, especially along the village PH, where embankment work is under progress to curb or at least to slow down the erosion. Even though households in location 1 have reported coastal erosion, there was no evidence of costal erosion at this location. It is perhaps a fear of coastal erosion as it has occurred in the north and here the response suggests a borrowed sense of threat from the experience of neighbouring communities. As one respondents from location 1 states,

"You (researcher) must be aware of the coastal erosion at north panchayat, along village Pentha, who knows we may be next. The coastline erosion is moving south we think, we may be next." (HH8_JB)

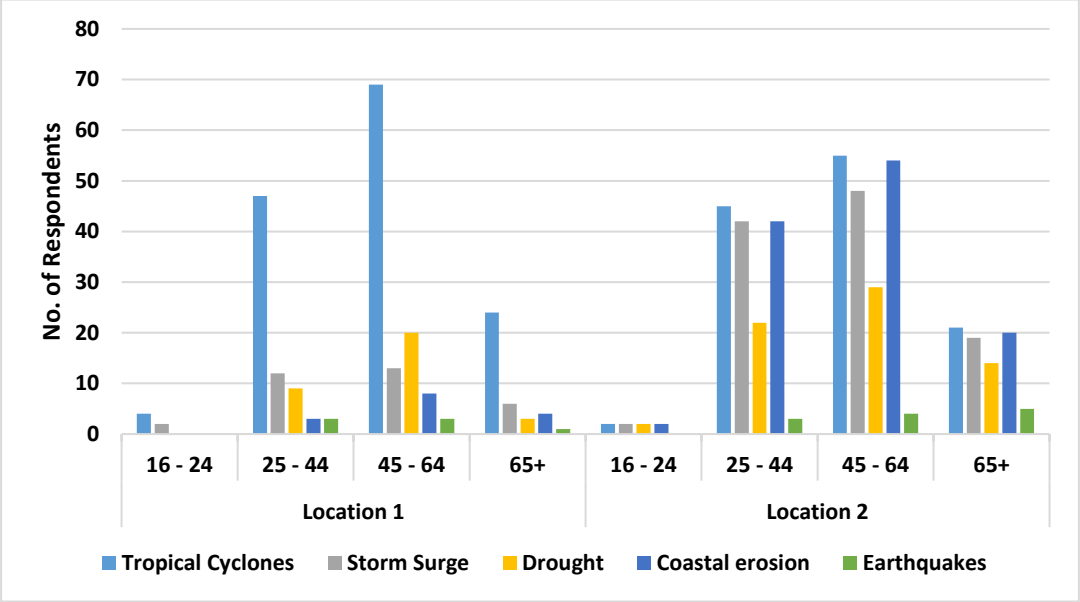
Does perceived level of risk to extreme events vary across a community?

The perception of risks from extreme events vary in between the households in a community depending on a number of socio-economic factors.

1. **Age**

The risk perception of the reported natural disaster does not show much variation across the age groups (Graph 6.16). The perception of risk of natural hazards do not reveal much variation across different age groups. However, older respondents, perceive a greater risk to all the natural hazards listed as compared to sharp variation in perception of risk by other age groups from different natural hazards.

Graph 6.16: Age as a function of perceived risk to extreme events

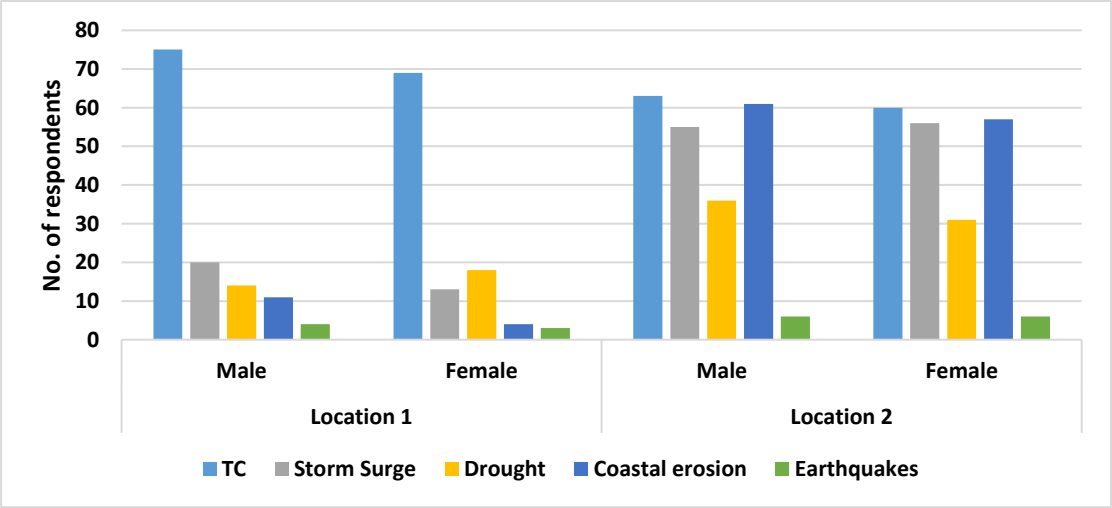


Source: Household Surveys (January – September, 2015)

2. Gender

In both the location 1 and 2, for coastal erosion and tropical cyclone the perception of risk across the gender is similar (Graph 6.17). However, it is noted that females have slighter higher perception of drought in both locations and comparatively perceived the risk of storm surges. It could be because drought stress on a household is more intrinsic affecting food security, income and migration which affects women of a household more as compared to tropical cyclones and storm surges which are bigger disasters and involves different resources and impacts on the household.

Graph 6.17: Gender as a function of perceived risk to extreme events

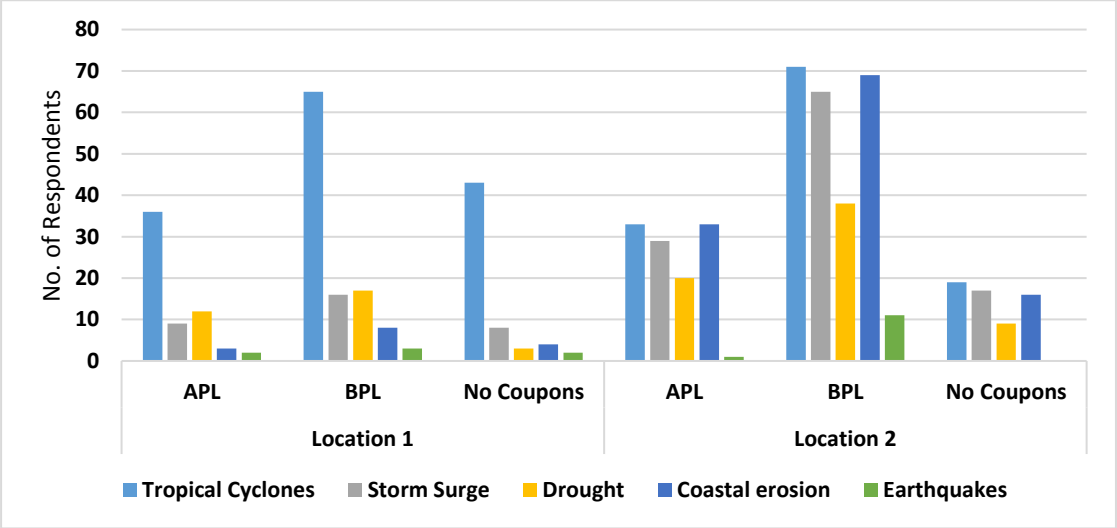


Source: Household Surveys (January – September, 2015)

2. Household income

Household with no coupons perceive less risk from droughts as compared to households with food subsidies (Graph 6.18). This could be attributed to the acceptance of migration as a means of livelihood. Those without coupons depend usually only on their land or leased land for food grains and hence are more vulnerable to even subtle change to food access and availability

Graph 6.18: Household income as a function of perceived risk to extreme events

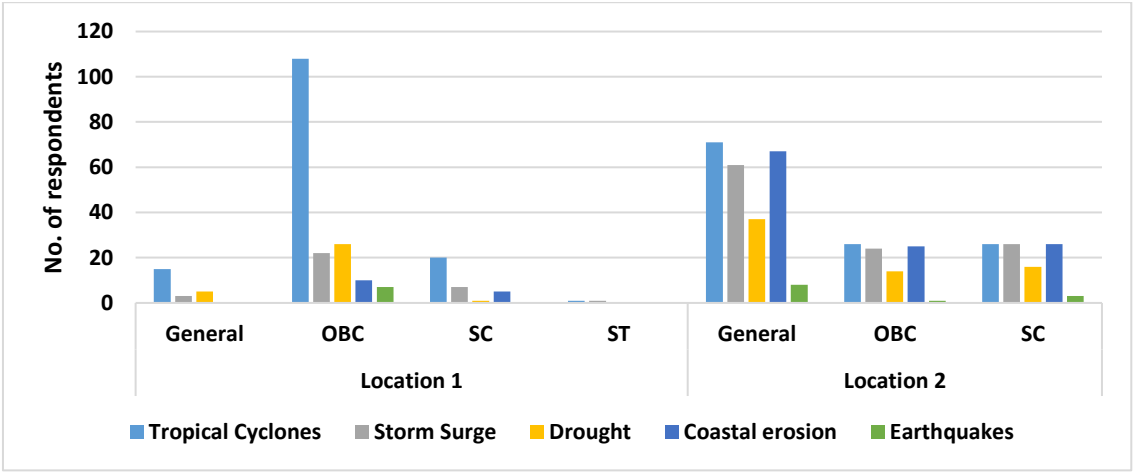


Source: Household Surveys (January – September, 2015)

3. Social category/caste

In location 1, it could be observed that the social category/caste of the household do not play any major role in the risk perception difference among the households (Graph 6.19). A slight difference in perception could be noted in location 2.

Graph 6.19: Caste as a function of perceived risk to extreme events



Source: Household Surveys (January – September, 2015)

Recorded data on extreme events timeline and impacts

The available data on major cyclones that has made landfall along the coast of the research location provides an insight into the severity and impacts of cyclone on households (Table 6.3). It can be noted that super cyclone of 1999 has been one of the most disastrous cyclones hitting Odisha coast till date.

Table 6.3: Timeline of tropical cyclones along Kendrapara Coast

(Tropical cyclones that made landfall either at Chandbali or Paradip location)			
Dates	**Cyclone categorisation based on damage potential**	**Strom surge characteristics**	**Damages/Impacts**
September, 1968	Severe cyclonic storm	NA	78 human deaths. 22,285 livestock perished. Damage in to property and infrastructure worth about 9 million USD (at 1968 price levels)
October, 1971	Very severe cyclonic storm	4-5 m Storm surge 5km inwards through land and 25km through rivers	7,623 deaths. million people rendered homeless, Homeless, 107,665 cattle killed. 3.3 million acres of crops valued at about 100 million USD was destroyed. Over 0.8 million homes were damaged to varying degrees.
June, 1982	Severe cyclonic storm	2-4.8 m surge	245 deaths. Large number of cattle killed. Heavy damage to crops and property
October, 1999	Super cyclone	7.5 m surge	9,885 deaths. Damage > 2.8 billion USD. Total number of people affected – 15 million. Number of cattle killed – 297,205. Number of houses damaged-1,579,582. Paddy crop damage – 440 million USD
October, 2013	Very severe cyclonic storm *(Phailin)*[21]	3.5 m	44 deaths. Number of houses damaged – 256,633. Over 13.2 million households affected.
October, 2014	Severe Cyclonic storm *(HudHud)*	Not significant	3 deaths. Over 156,000 households affected

(Source: DRMA, Government of India and OSDMA, Government of Odisha)

[21] Naming of cyclones originating in North Indian Oceans (Bay of Bengal and Arabian sea in east and west coast of India respectively) started after 2004. [Accessed https://public.wmo.int/en/About-us/FAQs/faqs-tropical-cyclones/tropical-cyclone-naming]

6.2.3 Summary

Coastal erosion in both the locations have increased the risk of the salt water intrusion/saline flooding. The villages are crisscrossed with numerous backwaters and depend on them for their household and farm water consumption. The water resources are thus highly dependent on the rainfall, tidal ingress and period of summer to maintain the salinity level for the households to be able to use it. So, extreme events like cyclonic storms and/or fluctuation in rainfall amount and period are very important to the households and the livelihoods. Most respondents rank saline flooding as another disaster of concern as once flooded with saline water the farm lands take a couple of years to recover. This reduces the agricultural productivity and hence reduces the coping capacity of the households to future disasters. Although, the region is not in a drought-risk zone, the region does experience drought following saline flooding. This usually leads to decrease in yield or sometimes no yield because of increase in saline content of the soil post-flooding. Thus, perception of drought is closely linked to tidal flooding and coastal erosion. Thus, disasters like cyclones have ripple effects and leads to worsening of other disaster impacts and reduce the coping capacity of the households to other impacts. Location 2 is more prone to tidal flooding as compared to location 1 because of topographical reasons. Consequently, the farming system in location 2 is more diversified than that of location 1, from submerged land to upland farming. Thus, the farming systems are more resilient to the disasters as compared to location 1.

The respondents also mentioned an increase in earthquakes and the threats of tsunami. The deltaic portion of Odisha is vulnerable to earthquakes of moderate to severe damage. Also, the recent occurrence of Tsunami over different parts of the world has increased the sensitivity towards such an occurrence. However, except for one warning in 2014 there has not been any occurrence or actual event. Thus, although there is a heightened sense of vulnerability towards such evet, there has not been any planning or focus on it yet.

6.3 Household vulnerability to non-climatic stressors: socio-economic structures and Institutional structures

This section sheds light on the contextual factors like historical, social and political realities which determine differential ability/capacity of the households to respond to climatic or non-climatic risks and hence are significant drivers of household vulnerability. The section supported by quantitative and qualitative data from the household interviews, key informant interviews and focus groups aims to improve the understanding of the local

level dynamics that shapes climate change vulnerability and adaptation decision-making at the community level. The aim is achieved by identifying and analysing the socio-cultural and institutional structures of the case study communities as detailed in the section 6.3.1 and 6.3.2 below.

6.3.1 Social structures shaping vulnerability

The significance of socio-economic structures in shaping vulnerability to climate change has been explored by a number of studies (Blaikie et al., 1994; Adger and Kelly,1999). These studies focused on the social construction of vulnerability by going beyond the physical hazard conceptualisation of climate change vulnerability. The conceptualisation of 'social vulnerability' that is used by the study follows the definition outlined by Adger (1999: 252) which states vulnerability as "a combination of social factors and environment risk, where risk are those physical aspects of the climate that are exogenous to the social system". The social factors used as indicators of vulnerability vary across the existing empirical studies within climate change domain (Blaikie et al., 1994; Bohle et al., 1994). This research identified specific social factors shaping vulnerability at the research location which are discussed below.

Ethnicity: The 'native' and 'migrant' identity

The district of Kendrapara is part of the fertile coastal plains of Odisha owing to its fertile deltaic geography criss-crossed by five major rivers that drains in to Bay of Bengal. The perennial rivers and calm coastal waters has meant that the district has supported agriculture, fisheries as well as other natural resource-based livelihoods for a long time. The villages along the coastline of Odisha thus represents a rural population with diverse livelihoods that draws upon the available resources and skill sets. However, the two study sites have very different historical contexts and paths which makes them an interesting comparative case study. The location 2 villages (Rajnagar) is a native 'Odia' (linguistically speaking) majority region and the primary/historically livelihood is farming and livestock rearing. Location 1, is populated by the 'Bengali' household who have depended historically on fishing as their main livelihood. The two study site village locations came into existence in very different ways and a very different composition which makes the difference of context in this case very apparent and significant.

Location 2 village households are the native households or 'Odia' speaking households and in the linguistically divided India are recognised as the natives of Odisha. The villages

have longer history and with established ancestry over centuries, a sense of ownership and entitlement is tangible in the communities in these villages. Although, historical evidences suggest that most of the villages in this location, including the ones under study, have gradually moved away from river banks owing to the annual floods that destroyed crops and slowly has made the land fertile for farming. However, the connected history of place and culture has made the time of the shift of the settlements blurry for the residents. There is also a lack of land records covering this period. Also, being older and native settlements, they layout and division of the community based on caste and livelihoods is much more visible.

The villages in location 1 are the 'migrant' and Bengali-speaking population who came from the neighbouring state of West Bengal. As discussed in chapter 4, the famine in West Bengal accelerated the migration from coastal WB to Odisha which was less populated at that time. The availability of land and fishing options made coastal Odisha for inter-state migration during that period. However, the 'native' and 'migrant' identity is one of the defining difference between the two villages. The issue was further complicated with the arrival Bangladesh refugee the coastal borders of Odisha. The cultural similarities meant that many of the neighbouring state migrants are often grouped into the 'refugee' group which continuously exclude them from the mainstream even after being settled here for past five decades (Chottray, 2017). This is very clear in the 'migrant' Bengali community where they themselves frame them as the 'others'. The researcher observed in her numerous formal and casual conversations with the community members that they spoke of the Odia population as 'your people' (researcher is of the Odia culture) and then Bengali population as our people. There is a perceptible awareness of the difference of culture and sensitivity in the Bengali community of the other community. This also holds true for the Odia village location where it could be observed that the 'Bengali' population is referred to as 'those people' and the respondents hesitant to frame them as refugee or native.

Cultural norms

The study of cultural norms in this section focuses on the role that religious and sect affiliations play in the framing of vulnerability by the households and its influence in moulding the adaptation decision-making at both individual and collective level by the community. In location 1, Dera Panchayat, a majority of households follow or are affiliated to the *Jay Guru* sect – a religious group managed by the village households and led by a

leader chosen by and from the village households. Although, the sect is primarily a platform for community to come together and practice their faith, it also acts as a community support group where households donate funds for charity events like community feasts, maintaining village temples and religious sites and arranging community events. However, the sect consists of members of higher castes which creates a different dynamic within the community where households of different castes exists. It adds into the existing narrative of higher castes as benefactors within any community, as observed by this study. However, the study did not find, and no households reported, any dissatisfaction with the sect, irrespective of the caste.

Caste and livelihoods

Historically, livelihoods were closely tied to the caste of the household. This still holds true for most or rural India. The two study sites were no different with livelihoods closely related to the caste of the household. The hold of caste system is strong and perceptible and so is the internalization of the system in the community to the point where it is a norm and part of life. In location 1, Rajnagar village location, the majority are the local 'Odia' population and of higher castes as categorised by the State as 'general' castes. In all the villages,the rest of the population is composed of, according to the state categories, Other Backward Classes (OBC) and Scheduled Castes (SC). There are no Scheduled Tribes (ST) in the villages which as the India Census reveals constitutes a minor fraction in coastal Odisha. The higher castes or General groups are historically farmers or priest with the current generation foraying into other jobs through migration. In the village of Kaitha, 25 % of the population is SC or *Harijan* as the households self-identify them. They were the population who were historically dependent on forest produce and were the basket weavers. This is the 'landless' population who currently constitute the highest percentage of agricultural labourers or share croppers, as over time stricter conservation and forest access regulations has led to their loss of access to raw materials. The higher castes, particularly Khanadayat or Karan, are the primary landholders in this location with varied sizes of agricultural land under ownership. The *Harijans* now constitute the majority of the tenant farmers or share croppers. The 'Brahmins' or the priest caste households are commonly engaged as priest in temples or facilitating religious rituals for other households, a livelihood practice called *Jajmangiri*. The village layout in this village is caste-wise with households of same castes around each other. The livelihoods are also strongly caste-oriented. As one of the respondents reported,

"We do not keep poultry.. in our caste [Brahmin] we don't rear poultry, that is considered beneath us, we only keep cows and oxen as livestock." (HH12_KH)

This perspective and livelihood orientation to the caste is also seen among the members of another caste 'Gopal' or the buffalo herder castes who take care of cows and buffalo and sell milk. As one respondent from the caste noted,

"We are of the Gopal caste, we know how to rear buffaloes. That is what our ancestors and grandfathers used to do, now there is no grazing land and no buffaloes, we don't know what else to do, we don't have agriculture land here and nor does the skill set. All we can do is migrate to towns and work as labourer." (HH23_KH)

This also resonates with the SC households in the villages who has been historically basket weaver. One of the respondents from this group have a similar viewpoint,

"We are harijans (Scheduled Caste) basket-weaving is our livelihood and this is what we do and know. We have always depended on this as our livelihood resource. We do not have agricultural land and nor are we farmers and so with no access to raw material we now have to work as agricultural labourers or as now most of our next generation is doing – migrate to nearby towns or other states to work as a daily wage labourer". (HH29_KH)

The traditional livelihoods of different groups (castes) of households in the villages are thus socio-culturally set and thus their assets – physical or skills – have developed around the available resources. The increased regulation and changing rules and regulations of the Government policy has thus deprived them of their traditional livelihoods. Further, with absence of required assets, because of historical disenfranchisement and the norms, it is difficult for these households to diversify without any external support. The norms around the caste are strong and deeply embedded so that creates a barrier for the communities to open up and adopt other livelihoods.

Class inequality: Wealth and political influence

Political power or access to the platforms of power and decision-making is not equally available to all the households in the community. The 'communities' are diverse even at the local scale and 'who' have a say on 'what' issues are socio-culturally embedded. So, a community painted as vulnerable will have its own elites who dominate the decision-making or access to benefits. They are the local level political elites who because of wealth or by building connections have better access to decision-making platforms at the higher level and hence command or demand more respect in the community. Also, the decision-

making capability differs in between the villages. The presence of political elites in a village gives it a dominance over other villages when represented at a higher level. As one respondent in location 2 reported,

"*We don't know the staff at the Gram Panchayat office. We are poor and uneducated people so if I need to know about government schemes, I usually ask the head of Jena household (a wealthy politically connected household in village) about it, they have all the information and it is easier to understand for me. They also have good political connections and has helped us with accessing movement subsidies." (HH12_JB)*

The political landscape in this case also differs because of different identity that the residents of both the locations/location carries. Location 2 is the native Odia-speaking population which do not show a very strong political cohesion in terms of supporting any political party. The perspectives are different, and the political leaning are different. In contrast in location 1, the political leaning shows a significant unification and open endorsing of the current ruling political party.

Gender roles and expectations

The gender roles in farming varied between both the study locations. In location 2, village location Rajnagar, the 'Odia' population has a more traditional framing of the role of women in agriculture. Although, women do most of the off-farm activities and are actively involved in the post harvesting phase of farming, the women traditionally do not go to farms and do farm activities like planting or ploughing. Women are engaged in household activities and backyard gardens and vegetable farming when in backyards. They are also the primary livestock carer. As one of female respondents smiles and points out

'*We women do not go to farms, our husbands and sons will make fun of us… [laughs] what will we do there, that is a man's work." We, ladies, take care of our cattle, backyard vegetable garden, of our household activities and children but we do help in the post-harvest activities like threshing, boiling and packaging/storing paddy for next year." (HH29_KA)*

So even if women don't do the 'important' farming, they share the majority burden of work in a household. So, traditionally, in a patriarchal society like that in India, men in these villages are still considered as the primary earners and women help them and take care of the house and children. However, as observed by the researcher, women do the majority of post harvesting work.

In the *Harijan* group of households the men and women are equally involved in the livelihood activities. In the households, both males and females are involved in basket weaving or sometimes, the collection of the grasses/raw materials is the duty of the males and the women of the household weaves the basket which is followed by the selling of the baskets in markets by the males. However, sometimes both males and females in the households alternate between the duties and are equally engaged.

In villages of Mahakalpada (location 1), the 'Bengali' household division of labour is different from that of location 2. In these villages, women are actively engaged in the livelihood activities, whether it is farming, fishing or livestock rearing. There is a perceptible difference in perception of the role of women in a household in these communities. Although it needs to be noted, even though it is the case for the majority, the wealthier and the higher the caste of the family is observed to be, the more the role /engagement of the females of the households were confined to in and around the house. Thus, the gender role perception also varies according to wealth and caste of the household. The women in this tend to be more educated but more confined to the roles of a household carer and more engaged in domestic activities. One of the young female extension workers, from the community, working with the local community stated –

"the girls/ladies in the Odia culture are encouraged to study and are confined to homes, we [Bengali women] are taught to work from childhood so we know everything from farm managing to household work by the time we are teenagers……" (KI_2_MH)

This is particularly seen with the households that are involved in fishing as their primary livelihood. The men and women in the household are both involved catching fish and sorting the catch. In case of direct markets, men are usually involved in selling. However, women are also engaged in the marketing of the catch especially the crab catch. In case of processing, women are the primary workers preparing processed fish and selling them.

However, these differences in gender roles and responsibilities between the communities do not translate into equal rights for the women. The women-headed households in location 2, were found to be more entrepreneurial and doing well financially in comparison to location 1, however the small number of such households means that they may not be representative of entire community. The households mainly face the struggle of political and social legitimacy. They usually have to depend on the other men (leaders of the community) to assert their household rights and talk on behalf of them. The cultural norm

of participation or acknowledgement of the work of women in farm land provides them with the decision-making power. The autonomy in the livelihood area of their lives provides them autonomy in other areas too.

Nevertheless, perspectives of climate change, livelihoods or other risks is gendered[22]. The risk perception of women varies from the men when it comes to climate change or other disaster risks. The articulation of this risk perception thus differs accordingly. The women perceive climate change in terms of the availability of food and availability of water for irrigation. Women are actively involved in irrigation if rain fails and they have to contribute to the manual labour. However, most of the women farmers are not aware of the cost and expenditure in farming inputs and hiring farm machinery in location 1 while the women in location 2 were found out to have a better idea regarding such issues. The presence of women in agriculture or fishing in location 2 has also meant that women were more entrepreneurially when supported by any State subsidies or programme. Many women showed active interest in diversifying livelihoods, particularly engaging in rearing livestock such as goat-keeping and poultry. However, dictates of cultural norms in location 1 has meant that poultry or goat-keeping had not received as much popularity or acceptance by the women. Many women showed interest in cattle/cow rearing for milk because of the available government milk collection centre (OMFED) within 500 metres of the village. So, the availability of good marketing chain facilitates more involvement of women in livestock or farming as the current socio-cultural context restricts access of women to markets, especially in rural areas, where market accessibility is already difficult for most farmers.

Women also become the vulnerable population who are left behind as the men migrate to towns. Although in this region, migration is of temporary type, it increases work load, but this also makes the women more resourceful and transfers the decision-making to them. This was observed in one of the villages in study location 2, where 80% of men work as migrants in another state. The women here are involved in catching crabs, doing paddy farming in small plots, goat-keeping or processing and selling dried fish. The women are actively involved in the all the household activities and generating extra income.

[22] See Section 6.2.2 (Graph 6.7) and Section 6.2.3 (Graph 6.16) for quantitative evidences of gendered perception of risks

6.3.2 Institutional challenges

The role of local institutions in maintaining livelihood security and shaping adaptation of households is well evidenced by various case studies (Adger, 2000; Berkes and Jolly, 2001, Agarwal, 2009). Institutions refer to formal rules and policies and informal norms that structure and shape individual and social interactions, attitudes and practices (North, 1990; Ostrom, 1990). In rural context, institutions influence vulnerability of households because of number of functions they perform – access to and sharing of information, resource mobilization and utilization, capacity building, leadership and structuring decision-making and linkages to other institutions (Agarwal, 2010). These functions are critical for facilitating adaptation process and reduce vulnerability of households. This section explores the institutional challenges that the households in the research location are currently addressing and what impacts it has on the contextual vulnerability of the households. For the analysis, the institutions are categorised in accordance to the role the play in the community – social, financial and political and in each category the relevant formal and informal institution and their linkages are examined to understand how the institutions holds the potential to undermine or enhance adaptive capacity of a household in the research location.

i. Institutions of social protection

Rural communities usually create informal support mechanisms that ensures livelihood protection and minimum subsistence of all its members (Platteau, 1991). This usually includes collective rules and mechanisms, reciprocity networks, insurance mechanisms and religious organisation (Platteau, 1991, Verpoorten and Verschraegen, 2010; Norton et al. 2001). Further, with growing recognition of the need of social protection for vulnerable households, developing economics are developing better formal social protection systems (FAO, 2015). The formal system is normally supported by the government, International donors or NGOs. The communities in the research location has varying formal and informal institutions of social protection that shapes livelihoods, resource access and coping with risks.

In both location 1 and 2, share cropping is an established mechanism of livelihood security. Although, it is beneficial for landless households in order to maintain their food security and have a livelihood resource, it does not enhancement of adaptive capacity of the households. As discussed in the context chapter 4, the traditional land tenure system is insecure and inconsistent, owing to the historical context of the research location. The

landlord-tenant farmer relationship can be exploitative and lead to unequal power relations. It does offer protection to the poor household to some extent, but it does not contribute to long-term adaptation. Given the pressures of climate change, low agricultural productivity and limited opportunities of crop diversification, the share-cropping mechanism has weakened in the research locations. While land-owners express dissatisfaction with the increased labour prices and an increased dependence on tenant farmers for farm productivity, the tenant farmers find it difficult to receive subsidies and insurance from credit institutions without property rights. Within this given context, the lack of stronger formal land tenure laws and formal credit institutions that could support tenant farmers is an important obstacle to reduce vulnerability of poor households. Although, there are a number of land-reforms currently being debated at the policy level. There has also been reforms in credit support by the state government in order to support tenant farmers in case of subsidies and access to insurance. Although, still in a nascent stage but formal laws and systems has a significant role in overcoming the institutional challenges of local customary laws and rules.

In location 1, community has similar collective rules around fishing grounds. With population pressure, dwindling fish catch and increased government regulation it has become difficult for new fishers to enter into the system. The only opportunity left is being a supporting worker on an existing boat. This again creates an unequal relationship between the existing fishers and the new recruits. This also restricts any opportunity for poor households to move out of this labour-dependent role in fishing. In addition, there exist a lack of cold storage or regulated fishing market close to the community. This makes them dependent on the wealthier households who function as ‘middlemen’ providing credit support to the fishers and purchasing the fish catch in return. This is an accepted contractual system in the community which makes most fishers tied to atleast one middlemen. This makes it difficult for the fishers to initiate any innovation on their own or have any negotiation power on pricing. Since, purchasing a boat and necessary fishing equipment are a huge investment for any poor household in the community, without the security of access to fishing grounds and access to better markets, fishing as a livelihood is highly vulnerable and the informal protection mechanism fragile and open to unfair practices. Further, the formal laws of fishing and marine conservation are now stricter with increased regulation on fishing periods and conservation of coastal forests and wildlife. As observed during the study, this has created a situation where fishing industry is

increasing becoming an unviable livelihood option. Both the formal and informal social protection institutions have failed to address the issue of disproportionate impacts of the rules and laws on the poor households. The power is held and exercised by those with the existing resources which reinforces the unequal power relations in the community. For example, while the wealthier households have a found a way around the fishing bans by investing on fish ponds and aquaculture, the poor households are left with an insecure livelihood.

Similarly, reciprocity networks in rural communities play an important role in households coping response to climatic shocks and stressors. This includes labour groups and producer groups – where a household or farmer help another with their agriculture tasks, household repair and livestock grazing, and the other farmer is expected to return the favour. In rural communities, such networks help to reduce the dependence on cash and keeps labour cost low. However, this is mostly for the poor household who cannot afford hiring labour. With increasing migration and disinterest on farming such networks are struggling. Also, informal mutual aid networks which involves voluntary participation by members to assist in risk pooling, community common management and mutual assistance has been important traditional social protection mechanisms. Although, they can be very effective in collective response to risks and acts as financial support systems for poor households, but they can be exclusionary. Since, such groups tend to be formed based on specific membership criteria, they could reinforce existing inequalities in the community by limiting the resource sharing to only the chosen few. This is evident in location 2, which have households depending on different livelihoods – farming, basket weaving, livestock and labour. In this case, since most the farmers are the higher caste and have stronger producer groups to represent their interest at political platforms, the benefits are also farming oriented. This has created lack of any significant livelihood support programme by the government for other households.

ii. Financial Institutions

In low income economies with weak legal institutions, formal and informal finance institutions continue to co-exist, which is also the case with rural markets in India (Germidis et al., 1991; Nissanke and Aryeetey, 1998). A prominent informal credit institution in the rural areas of India, are the moneylenders (Madestam, 2013; Banerjee and Duflo, 2007). The significance of this financial institution for the rural households is noted in both the study locations where they exist in form of wealthier households, traders

and landlords. The households depend on these moneylenders for emergency expenditures like health or bigger expenditures like education or weddings. However, the situation has been changing slowly over the past decade. A growing body of research case studies (Ghate, 2007; Pal, 2012) has shown that moneylenders usually charge high interest rate compared to formal credit institutions which is observed at both the location 1 and 2, where interest rate is 13% p.a. as compared to the normal 7 % p.a charged by all banks and cooperatives in the state. In the research location, the moneylenders are primarily, a number of wealthy families in the village and fish traders who lends money to other village households in time of need.

Other major change in financial landscape at both the study locations is the emergence of the Self Help Groups (SHGs) initiative for women, started by the Odisha Livelihood Mission, to transform the SHGs into robust financial institutions and micro enterprises. Although, in past efforts to encourage SHGs for rural development had not been very successful across India, the current livelihood-finance linking women SHGs are promising in their outlook. The new approach of creating multi-scale SHGs with more autonomy and training provided to them to handle the financial transactions and decision-making has created a more successful model of SHG. While the multi scale nature has created more accountability, the autonomy had provided the members of the SHG a better sense of ownership. The respondents in both the locations had a very positive view of the difference that these SHGs has brought into their life. However, it is particularly in location 2, that the change in the money lending practices could be seen. This could be attributed to a number of reasons that the researcher has observed during the interactions. The locations have a different perception and cultural norms that defines women's right and responsibility. The SHGs have a lower interest rate and with the seed fund provided by the government has had a good start. The streamlining of rule and regulation around the SHG functioning while balancing the autonomy of the members has ensured so far, a fair and responsible running so far. Since, the project is still under the government monitoring, it is difficult to conclude its long-term impacts when the government support is taken away and the SHG becomes completely autonomous. In location 1, however, the project impact has been limited. The SHGs failed to run in one village while the other two villages have limited participation and hence low success. The researcher observed a difference in the cultural perception of the women of themselves that could be the reason, which is discussed in Section 6.3.1 on gender roles, behind this observable difference.

Also, though the money-lenders as an institution has decreased in significance with the increase in rural cooperatives and bank subsidies but it is still found to be important during emergency expenditure needs of the rural households in both locations. Nevertheless, the National government has introduced a number of plans and programmes to streamline and formalize the financial profile of the rural households. This includes providing zero-deposit bank accounts, medical insurance plans to life insurance subsidised programmes in the rural areas to provide accessibility to financial resources in times of needs. The new insurance, saving or welfare schemes are also built around ensuring everyone has a bank account to make the financial transfers to the beneficiaries in a direct fair way which would minimize the exploitation by middlemen and corruption.

The cooperative banks are another important financial institution especially for farmers. The interest rate is low, and the farmers could take loans during farming seasons for inputs and are also covered by insurance plan for such loans. This does benefit the farmers during the farming season and the ability to take a substantial loan also means they usually do invest in new business or housing/construction or investing in assets. However, the loopholes of such cooperatives are many and they have been criticised for their policies. The cooperatives do not cover tenant farmers or share croppers, who are a large part of the farming sector. This leads not only to the exploitation of such poor households by moneylenders but if, and when, the crop fails without any insurance to cover the loss these households spiral down to poverty and more exploitation.

In location 1, the predominant fishing community, a lack of cooperatives in the financial landscape for fishers has been filled by the 'middleman trader'. These traders provide the occupation loans which include loan for the purchasing the boats, maintenance of the boats and purchasing other accessories like engine and fishing nets. In return, the fishermen are tied to the trader and have to sell their catch to these traders who then sell them in bigger markets nationally or internationally. The perspectives of respondents in the fishing community on this practice is divisive. Many find the traders are essential to the value chain and having a definitive contract with them ensures that the fisher do not have to worry about a buyer or marketing. They find the business model working and do not see any exploitation in this process. Many state that the traders they have been working with have always treated them well, never had any conflicts and had paid them well. Some respondents, however, reflected on how being in such a practice impacts their overall welfare (Box 6.1). The constant maintenance of fishing boats and nets mean they are never

debt free. They take loans before the start of each season for maintenance of their occupational machinery. The pay their loan back slowly through the earnings from the catch and by selling their catch to the same trader. However, boats are expensive for these poor households and need regular maintenance as does the machinery. Also, to maximize the catch per trip, each boat needs 3-4 helpers who are paid a share from each day of the catch. The earning thus at the end of the day for the boat owning fishermen are just enough to pay back the debts and survive each day. This practice thus does not provide any opportunity to the fisherfolks to improve economically in the long run. Also, there is a lack of government support in this region for fishers, such as, lack of any cold storage facilities for catch, any regulated auction market to get a fair price for the catch or any marketing linkages that could remove the middlemen. Thus, the price is determined by the middlemen/trader for the catch irrespective of the international/national price fluctuation. It is thus more profitable to be a trader rather than a fisher which many households have shifted to practicing. This does reflect on the entrepreneurship of the households and adaptation to increased risks. However, this also sheds light on the profile of the households that were able to make this shift and benefitted from this practice. The lack of cooperatives or any other financial options to depend upon has maintained the middlemen and money lender system. Although, the SHG initiative has been beneficial in this location and has reduced exploitative financial practices.

Box 6.1: Exploitative credit mechanism in fishery sector

The vicious cycle of credit in fisheries

HH_42 in village JB borrowed two lakh Indian Rupees (INR), equivalent to 3000 dollars, for purchasing their own boat in 2013 from a fish trader. The have now a contract with the fish trader that they will only sell their catch to them. He has also taken loans after each fishing season since the past two years, for the maintenance of the boat. The purchase of the fishing nets and the maintenance he pays by himself. Each time he goes fishing, he takes at least four helpers, with him for setting nets and help in the fishing process. Depending on the total catch, he keeps 50 percent and the rest is equally divided among the number of helpers he usually has which is 4-5 individuals. If the helpers have their own fishing nets they get more of the share. So, from the price paid by the trader to him he runs his household as well as pays off the debt slowly. Normally, the interest is low, at 2% annually. The HH after paying the debts and spending for household expenditure like food, education etc, is usually left with no savings and for any emergency or occupational needs again depends upon the loans from the trader. And, so this viscous cycle continue.

iii. Political institutions

At the community level, the main formal political institution is the Gram Panchayat with Sarpanch, an elected member of the villages, heading this council. The gram panchayat functions through the democratically run Gram Sabha, a meeting where village problems could be discussed, and solutions could be worked upon by inputs from the community. The villages, however, informally depend upon the village elders, *mukhiyas*, as the first platform for conflict resolution and village related welfare decisions. Although informal, this entrenched social system is a significant power-shaping factor in the community. The 'elders' are the individuals who represent the village and its household welfare and development issues at the block and district level and the community depends upon them as their negotiator and decision-maker. These invisible but influential dynamics in a community are the most significant reflection of the politics and power struggles within the community. They are the support behind the represented/elected leaders from the villagers and most often are the most influential actors in the governance process. The power relations within the community may not reflect the structured governance process. A village is a heterogeneous community and the normative social and cultural differentiation translates to the rights and accessibility to benefits that a household possess. In location 2, the political influence of the national or regional parties and political leaning are rarely visible. In location 2, a significant observation made by the researcher during

the fieldwork was that when inquiring about community-related issues, she was frequently directed to the '*Murabi*' of the villages for information, who are the elderly group of men are respected by the community. They exercise informal but customary rights which holds more importance within the community than the formal institutions. They are considered and accepted by the community as *de facto* leaders and spokespersons for the community who acts as interface between government organization and village households. Thus, local level disaster risk management and implementation of climate change adaptation measures are highly influenced by the motivation and interests of these leaders.

The local level government institutions also play an important role in shaping the perception and facilitating adaptation to climate change. The primary institution interacting with the community/village is the Block Office headed by a Block Development Officer (BDO) though which all the government welfare programmes are implemented and monitored. The Block Office houses different projects and programmes run by the State government for social welfare and livelihood development. The extension agents of different departments work with the communities and are a part of this set up.

In location 1, stronger affiliations to formal political organizations is observed during the interviews and group discussion with the community. The respondents discussed their political leaning openly and political parties and politics role in community development came up during many respondents. It is important to note that location 1 is far in terms of its distance from the district headquarters and is not very well connected by roads. The block office accessibility is also restricted to the villages at this location because of lack of bridges and roads. So, it is the informal networks of governance which again has a more significant role in the community day to day living than the formal organizations. The 'outsider' identity also plays an important role in the power dynamics between the formal and informal institutions. However, the gram panchayat office is at the centre of the gram panchayat which is the most important formal governance structure in the location. The location of the gram panchayat office provides very important insights into the power relations within and in between the different villages in the gram panchayat. Since, the gram panchayat office is located at JB village, the other two villages (KA and PH) of the gram panchayat had articulated their grievances that the any kind of social benefit always reaches the households in the village JB first and so does any government aid. The JB village and its leaders has acquired an important status in the gram panchayat. The historical context of this region sheds more light on this issue. This village was the first

one and biggest one established by the internal migration from West Bengal. Consequently, it has also the wealthiest and politically networked households in the location which keeps the village in focus for government welfare programmes. Thus, the location has a very visible political sensitivity. The bigger community and competing interests has also meant that there are more conflicts within this location as compared to the location 1. The informal governance process is thus more diversified and more embedded in this community. The have youth groups and community-based organizations that manages the village commons like ponds and temples. All these informal organizations form important part of the village socio-political dynamics. The informally chosen or accepted leaders have a greater impact in the implementation of formal projects and programmes and hence are the major actors in the decision-making process. However, these are often the community elites who have their own interests and agendas. Thus, communities are not a single entity but a composite of different perspectives and interests where some interests may get legitimized while others may get excluded depending on the informal political institution and its function.

The region is facing the complex and interlinked issue of coastal erosion, cyclone vulnerability and social issues which has attracted attention from national organization, bilateral and multilateral donors. This has led to a number of national and regional organizations working on the vulnerability aspect of climate change in the region. One of them is the regional NGO, RCDC which is funded by Concern Worldwide for a project ion reducing coastal vulnerability. Similarly, other research-based studies have also shown interest in this region. The local organizations like the NGO, have played a significant role in shaping the climate change perception of the households in this region. Although, only parts of location 1 were covered by the NGO project but the entire location has an awareness of the climate change debate because of the NGO. However, this has also become another power playing field for the competing interests in the communities as these projects are being increasingly getting associated with benefit schemes and international aid projects. In location 2, NGOs have minimum or no presence which could be attributed to it location and composition of population.

In location 1, another important organization is the coastal/marine extension services which was set up by the government to ensure the development of coastal households/fishers while focussing on marine conservation. It is monitored by the ICZM through the fisheries department which have extension workers implementing the project

at the village level. The have introduced alternative livelihoods projects like fresh water fish farming and poultry. The project is run directly by the ICZM without any involvement of the Block Office. The project implementation has not been very successful with poultry farms failing to find markets and the fishery inputs not suitable for the conditions which resulted in no profits to the household involved in the project. The organization presence in location 1 is however very less at present. The project lacked any follow up or monitoring and the respondents' state that the instruction provide to them were not clear to them. The project was a stand-alone project, uncoordinated and ill-implemented although ICZM has 'integration' of into broader policy as one its objectives.

6.4 Differential Social Vulnerability: An outcome of social structures and political interest interaction

As discussed in section 6.3, different contextual - social, economic and institutional factors play an important role in shaping the households' perception of risk and placing the households in different conditions that results in differentiated vulnerability in the community. These distinct local conditions thus are an outcome of the interaction of the existing social structures and political dynamics in the community. The section explores and examines these conditions which provides an insight into the role that power, and politics play in shaping household vulnerability and hence their adaptation responses to the external stressors. The conditions as described by the respondents and observed during the study can be categorised into the main themes of access to resources, political networks and leverage, gaps in local knowledge and trust, and conflicts between authorities over resources. While at household level the knowledge on climate change and the trust on expert advice is weak and the approach to such knowledge differs in case of each household, the conflicts on resource access between the government and the locals and between the rich and poor households within community drive attention to the issue who owns, who has the right to govern and whose voice is being heard in the decision-making and governing process of resources. These interactions and underlying power and knowledge interplay is described in detailed below.

6.4.1 Access to resources

The impacts of variability in rainfall and temperature on livelihoods is compounded by other factors like population pressure on land and other resources. Respondents' perception of risk to any variability in meteorological conditions are thus closely tied with other contextual factors. One such case in the study site is that of dwindling interest in

livestock which is voiced by the respondents during household interviews. While the unpredictable rainfall and increasing temperature has led to livestock's deaths and more expenditure in their upkeep which has discouraged households in investing in livestock. However, a major reason has also been the lack of access to veterinary facilities, access to markets and lack of access to affordable inputs like fodder. Also, important in this growing lack of interest in cattle are the forest acts and regulations which prevents the cattle to graze in and around the forests which were the traditional grazing lands.

In Kaitha village, a number of households belong to the traditional buffalo herders' groups with livelihoods depending upon rearing and grazing of water buffaloes, who are now slowly weaning away from this livelihood. The households interviewed attributes this to many factors, stricter forest regulation inhibiting their access to the traditional grazing lands in forests; limited common lands for grazing and rainfall variability worsening the situation, increased expenditure in health and upkeep of buffaloes due to rising diseases and epidemics which is associated to and lack of timely and effective veterinary facilities. This has resulted in a drop-in buffalo numbers and increased migration of the men of these households in search of better livelihoods. These buffalo herders depend upon the swamps around the mangrove forests for grazing their buffaloes which with the recent Forest Acts and Rules restricts such activities within protected forest areas.

Similarly, in location 1, all the three villages have very few cattle/oxen because of similar reasons. The villages in location 1 are surrounded by the mangrove forests which restricts the land available for grazing bigger livestock. This also means a lack of any common or fallow lands for grazing during the farming season. So, stricter forest regulation and geographic location of the location makes livestock rearing difficult. The villages in Location 1 also lack good infrastructure facilities to connect it to the cities and major market hubs or any support from a milk collection facility or marketing facilities. The rising summer temperatures were also attributed by the respondents as being a cause of the increased deaths of livestock/cattle. In location 1, however, households are still depending on cattle as an additional income source because of the presence of the dairy cold storage facilities near the village which makes selling of the products fair and easy. The cold storage facility being government run brings a stability to the dairy business for the households which shows the change that marketing support could provide for households to diversify their livelihoods. Rural areas, particularly coastal rural areas suffer from infrastructure facilities and are located farther away from the markets. This holds true for

location 1 which is farther from the state capital and do not have marketing or storage support from the government. Also, proving this challenge is the increased interest in goat keeping and poultry in both the locations. Particularly, goat keeping which is run by small traders who act as middle man and facilitate the transport and selling in the markets. In both the locations, specifically, goat keeping and small-scale poultry, has been a preferred livelihood income source for female headed household. The advantage of the trader collecting the livestock from the household/herders reduces the marketing risk for the women who may not access to the market because of social norms and other obstacles like distance and travel. Also, goat-keeping is dependent on smaller grazing lands and natural fodder that could be collected by the female herders. This make it a lucrative livelihood for the female headed households. The case is same with poultry, where small farms have flourished but bigger poultry farms started by SHG initiatives have failed. The small farms depend on local markets which are run by the small traders who collect the poultry from the poultry farmers. The bigger poultry farms meanwhile need to access bigger markets, which entails better marketing linkages, to be able to be profitable. The lack of infrastructure, stronger marketing linkages and particularly the fragmented nature of the poultry business in the location has meant that all the SHG initiatives have failed and the poultry farms now lie vacant. Although climate change is attributed as a reason for negative impacts on the livestock rearing but as reflected in both the locations, climatic factors added to the already existing structural issues and are perceived to have made the situation worse. The differential social capabilities and access to new opportunities shapes how households respond to such situation. In this case, some households migrated while others diversified to supplement their existing livelihoods.

The fishing population along the coastline is semi-subsistence and the fishers in addition to fishing sometime have livestock rearing as a complementary livelihood. However, growth in population and increase in competition with commercial trawlers has led to overfishing. Thus, small scale fishers, who may not have the adequate boat and safety equipment have to foray farther into the open sea which is an additional risk to their lives. This, as Wisner (2004) states, increases vulnerability of such small-scale fishers because of ‘absentee interest’ – in coastal resources and fisheries. In location 1, these are the conditions that the respondents point out. The number of boats has increased on shore, but the fish population hasn’t, in addition the increase in commercial trawlers had put on more pressure on fisheries. In order to reduce over-fishing and enhance conservation of wildlife

the government have enforced a ban on fishing for specified periods which further restricts the livelihood opportunities of these fishers. During the period when fishing is permitted the commercial trawlers are major beneficiary as they can fish faster and more extensively.

Another threat to rural livelihoods at location 2 is increase in diseases afflicting cattle population over the last decade. The disease has reached epidemic proportion and the local veterinarians has not been able to find good solution/cure. This has contributed to a lack of interest in rearing cattle in this region. Since, cattle are expensive (>10,000 INR/150$) for a calf depending on the breed) and require a substantial investment in terms of purchase and maintenance, the loss of one cow can affect a rural household finance significantly. The respondents attribute this recent epidemic of dying cattle to sea-level rise and the resulting coastal erosion which has led to alteration of the microclimate and hence is impacting the human lives and livelihoods. That has also led to loss of forest and grazing land that livestock was dependent upon. Thus, overall the rearing of cattle has become riskier proposition for the households.

6.4.2 Local knowledge and trust

Cyclones are one of the most frequent or damaging disasters that this coast experiences. The respondents were thus asked about their perception of risks of cyclones, present and future and their lived experience of the impacts and aid services. All the households interviewed, and through informal discussions with other village residents, cyclones emerged as the disaster that the households perceive as the main driver of their vulnerability or worsening their vulnerability. The major cyclones along this coast have occurred at a roughly 10-15 years interval – 1982, 1984, 1999, 2013, and 2014. The most disastrous was the 1999 cyclone which changed the policy of disaster risk management in the state. However, the elderly respondents (over 60s) usually remember 1982 as one of the most disastrous cyclones too. This variation also reflects on the perception of the respondents who views it as a natural event happening once a decade and the vulnerability to its inherent. These perceptions are also reflected in the outcome of disaster risk management of the households where no household necessarily makes plan for any eventuality or cyclone every year. As one respondent stated

"The *cyclone happens when it has to happen, roughly every 10 years, so we can't live our lives in fear the rest of the time. We go by our normal lives and if and when a cyclone occurs we do what is possible at that time. Not that we can prevent or fight off threats of a cyclone*". (HH32_CH)

However, it is also important to mention that with training and better evacuation procedures in place by the government there is an increased sense of safety. Also, there are infrastructural improvements like cyclone shelters which also provide safety during cyclones. Thus, although this has increased the preparedness to the disasters, particularly, emergency responses, there are lack of long term measures at both local and government level. The communities do perceive the coastal erosion and sea level rise which may threaten their lives and livelihoods but given that there is lack of awareness regarding the time scale or possibility of such a scenario at both local and regional level, households do not perceive any benefits or need for responding to cyclone impacts in long term. As reported by one respondent,

"I see the sea water ingress has increased over the decades, may be in few years we have to move because all this [house and land] will be submerged by the sea water ingress, but we don't know when that will happen, so we will decide how to deal with it when it happens. No need to worry about from now. Maybe there will be government efforts when such a thing happens like the plans and programmes (resettlement) implemented by the government upstream. For now, this is the only land we call our own, so we will stay and, anyways, we have nowhere else to go." (HH45_JB)

Thus, cyclone as disasters have risks that the households find difficult to frame in the long term unlike floods which happen annually and thus households show more autonomous adaption to deal with floods at the local level. Long term planning also has failed at the government level where the state programmes and projects in improving livelihoods do not necessarily take cyclone into account. A case in point, is the fresh water fish farming initiative by the Integrated Coastal Zone Management (ICZM), whereas group of local households were brought together to form a cooperative, land was leased from the local farmers who have land suitable for fresh water ponds and inputs like fingerlings and feed was provided initially to kick start the project. The main aim was to provide alternative livelihoods in response to the ban in fishing (about six months annually along the coastline due to turtle and marine resource conservation rules and regulations). However, the project failed to account for the change in the water quality of the fish ponds that is common to this coastal region during summer. Being along the coastline the salinization in the pond water increase drastically and if the rainfall is delayed then the salinization becomes damaging for the fish population. As one of the member of such a cooperative state describes the situation,

"*We were not consulted when we were provided the fingerlings. The varieties of fish we were raising were suggested by the project officers. They said this kind of aquaculture will work in our soil/water conditions and we will able to earn profits. They fingerlings were also not local varieties and were brought from another district. Eventually, as the summer advanced the salinization increased in ponds and the fishes failed to survive. The fingerlings they provided were not adapted to the high saline content of the water in this region"* (HH8_PH)

6.4.3 Marginality: Spatial and Social

Household vulnerability to cyclones need also to be seen through the lens of marginality. The cyclone exposure of a community is the same, but the impacts and disaster recovery of households varies and reflects the marginality and existing struggles in the community. All the households within a community will not be affected or recover in a similar way or at a same pace for a disaster. From the post disaster emergency relief of food and supplies to the long-term cash or infrastructure aid, the accessibility to these benefits or programmes is highly dependent upon the existing socio-economic and political dynamics. A one respondent stated,

"*We heard there was some food relief, probably biscuit packets, by a private organization for our village during the last cyclone. A few people received one packet or so and we heard nothing about it after that. And, after few weeks when some of our youth groups complained to the Block to know more about the relief materials, they found out the Sarpanch has all that stock hold up in his office. He got suspended from the position. This is a good progress but probably it does not matter, whoever will hold the office will do the same the next time. Those who have political power and influence will fill their coffers on the expense of poor people like us. That is the reality and we should just accept it." (HH27_BH)*

All the households perceive an increased risk to cyclones, but the coping strategies and outlook differs across the households on the basis of their socio-economic and political positions in the community. In location 1, particularly important is the location of the households. The primary road that runs through the village JB divides it into two parts – the left side with households that were the early settlers and with more socio-economic and political capabilities as compared to the households on the right side of the road along the coastline. The cyclone also disproportionately affects the household in the right side of the road. It is not only because of the location closer to the ocean but also that they do not have land tenure rights or have houses built on encroached government owned (cleared forest) land. Undoubtedly, these are comparatively poorer households in the village with more limited access to resources than other households.

Most of the farmers depend on subsistence farming and such smallholder farmers depends on credit to purchase seeds and other inputs at the start of each farming season which they pay off after harvesting (if the crop fails the debt keeps on mounting). In these conditions, those with capital take the role of money lenders and benefit from the exploitative practice of lending money at high interest rates. This serves to maintain the local social hierarchies and perpetuate the existing inequalities and the process of marginalization. The class dimension that is not accounted for in the policies are significant to any project implementation on the ground. Notwithstanding the increased agricultural subsidies and insurance, the capabilities of a farmer to access these institutions depends on his/her ownership of land, networks and availability of funds to cover the costs after subsidies. As reported by a farmer in location 1,

"We are poor household and always in debt. We have to take loan during farming season to buy fertilizers and hire machinery. We are share-croppers and cannot avail crop subsidies when we harvest, we pay off the base amount and keep paying the interest. However, before even paying off the interest, either there is a family emergency or another cropping cycle. We keep borrowing cash from moneylenders and with the interests so high, it is so difficult to pay off all the debt." (HH18_BH)

The policies thus perpetuate and strengthen the very structures that it is trying to dissolve. The focus thus needs to move beyond just benefit distribution to be one rooted in a social justice and equity approach. So, natural hazards like cyclones, in these communities, such households into marginalization and it becomes increasingly difficult to recover.

6.4.4 Environment conservation laws vs livelihood security

Another conflict shaping conditions in both the locations, are the wildlife intrusion to the farms and backyard gardens of the households. Especially, the spike in population of wild boars which moves in herd, destroys the crops and also could potentially kill humans on encounter. There already have been 4-5 such deaths in the past year. Both the locations are surrounded by mangrove forests which are protected by the forest rules and regulation for conservation. Thus, the wildlife is protected by law and this has over spilled into human habitats. Households are unsatisfied by the measures of the state forest department and the government in preventing such conflicts. However, the interaction between the conservation efforts and community has its own set of conflicts and contestation. Many respondents complain that the forest department is not doing enough for preventing the intrusion of the wild boar herds into farm lands. They protected the forests and the population has grown unchecked which is threatening the lives and livelihoods of the

villages around the forests. On the other hand, the forest department has tried erecting wired fences around the forests and habitation to check the movement of the wild boars. However, as many respondents reported, the wired fences keep getting stolen every time the forest department erects them. Some households believe that it is the fault of other village residents who keep stealing these wires for their households use or sell them in the markets to earn cash and then blatantly complain about the government efforts. The researcher did observe the use of similar steel wire (green-coloured) by some households in location 1 and 2, such as for livestock fencing and backyard plantation fencing. However, it was not possible to prove the veracity of these claims with any government officials. The wild boar issue has affected the vegetable production in backyards, particularly, in location 1. The locations also lie in the periphery of two conservation zones, the Bhitarkanika National Park and the Gahirmatha Sanctuary, so both the forest and the marine resources around it is under natural resources conservation rules and legislation by the State government. This added to the limited livelihood opportunities and disaster vulnerability creates a very strained socio-ecological system in this region. The locations being rural and not very well connected, most poor households depend on fuel wood from forest for cooking purposes. Also, in location 1, as the respondents have earlier stated in section 6.3.1, cattle are difficult to raise and maintain, which restricts the availability of cow dung as fuel for the households. Hence, the dependence is still primarily on the mangrove forests around the villages to meet the fuel needs and consumption. However, these mangroves forest are protected and are not allowed to be felled or altered. This leads to women of the villages sneaking and collecting fuel wood from the forests and getting caught. As some respondents opined,

"I*t is better to take risk and pay fine to the forest guards if they catch us. There is no other fuel option so what are we supposed to do. Usually they are lenient with us women and let us go if we pay them some money. However, few times men from this village were caught for felling trees in the jungle and were arrested."* (HH42_JB)

The women also have devised a plan, where groups of women go to the forest, cut the branches and leave them on the forest floor for few days to dry (Photograph 6.1). They then collect the dried branches and if they get caught, the can say that it was just the dead and already fallen branches that they collected from the forest floor.

Photograph 6.1: Mangrove forest at location 1 (Jamboo) showing cut trees and felled branches (utilized as household fuelwood)

Source: Fieldwork, Location 1 [Photograph taken by researcher on 12.03 2015]

Nevertheless, many of the households condemn this practice by their neighbours in the village. They acknowledge the importance of mangroves in providing protection from the cyclones, tidal surges and necessity for good rains and believe they need to conserve them. Most of the households who hold this opinion, were not necessarily wealthy but could be distinguished by older and bigger families who have managed to rear one or more cattle or do not want to be get caught in the law and thus managed to buy a gas cylinder for use, while collecting once a while dry fuel wood from the nearby degraded patch of forest. Those group of households who showed an inclination towards collecting fuelwood were young, small and poor families who do not have diversified assets or family networks to depend on financially. The forest conservation plan in the location is thus already fraught with difficulties and differences with distrust among the actors in the programme. In location 2, the situation is very similar, though there are commons and cattle availability for household fuel needs, but it affects the livelihood of the buffalo herders and artisans. The artisans depend on collecting grasses and reeds from the forest for basket weaving and other such products from the forest periphery and the forest boundaries were also used to serve as the grazing land of the buffaloes. Both the groups are denied access and being traditional depended on these livelihoods have no other options but to be a daily wage labourer or to migrate. However, there is a lack of awareness and corruption within the system which keeps this groups disadvantaged. As one of the female artisans said,

"*We had made a group and all of us [artisans] went up to the DFO (District Forest Officer) office and requested them to give us access to the forest or else how will we survive but he said he can't do anything as laws are laws and we need to follow it. However, he said maybe we could just speak to the forest guards of that area [bribe in most cases] and access the forest when we need to collect the raw material. (HH26_KH)*

The livelihood group of these artisan is not categorised as one the forest-dependent community under the forest protection regulations. As a result, they do not get access to forest based resources under the Forest Rights Act, 2006 of India which ensures the access of traditional livelihood groups to forest minor produce collection. So, though the government has encouraged this artisan livelihood group earlier by facilitating formation of a SHG and supporting exposure and marketing of their products. The government has now pulled out its support to the SHG and it is now defunct.

6.4.5 Local level development and adaptations projects

The coastal embankment plan/geotube project[23] brings out divisive perspectives in the residents of location 2, particularly, village PH which is the most affected village (Photograph 6.2). The construction of the Geotube embankment has meant more jobs which, for households, is a benefit. On the other hand, on the reliability of the Geotube as a protective measure, most seem sceptical. The respondents reported that the embankment that are built along the coasts keep getting washed away every year and this Geotube technology that is been used is likely to not last a long time along this coast. Also, the project has been grappling with compliance and corruption issues since its inception in 2008. Originally, to be completed by 2013, it ran into delays because of faulty Geotubes, slow transportation of raw materials, lack of timely technical inputs, forest conservation conflicts and environmental clearance. The project is now set to be finished in 2016. Meanwhile, a number of households in the Pentha village sold their land and property and have migrated to other villages nearer to the nearby towns. The focus on the Geotube project, first of its kind for the state, has shifted focus from other soft measures for long-term adaptation of the community. So far, there has been no initiatives by the GoO to address other impacts of sea level rise like salinization and decrease in farm yield and grazing lands along this coastline. There has been a lack of livelihood-oriented measures in this region. As a result, agriculture, the primary livelihood of this community has not

[23] The Geotube project along Pentha village coast in location 2 is described in detail in Section 5.2.3

improved, the crop yields have decreased, and death of livestock and the fish catch has decreased because of increased salinization. This has affected the view of the village residents on the Geotube and its effectiveness. Now most households perceive it as one more government plan that is probably not going to be effective in long run, and the main benefit of it is the current availability of daily wage employment. The households also do not comprehend the impact of the project as there has not been any clear discussion with the residents of the affected villages. The once or twice held community feedback discussion, which was held before and at the start of the project, in 2007-08 where the only time the community was informed or consulted in any kind of discussion about the embankment by the government. The respondents are predominantly of the view that they would like to be shifted towards the mainland as they consider the place not stable and will erode eventually. The recent resettlement of one of the neighbouring village upstream by the State government has given hope to the community that they could be better off resettled with new land to farm and stable housing and having a future in the mainland. There is absence of any study or focus by the State government on the further spatial or temporal impacts of coastal erosion like salinization.

Photograph 6.2: Geotube embankment project along the coast of Pentha village (location 2)

Source: Fieldwork, Location 1 [Photograph taken by researcher on 26.04.2015]

6.4.6 Politics of disaster risk management and recovery

The state-operated recovery process after a natural disaster, by default, favours the households already capable of recovery. The poor get poorer and the vulnerability gets worse with every cyclone or disaster with depleting assets and limited access to external support. One such government project was the Indira Awaas Yojana (IAY) for construction of *Pucca* houses as part of post disaster recovery to decrease vulnerability to cyclone. Many households benefitted from the process, but many respondents reported that the allocation process was skewed – the scoping process was subjective and who would get the IAY fund was dependent upon the damage to the house as inspected and determined by the block level officers. Further, the payment was provided in instalments – the second instalment was only provided when satisfactory progress of the house construction was shown from the use of first instalment. Many of the households were not able to get the second instalment as they progress did not meet the minimum required conditions. Further, the poor households without finance could not progress in the construction. This left many households with *Pucca* houses at various stages of construction which was observed in the villages. The respondents complained that it was such an arbitrary process and they were left 'in the lurch' by the government officers and those who had 'contacts' or political connections leveraged their network and managed to get access to the funds. Those who were already well off only got the benefits while the poor households without any 'contacts' were not supported. Similarly, the emergency relief, like food and daily utilities, were distributed not based on need or equity. The community members reported two main unfair practices that they believe needs to be addressed. First, in some cases, the village elites who probably did not need the aid/relief were those who were given charge of the distribution, so they took more than their fair share from the relief. Second, in many cases, the distribution was household basis, proving each household the same amount of food or utilities, which left bigger households (higher family members) with less food to share within the household. So, the emergency relief process was controlled and run by those who already are least vulnerable but benefits the most from these projects. So, all the power and access become concentrated within the political elites or wealthy households. This case does not show any variation when NGOs get involved either. The NGOs when making contacts within village tend to choose the more educated, articulate or influential person in the village to collaborate with and to coordinate their work. The knowledge shared and the access to the projects that then follows tends to represent the perspectives and ideologies of those who already hold power

and have their own interest to pursue reinforcing the already existing socio-economic inequalities. This process of 'elite capture' as described in various development literature has become very common in development-based projects like conservation or livelihood diversification where the project invariably tends to benefit some actors while marginalizing others" (Nielsen and Lund 2012; Sundberg 2006; Platteau 2004; Chambers 1983). The actors whose interests usually tend to reflect those of the powerful restricting access and rights of those who already do not have a voice.

Further, those who have *Pucca* houses or are wealthy families usually belong to the higher class in a village. They are the class with political networks and wealth to influence the bureaucracy and to extract favourable decisions at local scales. Then the handling of the post recovery situation, which are marked by chaos in most cases in the Indian context, falls upon these households who are the 'leaders' of the rural community and they become the decision makers of the welfare of the communities. However, during many past disasters event, in both the locations, these 'leaders' have acted to bring benefits of the community, in addition to increasing their own access to benefits. Nevertheless, most often, with competing interest, not only at the community level, but because of affiliations to institutions and systems higher up, the process to do not work in advantage of those who need it the most. In location 1, the political parties are very active and influence the community perceptions and norms. The researcher also noted the political nature of livelihood and climate change issues during many interviews, as many respondents spoke about the village politics and power asymmetries in the community even before questions were initiated in this regard. Many households openly spoke about the benefits that rich and influential households received while they did not have access to such benefits even though they needed them. As some respondent stated, after the 1999 cyclone when the government started providing relief/aid to the households, the well-off households received them first and they controlled the process, so many poor households don't know what was supposed to be distributed in the village. The poor households do need these leaders, or rather depend on these 'leaders' to get access to the bureaucracy, which in return give these 'households or individuals' the power to become the 'leaders'. As one respondent explains the post-disaster aid distribution in location 1,

"Post-1999 cyclone, we heard that the government and international agencies has sent a lot of aid for the cyclone victims. It was such a chaotic time that we were desperate to get whatever food or household articles we could manage to, but we never knew, or no

government official ever told us anything about what each household is supposed to receive. The wealthy households were less affected, so they took over managing the villages' aid distribution and we received what was provided by them. Months after, we found out what other villages or households received, and it was so varied across households. For example, what happened to the trucks of blanket that were sent to our village? Only a few households in our village received those, were did the rest go?" (HH5_KA)

Extreme events like cyclones in resource poor communities can have long term impacts and bring change in the system. In case of location 1, the cyclone of 1972, that was accompanied by wide spread tidal surges/flooding, washed away the salt factory near the village which not only affected the surrounding farm lands and yield because of the increased salinization but also the political situation. The spillage of the salt and the tidal flooding lead to low or no yield around the surrounding farm lands for nearly a decade. As the government failed to invest in the salt-processing plant again and revive it, the land remained bare and slowly was taken over by the influential leaders 'elites' of the village who now used it for shrimp farming. Slowly, over the years, this land arrangement is normalized in the region and with contacts and lobbying they have managed to keep the land. The work provided by the salt factory to the poor households was lost but the land was grabbed by the 'elites' who benefitted from the cyclone. Also, significant is the regulation of shrimp farming by the coastal authorities. Even though the government has stricter regulation in place to manage the coastal resource degradation.

The well-off households presented a different narrative of the community dynamics during and after disasters. The 'elites' have a sense of ownership and they believe that they are actually trying to help other households and assist them in their need and help them to reach and navigate government programme and bureaucracy. The same event has different interpretations – one of the poor households who take help but consider there is 'elite capture' and the well-off 'elites' who provide assistance. One such event is detailed below (Box 6.2) where well-off and poor households present a different picture of community support. A number of respondents mentioned this experience during household interviews.

Box 6.2: Different narratives of disaster management by poor and well-off households

One natural disaster, two perspectives

When the cyclone of 2013(Phailin) occurred, the village of JB (Location 1) had already received the warnings a week before and on that very day community members were advised to move to higher grounds like cyclone shelters or *Pucca* houses in the village as the cyclone was going to make landfall. The village of JB is a populated village with three cyclone shelters but they got overcrowded soon. So, most of the people took shelters in the few Pucca houses of the village. The rainfall continued for two days and as cyclone signs dissipated, the warnings were lifted. This event of two days is experienced by those who took shelter and those who provided shelter very differently. The researcher stayed with one of those Pucca house-based families (host) during the research period. During informal conversations, the household members often pointed out the number of people stayed in their house for those two days, how the house was packed and people were sleeping on floors and how they provided food for all the people who stayed with them for the two days. According to the household, they did their best to help everyone. However, those who stayed with such households state that, if it was not to save lives, they would never seek shelter with them, and that the wealthy and influential households get all the benefits dishonestly and look down upon them, as they are poor. This brought out other injustices that they perceive is happening within the community. As one respondent stated *"They are educated and wealthy family and we respect them.... but they do benefit in our expense, how do you think they were able to build this two storey Pucca house here and still stay on the BPL (Below Poverty Line) list. They have political contacts so they can do whatever they wish to, we are the only ones who suffer...no contacts, no lobbying so we could not access any benefits/welfare programmes"*. (HH31_JB)

(Source – Household interviews, Feb-Sept 2015)

The State politics of disaster risk management and its 'preparedness narrative'

The state of Odisha has shaped its disaster risk management programmes around the narratives preparedness and techno-centric projects and plans. This is illustrated in the case of state government's management of the very severe cyclonic storm Phailin that hit the coast of Odisha in October 2013. Phailin was one of the most damaging cyclones after the 1999 super cyclone, and also was one of the most efficient cyclone evacuation and management case for India. The forecasting was improved and timely, the awareness heightened, communication channels were better, and the aid/relief plans were in place before the cyclone hit the coast. It is in sharp contrast to the Super cyclone of 1999, where the warning was sent just two days before the cyclone made landfall on the coast of Odisha. While in case of Phailin, the monitoring started before a week, with its formation off the coast of Odisha and the forecasting and planning was regularly communicated across all state departments. The State and National government responded fast and mobilized the

fleet of disaster management staff and networks like the armed forces, volunteer groups and trained members which made the evacuation of more than 1 million people possible within 24 hours. The relief/ aid food materials were already organized for three days at all the rescue centres. However, as the cyclone receded, the incessant rains gave way to floods which marooned people for a week more. The state government was not prepared for this eventuality. The resources were not sufficient for this kind of situation. So, though the State government carried out a laudable evacuation programme and has come a long way in disaster risk management as compared to the 1999 cyclone, DRM is still in its infancy at the state level. The sole dependence on only forecasting and post-disaster management solutions as part of state DRM plans is reflected from the experience of cyclone *Phailin*. While the disaster preparedness and emergency service worked extremely well and efficiently, the post disaster recovery faltered. The cyclone of 2013 was followed by another cyclone exactly after a year, cyclone *Hudhud* in October, 2014. This worsened the recovery process of the already struggling households trying to rebuild their lives and livelihoods. Thus, during cyclone *Phailin*, though DRM was efficient in its pre-disaster management plan as carried out by the State government but the management process for disasters like cyclone entails a long-term vision that also take care of recovery and reducing future vulnerability. The infrastructure-based programmes which became the focus of the State government after the 1999 cyclone has resulted in more than 200 cyclone shelters along the coastline and more are under construction. Again, though the State government has invested heavily in infrastructure, the monitoring and maintenance plans are unclear. There is a lack of long term planning and strategy development in the disaster risk management policy and implementation narratives. The well carried out evacuation and emergency plans garnered praise for the State government from national and international agencies which may have further cemented the current focus of the State government on such techno-centric and preparedness plans.

6.5 Summary

This chapter attempted to understand local vulnerability and the role contextual factors play in shaping a community's vulnerability to climate variability and natural hazards. This chapter outlined the risk perception of community to the natural hazards and climate variability over the last decade. In addition, it aimed at developing a picture of the community reality of vulnerability by analysing the socio-cultural and institutional factors that shapes risk perceptions of households and how these factors lead to differential social

vulnerability that is found to be existing in the study villages despite the regional and national policies in place across these communities. The major findings of the chapter are summarized below.

- Risk perception shows variation across households within and among the different study villages (Section 6.2). While rainfall variation is perceptible and is considered as a growing cause of concern by a majority of the households, regarding change in temperature there is a lack of consensus, as to whether any variation is noticed or not. The risk perception study reveals the difference among different age groups, gender and wealth category when it comes to perceiving risk and hence the framing of individual vulnerability narrative when addressing impacts of climate variability and natural hazards.
- Analysing the dominant societal structures, socio-cultural and institutional, in the communities provided an in-depth understanding of how these existing contextual factors shape the local vulnerability and create inequitable and unfair environment at the local level within which the state and national policies are then implemented (Section 6.3). Local social-cultural norms and economic status plays an important role in how households frame their own vulnerability and the observed vulnerability. There is a breadth of literature in the area of climate change, particularly natural hazards, that explores the issue of social vulnerability (Adger, 1999; Cutter et al., 2003; Brouwer et al., 2007: Fussel, 2007).
- An important factor that shapes local vulnerability is found to be the power dynamics that controls who has access to resources (Section 6.4.1). The access to local resources indicates how and to what extent the households would benefit from national and regional policies. The closer the households are to the centre of political power, the more benefits they were found to receive (Section 6.4.3). This is irrespective of the wealth or socio-cultural status of the household. However, the political leaders in all these communities are either wealthier households or higher caste households. The power still lies with the informal institutions at the local level which influences how the formal institutions functions at the local levels. This could have a significant role in how the adaptation policies are implemented at the local level.

This chapter describes the local level dynamics and the existing differential vulnerability within communities. The chapter also outlines the actors and institutions who hold power

and shape the socio-economic dynamics at the local level. The interaction of how these local level power dynamics influence and shape the policies and formal structures of power at the regional level is explored in the next chapter, chapter – 7. The next chapter explores the interaction between these local level dynamics within the policy structures developed at the higher levels of governance and how and what implications it has on adaptation governance 'in reality'.

7. The Policy-Practice Interface: Interactions and Outcomes

7.1 Introduction

After examining the prevailing discourses of the current national and regional policy setting on climate change and disaster risk management at the national and subnational level in chapter 5 and the social vulnerability of the community to climate change impacts at local level in chapter 6, this chapter investigates these policies in action at local level. This chapter seeks to understand how these policies translate into practice at the local level and how households and community develop and reshape their individual and collective coping and adaptation strategies in order to address vulnerability to climate change within the contextual boundaries shaped by these policies. This chapter draws from the primary quantitative data from the household survey questionnaire. Furthermore, this chapter uses the qualitative data collected during household interviews, in-depth case studies and key informant interviews from the study locations to better understand the household and community level scenarios of decision-making and interactions around climate change adaptation agendas. Based on this household and community-level data, analysed statistically in the case of the quantitative data and built on emerging thematic patterns in the case of the qualitative data, this chapter seeks to address the third research objective – *to characterise the interactions at the policy-practice interface as the policies undergo implementation and influence existing community responses to stressors and identify the factors shaping the interactions and their outcomes.*

The next section therefore presents and examines the household and community level coping and adaptation strategies employed in the study locations, in order that they might manage social vulnerability and address the impacts of climate change. This is followed by section 7.3, which examines the implementation process of the climate change and disaster risk reduction policies by identifying the actors and narratives that are significant to decision-making at this level within the case study locations. It outlines and provides insights about the interaction among actors and the narratives that emerge during the process of implementing new practices, and the negotiation issues that unfold within the socio-political context of the local community. Section 7.4 contextualises these patterns by focusing on the multitude of factors, encompassing place-based politics, which create a constraining or enabling environment for local adaptation strategies to succeed. The chapter concludes with section 7.5 which discusses in detail the scalar interactions of the top-down adaptation planning and local strategies. This section seeks to identify the

diverse adaptation pathways that are the outcomes of these interactions and why some of these adaptation pathways gains consent and are perpetuated while others loose support. This question is approached by attempting to outline and understand different factors that shape these outcomes.

7.2 Household coping and adaptive responses to climate shocks and stress

This section seeks to understand the local coping and adaptation responses to the perceived risks of variability and change in temperature and rainfall, and natural hazards detailed in chapter 6. This section focuses on local level dynamics and characterises local response to impacts of rainfall and temperature variability and frequent extreme events. It attempts to understand what and how farmers and fishers in the study location have developed their own short-term coping strategies and long-term adaptive strategies. This section provides an in-depth understanding of the range of autonomous household and community coping and adaptation practices in the study villages. Further, it examines the socio-cultural barriers and enablers that facilitates the adoption of one response strategy while impending others in the research location and how it varies between the two village clusters. The section focuses on the household and institutional response within the community and analyses them independently and their dynamics to provide an in-depth reality at the local level in contrast to the intended outcomes of the policies.

The spectrum of adaptation strategies includes short term options like tapping into social networks for credit to long term options like changing livelihoods or migrating temporarily. Depending upon socio-economic status of the household, the adaptation strategies basket also varies in a community. The adaptation strategies of a household also depend on its access to the social networks and common resources which plays an important role in recovery and rebuilding of lives.

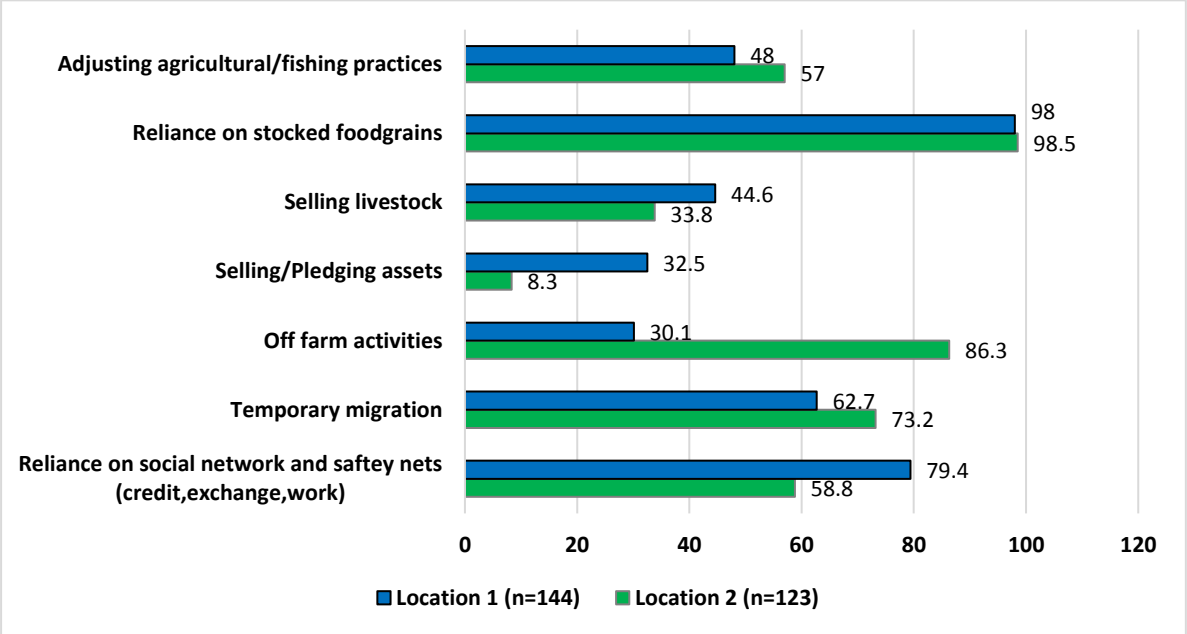
7.2.1 Observed household responses for managing impacts: short-term coping strategies

At present, the coastal households in the research location, both farmers and fishers, are practicing a range of short and long-term strategies to cope with and adapt to the changing geographical and meteorological conditions. This section identifies the various short-term coping strategies the households employ to address impacts of climate variability like lower rainfall and increased temperatures. It also provides insights into the specific coping

strategies that are employed by households to reduce impacts of natural hazards like tropical cyclones, drought and floods.

In case of climate variability (changes in rainfall and temperature frequency and amount), the short-term coping strategies, as revealed from the household interviews and case studies, are detailed below in Graph 7.1 below.

Graph 7.1: Household coping strategies in response to climate variability



Source: Household surveys (January-September, 2015)

1. Adjusting farming and fishing practices

The first coping response by farmers and fishers to address any kind of livelihood stress is to modify or adjust their traditional activity to reduce the impact. Around half of the respondents in both study location (48% in location 1 and 57% in location 2) made adjustments to farming and fishing practices during the early period of stress. In the event of seasonal crop failure, farmers tend to either go for a second sowing season or may let it go fallow for the season. Since, the soil type of the region only supports one crop annually, a delay or failure in monsoon may lead to no crops for the entire year. The second sowing is also highly dependent on the rainfall and risk-averse farmers usually tend to let the farmlands fallow than risk the loss. Sometimes, farmers may move inwards to farmlands along rivers in the neighbouring villages and practice share cropping, if available. This holds particularly relevant in case of natural hazards like cyclones where the land could

become too saline for one or two crop years and hence farmers may take up share cropping in neighbouring villages of the district. A paddy farmer interviewed reported,

"If tidal water floods the farmlands, it is better to leave them fallow for few years to let the sail salinity decrease. Otherwise, because of soil salinity, paddy productivity will be very low and we would just make loss. I did the same thing after the 1999 supercyclone. The soil was too saline to grow any variety of paddy and paddy is the only crop we grow in this coastal region" (HHJB_37)

Similarly, in fishing, a longer summer season and delay or insufficient monsoon leads to increased salinity along the coast and river mouths which are the primary fishing grounds for the small-scale fishers of this region. The fishers in such cases move their fishing grounds seawards or to the inland backwaters. However, given the pre-determined nature of fishing grounds, lack of modern fishing equipment and the government regulations and restrictions, this coping strategy is not as effective and hence is practiced by only a small proportion of the fishing households. The smaller adjustments to the traditional livelihood practices is slightly lower in location 1 as compared to location 2 which could be attributed to the dominant fishing population who do not have much flexibility or ability to adjust the existing fishing practices. A male small-scale fisher in location 1 detailed the constraints on changing existing fishing practices as,

"The fish population has decreased, and the fisher population has increased, so there is barely enough for everyone during the fishing season. So, if the monsoon fails, the fish population drops too low for fishing viability and as small boat owners we cannot go further into sea. So, it is better just to drop fishing for that season or year and find some other work…" (HH31_JB)

2. Livestock Selling

Livestock selling is another widely practiced coping strategy in response to climatic shocks and stressors. In household interviews, around 44.6 % of the respondents in location 1 and 33.8% respondents in location 2 reported to have sold or view livestock selling as one of the first coping response in times of climatic or non-climatic stress. In location 1, most households rear goats and poultry as part of their livelihood portfolio and hence sell these to address short term stress while in location 2, households rely on selling cattle and goats only during stress periods. The number of respondents relying on selling livestock as a

coping strategy is higher in location 1 compared to location 2. As noted from interviews, respondents were more willing to sell livestock like goats and poultry during times of need as compared to cattle which also holds religious and cultural importance for the households. Also, in terms of livestock, location 1 has more goats and poultry that they rear primarily for livelihood purpose while households in location 2 cattle rearing is a socio-cultural priority as compared to a means of livelihood. A female respondent from location 1 reported -

"Rearing goats and poultry is part of our livelihood strategy and it is really helpful in supplementing our income from fishing. My husband does fishing during the season but there is no other income generating opportunities during off season. Since, we have two small kids (3 year old and 6 year old), migrating to work in cities is not suitable for my husband. So, investing in livestock rearing works for us. This has helped us to tide through lean season in fishing too."

However, in location 2, selling livestock is one of the less preferred coping strategy given the lack of diversity and reliance on selling livestock as part of livelihood strategy. This is illustrated in the quote of a female respondent in location 2,

"We are farming households, so we do have cows but not for selling. It is part of culture and we worship and care for our cattle. In our case, we depend on milk that we use for home consumption and when during some periods the milk is surplus we sell in our village. However, we have sold two of our cows over last few years during periods of medical emergencies. We didn't have much option, as we needed cash and we did not have enough resources to maintain them." HH31_KA

3. Temporary income strategies

The most common coping strategy in term of maintaining financial security in adverse climatic and non-climatic stress in both the location is engaging in off-farm activities. The off-farm activities include daily wage labour in nearby villages to temporary migration to neighbouring urban centres. In the last decade, temporary migration has become one of the most preferred strategy for off-season income generation and thus also one of the coping strategies, if the farming and fishing season fails. Seasonal labour migration has been traditionally common practices for this coastal region during normal (non-drought/non-cyclonic) years because of one-season cropping cycle annually. The cyclic migration ranging from few weeks to couple of months ranging from nearby cities to other states and then returning to home village only during the cropping season has already

become an established pattern of livelihood and migration. These patterns and networks of circular migration being already in place further makes it a preferable coping response for farming or fishing based households to draw upon in emergency events. Depending on the need and socio-economic conditions, the migration patterns varies for different households which are explained by two respondents below,

"During off-season, I usually work at construction sites in Pune (Western India). One of our neighbours in the village have contacts there and many of the farmers from our village work with that contractor and refer us when we need work. So, if the productivity is going to be low, we just leave the farm fallow and work as daily wage worker. I have been doing it since last 5 years and it has helped to improve financial condition of our household." (HH18_CH)

"If the fishing season do not generate enough income, I migrate for few months to Paradip (port town around 20km from location 1). I work on the marine fishing boats there and there are opportunities as daily wage worker on public sector constructions currently in progress around the town. I have family here and being the only male in the household, so I don't think it is appropriate for me to migrate to other states. I have contacts in Paradip and the income is enough to support my family. Also, I have a marine card that allows me to avail subsidised grains monthly from the public distribution system. (HH 32_JB)

4. Reliance on social networks and safety nets

One of the most important coping strategy in slowly unfolding disasters like drought or emergency events like tropical cyclones, that households turns to is to rely on their social networks. The social networks include formal networks like cooperatives and SHGs but most beneficial are the informal networks as reflected in the household survey and interviews. The informal networks that is weaved within a community are found to be the most reliant ones – between neighbours, relatives, social groups. The households depend during adverse situations on these social networks for information, food and cash. Most respondents find neighbours or other village residents as the most reliant ones in event of dealing with climatic and non-climatic stressor. However, in Indian villages which are traditionally kinship based, most of the households in and around each other are usually related to each other through some familial ties. Thus, the households support each other as both being neighbours and relatives. From emergency shelter to loans, as outlined in Table 7.1, the intricate social networks that are created among the households are the most reliable coping strategies in times of need.

Table 7.1: Reliance on social networks as a coping strategy

Coping strategies	Illustrative respondent quotes
Food security	*"Our neighbours have been helpful at times of need. If anyone has rice in surplus, we take them as loan for the year to supplement our rice stock. Most of the times, we repay it in the form of paddy the next cropping season after our farms are harvested. It is cheaper and we don't have to worry about transport." (HH23_JB)*
Cash support	*"In case of emergencies, cash loans are our most common strategy. The village have many households who lend money on interest and we rely on them. Although, the interest is high, we can immediately get cash in times of need and since we are of same village and trust each other we pay it back when we have enough earnings."(HH15_BH)*
Access to labour	*"In 2014, when the crops failed, I decided to migrate to the neighbouring states for daily wage work. Since, men from many households in our village already work in Bangalore (Southern India), I decided to work there for a couple of months." (HH28_KH)*

Source: Household surveys (January-September, 2015)

External aid, specifically support in forms of cash or subsidies by the Government and State agencies emerged as the coping strategy that most respondents depend on, especially, during natural hazard phenomenon. Based on previous experiences, most respondents (Table 7.2) find it given that external aid is the first solution when faced with natural hazards and in many cases the only coping mechanism that is available to them. In addition, social safety nets in place already like food subsidies (PDS) is another coping strategy that the households rely on to deal with periods of stress and shocks. The food subsidies are drawn upon for use by the households and in some cases, these subsidies may also be exchanged for cash or kind. Such subsidy programmes not only support the household during regular/normal period but also through periods of stress and difficulties due to exchange options.

Table 7.2: External aid as a coping strategy

Government emergency relief aid	*"What can we poor people do when cyclones happen? We don't have any savings nor pucca houses to keep ourselves safe. During such situations, we depend on whatever help government provides. During 1999 cyclone, we survived on dry food that was provided by the government as relief, for the following few weeks. We were left with nothing – no food, no water and no shelter. There is nothing we can do other than depending on government relief. (HH31_KH)*
Government funded state subsidies (PDS)	"*The rice subsidy (25 Kg @Rs.1/Kg or 0.015$/kg) that we avail from PDS as a Below Poverty Line (BPL) family is a help during periods of low harvest. It maintains our food security and if we don't have enough cash we sell it in nearby villages" (HH9_PH).* *The marine rice subsidy (25 Kg @Rs.1/Kg or 0.015$/kg) for the fishers since 2014 helps us manage our household during the fishing ban season. There is not much income nowadays from fishing with the longer fishing bans on coastal waters and depleting fish stocks. So, the rice subsidy has atleast ensures that we have some food at home to feed our children. We also sell a part of it to get some cash to manage our house expenditure. (HH12_KA)*

Source: Household surveys (January-September, 2015)

5. Asset selling/pledging

In both the locations, household only turn to selling or pledging physical assets like jewellery or land when other coping strategies fail to meet the household needs during stress periods. In location 1, while 32.5 % of the respondents, said to have sold or pledged assets during past stress periods, only 8.3 % of households had done so in location 2. The low percentage of households depending on asset pledging or selling could be explained by the rate of poverty in the study locations. Since, poor households have very less physical assets like jewellery or land which they prefer to rely on as a last resort. As a female respondent in location 1 reported,

"…sell assets during difficult periods? Don't you see our thatched mud house? All we have is a piece of farm land that we don't even have ownership of. We manage by farming and remittance sent by husband during off-season when he migrates to different states. In our hand to mouth existence where we would have assets to sell? We take loans and when husband returns during agricultural season we pay off the debts. Similar is the condition in case of crop failure or cash need - migration and loans." (HH28_JB)

The households in both location 1 and 2 rely on a number of coping strategies to manage periods of stress experienced due to climatic or non-climatic factors. Each household tend to draw from a set of available and accessible coping strategies to ensure food security over the stress periods. An illustrative case study (Box 7.1) of a poor household in village Jamboo of location 1 provides a better understanding of household level dynamics during stress periods, like failure of crops and drought situation.

Box 7.1: Illustrative example of a household's drought coping strategies

Coping strategy of a farming household during drought 2013-14

H66_JB is a female headed poor family of six constituted of the female household head, son, daughter in law and three grandchildren aged 3, 5 and 10 years old. They represent a typical poor household in the village with 0.4 ha of farm land and a few square yards sized home garden that they grow seasonal vegetables for home consumption. The only earning member of the family is the son who helps in farming during agricultural season with help from the mother and wife and then during off-season working as a daily wage labour in nearby locations. In those years that yield was low or crops failed, the first coping response was to depend on the stocked food grains from the previous harvest year for maintaining food security and engaging in daily wage labour to maintain income. As the stress worsens, the household supports itself through borrowing cash from moneylenders till the next cropping season. A lack of livestock and any other significant physical asset means there is no selling or pawning option to generate cash. Since, the son is the only adult male in the family, migration to nearby urban centres is undertaken as the last coping strategy and usually for a couple of months. Meanwhile, the family copes with the negative shocks through support from neighbours and relatives from whom they can borrow more cash. As debts increased, children had to drop school and were sent to stay with relatives for a couple of months. As the next cropping season failed to take off because of insufficient rainfall, the son migrated to southern India states to work in the construction sector as a daily wage labourer with fellow farmers till the next cropping season.

II. Coping Responses to Natural Hazards

Coping strategies in response to natural hazards between the households in the study locations differ in a number of aspects from the coping responses to stress periods associated with climate variability and non-climatic factors. Coping responses for natural hazards with precedence, like cyclones and tidal flooding, usually follow a sequence of strategies adopted by the household which could be categorised as – pre-disaster, during disaster and post disaster responses (Wisner, 2004). Households, depending upon a

number of driving factors, move along the continuum of the coping strategies available and practices a variable set of coping strategies depending on the household context as detailed in Table 7.3 below.

Table 7.3: Household coping strategies in response to natural hazards

Disaster Type	Pre-disaster (risk management)	During disaster	Post-disaster (Coping and recovery)
Tropical cyclones	Strengthening of *kutcha* (mud) houses through reinforcing walls and new thatched roofing Investing in *Pucca (brick)* houses Storing food grains in safe places – hanging from bamboo ceilings, underground storage Preparing dry food – flattened rice, jaggery, water bottles Maintaining weather information access	Taking shelter in designated cyclone shelter, public Pucca buildings, neighbourhood pucca houses Putting evacuation training to practice and ensuring safe shelter for everyone in the community Reliance on stored food stocks and external emergency food aid	Reliance on wild vegetables and sea food for sustenance Relying on social networks (relatives, neighbours, community) for food and cash Government and non-government emergency aid – food and utilities, cash for work, house repair cash support Temporary migration and off farm work
Coastal Erosion	None	Cultivating saline tolerant paddy varieties, improving drainage in farmlands	Changing location of farm land and house, permanent migration
Drought	Maintain food stocks	Relying on stored food stocks Credit access Off farm activities Government social safety nets and subsidies	Selling and pledging assets Temporary migration
Tidal Flooding	Raised houses Reinforcing housing/walls Bundhs/embankments around farmlands	Taking shelter in designated cyclone shelter, public Pucca buildings, neighbourhood pucca houses Reliance on stocked food	Reliance on wild vegetables and sea food for sustenance Relying on social networks (relatives, neighbours, community) for food and cash Government and non-government emergency aid – food

			and utilities, cash for work, house repair cash support Temporary migration and off farm work

Source – Household interviews and case studies conducted by researcher (January-September, 2015

Coping strategies in response to tropical cyclones

Tropical cyclones are common to this region and the study location villages has experienced tropical cyclones of different intensity over the years. However, natural hazards like tropical cyclones which are episodic evokes different kind of response from the households than unpredictable but slowly developing expected events like rainfall variability and drought. As one respondent stated,

"*What can we do about reducing cyclone impacts? It's a regular phenomenon, happening nearly every 10 years. We are used to it and deal with it in our ways when it happens. We are coastal people and we know how to live with this." (HH35_JB)*

Nevertheless, the past experience of tropical cyclones has led to emergence of a range of coping strategies that are followed traditionally by the household. The coping strategies are also support by a number of intervention strategies from the government and non-government organisations. As reflected and noted in the survey and interviews the following coping strategies are adopted by the households in the research locations

Pre-disaster management – Tropical cyclones being one of the most frequent natural disaster to strike the coastal region, households has awareness of its impacts and over the period have developed risk management strategies to minimize the impact of tropical cyclones on lives and property. The risk management strategies mainly include a safe shelter and maintaining social networks and assets to facilitate the recovery process. Particularly, where resources were available, households first priority were strengthening houses – either investing in building brick/pucca houses or atleast strengthening/restructuring walls and roofs of kutcha houses. However, the resources that a *Pucca* house requires, particularly in spatial marginalized locations like these coastal areas, it is too high an investment for the poor household to afford and they rather invest annually in repairing the kutcha houses. The need for safe shelter was stressed by most households as majority of houses in the study location are made up of mud/kutcha houses

which are vulnerable to cyclone winds and tidal flooding. Some of the concerns and plans on housing needs reported in the study locations are detailed below.

"All we are capable of within our means is strengthening the house for the cyclone season and that is our first priority before every cyclone season (October). I am trying to save up some money to start building a Pucca house next year." (HH13_BH)

"Following every cyclone, the government pays some compensation for house damages, but I hope they would start some scheme that can assist us in building pucca house. It is the only way to address cyclone impacts. Currently we try to seek shelter in our neighbour's pucca house as the cyclone shelter is far from our house, but it gets very crowded… Having a pucca house not only provides safety but also we could protect our food grains, assets and would not have to keep rebuilding our kutcha houses every year after the cyclone season."(HH18_JB)

"Our village do not have any cyclone shelter. The one in the neighbouring village gets crowded by the time we reach it. Also, the roads are dirt paths between the two villages, so they get muddy and unusable during that time. The only way to save ourselves, our assets and livestock is to invest in a pucca house during cyclones. All of us here aspire for a pucca house but given the distance of our village from major towns it is very expensive to transport the raw materials. If we can have enough savings, I would start the construction process and have atleast one pucca room in the house." (HH6_KA)

During disaster –A safe shelter is the most important requirement during cyclones and households living in kutcha houses usually depend upon their neighbours with *Pucca* houses or pre-designated cyclone shelters in and around the villages for safe shelter. Households who seek shelter in cyclonic shelter tend to depend completely on government aid and support during cyclonic storms for food, emergency support and rescue. Households who depends on neighbours for shelter may depend on neighbours for food and support. In both cases, though many households stated that they now prepare and carry some dry food for such short period, because of the space and time constraints it is usually limited to support children.

Post Disaster – Post disaster coping practices shows a range of responses from the households. A harvest season tropical cyclone means loss of crop, piling up of debts and damaged assets of varying degrees. An immediate coping response is borrowing food and cash from neighbour and relatives but in case of disaster of higher intensity where the entire village is affected households look towards relatives or friends from other villages for help. The support includes sending children stay with relatives or borrowing food and cash from them. Households also stated depending on government aid and support as one important coping response. The government support includes emergency food and utility

supplies after the disaster and long-term support like work for cash and house-rebuilding subsidies. Employment through government recovery and renovation work is one of the most important recovery interventions post disaster. As stated by a male respondent in location 1,

"After the 1999 cyclone, there was construction work for strengthening the embankments and the village roads. So, we worked in that for few months following the cyclone and were paid in paddy (rice) and some cash. It was then followed by reforestation programme by the State government along the coast that provided us work for a period few months following that. It helped us to recover and we did not have to migrate and leave our families here by themselves during such difficult conditions." (HH10_KA)

The severe cyclone like that 1982 and 1999 were followed by such public works around all the affected areas which provided work for the local population following cyclone and assisted them in recovery process and building damaged public infrastructure.

Another significant coping strategy that is undertaken after few weeks to months following cyclones is temporary migration to meet financial needs and sustain the household till the next farming season. Although off-season migration is part of the livelihood portfolio of a significant number of household during such events the net flow out of the region increases. The already existing social networks and channels of communication helps in the migration process. However, the migration in this case, is more within the state so that men, the primary migrant population, of the household could assist in the process of recovery and get employment. The migration network in both locations is significant and remittances forms an important part of the household income.

As a female respondent states the importance of remittances and migration for the community in location 1,

"No men over 18 years old, in any household, stay here in the village. There is not enough income from fishing and we don't farm lands to cultivate any crops. All our men in the village work at construction sites or steel factories in South Indian states. They come back for few months every year. That is how I manage my household expenditure – the money my two sons send back home. My daughter-in-law's and grandchildren, we all depend on that income for education, food and daily expenses. Since, the income is stable in the factories, many young men from our village has also started migrating seasonally, when fishing doesn't generate enough income for them. (HH4_KA)

In location 2, the labour migration and dependence on remittances follows same patterns. A male respondent, who is a paddy farmer, also shares similar experience,

"After cyclones, either 1999 or the recent 2014, the farm land becomes saline. It is not worthy to invest in growing paddy at least for 2-3 years till the soil salinity decreases. So, after depending on the government relief and public works for few weeks, I decided to find work in nearby districts as daily wage labour – on and off for following one year. We were able to maintain some income and repair our house slowly. This also helped, I was able to keep track of any subsidy or relief that were being provided by the government post – cyclone. Otherwise, our household may have missed government benefits and support."

7.2.2 Observed household responses to address future impacts: Adaptive strategies

Over the years, households in the study location has developed their set of adaptive strategies to the expected uncertainties and shocks related to climate related adverse events.

1. ***Changes in agricultural and fishing practices***

Shift from native to HYV of Paddy (High Yielding Varieties) – The current farming practice in this region has shifted to HYV seeds of paddy. The relentless introductions and continuous improvement of HYV has been a government priority in agricultural sector, supported by investment from the State in scientific and technological innovations to develop such varieties. Further, farmers' interest in the HYV because of its high yield and short cropping season, has also been significant and through repeated trials farmers have adopted suitable HYV for their farmlands. As mentioned by many farming-based respondents, HYV have been the most important reason for increasing yield or rather maintaining the yield in face of decreasing soil productivity, salinization of soil and water and lack of irrigation facilities. However, most HYV are particularly aimed at medium to upper lands and as a significant portion of the study region is only suitable for cultivating lowland paddy because of its coastline geography, the paddy farming in both the study locations is still is not efficient enough to move away from subsistence. Particularly location 1, which has mostly low and water-logged farmlands, paddy farming is still subsistence and low yield because of lack of options in HYV for this soil type. As one paddy farmer in location 1 states,

"High Yielding Varieties (HYV) of paddy are great but all we have here is lowland, so we can't grow them here as those varieties won't survive in these water-logged and saline conditions. So, there is no option for us other than growing the indigenous low yield variety of paddy that we know. Atleast, we will get something out of our farmlands." (HH7_PE)

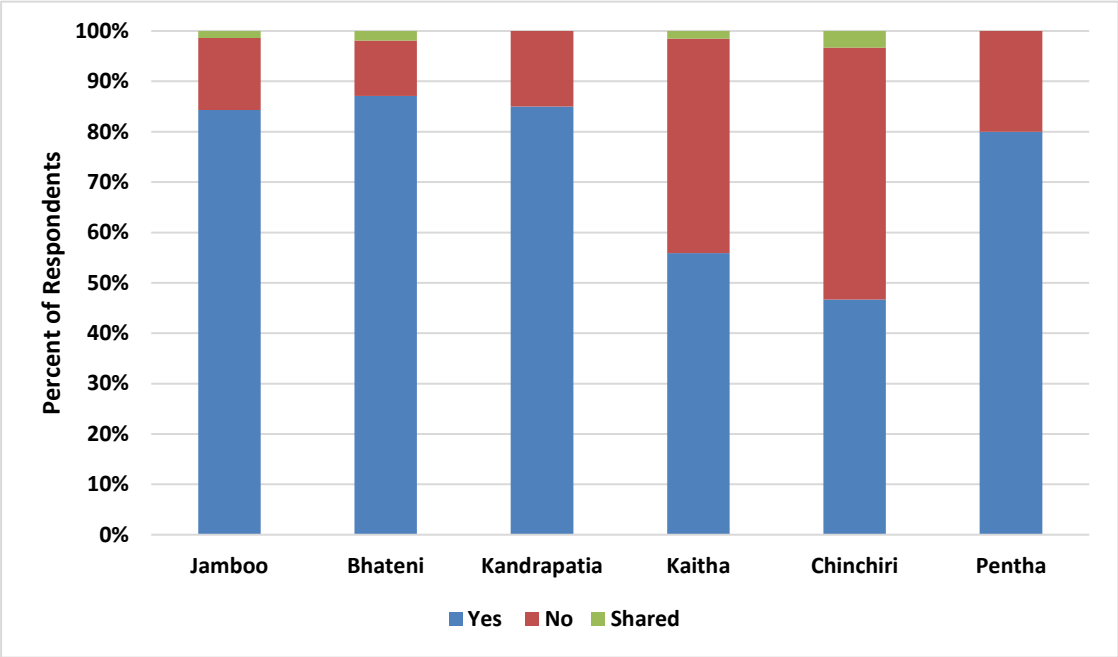
Paddy farming is integral to the livelihood of the households, in addition, it has cultural and social value. So, farmers resort to paddy farming in such lowlands even if it is low yield and labour intensive. However, there has been uptake of SRI method of paddy farming by the farmers. The SRI farming, introduced by the State government, through its agricultural programmes is intended to increase paddy productivity. However, again, SRI is suitable for medium lands and would benefit only a small proportion of farmers as stated by another paddy farmer in location 2,

"The OLM project has been training farmers since last year (2014) in SRI and a number of farmers in our village too were supported by the project also this year (2015) to practice SRI in their farm. They told us it will increase yield, but the paddy variety provided is of shorter variety and is only suitable for midlands or uplands. Our farm is near the coast and is low-lying where these varieties wouldn't survive. So, it is of no use to us." (HH7_CH)

2. *Diversification of farm-based strategies*

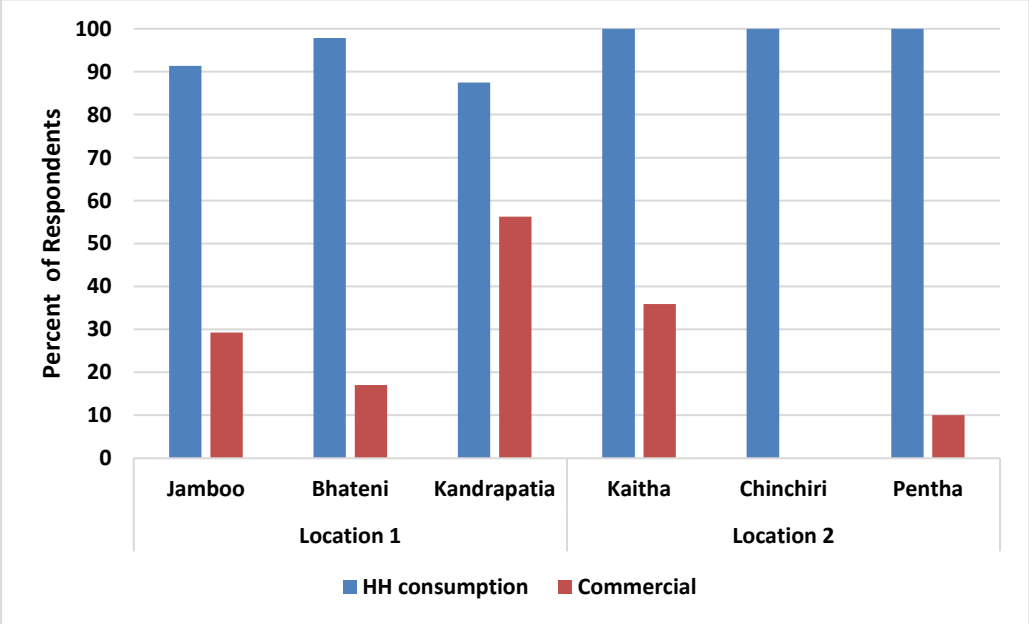
There has been an increase in livestock rearing in the region, particularly, a shift towards poultry and goat production. One of the main reason being better infrastructure and roads that have facilitated exposure to markets and traders, so farmers and fishers have actively taken up this as a livelihood strategy. As shown in Graph 7.2, livestock rearing is more widespread in location 1 as compared to location 2. In location 1, while goat keeping, and poultry are the preferred livestock, in location 2 cattle is the preferred livestock option. Although, primarily the livestock rearing in both location is for meeting home consumption (Graph 7.3), livestock is increasingly reported by the respondents a significant livelihood strategy and option to fall back on during periods of shocks and stress.

Graph 7.2: Livestock ownership by respondents (%) at each village



Source: Household surveys (January-September, 2015)

Graph 7.3: Livestock ownership by respondents (%) on rearing purpose at each village



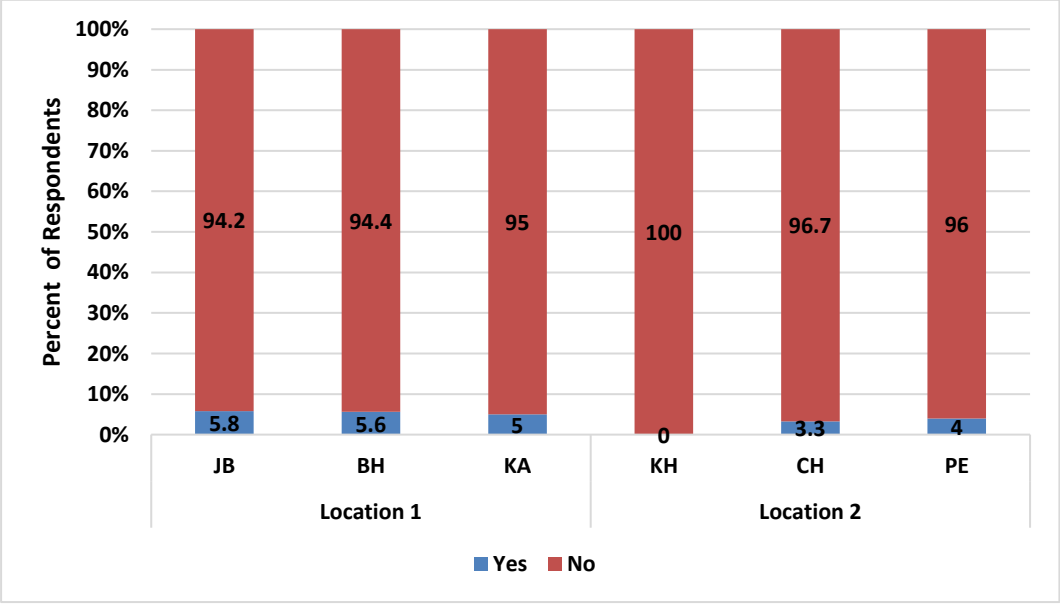
Source: Household surveys (January-September, 2015)

3. Increased focus on aquaculture for supplementary income

The fishing community of location 2 has been practicing aquaculture over many years. Most of the household have a pond in their backyard for aquaculture to meet the household's food requirements. However, with rising price of fish catch and demand of

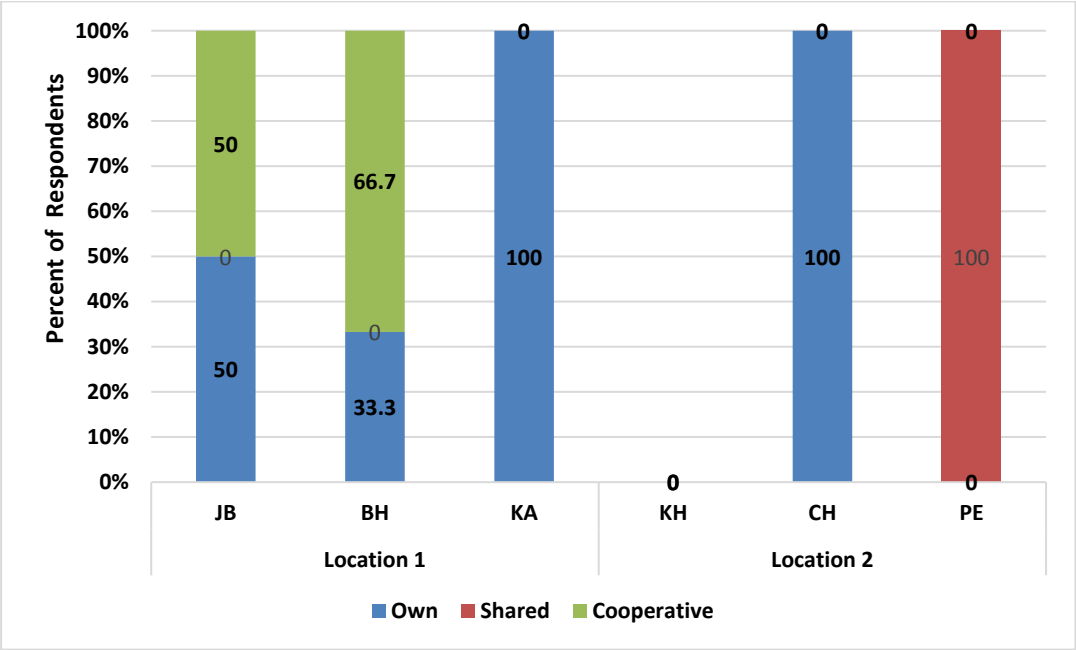
shrimps in international markets, aquaculture has become a profitable venture. Particularly, shrimp farming, has become a preferred investment option for livelihood diversification that many households are going for in location 1. Nevertheless, shrimp farming are highly risky, they require a substantial investment and meticulous care. Also, if harvested at the best it could be a windfall for the farm owner and if the farm gets diseased, which shrimp farms are very prone to along this coastal stretch, then it could lead to huge losses. Thus, even when there is opportunity, only the wealthy households could access the opportunity because of the presence of safety nets and sufficient funds to cover losses and reinvest. The state government has a number of aquaculture-based programmes as part of its livelihood diversification projects to assist small scale fishers to diversify their livelihoods. So, although, it is an introduced intervention, pond fisheries provide security during fishing ban periods. However, the programme is not doing well in most of the intervention sites because of several implementation and infrastructure issues. So, although farmers have shown interest and have also tried to invest in this intervention, but structural issues have marred the chance of success. This is reflected in the low percentage of reported commercial aquaculture farms by the respondents in Graph 7.4. Also, Graph 7.5 shows ownership patterns of the commercial aquaculture farms where location 1 has cooperative or the ICZM producer group aquaculture ponds, while location 2 has no ICZM project implementation which in seen in the lack of any cooperative aquaculture ponds.

Graph 7.4: Village level distribution of respondents with commercial aquaculture farms



Source: Household surveys (January-September, 2015)

Graph 7.5: Village level distribution respondents according to ownership of commercial aquaculture farms



Source: Household surveys (January-September, 2015)

4. Dependence on social welfare and state-funded subsidies

An important safety net in rural Odisha are food subsidy programmes of Public Distribution System (PDS). The most important scheme among these is the subsidised rice provision to the Below Poverty Line (BPL) households. This not only ensures food security but also provide a source of income at the time of need. Similar food subsidy programmes for widows and senior citizens called the *Annapurna* and *Antodaya* programmes respectively, are other safety nets that households depend during periods stress. Similarly, elderly individuals and widows also receive cash support through state welfare schemes which is an important coping strategy for such households. Government welfare programmes are thus an important part of maintaining the coping capacity of the households. Thus, most of the households has a strong dependency on external aid in times of shocks and stress. The State, through its women-led SHG credit programmes, has also facilitated entrepreneurship opportunities like sewing for women. The food subsidy-based development programmes (Table 7.4) has shown positive impacts on strengthening the safety nets but the long-term impacts of such development programmes are debatable because they are populist than vision-oriented (Kocchar, 2005; Kaul, 2013; 2016).

Table 7.4: Public Distribution System (PDS) based subsidies in Odisha

Programme	Year of Launch	Target group	Scale of Entitlement
Annapurna Yojana	2001	Senior Citizens above 65 years old not covered by National Old Age Pension Scheme	10 Kg/month rice free of cost
Antyodaya Anna Yojana	2000	Poorest of poor households, Widows	35Kg/month rice @ Rs.1/Kg
BPL Scheme (current programme)	2008, modified 2013	Below Poverty Line households	25Kg/month rice @ Rs.1/Kg for
Marine Card (Fishers) scheme	2014 (closed from year 2017)	Fisher households in the villages along the coastal stretch under fishing ban for fish breeding and turtle conservation schemes	25Kg/month rice @ Rs.1/Kg for 7 months (November –May)
Fisher Saving-cum-Relief scheme	2016	Fisher households in the villages along the 480 Km coastal stretch under fishing ban for fish breeding and turtle conservation schemes	Rs.1500/month for 3 months from April-June (HHs under fishing ban periods along the coastal stretch). Rs. 5000/month for seven months from 15th November-15th June (HHs under fishing ban in the Gahirmatha Marine Sanctuary)

Source: Odisha State Civil Supply Corporation, GoO and Food Supplies and Consumer Welfare Department, GoO website [Accessed: 20.02.2017]

The most divisive of the programmes is the current PDS programme which provides Rs.1/Kg rice (0.015$) to each BPL family monthly from government PDS centres. The programme intends to ensure food security of poor households and is one of the most populist programmes of the ruling party in the state. Although, a number of criticisms (Table 7.5) has been made against this programme from opposition political party and the Central government, the state government has gradually invested more in this programme to increase its reach. Empirical studies (Kocchar, 2005; Panigrahi and Pathak, 2015) on the Odisha state PDS programmes suggests that the scheme needs to address emerging concerns, such as - not every BPL household has the same level of poverty and as a result the scheme is being exploited, the high corruption level in the delivery mechanism, decade old beneficiaries list and illegal exclusions. Also, rather than providing livelihood options

that could facilitate upward movement of households this is an aid-driven scheme that would not contribute to social or economic mobilisation of disadvantaged households

Table 7.5: Criticism of rice subsidy scheme by central government and political parties

Criticisms of the rice subsidy scheme	**Source**
"The Comptroller and Auditor General of India has slammed Naveen Patnaik's poll-winning scheme of Rs 2 per kg rice for BPL families, terming the distribution of rice at a reduced scale of 25 kg a month from the specified 35 kg a month as illegal diversion."	The New Indian Express Newspaper dated 16.12.2012 [Accessed 14.10.2015]
"The Comptroller and Auditor General (CAG) of India has rapped the state (Odisha) for diverting the central government fund illegally and criticised the government for using the scheme (BPL food subsidy) as a tool to win 2014 elections"	The Business Standard Newspaper dated 28.01.2013 [Accessed 14.10.2015]

5. ***Traditional food grain storage strategy –*** A fundamental feature of every farming household in both locations are the traditional paddy storage vaults (Photograph7.1). These varies between the households and among the villages but are very important feature, built carefully, in every household, to store paddy till the next harvesting period. This storage strategy helps to ensure food security during the offseason as the region has only one cropping season annually and also for scenarios like crop failure atleast for one cropping period. This also functions as a safety net in situations of food insecurity –like floods or droughts.

Photograph 7.1: Traditional structures for storing harvested paddy

Source: Fieldwork, Location 1 [Photograph taken by researcher on 01.02.2015]

7.3 Characterising policy implementation process at the local level

The objectives and plans of policies do not follow a linear process from its formulation to its achieving the outcomes (Hill, 2014). Policy implementation is an important stage of the policy process which shapes the final outcomes of any policy. As defined by Meter and Horn (1975: 445) policy implementation covers "those actions by public or private individuals (groups) that are directed at the achievement of the objectives set forth in prior policy decisions". However, increasingly policy implementation studies have argued on this rather simplistic separation of the implementation process from the formulation stage which fails to conceptualise the complexities of policy as practice. This conceptualisation of implementation is encapsulated by Friedrich (1940:6) who argues, "*public policy is being formed as it is executed, and it is likewise executed as it is being formed*." This section explores this stage of 'execution' in the policy process and how it shapes the practices that comes to exist at local level. This study follows the bottom-up

conceptualisation of policy implementation and uses the actor oriented approach for analysis which focuses on the actors, their agencies, and their interactions to understand who, how and why is influencing the implementation process .This section is structured into three sub-sections to understand policy implementation at the research location - actors and networks critical to this 'linking space', the implementation process at the research location and the dominant narratives shaping it and the what and why of interaction patterns of these actors and their narratives across horizontal and vertical scale[24] as they go about implementing them at the local level[25].

7.2.1 Mediating Actors and Networks at local level

At the outset, it is important to identify both the state and non-state actors and networks at the local level and the positions they occupy in the implementation process of the policies at the research location in order to understand policy-practice interface. They occupy an important position at the interface and as argued by the third-generation implementation studies translates and transforms policy into practice through their actions and interactions. The various actors and networks mediating policy implementation process at the research location, as identified from review of secondary data and field survey and interviews, are detailed below.

i. State actors - The Panchayat Raj system and extension workers

The local governance unit in the research location (village – level) is the gram panchayats with the panchayat samiti at block level and the Zilla parishad at the district level as we move up. This local governance system called the Panchayat Raj system at the local level is a result of devolved governance system laid out by Indian constitution bestowing more power and autonomy at the local level. As presented in Figure 7.1, in location 1 the three study villages are under gram panchayat Jamboo while in location two villages are under gram panchayat Dera and one village under another gram panchayat Brahmansahi[26]. The gram panchayats consist of elected members from the villages which they cover – a

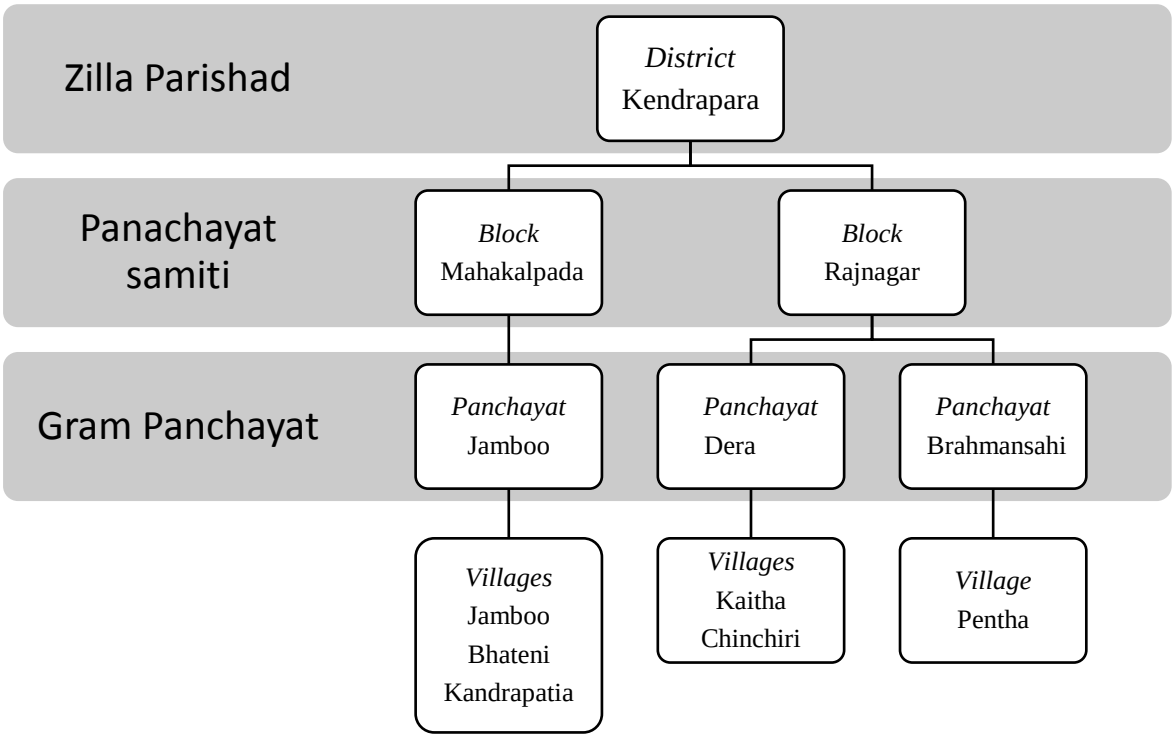
[24] The study here makes a clear distinction between the terms scale and level – scale here is defined as an hierarchical but non-directional, unfixed and constructed levels with unequitable distribution of power open to negotiation and contestation while level here is defined as the administrative or actor levels – national, regional and local level forming the governance 'steps' for the political functioning within the hierarchical space continuum.

[25] Local level in this study encompasses the administrative levels of gram panchayat and village/community level.

[26] See Section 3.2 for research location details

Sarpanch, (president), Upsarpanch (Vice-president) and two officers supporting the functioning of the gram Panchyata. Further up, the Panchayat Samiti at the block level consists of the Sarpanchs from all the gram panchayats under it and members from socially marginalised groups to ensure fair representation. The highest tier, Zilla Parishad at district level, consists of representatives from all the panchayat Samiti, representatives at state legislature for all the blocks and all the staff of the different state departments (Agriculture, water, food supplies, etc) working at the district level and below and is managed by a government appointed Block Development Officer (BDO).

Figure 7.1: The three tiers of Panchayat Raj system at the research location – district level, block level and village level



Source: Document reviews and key informant interviews (January-September, 2015)

iv. Non-State actors: NGOs, community-organisations, local elites

Apart from the formal administration units in place at the local level, particularly the village and block level in focus here, a number of formal and informal actor and networks play an important role in implementation of different policies, which are outlined below -

Non-Governmental Organisations (NGOs)

NGOs play an important role in the bargaining of power at the local level and shaping local ideologies and perspectives. In both the study sites, there are a number of NGOs

actively involved in executing both donor driven and state driven programmes. Both research location 1 and 2 have active NGO presence (Table 7.6 and Table 7.7) working on development issues ranging from livelihoods to health care and children education. In location 1, most of the NGO programmes started in late 90s, particularly post-1999 (after the supercyclone) when a number of National and International NGOs funded and carried out activities at the location 1 on livelihoods and poverty alleviation but most of them has gradually pulled out of the area. However, the influence and impact of NGO interventions that was carried out just before and following the super cyclone of 1999 is still perceptible at the research locations. In 1998, the national-level NGO, MS Swaminathan Research Foundation (MSSRF) implemented a programme on coastal protection in location 1 and specifically village KA. The NGO funded strengthening of embankment along the coast of the village KA and provided employment to the village households through these embankments building projects and mangrove replantation programmes. Two other national level organisations that were active are Red Cross and Church's Auxiliary for Social Action (CASA). Both Red Cross and CASA, separately, implemented their community disaster risk reduction programmes at location 1. This involved construction of multi-purpose cyclone shelter and provision of emergency aid during disasters by CASA, while the Red Cross programmes included construction of multi-purpose cyclone shelter and training on preparing and responding to disasters and management of cyclone shelters. There are four multi-purpose cyclone shelters in Research location 1 – three in and around village JB and 1 in Village BH.

Table 7.6: NGOs operating at location 1

NGOs/Projects	Years of activity	Activities	Focus Area
MFSSTRD	1998-present	-Mangrove protection and planting - Embankment strengthening	Forest conservation Coastal protection Disaster risk reduction
VARRAT	2010-present	-Financial and material support for school education for children of poor households -Financial support for education and wedding of girl child of poor households	Child development and welfare – Education, day-care and health interventions
CASA	1999	Construction of Multi-purpose cyclone shelters Emergency aid relief during and after disasters	Community disaster risk reduction
Indian Red Cross Society (Odisha Disaster Mitigation Programme)	1995-2002	Construction of Multi-purpose cyclone shelters Emergency aid relief Training and capacity building of community on disaster risk awareness and disaster preparedness	Community disaster risk reduction

Source: Document reviews and Key informant interviews (January-September, 2015)

In location 2, the only NGO working and reported by the respondents was a regional level NGO, Regional Centre for Development Cooperation (RCDC), working on issues of reducing community vulnerability to climate change and disasters like cyclones. The project is part of multi-country climate change resilience programme, funded by international donors and is particularly focussed on livelihood diversification and facilitating adaptation among the coastal communities.

Table 7.7: NGOs operating at location 2

NGOs/Projects	Activities	Focus Area
Regional Centre for Development Cooperation (RCDC) – 'Paribartan'	-To increase the resilience of coastal communities along the Bay of Bengal to climate change and natural hazards -Being implemented in 6 GPs of Kendrapara district since 2011. In partnership with Concern Worldwide and supported by European Commission	Climate Change Adaptation and Resilience Disaster Risk Reduction Livelihoods

Community-based organisations

Other key players at the local level are informal community groups like youth organisation or religious groups which are critical in shaping how the policies unfold in action at the local level. Informal groups such as this are important to community cohesion as they organize and manage community events particularly religious and social activities. They are an important link between local level government organizations like gram panchayat and block council as many households depend on these youth groups for more information on state sponsored programmes and schemes and assisting them in availing such schemes. However, they may not be of such significance in every community as spaces like this may get occupied by influential leaders and individuals.

In location 1, village JB, the youth group is very active and involved in local development. From managing community events like religious festivals and entertainment events to opening private schools, the youth group shows a much deeper investment in the village. On the other hand, youth groups in rest of the five villages have minimal to no significant role in community matters except cultural events. However, when such groups are present they become medium through which program implementation proceeds and the interpretation and narratives of such groups exerts a greater influence on how households or the community perceive such programmes or schemes.

In location 2, although the respondents did not report any important CBOs like youth organisation, the religious sect *Jay Guru* has shaped an important community group. The religious group is managed by members drawn from the follower households which are part of committee which arranges religious and cultural events along a designated coastal temple every year. The group is important as it significantly shapes the community knowledge and values regarding livelihoods and perception of disasters. The religious

ceremonies funded by the households and held along the coast is believed by the respondents to appease the divine forces and reduce cyclones forming along the coast and to protect farmland and lives.

Local elites

The creation of formal decentralised governance spaces[27] has also promoted evolution of informal leaders and decision makers. This new local platform of administrative-political power has strengthened the emergence of the 'local elites'. These local elites are either socially and/or economically advantaged households/groups who take up positions as local leaders and occupies an important position in the local political landscape. In some cases, like location 1, which are political more active sites, the 'political elites' have stronger influence and are more visible in the village development plans and programmes.

The discussed programmes and plans in the next section sheds more light on these local elites and local institutions and their dynamics that influences the translation of policy into local practices. Also important is the understanding that 'local elites' is far from a homogenous or politically cohesive group. The group exists with competing claims through bargaining and with contesting ideologies. Formal institutions play an equally important role as informal institutions at the local level shaping ideologies, providing platforms for the competing and often voiceless groups to forward their issues. Thus, the understanding encapsulates the process of implementation and underpins this chapter, is the plurality of actor interests at different governance levels and their exercising of agency by drawing from the resources available to them (Giddens, 1984; Woolmer, 2006). The top-down setting of boundaries for any decision-making process at the local level and the exercising of agency of the individuals within these existing structures reflecting their diverse interests shapes the outcomes of policies.

7.3.1 The policy implementation process at local level: practices and narratives

As detailed in Section 7.2.1, the above-mentioned actors are the key players operating, interacting and driving the policy implementation process at local level. This section moves forward with the 'actor-oriented approach' adopted by this study and explores the process of implementation of the schemes and programmes focussed on climate change,

[27] This refers to the three-tier Panchyati Raj system in rural areas of India. This decentralised system of governance system was formalized through constitutional amendment by Government of India in 1992. See Section 5.3.2 for details of the three-tiers (village level, block level and district level) of administration units at the research location

disaster management and development by analysing the interests and narratives shaping the through the lens of actors, their roles and interests and the network dynamics driving the process. In addition, this section also highlights how these interfaces, as a result of the diverse interests and competing claims becomes, essentially, sites of transformation of policies and reproduction of narratives leading to intended and sometimes unintended actions.

Implementation of climate change plans and programmes at local level

The study location falls under the district of Kendrapara, which is a natural resource-dependent coastal district. According to the OSDMA (2008) hazard ranking mapping for the state, the district is highly vulnerable to tropical cyclones, high winds and flood prone (rank 1) while being a slight drought risk zone (rank 3) and consequently has received a greater attention and funding under the Odisha Climate Change Action Plan (OCCAP) drafted in 2010. Although under the OCCAP, projects or new schemes are yet to begin, the state government in partnership with international donors and non-governmental organisations is already executing climate change focussed projects in Kendrapara. One of the first projects to be implemented is the Integrated Coastal Zone Management (ICZM) project in funding with World Bank implementing a number of interventions at community level like livelihood diversification and coastal zone protection in light of the uncertainty around climate change. The project started in 2010 is implemented through cooperation from different state departments and through its array of short term extension workers at the local level appointed under this project. The ICZM projects at the research location were focussed on improving livelihood of fishers along the coastal districts. As other local level projects implementation in rural areas, the programme involved participatory exercises to identify beneficiary households and was followed by implementation of project activities. The activities included formation of 'producer groups' to develop and run aquaculture farms, creation of poultry farms and in few cases livestock like cattle were provide to support the fishers during long lean period that marks this stretch of Kendrapara coastline because of turtle and marine resource conservation regulations. At the interface for this project were the extension worker, implementing programmes outlined by the state department in partnership with international donors. Although the programme included state-level officials monitoring and executing the project, at the ground level, it was the group of appointed extension workers who were responsible for the project implementation and monitoring at the research location. These extension workers

appointed for every block, reported to the District Rural Development Agency at the district headquarters but there were no village level worker/staff appointed. The project was managed at the field level by the ICZM block office staff with planning and monitoring support from The Directorate of Fisheries Department at the State-level. The project implemented a number of focussed interventions for the fishers but as the current evidences shows it failed to take off from the very start. The dissatisfaction of the community with the project is perceptible and so is their confusion regarding the purpose if the project. During the researcher's own study period, the project was coming to a close (March, 2015 was the end date) and most of its extension workers for field have already left the job. One extension worker for the Odisha livelihood Mission (OLM) in the research location 1, who was interviewed during a department meeting at the district level opined,

We have been working in the villages (study research location) since last five years on livelihood diversification and credit access, we very rarely came in contact with field staff of ICZM project. You do not see them on field as much. Also, the project has ended so there is barely any staff currently…. I am not sure how their projects impacted community as we don't hear any positive review or for that matter any reviews from the community. [KI_3_Feb, 2015]

The researcher is aware that the extension workers of the OLM project could be biased and endorsing their project as more successful or their staff as better than the ICZM staff. However, researchers own observation of the field situation and conclusion drawn from key information interviews and household survey also supports this statement. Respondents during household interviews reported a weak implementation process and were dissatisfied as no long-term support to the beneficiaries materialized through this project. Further, the confusion of the community about the project and the intention also reflects the lack of relevant interaction with the community. The lack of communication and weak links at the interface could be seen as an important reason behind the (observed) limited success of the programme. As a respondent who is a beneficiary of the programme reported,

"I am not sure from what government department they were from, but I am sure it was a government scheme. We call them the marine department as they introduced projects especially for us (fishers) that included aquaculture and livestock rearing. They used to come frequently at start, every month or two, now we don't see them at all. The aquaculture ponds became salinized, fingerlings perished, and livestock did not survive. That's how the scheme ended for us." (HH12_KA)

The project brought investment into the local economy and implemented required plans, but the benefit was not long term and nor did it include all potential households that needed the support. On paper, the concerned regional state department, the supporting activities were neatly outlined and as observed during the study period by the researcher, households in the beneficiary villages were very interested to get engaged in the project. However, the project was not able to realize its intended outcomes. A number of issues emerged at the local level during implementation stage, which became major obstacles to the project success at the local level.

Table 7.8: Drawbacks of the ICZM livelihood project in location 1

Drawbacks of the ICZM livelihood project	Illustrative respondent quotes
Unsuitable fish varieties for the local soil and water conditions	*"We told them that these small ponds will get salinized over the summers so let us choose the suitable fingerlings. But we were directed that we can only be a project beneficiary if we will take the fingerlings provided by them. The ones they provided were not suitable for these kind of saline environments"* (HH5_KA)
Lack of periodic monitoring of the progress of the project at village level	*"I took the fingerlings provided by the project. They told me it is suitable for aquaculture in saline environments like ours but the fingerlings did not grow to its full potential. I did not get enough catch so it did not make any financial sense to sell them in markets. At the end, we used it for our own home consumption"* (HH4_BH)
Lack of initiatives for market linkages and storage opportunities	*"We formed a producer group of 8 members in our village. The land for the pond is leased for five years from the owner and the project provided funds for it. The pond construction and the feed was also subsided by the project. The fingerlings were selected by the project staff and they provided it for free the first time. They had already guidelines of the fish types that we could breed and the hatcheries from where to obtain them. The hatcheries are really far and we got our fingerlings from Balasore district (approx.170 KM from the research location). The fish did grow well at start and we got marginal profits. However, there are no fish markets or cold storage nearby which makes it difficult to get a good price for our catch. Also, after first harvest we are not sure should we continue or not as now we will have to cover all costs. The hatcheries they suggested would lead to higher transport cost and there are not any adequate marketing facilities after harvest. We are now not sure about its long term viability but we do feel it*

	is a profitable venture, if only we can have access to supporting infrastructure." (HH 21_JB)

Source: Household survey (January-September, 2015)

Implementation of disaster risk management projects and programmes at the study sites

The vulnerability of the coastal district of Kendrapara to natural hazards such as tropical cyclones, storm surges and floods has meant that it has been always a part of state-sponsored programmes or international donor-funded programme on disaster risk management. The major funding agencies for the state projects has been World Bank, Red Cross and GIZ. The major projects currently operational are the ICZM and National Cyclone Risk Mitigation Project (NCRMP) funded by international donors, UNDP and World Bank respectively. While ICZM has carried out more activities in location 1 (Mahakalpada block), NCRMP project has so far covered primarily location 2 (Rajnagar block). Both the projects started in 2010 and while the active project period of ICZM ended in 2015, NCRMP is scheduled to finish the project activities by 2017.

ICZMP is a multi-state coastal zone project focussed on reducing coastal vulnerability to natural disasters and climate change impacts and facilitate diversification of coastal livelihoods[28]. At the regional level, it is multi-department project coordinated by the independent ICZM project office at the state capital, Bhubaneswar. At the regional level the project is built on inputs from different state level departments and is operated as a cross cutting focussed project. The ICZMP project in terms of disaster risk management focuses on the long term focussed pre-disaster interventions like reducing coastal erosion and vulnerability reduction to disasters like cyclone through infrastructure interventions. Thus, from the project viewpoint, the ICZMP interventions in the study sites serves the dual objectives of addressing disaster risk management and climate change.

At the local level, ICZM functions through its locally appointed project managers and project officers who execute the plans drawn by the regional office. The DRM activities of the ICZM has so far focussed on construction and maintenance of infrastructure in the coastal villages and the Geotube embankment under-construction to reduce coastal erosion. The infrastructure development by ICZM is primarily manged at the regional level which appoints technical staff and contractors for planning and construction the infrastructure. The local level involvement in the project is mostly confined to the labour

[28] See Section 5.2.3 for details on ICZM

that the local village provided. The respondents of village PH in location 2, which is the site of the coastal embankment construction has different views on the implementation process. While residents find it beneficial that the construction of embankment has led to better roads, daily wage employment for the men in the construction process and an increased focus of different National and International NGOs to the village but the residents also report being excluded in the implementation process and do not place much trust in the embankment. There is no perceptible local involvement or influence of local agency on the infrastructure development except being a source of labour. As two respondents reported,

"My husband works as a daily wage labour for the embankment construction. Atleast one member of each household in our village works for the construction. I am not sure if the embankment will last but it does provide us with employment for time being." HH10_PH

"We were never consulted on anything regarding the geotubes. They did hold a meeting when they started and told us about the construction, its benefits and when it will start. The first embankment with the rock-piled cages got washed away and then they started constructing the current embankment in progress. Government has appointed their experts from other states and big contractors who are managing the project. So what and why to ask us? We can only hope for the best. However, the construction has provided us employment in short term. So, that I will count as a benefit of the project". (HH14_PH)

Implementation of climate and disaster risk management related social development projects and programmes at the study sites

In both location 1 and 2, a number of social welfare programmes are being implemented ranging for education to child care. The study, without going into detail on the social and development programmes at the village level which are varied and beyond the study context, seeks to outline the implementation of the social programmes in brief in order to understand the linkages that these implementation programmes could and have with climate change and DRM programmes.

The two important state-funded welfare programmes are the community health worker called is the *ASHA* and the rural child care programme called *Anganwadi*. This programme is important to the climate change and DRM as health is one the sector that is significantly affected by climate change and extreme events. The ASHA programme works through appointment of a lady health worker at the village level selected among them. The appointment is done through block level government offices and the ASHA worker is provided with medicines for diseases and trained to assist in child birth and care for

lactating mother and new born health. The ASHA worker is paid monthly and though commissions for the number of child births that they assist. Thus, the appointment as ASHA worker is a lucrative employment and hence at most of the study villages a matter of interest and conflict.

Another livelihood project of importance at the study site is the Odisha Livelihood Mission's project "TRIPTI" which is now renamed as NRLP. The project, functional at the study sites since 2010, aims at diversifying livelihoods and creating a robust community credit system to strengthen financial safety nets in communities. The project implementation takes place through its hierarchical implementation units set up at the start of the project at different administrative levels. In addition, there are a number of agriculture diversification programmes operating at both research location 1 and 2 (Table 7.9) that are being implemented by the relevant state departments through the block level state agencies.

Table 7.9: State-funded agricultural diversification and productivity programme

State-funded programs	**Activities/Support provided**	**State department concerned**
Location 1: Mahakalpada Block		
Cashewnut cultivation	-Supply of subsidised seedlings -Subsidised fertilizers and pesticide -Irrigation support through funds for pumps (1500/-) per farmer at the start	Directorate of Horticulture
Coconut cultivation (Special Crop specific scheme 2012/13)	-Subsidised saplings - Financial support for farm maintenance - Financial support for first two years for irrigation and fertilizers/pesticides	Directorate of Horticulture Coconut Development Board
Betel leaf cultivation (Special Crop specific scheme 2013/14)	-Financial support of upto 50% for the first year of establishment of farms1	Department of Agriculture
Location 2: Rajnagar Block		
System of rice intensification (SRI) programme	-Financial and technical support for farms for first cropping season - Free seeds	Department of Agriculture Odisha Livelihood Mission

Source - Department of Agriculture Outcome Budget, 2015-16, GoO and FGDs

7.3.2 Discussion: A typology of policy-practice interactions at local level

Local actors and their narratives play an important role in the implementation of policies. The local 'decision-making' bodies, both formal and informal, play an important role in shaping the outcomes of the policies at local level. Depending on the mediating actors and their interests at the implementation level the policy and practice, interactions among them could result in different outcomes and follow different pathways. The typology construction draws from the approach to social interface analysis (Long, 2004) and is based on the works on categorisation of interactions among the actors of the implementation process (Bressers, 2004; Owens, 2008). This typology indicates how effective the project implementation has been and its potential success in future. The categories of interaction type observed by the researcher at the implementation level at the local level are outlined in the Table 7.9 below.

Table 7.10: Typology of interaction between actors at implementation stage

Project/ Programmes	Initiators	Implementation actors	Target groups	Outcome (Interaction type)
State Sponsored				
ICZM – livelihood interventions	State Department of Forest and Environment	State Project Management unit Project hired field staff	Fishers	Negotiation
ICZM – embankment and infrastructure development	State Department of Forest and Environment	State Project Management unit Independent contractors/consultants	Coastal community	Contestation
NCRMP – DRR through structural and non-structural interventions	NDMA	OSDMA Independent contractors and consultants Community-level Cyclone Shelter Management and Maintenance Committees (CSMMC)	Coastal community	Mutual learning
Agricultural interventions/ Cropping support	State Department of Agriculture Directorate of Horticulture	Block office/ Block Development Officer Extension actors	Farmers	Mutual Learning
OLM	Panchayati Raj Department	State Project Management unit Project hired field staff Local trained women staff	Farmers Fishers Women	Mutual learning
NGOS/Non-state				
Infrastructure, Aid and Disaster Risk Reduction support	Christian Aid International	Church Auxiliary for Social Action (Regional NGO)	Community	Negotiation
'Paribartan' Climate Resilience and DRR	Concern Worldwide (with European Commission)	RCDC (Regional NGO)	Community	Mutual learning
Child Development and Support	National and International NGOs (Childfund)	Voluntary Association for Rural Reconstruction and Appropriate Technology (VARRAT) (Regional NGO)	School Children Girl Child	Negotiation

Source: Developed by researcher from household survey analysis, Key informant interviews and document analysis (January-September, 2015)

1. **Contestation/Conflict -** The climate change and disaster risk management projects has so far followed a less contested trajectory at the implementation stage. The new concept of climate change and the top-down planning of the projects did not leave enough space or time for the local community to understand and participate in the project implementation. So, though the local community is not necessarily supportive of every project, there has not been contesting narratives with respect to climate change narratives of the government. However, there are conflicting perspectives regarding the ICZM embankment project near location 2. The respondents view the project as a failure with the only positive contribution being the availability of the jobs for the village men. The repeated washing away of the embankment and the lack of communication between the community and the project implementation actors have created a space for confusion and conflicts to develop.
2. **Negotiation –** The implementation interface can also be the site of negotiation between actor narratives and interests. In case of ICZM livelihood programmes, this negotiation between actors within and across scale is most prominent. Although, the project has still to show any widespread impacts on the livelihood outcomes of the community and has repeatedly faced obstacles in implementation, households have participated in these projects to diversify their livelihoods. While actors responsible for implementation – government staff and chosen village coordinators states that lack of interest by the households limited the project success. The households show dissatisfaction on the lack of knowledge support and training from the implementation agency. In cases, such as project providing fingerlings to the households that had already said that those species of fish would not be suitable for the region, the households had to invest on raising those fingerlings. Eventually, the fingerlings perished in the saline conditions and the households had to source the fingerlings on their own as they have already invested on the ponds and other necessities.
3. **Mutual learning –** In both the communities, many projects has shown success and an important driving factor has been the building of trust and mutual learning between the actors across scales. This has been the case with the NGO projects detailed in Table 7.9. Post-1999 super cyclone, the cyclone shelters that were built in location by international organisation are a good example of this outcome. While the organisation provided the necessary funding for construction, the maintenance

and utilization decision of the buildings were left on community leaders. This created a sense of ownership in the community and has led to better utilization and maintenance of the shelters. The cyclone shelter now accommodates primary schools during normal conditions which has created an access to education for many households who were not able to send the children to government school located far from the village.

However, this categorization is not in absolute terms as the level of negotiation and contestation exercised by the implementation actors and how they perceive the policies and translate it into practices and strategies for local community, moves along the spectrum of the cooperation and contestation. The actors who occupies this implementation process are significant to understand the governance as their interests and narratives and interpretation of the policy varies significantly ranging from the policy protectors to the policy receivers. The diversity of actors and the plurality of interest at this stage provides an in-depth view into the complexities of policy to practice realities. The focus on the interaction is thus particularly significant to bring out the power struggles and the actor interests that marks the process and thus can lead to a success or failure on achieving the intended outcomes for the policy. As policy implementation research has pointed out, the interactions at the implementation stage are as important to the policies as the policy formulation. The narratives that are shaped by implementation stage actors or the narrative frame with which the actors at this stage view the process shapes policy outcomes.

A typology as described above could be used to reflect on the progress and thus monitoring of the past projects and current projects which then could be used to focus on areas that the project need improvement. This typology further forwards the argument that policy process which usually frames project/programme implementation as technical and political neutral process risk more uncertainty than an adaptation intervention that is designed by taking into account the logic's and progress of past projects. This also sheds light on the significance of implementation actors and their narratives on outcomes of policy and plans. In climate change adaptation programmes where most studies focus on the improving policy frames or local level practices – this 'implementation interface' often do not receive required focus for consideration. Although studies exploring development-based policy and process, has been increasingly focussing on these actors at the interface like the local elites and the formal and non-formal actors at the helm of implementing

plans, climate change adaptation or DRR studies are still focussed on the community dynamics or the policy process at the local and the regional/national scale. This scale structuration fails to understand or account for multi-level governance complexities as that of climate change adaptation. The understanding of power relations between the actors and their framings of the 'problems' at this implementation stage is an important 'connecting space' to capture the interplay of knowledge and power across the scales.

7.4 Limits and Barriers to adaptation at local level

Household coping and adaptive strategies towards addressing negative shocks and stress are shaped by a multitude of factors. The factors range from cognitive factors like attitude, value and behaviour to contextual factors like socio-economic positions, political context and cultural norms. The adaptation literature (Adger et al., 2008; Adger et al., 2009; Moser and Erkstrom, 2010; Briesboeck et al., 2013) categorizes these factors as limits and barriers to adaptation.

This section focuses on the inter and intra household level barriers to climate change adaptation to analyse how actors realize their interests and express their agency to respond to the negative impacts of disasters and climate change and their interactions, in the given context and structural boundaries. Moving forward with the understanding of different outcomes at the implementation interface from the section 7.3, this section attempts to identify the limits and barriers that exist at the study locations, including the factors shaped by the actors and narratives at the higher governance level as discussed in section 7.3 and the existing contextual conditions at the local level. Thus, this section sheds light on the how and why the coping and adaptive strategies that were reported by the interviewed households were decided upon and the how the local level actors interact with the each other and the structures of knowledge and power. The household barriers to adaptation in the research location is here grouped into four major categories – Socio-cultural, economic, institutional and technological. The barriers are discussed and analysed in detailed below.

7.4.1 Socio-cultural barriers

Socio-cultural barriers refer to the social and cultural process that governs individual and collective responses to impacts of climatic stressors (Jones and Boyd, 2011). The social processes play an important role in what adaptation strategies a household adopts and the ones that they fail to employ ((Löf, 2006; Hulme et al., 2007; Adger et al., 2009). Further,

social barriers reflect the structure and organisation of a society and vary within and between societies, are dynamic and can be overcome (Hulme et al., 2007). This section here explores different social institution – caste and gender and cultural norms that shapes the decision-making of the households addressing their vulnerability to climatic stressors in the study locations.

i. Role of caste stratification in livelihoods diversification

Livelihood diversification is considered as a significant feature of resilient and adaptive households (Bebbington, 1999; Ellis, 2000; Eriksen et al., 2005). In agricultural context, the ability of a household to expand its livelihood portfolio on-farm and off-farm varies within an across communities and depends on a household's access to resource access – social, cultural and financial (Ellis, 2000). In the study location, caste stratification plays an important role in shaping the access of a household to the necessary resources for livelihood diversification.

As noted in Section 7.2, a major coping strategy to address negative shocks and stress in the region is rearing and selling livestock and utilizing existing food grain stocks from last cropping season. However, all the households do not usually have enough food stocks to tide through lean periods. This holds particularly true for the 'schedule caste' groups in location 2. The outline of the different caste and their livelihood has been presented in Section 6.3.1 of Chapter 6. Building on that outline, the SC group or the basket weaver community in location 2 are known to be historically landless group who depends on forest-based resources for livelihood. This has led to the skill set being restricted to their artisan skill without much diversification opportunities. This also has created the hand-to-mouth existence of these households that now depends only on selling the baskets in local markets. In adverse situations that impact the entire region/district, local markets suffer, as purchasing capacity decreases of consumer households. Consequently, the basket weaving community struggles as their income drops during such stress periods (Box 7.2).

Box 7.2: Household coping strategies of the basket weaver community of location 2

The struggling basket weaving community of Kaitha (Location 2)

Mrs Sanjukta (name changed) is a 53 year old basket weaver in Kaitha, one of the last active basket weavers among the nearly 80 basket –weaving households of Kaitha. The community resides at one end of the village and all the households belong to the SC (scheduled caste) category. They community used to be basket weaver supplying baskets for storage, from storing fish catch to food grains. However, times have changed. Mrs A one of the handful, particularly elderly, basket weavers in the community now. She states that the recent restriction in accessing forest, from where they used to collect the grass for weaving and the lack of market, makes it unsustainable to carry on their traditional livelihood. She reports that young men in their community are daily wage workers, including her own son. Some work in the capital city while some have migrated to other states for work. It is only the females and old people left in the households.

[Source: HH31_KA]

Mrs Pallavi (name changed), a 35 year old, mother of three, concurs and adds that there is no training or other opportunities for them. A group of weavers had started a SHG group a couple of year back to make markets accessible to the artisans but then the government stopped supporting it and she has no idea why. However, she wants to pursue this livelihood and has manged to find bamboo as an alternative for the weaving. Although, bamboo is expensive and she has to pay for transportation too, she is still hopeful of continuing this business. She explains that they have no farmland and this is only skill they have so there is no other option. They don't have access to grazing lands or else maybe livestock could have been an option. She has invested in poultry, rearing them in the house backyard. Those who can manage have migrated to cities to work as daily wage labour. However, her husband has disability and he can't work as a labourer, so they had to pursue this livelihood.

[Source: HH36_KA]

Although, over the years, few households have diversified into share-cropping learning the necessary farming skill set to maintain food security, majority of households still depend upon their artisan craft or remittances from family members working as farm or daily wage labour in the village or as a migrant labour at construction sites or as cooks in a different district or state. Further, share cropping though provides enough food security to the next harvest season, but it is difficult to manage adverse situations beyond that given the reserves. Traditionally, the lack of physical assets like land tenure also has influenced the livestock rearing ability of this livelihood group as the groups barely manage to build their financial assets that could support them in emergencies. Although, the confines of caste that has dictated the livelihood capabilities of this group traditionally has loosened

but the socio-economic impacts of this deep-rooted barrier is yet to be overcome completely. Thus, households facing any kind of impacts from climatic and non-climatic impacts do not have many coping or adaptation strategies to choose from other than migration or daily wage labour.

Caste also has deeper individual influences such as the attitude towards the accessibility of common resources. The common resources like grazing lands or forests are dominated and managed by the 'default' authorities like village elites or the government organizations. This influence, to some part, the agency that these lower group holds towards livelihood diversification as it depends upon these authorities to gain access to resources necessary for diversification. Respondents interviewed conveyed an acceptance of these 'authority' practices and followed these traditionally embedded social rules and norms. The lack of land tenure although mentioned as a barrier to respond effectively to stressors but never was stated as a social or political contentious issue by the households of this group interviewed for survey or case studies. The acceptance of the lower 'position' in the social hierarchy and working within these social boundaries was observed in the household narratives of vulnerability and adaptation. A male buffalo herder in location 2 explained the dynamics of the access to grazing lands,

"It is not very profitable to be buffalo herders anymore. The access to forest lands are restricted because of conservation and community lands are not supposed to be used for grazing. We have to request and bribe the forest officers to let us graze our buffalo near the swamps. We (buffalo herders/Gopal caste) don't have any land ownership so there is no grazing lands for our buffaloes. However, there is a cold milk storage run by government in our block so there is a good market for milk production. So, I am trying to buy some cows as they easier to feed which I can buy or collect." (HH26_KA)

In location 1, caste takes a different form and has different impacts on the community dynamics and their coping and adaptation responses. The population in Location 1 is primarily of the SC and OBC group which changes the hierarchical positioning of different households as compared to location 2. The caste system here plays a less dominant influential factor as compared to the wealth class. Also, the land tenure issue is a significant barrier for a most of the households in this region given the complex forest clearing and settlement process that preceded the creation of the village post-1942 (Famine in West Bengal) and post-1972 (creation of Bangladesh). Over the last decade, the state

government has been providing leased land rights to the households in the villages but none of the households have an absolute land tenure right yet. This leased land farming is the norm for most farming-dependent households in location 1. Hence, though caste is significant to the social structure of the village and integral to the interaction and actor dynamics, it does not create the same level of livelihood diversification barriers in location 1 as compared to location 2.

ii. Gendered norms and practices

The gendered nature of vulnerability has been widely explored in climate change and disaster risk literature (Baden et al., 1994; Blaikie et al., 1994; Khondekar, 1996; Enarson, 2000; Canon, 2002). The social constructed vulnerability of women, shaped by long-established patriarchal traditions and unequal power relations, often limits their adaptive capacity to external stressors (Canon, 2002; Denton, 2002). These multitude of socio-cultural and structural barriers hinders their access to land, financial resources, social networks and knowledge pools (Denton, 2002; Nelson et al, 2002). In location 2, female household heads and member interviewed recognize these barriers and has both a positive and negative perception of this barrier. The traditional roles of being confined to the household chores or taking care of livestock limits their access to farm activities and markets. Female respondents reported that their positions are determined by socio-cultural norms and their departure from the 'accepted' rules would just bring them ridicule and embarrassment. This reflects in the cultural norms of limited access to public spaces, the under representation of women in the local governing bodies and the lack of participation in the decision-making particularly pertaining to financial matters. This translates to the lack of networks that women could utilize into to diversify their livelihoods. The traditional cultural restriction of female household members at farm level, specifically of this region, also leads to land tenure rights not being passed to daughters or wives. Nevertheless, a number of female headed households, has succeeded in smaller business like selling vegetable and livestock, in this region. Also, local level/ grass root government organizations like day care centres and medical aid provider have specifically encouraged women to work outside home even though these jobs are village based and have flexibility that is essential for rural households. This has meant that an increased acceptance and cultural flexibility of women working outside houses.

Another 'cultural norm' that is reported by female respondents in location 2, is the role of women as decision maker. This deep-rooted practice of women not being included in

decision-making at the farm or household level is a hindrance on acceptance of women pursuing livelihood activities in the community (Table 7.11). This is better explained in the case of SHGs struggling to increase participation and bring change in location 2. In the three villages of location 2, the lack of good response to SHGs reflects how gender-bias can have negative impacts on the household adaptive capacity. The perceptible lack of interest of female households in decision-making and the lack of trust of male members on SHGs as actual organisations that could make a difference in the community is well observed in a number of interviews conducted. The male members in such case ridiculed SHGs as just a waste of time that women indulge in gossiping. A number of male respondents stated that they don't think the female members could manage financial issues.

Table 7.11: Observed social-cultural barriers for women in research location

Observed socio-cultural barriers for women	**Illustrative respondent quotes**
Women are 'poor decision-makers' perception	"*What can these group of village women do? I don't think SHGs are of any use. The women just sit together and gossip. Then they fight over the funds and SHGs break down. They don't have financial management skills"* HH22_KH
Perceived self-efficacy by women	*"I have always been taking care of our household. I don't much about farming or where my husband gets the fertilizers or crops from. My mother-in-law and I do help in processing and storage of grains. I would be just laughed at by the men, if I will go the farms" (HH8_KA)*
Accepted lack of agency	*"I didn't join the SHGs as I have household chores and my kids to take care. My husband thinks it is a waste of time and we don't need to be involved in those organisations". (HH12_PH)*
Accepted traditional roles	*"It would be shame for our household if we women have to work on farms. In our community, men work on farms and take care of business. We women take care of household. It will be ridiculous for me to work on farms or take livestock for grazing" (HH5_KA)*
Low social status of female-headed households	*"I had to raise my three sons all by myself. After, my husband passed away, I didn't get much help from any relatives. What is a household without a man? The community is kind to us but our household would have been differently treated if my husband was alive. I have to rely on kindness of neighbours for any information or financial help."(HH35_JB)*

Source: Household Surveys and Case studies (January-September, 2015)

However, this was in contrast with the reception and success of SHGs in location 1. In location 1, both men and women showed trust in SHG process and invested time and resources. The male members of households observed the benefits of the SHG as financial agencies and recognized the SHGs and its female members as efficient. Further, the researcher also observed throughout the research period by attending the SHG meetings, the active participation and agency that the female members exercised in these organisations. This could be attributed to the how female household members are perceived in location 1. Traditionally, in fishing households, female members have greater role and participation in livelihood activities and decision-making. The female household members not only accompany male members in fishing sometimes but are independently also involved in crab and shrimp harvesting, preparing dried fish for markets and also selling the catch and dried fish in local markets. The social norms around female participation and agency differs in both location 1 and 2 which shapes their capability to address negative shocks and stress on their own.

Access to the government programmes are also gender biased. In both locations male members have greater networks and accessibility to government office. Irrespective of household wealth, it is the male members who go to government office, given the lack of women in social spaces. Social norms around mobility of women hinders their access to the government office without being accompanied by any male members. This constrains access of women to new knowledge and innovation their active participation in formal decision-making at the implementation interface.

iii. Religious norms and practices

Cultural and religious beliefs and practices has a significant role in shaping the attitude and behaviour of an individual and influencing their decision-making on adaptation strategies (Ensor and Berger, 2009). Research location 1 and 2 have linguistically differentiated population which differs in their cultural practices even though they are of same religion - Hindus. Although in location one no such religious practices were reported influencing the adaptation behaviour, in location 2 such practices were noted. In location 2, a group of households follow a religious sect that prohibits them from rearing livestock other than cows which are considered sacred. This restricts their access to significant adaptation strategies which is selling livestock. Poultry and goats are considered as lowly

to be reared by the households following the sect principles. As stated by a female interviewee in location 2,

"*We don't rear poultry or goats as they are against our sect principles. We only have cattle as livestock. You will notice in this* dandi *(neighbourhood) no one has any poultry or goat production as we all here follow the same sect." (HH21_KH)*

7.4.2 Economic barriers

Financial capital plays a significant role in determine the adaptive capacity of a household (Darnhofer et al., 2010; Steneck et al., 2011). Thus, economic barriers, especially for poor households, is a major obstacle in order to become resilient in face of external stressors and shocks. The ability to access financial instruments to prepare for or recover from shocks and stress is an important factor that shapes the adaptation of a household. In both the study villages with a majority of respondents being BPL the available financial capital for most of the households is low. The major economic barriers reported by the respondents (Table 7. 12) in research location 1 and 2 is low income livelihoods, lack of formal financial credit schemes and institutions and lack of access to fair financial instruments.

Table 7.12: Household-level economic barriers to adaptation in research location 1 and 2

Reported Economic Barriers	Illustrative respondent quotes
Location 1	
Low per capita income from fisheries	*"The number of fishing craft has increased while the fish stocks have decreased. In addition, the government conservation regulations mean we can barely go to seas for 30 days (in June –October). How will we catch and then earn enough to provide for our families in such conditions? We manage by taking loans most of the year." (HH45_JB)*
High input cost in fishing	*"It takes around 2-3 lakhs for a motorised wooden boat (dinghy). Then the nets cost in thousands and need annual maintenance. In addition, there is fuel charge and payment to helpers for each trip to sea. I took loan for the boat from a trader two years ago and with all this annual expenditure on the craft maintenance and process, I am yet to repay my debts and earn any profit." (HH33_JB)*
Lack of access to credit	"*I share crop 1ha of land and it is barely enough as a livelihood. I am interested to start a business like a shop, but I do not have any collateral as land or property, so I*

	can't get loan from any bank. The SHG is good for loans but I have to wait for our turn and it would not be enough to start a shop. I have to then take some loan from moneylender" (HH17_BH)
Location 2	
Lack of formal credit schemes	*"I am interested to invest in basket weaving by resourcing bamboo from nearby villages. However, the upfront cost of transportation and purchase or raw material is too high. The bank would not give loan for such business and we are landless community so we do not have any collateral either for getting any loan."* (HH52_KA)
Low income from subsistence farming	*"I have 0.8 ha of land that I farm for paddy for one cropping season annually. This meet the food demands of our household of 6 members and then during off season either I work around the villages for MNREGA activities and other construction work, if available. We have no savings at all so how will I buy any agricultural equipment like pumps or power tiller even when I want.* I rely on renting thresher and tractor and using '*seni'* (manual irrigation) every year for farming." (HH20_CH)

Source: Household Surveys and Case studies (January-September, 2015)

Rural areas, like the study sites, lacks formal financial institutions and even when they are present the strict norms and regulations means that not every farmer or fisher who is in need of a loan is able to avail one. In location 1, although with the current foray of SHG micro-credit schemes, financial access for the households is now easier with low interest rates. There is still lack of formal credit schemes for both farmers and fishers. In both the locations, at the block level, cooperative banks are present which provide crop loans to farmer if they can provide documents of their land tenure rights. In a rural system where a large proportion of the farming is done by share-croppers and in case of location 1 where many households still lack land tenure rights access to crop loans under such regulations becomes restricted[29]. In the absence of these channels of finance, the farmers or fishers depend upon moneylender or more recently SHG for financial support. However, SHGs being created with keeping micro-credit needs of household in mind, they struggle to meet the needs of livelihood expenditure. It is the same situation for location 2, where credit can be availed from a nationalised bank and a Cooperative bank located in the Gram

[29] In the monsoon session (September 2016) of Odisha assembly, The Government of Odisha introduced the Bill 'Land leasing legislation' which will provide one year land lease agreement to the share croppers to ensure their access to bank loans, insurance, and input subsidy. This will also ensure that they are provided relief and compensation following crop loss due to natural disasters. The bill is yet to be passed.

Panchayat. However, the bank only provides agricultural loans in lieu of proof of land ownership.

There is a lack of flexible financial schemes for livelihoods other than agriculture. In location 1, where majority of the households are involved in fisheries there is no formal credit institution or scheme. The only source of credit for them are the fish traders or money lenders. This lack of availability of credit is a major constrain for fishers because of the high upfront costs of fishing. The purchase of boat, annual maintenance of boat and nets, purchase of pumps, fuel and other fishing gear before fishing season leave the fishers in need of cash at the start of every fishing season. This is similar for the basket weaving community and the buffalo herder household groups in location 2 which do not have any formal credit institution or scheme to support their livelihood.

7.4.3 Institutional barriers

In local context, institutions are integral to the distribution and governance of access to resources (Adger, 1999; 2000; Berkes and Jolly 2001). Thus, local institutions are critical to adaption and their accessibility shapes adaptive capacity of a household (Eakin, 2005; Agarwal, 2008). Local institutions of importance and their role in the study location dynamics and power relations has been discussed in section 6.3.2. This section addresses the range of barriers that different households face regarding their access to these informal and formal organisations or social networks at the community level. The major institutional barriers reported by the respondents (Table 7.13) in both location was – unfavourable and restricted land tenure, inflexible forest and conservation regulations, lack of disaster-specific financial schemes and lack of flexibility in local organisations.

Table 7.13: Institutional barriers to adaptation at research location 1 and 2

Institutional Barriers	Illustrative respondent quotes
Location 1	
Insecure land tenure	*"We are surrounded by forests and the government has become very strict on forest conservation. Those who had influence and cash got the temporary land lease deeds recently but most of us just farm on these 'KHAS'[30] land and who knows when the government will decide to stop us. However, for now we can just hope for the best." (HH41_JB)*
Lack of access to emergency financial instruments and insurance	*"We do not have any financial security. We, being sharecroppers, do not get loans, subsidies and if crop fails because of natural hazards, we don't get any compensation either. Also, if we need loans there are banks would not give us loan due to lack of collateral." (HH18_BH)*
Restrictive forest and marine conservation regulations	*"We are not allowed to access fishing grounds for 7 months in a year which are the best fishing periods. Moreover, the rice provision as compensation for the period is not available to us as we did not qualify for a Marine ID card even when I am fishing since past 10 years. What am I supposed to do? I work as a farm labour or migrate to nearby towns during off-season". (HH14_JB)*
Lack of access to fish and livestock markets	*"There are no fish mandi (markets) which will ensure fair pricing of the fish catch. There are no cold storage facilities to store the catch. So, we are forced to sell the fish as soon as possible at the rate the fish trader quotes. This is such a big fishing village, but we have no market or storage facilities*." (HH9_KA)
Location 2	
Lack of access to emergency financial instruments and insurance	*"I don't know about crop insurance. I think only those with land rights/documents can take loan from the cooperative bank and hence receive insurance for the crops too from them. I am share-cropper so I cannot access loans or insurance from banks". (HH12_CH)*
Restrictive forest and marine conservation regulations	*"I don't think we harm the forest as we collect the reeds from ground but they (forest officers) said that we cannot go to the forests to collect the reeds (for basket weaving) as it is against rules. We requested the DFO so many times, but he said he can't do anything – government rules are rules. We should try to talk to local forest officers and negotiate with me for access". (HH53_KH)*
Lack of support to	*"We are traditionally buffalo herders but with the loss of access to forest and decreasing common land for grazing it got very difficult to rear buffaloes for milk. There is a milk centre at the end of village*

[30] *Khas* land in India refers to government owned fallow land on which no one has property rights.

alternative livelihoods	*which is helpful but mostly for cows. Lack of grazing land and lack of veterinarian facilities makes rearing buffaloes is very difficult. My last pair of buffaloes died last year due to diseases so I have decided not to buy anymore and focus on share cropping". (HH32_KH)*

Source: Household Surveys and Case studies (January-September, 2015)

In both location 1 and 2, the land tenure system is insecure. The problem is more serious in location 1 which was is part of the mangrove forest zones along the coast of Odisha. Historically, location 1 was mangrove forest that since 1945 was gradually cleared by the immigrating Bengali population escaping the famine in West Bengal and breaking up of Bangladesh (formerly West Pakistan) from India. Although the government has started provided lease deeds for the farmlands to the households but only a few households in location 1 have the financial capabilities and political ties to navigate the bureaucratic process of accessing these land deeds. Another reason of the slow state response in providing land deeds to the farmers is state government's efforts to avoid legitimization of deforestation for farm lands and to keep the politics of vote banks alive in this region. In case of location 2, the problem of land tenure system is the same, but the cause is different. The inequality in land tenure arises in the location 2 because of the entrenched caste system. The lower castes, like the basket weaver and the buffalo herders of location 2, have never had access to land ownership because of the caste-based livelihoods. With their traditional livelihoods under stress, a number of the households of these groups have moved to share cropping or clearing the common land along the coast for farming. In both cases the land ownership is inherently fragile as their livelihoods depends on other groups and the government decision-making.

A major institutional barrier to foster autonomous adaptation for households in both location are the inflexible forest and marine conservation regulation. Respondents in both locations reported dissatisfaction with the forest conservation measures and the forest official activities. However, this has more to do with the lack of platform to express their concerns and issues than the regulations and rules itself. In location 1, the fishers complained about the yearlong marine conservation rules that prevent them from fishing. There is currently fishing ban for nearly 7 months – November 1 to April 15 for turtle breeding and April 15 to June 15 for fishing breeding period. Although the state government provides food support in the form of rice (25 kg/Month) for each fishing household registered in the system for the period of turtle ban, the system has a multitude

of flaws that prevents every fishing household to sustain itself through this period. The first being the household registered as 'fishing families'. The registration for the fishing households took place in 2013 and there was no platform for fresh registration thereafter. The process of registration was not transparent either, as a result many households where male members worked as helpers in other fishing boats were not able to access the benefits. Similar was the case of household's head of the household were females and the young sons were working as helpers in fishing boats. As the head of the household was not involved in fishing the families failed to qualify for the benefits. Moreover, without any platform for registering as fishing household, the young families' breaking from the parental homes to set up their own households were not able to access these benefits. Further, in case of those who availed the benefits, providing just grains to a household was not enough to sustain the families. Respondents with benefits reported the need for cash incentives, nutritious food especially for children and the need for some work-based compensation to take care of their households. Barely five months of access to fishing grounds of which are last two months (September and October) are mostly difficult to venture into sea because of tropical cyclone and low-pressure formations in the Bay of Bengal, fishing as a livelihood has become unsustainable for many fishers. However, the back waters in location 1 are fertile fishing grounds accessible during those ban months but the population pressure on these fishing grounds with dwindling fish population has meant that the profit is not enough to cover the input costs.

The top-down decision-making of these environmental and forest regulations leaves no space for the community to provide their feedback or raise their concerns. However, the emergence of fisheries trade unions had significant impact on the state government policies on fishing regulation along the coast of Odisha. The Odisha Traditional Fish Workers Union (OWTFWU) has successfully created pressure on the State government on its Marine Regulation Act (1982) that enforces fishing ban for turtle conservation every year. The turtle conservation politics along the coast and its implications of fishers' livelihoods has been discussed by a number of studies so far (Chottray, 2014; 2016). The government rhetoric on conservation, the 'exaggerating 'rhetoric of national and international environmental NGOs and the counter-rhetoric of the trawler owners and the OWTFWU has made the situation one of the most politicised conservation policies of the State. This also brings into focus the 'scale' of this political situation where it has slowly moved from

the local to the regional level with ongoing debates between the State, National and International NGOs and the Trade Unions.

In location 1 which is along the marine conservation zone, the problem is not getting better. The OWTFWU and the Marine Regulation Act which both puts forward their objective is to provide voice to the 'poor' fishers and protect the 'poor' fishers from the mechanized fishing respectively, their efforts so far have been only counter-productive to this cause. While turtle conservation supporters leveraged the OMRA to bring about the fishing ban along the coast the powerful clout of the trawler organisation ensured that the debate is continued, and their fishing grounds are not taken over. The 'poor' fishers that everyone wanted to support slid out of the focus gradually. OWTFWU repeatedly made a case for the 'traditional 'fishers to be separated from the 'mechanized trawlers' in the blank ban on fishing regulation. The traditional fishing which does use 'pumps' for their wooden boats 'dinghy are different from the trawler and the net system which the environment organisations were against. Although OWFTWU has succeeded in negotiating concerns of the fisher into this debate, the poor fisher has been isolated by this long continuing impasse. Most of the respondents in location 1 expressed their dissatisfaction with the government regulation and wondered why there is not a platform for them to raise their concerns. There is the divide between the fishers and marine and forest conservation regulators where both stands opposing each other. While the fishers are 'supposed' to be scared of the regulations, the regulators are the framed as anti-people. The mutual distrust by all the stakeholders in the conservation process has led to an impasse that has as of 2016 still under negotiation. However, in July 2016 the State made amendments to the OMFRA and has agreed to start a fiscal incentive program from 2016-17 financial year whereby each fishing household would be compensated with Rs.5000 per month during the 6 months fishing ban period. The institutional silos and the lack of communication and participation structured into them creates isolation of communities and creates roadblock to their accessibility of information and resources.

7.4.4 Technological barriers

In both the research location, the respondents reported their concerns on lack of technological innovation and support as a barrier to their better preparedness and response to climate shocks and stressors. It is not only a lack of availability of technology in the rural areas but the lack of access to the existing technology is a major obstacle. The

technological barriers also include lack of access to essential information and knowledge required for adaptation innovation. Different technological barriers reported by respondents at both location 1 and 2 is listed in Table 7.14 below.

Table 7.14: Technological barriers reported by respondents at research location 1 and 2

Technological barriers	Illustrative respondent quotes
Limited farm mechanisation	"*There is no new high yielding variety of paddy introduced for the low lands that is most prevalent to our coastal region. All the HYV of paddy is for upland and midland farms, so we have to grow the same indigenous variety that has low productivity." (HH11_KA)*
Lack of extension services	*"I don't know about training services for farmers. I have heard a few times that farming training would be provided in the block office, but I have not participated in any yet. We are just limited to growing paddy in this region and crop productivity is stagnating. I think training on new crops, fertilizers and yield increasing techniques is essential here." (HH22_JB)*
Lack of market linkages	*"I have invested in poultry, but the only buyers are the ones who come to village to source poultry. We then don't have much negotiating power in terms of prices as we don't have access to any other market. If there is facility of linkages to markets where I can sell my poultry, I will like to invest and expand it."(HH18_BH)*
Limited information access	*"I depend on my neighbouring farmers for any information on new crop variety or fertilizers and learn from what they are doing for their farms. There is no other information source. Maybe the block office does provide information on new practices, but I don't know whom to ask" (HHCH_13)*
Lack of innovation in fishing	"*We use the traditional boats and fishing nets; the trawlers are only for rich businessmen who can afford to do fishing off-shore. There has not been much changes in our fishing practices." (HH29_JB)*

Source: Household Surveys and Case studies (January-September, 2015)

In location 2, though farm mechanization is under progress, there is not much support from the state on increasing agricultural productivity. Majority of farms has adopted mechanisation practices for their farm either because of individual efforts or collective action. The study villages have tractors, water pumps and threshers, owned by some, and rented by most farmers during the farming season. However, the farms being monoculture (paddy farming), they rely on improved varieties to increase farm yield. The major barriers reported by the farmers were lack of extension training on farming practices, improved varieties of paddy for the lowland paddy farming, lack of irrigation facilities, lack of crop

insurance and lack of dissemination of new knowledge on fertilizers and crop diversification. Farmers in location 1 also reported no availability of training or any state-sponsored support in the villages to increase farm productivity.

In case of fishers of location 1, a number of technological and awareness related interventions has been reported. However, most of the programmes failed to achieve their outcomes or benefit the intended target groups. The fishers report knowledge gap between the interests of the target groups and the programmes. The top-down knowledge transfer, lack of communication on project progress and restricted participation of the target groups in designing outcomes were reported as the major factors behind the limited success of the project. The fishers also report lack of any training or dissemination of new fishing technology by the state-sponsored programmes. So far, the programmes has been restricted only to supporting aquaculture or poultry farms. Further, the aquaculture and poultry farms suffer from lack of a holistic approach – there is no market linkage, no farmer feedback and discussion platform, sporadic monitoring and a lack of long term sustainability plan for the programme.

The lack of infrastructure and modernisation of fishing gears and any technical advancement has been more problematic because of the wider economic and conservation pressures. As seen in ICZM project interventions, the focus has been on aquaculture and livestock rearing like poultry as alternative livelihoods for fishers. The respondents showed enthusiasm for the ICZM projects, but many pointed out that fishing is their traditional livelihood of the respondents in location 1 for which they have the skill set and there is a rising demand and profit from fishing in national and international market, so moving away from fishing as a livelihood is not lucrative for them. Another barrier as reported by the fishers is the lack of a fish marketing infrastructure. There are no fish landing infrastructure, fish trading centres or cold storage for fish catch near the study sites. This makes the fishers dependent on private fish traders' demands and decisions on catch price and trading. In addition, the alternative livelihood interventions that were introduced by the ICZM also suffers from the same technical barriers – lack of marketing facilities and lack of training and innovation. The poultry producer group formed by ICZM reported lower prices for the poultry given the distance of the study sites from the main marketing centres. Also, lack of training on disease prevention and lack of medical

facilities lead to death in most of poultry farms supported by the ICZM and all the poultry farms in the study sites lie empty now.

In location 1, the major barriers reported by the farmers is similar to the location 2 – lack of improved seed variety for lowlands, lack of training in increasing farm productivity, lack of irrigation facilities and lack of communication in relation to subsidies and new farm technology. The other livelihood groups in location 2 – buffalo herders and basket weavers- reported some more barrier to adaptation at their household level. The buffalo herders reported lack of veterinary facilities for their cattle and lack of improved milk yielding varieties and absence of training in maintenance/taking care of the cattle. Although the milk centre provided fodder at subsidised price, there was no training or knowledge dissemination on how to improve diary productivity. In case of basket weavers, the lack of marketing facilities and lack of any support for innovation in their livelihoods were reported as the major barriers. The basket weaver can possibly produce handicrafts from other raw materials like bamboo but there is lack of any support to maintain the livelihood of these groups.

In both the location, DRR awareness and communication is relatively stronger than it was a decade before. While location 2 respondents reported DRM, training provided to the village level committee and preparedness and rescue briefing during disasters by Red Cross, location 1 respondents reported no such trainings. They reported that one of the multi-purpose centre in between the village Jamboo and Bhateni is managed by Red Cross staff who provides warning during disasters but there is no Village Disaster Management Committees in location 1 as reported in location 2. A reason could be that the cyclone shelters in location 2 are recently built by OSDMA (2010-15) while all but one cyclone shelters in location 1 are constructed by the international NGOs like CASA that did not invest in specific management committees. In location 1, the cyclone shelters are used as schools throughout the year which was supposed to take care of the maintenance.

7.5 Local enablers of household and community adaptation

As detailed in section 7.2, at local level, both autonomous and planned coping and adaptation strategies by a household or entire community faces multiple barriers to succeed. In both location 1 and 2, a number of socio-cultural, economic, institutional and technical barriers have historically prevented households to realise their full potential in

planning and implementing coping and adaptation strategies. In addition, short term coping responses at the household level, either because of available resources or lack of information, have acted as detriment in devising long term adaptation strategies by the household. However, the research location over the last decade have also progressed in addressing the baseline changes in weather patterns and extreme events in a more effective way. Despite the barriers that a household face towards adaptation at the local level, households by relying on their individual and community efforts and several effective government interventions, are found to be better positioned currently in addressing climate variability and change. This progress could be attributed to a number of factors at play at the local level which includes evolving institutional practices, strengthening and depending on social networks and increased household sharing of information and knowledge amongst each other and technological advancement and awareness at the local level. This section seeks to understand how these enablers have so far and in future could hold a potential in creating platforms that would mobilize household and community efforts towards adaptation to socio-economic and climatic changes in long term.

7.5.1 Adaptive Institutions

After 1970s, a slew of local level reforms from the National Government and the efforts by state government to decentralize governance process and shift the decision-making powers to the local level, transformed the formal institutional landscape at the village and block level. Particularly, the reform in education, health, maternity and childcare and finance sector changed the formal institutional organization and practices at the local level as more decision-making power was transferred to the local level organisations and contact points were created at the village level. Also, the focus on utilizing these positions to encourage social mobility by providing work to women and marginalized groups at the local level, created spaces that facilitated social organization and learning platforms. The transformed formal institutional network at the local level post-1972 provided more opportunities to the household and improved their ability to cope and adapt to both ecological and socio-economic disruptive events. Free education at primary school level, subsidised education at secondary level and subsidies to encourage enrolment of females in school supported the strengthening of social assets in long term. Child care facilities at the village level and maternity support reduced the load on financial assets of poor households and helped them to maintain food security, especially for children, at times of distress. These programs aimed at bringing development of rural areas contributed to

household adaptation to stress and shocks by acting as social safety nets that the household could depend upon and reduced erosion of assets of a household. These institutional reformations has ensured better access and participation of all members of the community in the decision-making process for the benefit of the households and the community.

These formal institutions closely interact with and is influenced by the informal institutions at the local level. The role and influence of these informal local governance institutions (ILGI) differs between villages across India. As detailed in section 7.2, informal institutions have a significant impact on how households access resources both from common pool and government interventions and thus could shape household adaptive capacity. The previous section shed light on how certain informal institutions on place has affected the household coping and adaptation strategies and are barriers to household adaptation to climate change. Nevertheless, on the face of changing formal institutions, informal institutions are also evolving and contributing positively to household and community adaptation to stress and shock and local level. Informal institutions in both the location 1 and 2, like the ILGI are more in tune with the formal rules and policies of the State. Although, they are in most cases of conflicts are the first organisation that households seek to mediate resolution, the ILGI, as observed during this research, in the study locations carefully align themselves in accordance to formal rules and policies. The ILGI, are thus in this case, are observed to be effective mediators of diffusing conflicts at the village level before it escalates. However, this do not overlook the fact that in all the villages the research was carried out, the leaders are from the older higher caste males who commands respect from the entire village because of entrenched social hierarchy. Nevertheless, these informal institutions/ILGI, working with Gram panchayats, have contributed to increased awareness of climate variability, addressing impacts of extreme events and bringing in social mobilization at the village level. ILGI in the villages, although are primarily religious and cultural bodies, they play a significant role in shaping social and political networks within the villages (Box 7.3).

7.5.2 Reliable social networks

Social networks can be both a barrier and enabler of adaptation. As discussed in previous section social networks could be rigid and dense and can potentially obstruct information flows from outside, establish inflexible social norms and could get caught up in maintain the diversity within the social network preventing social learning and innovation. Further, heterogeneity of social network, even though primarily is considered as a positive factor

in the outset, could make decision-making difficult and hinder integration. Nevertheless, social networks hold significant potential in facilitating adaptation at local level and are one of the most important enablers as a number of previous studies have shown (Adger,2003; Marshall et al.,2015).

Box 7.3: An example of conflict resolution mediated by an ILGI at research location 1

The significance of Informal Local Governance Institutions (ILGI)

Madan Bal is a buffalo farmer in Kaitha village (location 1). Recently his buffaloes meandered into paddy farm of the one farmer in the village damaging his paddy. The farmer decided to take the buffaloes and tied them to his house courtyard. A conflict followed between the two parties and both blamed the other which concluded the farmer threatening Madan Bal that he will complained to the police that he knowingly left the buffaloes in his paddy field and now is trying to attack him. Madan Bal exasperated came to the *'Gaan murabi'* or the village elders and told them he is going to the police now and will complain that the farer stole his buffaloes. They *murabis* mediated and told him that it is a village matter between two household and Madan shouldn't be hasty to drag police into such a minor matter. Both the parties discussed the matter in front of the *murabis* and the matter was resolved as the *murabis* decided that it is a onetime mistake by both parties and they should forgive each other for peace and maintaining dignity of the village. The researcher was present in the village during this time and observed the entire conflict resolution process.

[Source: Observed by researcher on 03.09.2015]

Note - The 'murabis' in any village are usually old male members of the village who are respected by all the households either because of the higher knowledge/education, higher caste or political/leadership qualities. They are an informal institution who mediates village level conflicts or issues and brings together the village households. They are respected by all households and usually treated as informal village heads.

Social networks when adaptive and flexible could foster stronger social learning and innovation, create stronger channel of information flow from external networks and support novel ideas and knowledge by facilitating diverse pathways of learning and innovation.

In location 1 and 2, as in the case of rural India, social networks are integral to the households' position in the village and to its daily life (Table7.15). The social networks, when stronger yet dynamic, promotes self-learning and self-organisation in a community strengthening the adaptive capacity of the households. Households depend upon their social network for diversity of support ranging from information to cash. A tight knit social network could be very committed to the interest of all the actors in that network and could foster stronger collective identity and hence a support system to fall upon at times of

emergency or need. Heterogeneous social network, despite their complexities, creates better communication channels and stronger bonds between households/individuals to rely on when in emergency situations.

Table 7.15: Significance of social networks in enabling adaptation at research locations

Role of social networks	**Illustrative respondent quotes**
Facilitating livelihood diversification	*"My neighbour had four chicks which she took really good care of and when they reached necessary weight she was able to sell them for a good price. I saw an opportunity and got information from her on how to procure them, raise them and when and where to sell them. Now I have chicks and ducks which I am able to raise and sell when in need*." (HH16_JB)
Strengthening Financial security	*"There women from neighbouring houses were part of an SHG and I noticed the financial benefits they received from being part of the groups. So, when a new SHG was going to be formed by the OLM, I joined too. We pay a small amount monthly and can take loan depending on our needs. It is such a help in emergency situation like going to hospitals, the cash is immediately available, and the interest is low." (HH38_KH)*
Information sharing	*"I go the block (office) directly atleast once in a month so I know what new subsidies there for us are (farmers) and what training is available from the extension workers. This helps me forge better relationship with the extension workers and the government officials in the block. So, they inform me about any new scheme first." (HH45_KH)*
Fostering Innovation	*"We usually learn about any new scheme or better seeds or fertilizers from fellow farmers. I saw that a farmer friend is growing another rice variety in Chinchiri – He has got the rice variety from another district where it has shown very good yield. We all saw what good harvest he received so in next cropping season we all brough that paddy variety from him for cropping. Now, mostly all farmers in our village so that paddy variety. It got name as the 'his' paddy variety and we all call it that." (HH27_CH)*

Income opportunities	*"The OLM project was providing free seeds for home gardens and technical and financial support for the biogas plant (for manure) through the Women SHGs of which I am a member so I thought that since I have enough backyard space and pond so why not take put some effort into it. You can now see how good my home garden harvest is…We use it for our home consumption and I managed to sell a part of it too. It not only provides food security but also extra income." (HH63_KH)*

Source: Household Surveys and Case studies (January-September, 2015)

7.6 Discussion: Outlining actor interactions at interface and adaptation pathways

Perception is at the heart of bias formation. Bias formation in adaptation regimes, in turn, determines which adaption pathways are considered viable (Sova et al., 2016). The actors at different level, their interests and worldviews shape their perception and frames the narratives through which they interpret their own vulnerability and adaptive capacity. This section discusses various patterns of interaction at the interface as the narratives and interests of the actors at different governance level interact and the outcomes of these interactions that are being observed at the study locations. The section also explores in-depth findings to understand how the 'structures' of power at local level and policy structures of state shapes the 'process' of learning and innovation within communities and the potential ways local politics and interests can influence existing power structures. The actor interactions analysis in this section utilizes components of the social interface analysis (Long, 2004) as drawn upon in section 7.3, to understand the outcomes of knowledge and power interplay of the actor interactions. The findings and observation from the interviews and case studies at the study location shows a number of patterns that the interactions can be categorised into. This is discussed in detail below with the outcomes and its influence on the community dynamics.

i. Conflicts and contestation

The policy discourses and the implementation actors may not have the same perspectives on the issues that the communities are facing. Such conditions have been discussed in the section 7.3 that discusses the policy-practice interaction outcomes and section 7.4 that outlines the barriers perceived by the households for strengthening their adaptive capacity. In location 1, the conflicts have been centred on two main local issues - the land tenure system and the state government conservation regulations that prevents the access of the fishers to the coastal waters. Both the farmlands and coastal fishing are integral to maintain

the livelihood security of the households in location 1. As discussed previously in section 7.4, the conflicts around these issues have over the years intensified. However, the policy around them has not been through much changes. There have been attempts by the state government to provide monetary and technical support to the households, as local communities mobilized and put pressures through political channels. The policy discourses around the land tenure and fishing regulations are both rooted in the environment and wildlife conservation agenda of the government both at the state and national level. At the regional level to national level, actors like NGOs and civil society prioritize the conservation reforms given their considered long-term benefits and that makes it difficult for them to reach a consensus in these issues. Particularly, land reforms have not so far been part of any formal negotiation at the regional or state level. The efforts of the local households and the political power of the community representatives have been the only pressure on the state government which has led to the current land leasing scheme in place at location 1. Also, the narrative of the Bengalis in location as illegal migrants has created conflicting political discourses at the regional level. The conflicts in location 1, of the local community and state policy and plans, reveal the nature of the top-down approach that is inherent to the governance system. This top-down approach to local problems is also reflected in the adaptation governance in the study location. In such a system, the actors who can manipulate the rules gain benefits which is also observed in location 1. As reported by respondents during household interviews, land rights have been given, though on a temporary basis, to the wealth households in form of leases. These leases are supposed to formalize the land ownership and after a few years transfer the permanent land rights to the owners. However, this plan is only set to benefit the households who can access the legal support and have the financial resources to go through the process. So, though local actors hold power and have the ability to modify the system, that influence is only restricted to few – the wealthy and politically connected households. Livelihood security is integral to an adaptive and resilient household. This shaping of adaptation politics and debates by the powerful actors and norms has been increasingly explored and highlighted in adaptation literature (Few et al. 2007; Pelling, 2011, Sova et al., 2015). So, even though adaptation initiatives are attempting to be inclusive and reach the target groups of poor and vulnerable households, the local power structures need to be addressed for the plans to succeed. Also, significant is the understanding of the perception of the households of their capability and rights in any community. Decades of deep-rooted power relations, based on caste and cultural norms, have led to increased acceptance of the

inequality and imbalance in the social dynamics. The narratives of the local authorities – elites and chiefs - becomes the narrative of the community and communicated to the higher governance levels.

In location 2, conflicts are much less apparent on the surface. A highly caste stratified community, the villages in this location are conscious of the socio-cultural norms. The conflicts over lack of land rights, though is acknowledged by the lower caste households, but it hasn't led to any contestation. The traditional narratives of linkage of caste and livelihoods is accepted without any contestation that reinforces the existing power structures. The adaptation policy and interventions at the community reveals this bias. The adaptation strategies are thus oriented towards migration for the lower castes and a focus on increased farm productivity and livestock rearing opportunities for the higher castes. Although conflicts of interest between the higher and lower castes is observed in location 2, it does not lead open contestation between the different actors. This could be due to the entrenched historical structures of power and influence shaped by caste which is maintained by the actors who holds the power.

ii. Mutual learning

Households through individual and collective efforts have brought changes to the traditional adaptation strategies. An important example is the SHGs an initiative for financial empowerment of the women. The SHG initiative by the government has flexibility and local capacity building as its primary component. This has shown success at the community villages as women found it more than just a platform for financial management and credit. The villages where actors at the implementation level and the households showed better coordination, the SHGs are showing growth and participation. This is the case in location 1, where the active participation by the block and regional level authorities in the SHG as a source of training and advice created opportunities for women members and facilitated capacity building, empowerment and technical information sharing. The sense of ownership of the members and assurance of support by external expertise has helped the SHGs to grow into successful credit mechanisms that benefits rural households. The success of the SHGs in location 1, shows how shift in power relations and a more collaborative environment can encourage assertion of agency by actors previously marginalised and overcome the existing structural constraints. The opening of decision-making platforms around financial management and livelihood

diversification to women who were earlier marginalised created opportunities for the women to learn from the SHG network and contribute to its success.

iii. Negotiation

Actors at the local level, given the contextual and structural constraints, constantly negotiate to make the best use of the resources available to them. This involves innovation within their traditional livelihoods, creating new social networks and institutional changes. In location 1, this has been the case with ICZM programmes and plans. The actors at the local level are constantly negotiating with implementation actors and other households. This ICZM has complex interactions at local level. While few households have benefitted from the programmes, the beneficiaries have been households which have existing resources to start with. The fishing ponds and poultry were given to those who had land rights. But in communities where poor households have insecure land tenure, many vulnerable households could not be included in the beneficiary list. The ICZM intention behind it was to improve compliance and reduce any legal complexities later in the programme. However, the existing inequalities were exacerbated by these programmes. Nevertheless, farmers have found ways to address these issues through their own innovation – sub-letting farms from the land owners on leases and forming small producer groups for aquaculture. Similarly, for poultry, women formed producer groups to share the work. However, analysing these initiatives through the lens of power and knowledge, it could be understood that the state projects sometimes fail to take into account the socio-economic structures at the ground. Resources are provided to develop those who already have resources to show that they can comply with the rules of the plans and programmes. In location 1, the ICZM started to provide funding for aquaculture to households without land tenure after few years into the programme as the project failed to reach the target groups. This came after repeated lobbying from the representative leaders of the community and negotiation with the implementation leaders. However, the power to negotiate again lies with the households who have political leverage or social networks to utilize at such times. In location 2, negotiations between actors of higher and lower castes contribute to maintaining of the rigid social structures of caste and politics that is shaped by these structures. Negotiations do not always benefit all the actors involved. As seen in location 2, negotiated access to natural resources maintains the status quo which is restrictive to the lower caste households.

7.7 Summary

This chapter focussed at addressing the third objective of the study which is to understand how at the interface of policy-practice actors interact and what are the factors that shape those interactions. The aim was achieved by analysing - how the households perceive risk and the adaptation strategies they employ to reduce the impacts of risk, what factors enable or restricts a household from adopting certain strategies – contextual factors and external factors. The last section delved into understanding how the actors interact with these factors and the outcomes observed as a result of these interactions. The chapter thus attempted to reveal the complex and complicated 'reality' of adaptation governance process and an understanding of the significant role power and politics plays in adaptation policy from its planning to adoption by households. The major findings from this chapter are categorised below.

- The findings suggest that local responses to climate change impacts, to an extent, will be structured by these policies as they trickle down the hierarchical governance setting and framing the context at the local level. However, the exercising of agency by communities, despite the context setting, is significant when it comes to the outcomes of adaptation strategies planned at the policy level and its implementation process at the community level.
- Coping and adaptation strategies vary within and across the communities. The adaptation strategies employed by the households differs on the basis of socio-economic status of the household. While diversification of livelihoods is the primary adaptation strategy for well-off household, poor households employ migration as the most common adaptation strategy.
- Coping and adaptation strategies employed by households to address natural hazards varies from strategies employed to address impacts of other stressors, such as failure in monsoons or socio-economic shocks. Natural disasters are perceived as risks beyond 'capacity to manage' and household coping responses to hazards like cyclone and floods usually are reliance on government aid and support. However, various pre, during and post-disaster adaptation strategies are being employed by the households. The primary ones being investing in good housing, awareness of emergency evacuation plans and safe storage of dry food stocks.
- The households in both location 1 and location 2 both face a number of barriers in employing particular adaptation strategies. The major barriers reported are lack of

access to technological, information and financial resources, and exclusion from institutional structures. The limits and barriers - social, technological, economic and institutional are not rigid and are found to be successfully negotiated by households by tapping into their social networks and building political networks. However, if not overcome, these factors affect the adaptation process of the households in hindering their access to social, physical and financial resources and creating unfavourable conditions like power inequalities and social challenges for the households.

- Institutions are key to adaptation. They can become barriers but depending on how the actors at the level access and perceive it, they can bring change to the existing` inequalities and strengthen adaptive capacity of households. Institutions are an important link between governance scales and hence focussing on institutional linkages across scale can be good starting points in making adaptation governance process efficient.
- Implementation actors are integral to the success of any adaptation policy and planning. The finding revealed the important role the actors at the implementation level and their narratives play in the adoption of adaptation as household practices. As, they are at the interface of the local community and the government organisations their interpretation of the community dynamics and policy components is significant in how the community perceives a policy. Implementation actors includes the staff of government organisations, NGOs, international organizations who could be local or hired as external expertise. In section 7.3, implementation was analysed as an interface to categories and understand the actors, their interests and their interactions. It is found that they interactions could be categorised broadly into – conflicts, negotiation and mutual learning. In case of conflicts on interests and narratives between actors at implementation at local level, plans have more often than not struggled to take off. While negotiation and mutual learning has usually shown a positive impact on the adoption of the government initiatives.
- Understanding outcomes of the actor interactions at the local level can shed light on the structural and institutional issues that a community may be facing. In both the study locations, analysing the actor interactions within the social and power structures revealed the multitudes of outcomes that shapes the community response

to climate variability and natural hazards. The discussion on the outcomes of the clashing narratives and interests of the local households with the narratives and interests of the targeted policies and the actors at higher governance level, revealed that perception and attitude of actors influence which planned adaptation policies are adopted by the community. The perceptions and attitudes of the actors are shaped by their contextual factors – social, cultural and economic landscape that they occupy. Thus, even when actors exercise their agency such as in case of on-farm innovation and livelihood diversification, the social and power structures play an important role in determining the success that they could achieve.

- The knowledge and power interplay at the local level is complex and complicated but is essential to understand in order to ensure that adaptation initiatives are not reinforcing existing inequalities and unfair power structures. Since, adaptation governance would not unfold in a political vacuum and will require integration with existing sectoral governance mechanisms, understanding the underlying power distributions is essential to ensure adaptation of the most vulnerable groups.
- The approach to adaptation governance requires a theoretical and conceptual shift in order to better incorporate local level complexities. The act of framing of policies to its interpretation by the implementation agencies and its adoption in a community is influenced by power relations and knowledge exchange.

This chapter examined the interaction patterns of actors and structures and explored how local agency navigate and reproduce institutional structures across scale to pursue their interest. This chapter combined the understanding of policy structures at national and subnational scale from chapter 5 and socio-economic structures at local level from chapter 6 to investigate the process of adaptation governance at the research location. It provided insights on the role of agency in bringing change to multi-level adaptation governance systems. This chapter is followed by the conclusion chapter (chapter 8) which summarizes and contextualizes the research findings in existing literature to present the contributions of this research, and theoretical and practical implication of this study on future adaptation governance research.

8. Conclusion

8.1 Introduction

This research set out to understand the role of power and politics in the multi-level governance process of adaptation. By comparing and contrasting two research locations at the local level and analysing the higher district, state and national level adaptation process the study identified policy discourses at the national and regional level, explored the social vulnerability at the local level and examined the policy-practice interface of adaptation governance at the local level. This final chapter summarizes the key theoretical and empirical findings of the study and discusses the contributions of this research to the policy and practices around adaptation governance at local, regional and national level in India and in broader context. The main findings are organised under the three objectives of this research and discussed in the sections. The chapter concludes with an outline of the potential research directions in the field of adaptation governance policy and implementation.

8.2 Main findings

This research explored, examined and discussed the how and why of multi-level adaptation governance processes in the existing socio-political context of two clusters of coastal villages in the state of Odisha in India. The main findings from the study are summarized below under the three main objectives that this research has aimed to fulfil.

8.2.1 Policy structures and process at national and subnational level

The first objective of the study identified the dominant policy discourses and actors at the national and regional level and examined the policy process and institutional structures that frames the national and regional adaptation debates and plans. The main findings are discussed below,

Who are the main actors and what are the narratives that shape the climate change decision-making at national and regional level?

The main actors in the multi-level adaption governance for the research locations are identified as: the national government and its relevant departments that outline the policy and financial allocation; the relevant state departments that formulate the plans and programmes and bring funding from the national budget; international organisations, civil society and NGOs that works with international organisations (NGOs) to implement projects and plans the local level; at the local level, the district, block and gram panchayat

level staff of relevant departments, and the village leaders and 'elites'. Thus, the multitude of actors involved in adaptation governance and their varied interest creates a process that has to accommodate plural framings of climate change and adaptation.

The interests of different actors are explored by examining the narratives identified through analysis of different official documents that outline the policy and plans for the adaptation governance process at each level (Section 5.2.2). The major focus while examining the documents was on the framing of climate change and adaptation as a policy issue, the gender and poverty focus within the policies analysed, and the solutions outlined to address climate change at different governance level. The climate change policy of India (NAPCC) is oriented toward its international agenda because it emphasizes equity and community responsibility among countries in order to contribute to solutions that address climate change– adaptation and mitigation. The national narrative about adaptation to climate change is to develop *integrated* strategies that *co-benefit* other sectors, which can fulfil development objectives of the country. The policy also stresses the need of inclusivity and equity in capacity building and ensuring engagement from the public. However, this is not reflected in the action plans put forth in the NAPCC. In contrast, the national policy is broader in its approach and has outlined 8 national missions regarding climate change (Section 5.2.1) for states to develop them in detail in accordance to their needs. The policy focus is on developing infrastructure and technical capacity as a preparedness and impact reduction measure. Another major narrative about climate change and adaptation at the national level in India is that it is the state responsibility to identify the vulnerable sectors and develop actionable solutions. The national level departments act more as funding, planning and monitoring agencies.

What are the dominant discourses shaping policy framing and outcomes?

The study identified four dominant discourses within adaptation governance at the national level in India and the state level in Odisha – the framing of the adaptation as an 'economic risk', the complexity of climate change as a policy issue, stress on the integration of disaster risk reduction, development and adaptation programmes and addressing adaption through techno-centric and infrastructure investments (Section 5.4). The main operational outcomes as a result of the discourses and clashing actor interests is a disjunction in planning and implementation across scale, confusion on differentiating between targeted

disaster risk reduction and adaptation plans and techno-centric and infrastructure-based programme for the research location (Section 5.5).

The benefits and constraints of current institutional structure of climate change adaptation governance for Odisha and India?

The current institutional structure of climate change adaptation for Odisha and India is broadly similar to that of other policy structures at the state and national level. National government draws the policy and plans, and the state creates the action plans that the national government provides fund for depending upon the discretion. So, the funding for all government projects at the state level mostly comes from the national budget for climate change impact reduction initiatives. Thus, between the national and subnational level the coordination on funding and financial governance is one of the most important issue around which actor interests are challenged and negotiated. Since, the state government is run by a different political party than the one in control at the national level, the power struggle is found to be apparent (Section 5.5). The study found that this politics of interests between national and state government has implications on how the state has so far planned its adaptation plans and projects. The state has attempted to fill the gap from the national government funding by encouraging international organisations (DFID, SIDA) projects and World Bank funded programmes in the state. This route of funding has its advantages and disadvantages. While the state has benefited from international expertise and increased exposure at the national and international level, it has added to the state debt from World Bank and increasingly donor-driven state policies. This situation of donor-driven programmes and the increasing control of outside entities in democratic functioning of a government is an emerging research focus around climate change adaptation and development research (Sova et al.,2015).

Another implication of the top-down institutional structure as revealed from the policy analysis is that the decision-making around climate change adaptation is entirely driven by the national and state agendas (Section 5.5). Although, this is not very different in comparison to other policy structures in India, the infancy and urgency of climate change adaptation makes these conditions more significant. NGOs and grassroots organizations in India have routinely criticised this drawback of the adaptation governance system. Neither at the national level, nor at the state level were the civil society organisations included in drawing out the NAPCC or OCCAP respectively. Moreover, when the policies

were opened for civil society organisation for discussion and providing inputs, the engagement was kept to minimum and the decision-making was controlled by the National and state government.

8.2.2 Social vulnerability: Local institutional structure and social practices

The second objective of the study was to identify the social, cultural and institutional structures at the local level and examine the role played by these structures in shaping the social vulnerability of the community. Exploration of the contextual factors of individual and collective vulnerability at both the research location 1 and location 2 revealed that vulnerability is a function of multi-scale interactions of exposure to stress, ownership of assets, capability to form and maintain social networks and access to institutional and market structures and dynamics. The main findings on local social vulnerability revealed at both the research locations are detailed in the sections that follows.

What factors shape household risk perceptions of stressors?

The study seeks to gain insights with respect to the understanding that perception is at the heart of bias formation and exploring risk perceptions helps to understand differentiated adaptation responses (Sova et al., 2015). The study explores the perception of risks by households to understand the factors that shape their response behaviour. The study revealed that perceptions of risk to climate variability and natural disaster impacts varies across households within and between the two local research locations. Section 6.2 shows that household perceptions of risk shows variation across demographic characteristics (age, gender, education, caste) and geographic characterises (location, soil type) and especially, ownership and access to resources (physical, financial, social and institutional). The study findings revealed how perceptions and narratives of risks of a household are shaped by its position and power to exert influence within the local socio-economic structure. Although, the findings on risk perception corroborates existing empirical literature on social vulnerability, specific differences in the local community was also noted as outlined below.

- In both location 1 and location 2, demographic characteristics (age, gender, education level, caste) were important indicators of the perception of risks of a household to climate variability and natural hazards (Section 6.2). Since, demographic characteristics drive the access to information and resources required to address the impacts of stressors, they were found significant in shaping

differentiated perception of risks. While older respondents perceived a significant change in the rainfall and temperature over the last decade, the younger population (<35 years old) viewed the climate variability as a normal phenomenon and no such remarkable change in climatic factors. The older respondents have past experiences to make better comparisons and their perception of climate capability represents this experience. In case of gender, male respondents were found to have stronger perception of variation in rainfall amount and temperature than the female respondents. This is found to be true in both the locations. In this study, this can be attributed to the difference in access to information and the well-defined structure of division of labour in the household. Since, the male members take farming related decisions while female members were responsible for household activities, women were less articulate about their perception of variation of climatic patterns.

- Households in both the locations perceived risks of climate variability and disasters on the basis of education level. While respondents who were illiterate or attended atleast primary school were found to be more perceptible to climate variability and increase in frequency and intensity of natural hazards, those who have education qualification beyond high school perceived the changes as much more a normal phenomenon of fluctuation (Section 6.2).
- The perception of risks from natural hazards also is found to be differentiated in the community, particularly between the poor and wealthier households (Section 6.2.2). This adds to the existing literature on disaster risk reduction reinforcing findings that pre-disaster ownership and access to resources shape the risk perception of households and their vulnerability. In both location 1 and 2, poor households (BPL category) were significantly more perceptible to changes in the frequency and intensity of cyclones, coastal erosion, drought and potential earthquakes. The poor households' weak resource base and past experience of difficulty in accessing resources to rebuild their lives post disaster has shaped their heightened risk perception to natural hazards.

How local contextual factors shape vulnerability?

The findings in Section 6.3 emphasize the influence that socio-cultural norms and institutional mechanism have at the local level and shaping household responses to stressors. Both location 1 and 2 are exposed to a number of climatic stressors – cyclones,

drought, coastal erosion and coastal flooding that increases households' vulnerability. In addition, given the fragility of coastal systems in terms of livelihood opportunities requires the household to maximize their income opportunities continuously. This is noted in different livelihoods that are found in location 1 – marine fishing, off-shore fishing, crab rearing, aquaculture, shrimp farming, paddy farming, Cashew farming, betel leaf farming, poultry and goat keeping, and off-season or temporary migration for labour work. In location 2, livelihood opportunities are narrower, namely, paddy farming, basket-weaving, poultry, goat keeping, buffalo rearing, aquaculture and off-season or temporary migration for labour work. Households in both locations practice one or more from this range of available livelihood opportunities. However, the findings suggest that the potential livelihoods that a household could pursue depends on its access to resources like finance, information, social network and market knowledge. The findings from section 6.3 illustrates how the contextual factors (socio-cultural and institutional structures) shapes the resource ownership and accessibility to the resources and as a result determines the livelihood outcomes for the households. The main findings are outlined as follows.

- In location 2, caste plays a very important role in the livelihood diversification opportunities that are available to a household (Section 6.3.1). It is found in the case of basket weaving artisans and buffalo herders (for diary), both livelihood groups belong to lower castes and are traditionally landless households. Their dependence on the fragile market mechanisms and lack of resource ownership makes them vulnerable to additional stressors. While the buffalo herders, due to lack of access rights to grazing lands (commons) and forest (conservation regulation) are practicing a now struggling livelihood, the basket-weaver are also struggling because of lack of access to raw materials from forest (conservation regulations), lack of market access and information. In both cases, migration has been the only option left for the household to maintain income flow. The entrenched injustice within socio-culture structures in the Indian society against the lower castes such as limited resource ownership, restricted social mobility and lack of representation at political platforms makes these households inherently vulnerable to climatic stressors. In location 1, which is a majority lower/scheduled caste, the community dynamics are found to be different. The households have greater flexibility in livelihood diversification from livestock to cash crop farming. The land ownership and access patterns were also different from location 1, as

scheduled caste households were found to have substantial land ownership (though not formal) and livelihood opportunities.

- The study also gained insights into how ethnicity and identity politics shape household vulnerability. In location 1, the Bengali-speaking population still is conscious of its migrant identity in Odisha and its interaction with the government programmes and institutions are framed through that lens. This is noted in the insecure land tenure system in location 1 and the highly politicised nature of the government programmes and institutional mechanisms (section 7.1).
- In patriarchal societies like India, gender is crucial to the ownership and access granted to individuals in the community. Especially, in the higher caste households, role of women is well-defined and limited to household chores. This difference between the role of women in between poor and rich households and higher and lower caste households in both location 1 and 2 was well emphasized in the findings. In location 1, women in poor households played a much active role in income generating opportunities like accompanying spouses and sons during fishing trips, crab and shrimp catching in the back-waters (women-dominated livelihood), poultry and goat rearing. While women in location primarily were confined to household activities or farming activities like processing and storing paddy. This prevents the participation of women in the broader debates around adaptation in the community and make women more vulnerable to stressors. However, in location 1 the involvement of women in livelihood activities beyond household chores also translates to better entrepreneurial skills and activities and provides women with better resources to address impact of stressors at individual and household level.
- In location 1 and 2, both formal and local institutions are integral in driving the responses of rural households to external stressors. In both locations informal financial institutions like moneylenders dominate the credit landscape. This makes the both the farmers and fishers depended on the wealthier households for emergency situations and hence shifts the power of decision-making ion the community into the hands of wealthier and politically connected households. Moneylenders or traders may not be preferred by the dependent households but are ‘respected’ in the community as moneylending is also a social transaction that helps households to garner power and influence within the community. In case of

fishers in location 1, the poor fishing households are tied to a trader for cash help and market access which is a roadblock in a more competitive market and social mobility.

- Access and influence of political institutions in both location 1 and 2 is found to be notably different from the mechanisms of credit institutions. While the wealthier households do have a significant political leverage, access to political institutions in also open to poor households who can take advantage of it. However, the already existing socio-cultural system in both the locations favours those who belong to higher castes and power thus remains concentrated in the hands of few. In location 1, this was found to be the case, as many households are found to be very politically active within the formal and informal institutions. Since location 1 is geographically in a strictly regulated zone by the government – forest conservation rules and regulation, marine protection laws and land tenure regulations, being a political connected household guarantees better access to the resources within these regulations. However, formal positions of power within the state agencies is still controlled by the higher castes and wealthier households. The village heads tend to be from higher caste households and are a significant part in negotiating community level conflict. Further gram panchayat head (Sarpanch), block level staff or community services staff are all elected through a strict selection process which tends to favour those who have the necessary social and political network. Thus, households who are actively trying to establish socio-political networks are still able to function and access resources within the rules of the entrenched socio-cultural structure. This resonates with the increasing empirical studies on politics of vulnerability and adaptation (Few, 2007; Sova et al., 2015).

Understanding the role of power in shaping perception of risk and differentiated vulnerability

The socio-cultural and institutional structures in location 1 and 2 have both commonalities and differentiation between them which shapes the distinctive social vulnerability in both the locations which was illustrated in the findings in section 6.4. The main findings emphasize the role of power and politicos that are inherent to these structural components of society, which are illustrated below.

- The findings on the spatial and social marginality within both location 1 and 2 highlights the needs to understand the existing inequalities and power asymmetries within a community to understand the risk perception and vulnerability of households to climate change. In location 1, poor households and in location 2 the lower caste households struggled on getting back to normality and maintain food security after major disasters like cyclones of 1999, 1984 and 1982. The lack of asset ownership left them with without any resources to depend on or draw upon during the post disaster phase. Furthermore, lack of any long-term government support, the struggling households depend upon the wealthier household for help and access to government resources that reinforces the existing power asymmetries in the community.
- As examined in section 6.3, the access and ownership of resources is a significant factor in shaping of risk perception and vulnerability of households. In section 6.4, exploring of the inherent power dynamics regulating the access and ownership of resources in location 1 and 2 revealed that traditional and historical socio-cultural norms still are integral to decision-making on resource distribution. In location 2, the buffalo herding households are managing the new restricting forest regulation and reduced grazing land because of coastal erosion, however an additional factor is also the lack of access to the commons (grazing lands). The established protocol around it do not allow herders to use them as grazing land and it is followed by the herder community even if they are struggling with fodder and grazing issues. The commons are managed by the village elites or leaders who belong to the upper caste and well-off households whose interests regarding the commons are different from that of the herders. This has led to a decline in livestock rearing by the buffalo herders as resources available to them are not accessible to them anymore. In location 1, particularly government managed resources like public subsidies, land tenure and marine regulation are easily negotiated by those who have political and financial resources to use to their advantage. While wealthier households with trawlers are reaping benefit of fishing off-shore and thus avoiding fishing bans, the well-off households are still beneficiaries of food subsidy programmes of the government.
- Government rules and regulations around resource utilization may not equally benefit all households in a community. The village elites who dominate the village

agendas and act as gate keeper of the community tends to benefit from the power drawn from these formal governance structure. In location 1, the conflicts around the forest conservation and fishing ban impacts the poor households much more than the well-off households who have other livelihood sources like aquaculture and trawlers for deep sea fishing. The engagement of the poor households in the negotiation process with the forest department or the environment department at the state level has been so far mediated by the chosen few representative political leaders. However, this has not been any fruitful so far and the ground level reality is an everyday negotiation between the government staff and local households resulting in conflicts between the local government organisations and the households (section 6.4.5). This shapes how the households perceive their own rights on resources and state role in granting access to the resources. The lack of grassroots engagement by the state agencies thus creates conditions that reinforces local socio-economic structures and cements the role of the educated *elite* mediator and leaves the vulnerable household more exposed to stressors.

- In location 2, the Geotube project is an important example of the state role in resources management and access. The Geotube project has a limited engagement of the local community and decision-making is done at the state level. As a result, the community is not invested in the project and does not consider it having any impact on reducing vulnerability of the region. This lack of engagement of the households in such a long-term project on reducing coastal vulnerability creates a sense of disempowerment among the households. This further emphasizes the role of state as the decision-maker and the provider for the community. The vulnerability of the households in such a case becomes dependent on the state support as evidenced by views of the PH village respondents who consider the state as the decision-maker, in case the coastal erosion gets worse and they have to resettle.

8.2.3 Policy-practice interactions and adaptation outcomes

The third objective of the research was to examine the interactions at the policy-practice interface to understand the outcomes and what factors are shaping these outcomes. The identification of coping and adaptation responses of the households to external stressors and the interaction patterns of the policy and practices at the local level furthers the

understanding of the realities around multi-level adaptation governance. The main findings of this investigation of the realities of policy-practice interface are detailed as follows

What are the household responses to the multiple stressors?

Section 7.2 listed and discussed different ranging from short term coping responses and long-term adaptation responses that households are making at local level to address the impacts of climatic and non-climatic stressors. The short-term coping responses are made when stressors are perceived to be manageable to maintain the status quo of the household. At research location 1 and 2 it included food saving strategies, asset pledging and selling, increased dependence on fertilizers and pesticides to increase crop yield, dependence on loans, reliance on social networks and temporary migration as an income generating activity. The adaptive responses included changing paddy variety according to the soil type, poultry and goat keeping as an additional livelihood strategy, changing fishing locations, aquaculture as an individual or collective livelihood activity and migration on a long-term basis.

How policy-informed structures at the local level are mediating household responses?

The existing literature on climate change vulnerability and adaptation has provided evidence on the role of socio-cognitive factors, risk perception and perceived ability of the households to respond on decision-making around coping and adaptive responses. This study adds to these findings (section 7.2) and takes forward the recent findings on how household coping and adaptive responses to stressors are shaped by availability of external support, market dynamics and intuitional framework. The implementation interface, populated by its actors and their interests, provides insights into how actor agency modifies and reproduces policy structure and the transformation that it goes as practices at the local level (section 7.3). The main findings from the analysis of the implementation process is detailed as follow.

- The mediating actors at the interface level are integral in determining the direction of policy to practice process. The actors include the staff of government agencies at district level, block level and village level, local NGOs and village elites. Local socio-political context varies within and across the villages in research location 1 and 2, which is reflected in different positions and different role these mediating actors take at the interface (section 7.3.1). The influence and power of these actors to negotiate the policy structures within the socio-economic contextual factors

plays a significant role in establishing the local narrative around the state plans and programmes.

- The actor interests and motivation shape the local level adaptation and disaster risk reduction practices and moulds household narratives of adaptation and vulnerability. In location 1, while the state-funded agencies dominate the implementation interface and shaping household coping and adaptation responses, in location 2 it is the state –based agencies and NGOs which has been instrumental in interpreting and transforming policies around adaptation and disaster risk reduction into practices. In addition, both location has dominant village *elites* who were integral in shaping adaptation responses through their influence on access to external support and institutions and market access facilitation (section 7.3.2).
- The patterns of interaction at the policy practice interface is categorised into three groups
    i. Contestation which includes interactions of actors at the implementation stage marked by conflicts with challenging agendas between the mediating actors and community which is the case with the ICZM embankment programme and the new forest conservation laws and fishing bans in location 1 and 2
    ii. Negotiation is the most common interaction pattern found at the implementation stage with actors renegotiating their roles and abilities to maintain their livelihood and food security within the policy structures. The ICZM livelihood programmes, Disaster risk reduction programmes by state agencies, livelihood projects by OLM are different programmes which have opened up the space for negotiation between different actors involved in the process. This has benefitted certain households, but mostly poor and political disadvantaged groups are navigating this negotiation space with limited success.
    iii. Mutual learning benefits most households as programmes evolve with its reiteration and actors learning and modifying the structures and rules to tailor it to benefit their own households and policy succeeding in its objectives.

What are the barriers and enablers to household responses at the local level?

Households are constancy negotiating and resonating the formal spaces of decision-making at the implementation interface to protect their interests and strengthen their positions to access resources with respect to other households. However, these interactions and the ability of actors to navigate the interface is shaped by its own position in the community context. Factors like socio-economic position, institutional and social networks and competing actor interests (section 7.4) can act as barriers or may enable household responses to stressors. The main findings on the enabling and constrain factors shaping adaptation responses at the local level are as follows.

- Caste as an indicator of socio-economic position of a household is crucial to its ability to access resources and social and institutional networks. In location 2, caste acts as a barrier for the buffalo herder and basket weaver households in broadening their adaptation responses, as they have no land rights and limited access to common resources and engagement in local political debates.
- Female members of households or female-headed households have limited access to external support and interaction with state agencies. The socio-cultural norms and entrenched gender perspectives is an obstacle for women in both locations for developing their entrepreneurial capacity and ability to address external stressors at an individual or household level
- Religious norms like maintaining religious purity and conforming to peer practices of religious standards acts as a barrier in diversification of households at location 2. The Brahmins households do not consider livestock (poultry and goats) rearing as an acceptable adaptation response as it is against their religious guidelines.
- In both location 1 and 2, financial barriers like lack of access to subsidies, low interest credit institutions and dependence on informal institutions like moneylending prevents household from diversifying their livelihoods by trapping them in a hand-to-mouth system. It prevents them from asset building and ensuring pre-disaster preparedness which have proven to be important adaptation strategies.
- Institutional barriers like insecure land tenure, restrictive forest laws and marine conservation regulations, limited formal financial support, lack of market access, lack of cold storage units are barriers to the fishing community in location 1. In location 2, the farmers also are facing similar institutional barriers – lack of HYV of paddy for all types of farmlands, inefficient farm subsidy programmes, limited

formal credit institutions and lack of livelihood diversification support from state agencies.

- Significant technological barriers are also reported in location 1 and 2 which shapes household adaptation response. Both farmers and fishers are still reliant on traditional strategies but in case of fishing practices the innovation is much less limited. Other barriers noted were lack of information sources on new technologies, access to better markets and limited extension services in case of agriculture at both locations.
- The study findings help to gain understanding into the enablers of adaptation at both locations too. Adaptation strategies has changed over the years in both locations and the two most enabling factors has been evolving adaptive institutions and social networks. In location 1 and 2, new institutions like SHGs and producer groups have brought a level of financial security for many households. It has created a platform for developing entrepreneurial skill for women and poor households and has supported new livelihoods. The introduction of new institutions and external pressure on existing institutions can change how the actors access and benefit from them. In this regard, institutions play an integral role in shaping adaptation responses of households. The role of social networks in enhancing adaptive capacity of households is also well evidenced in existing literature (Adger, 2003; Marshall et al., 2014). In both location 1, farmers and fisher benefit from a stronger social network. Households with bigger and stronger networks have better access to information, technological innovation and a safety net to rely on times of emergency like post-disasters. Social networks also support the sharing of resources and help households to maximize their potential in utilizing available resources.

8.3 Theoretical Contribution

This research furthers the nascent literature on politics of climate change adaptation (Sova et al., 2015). It is one of the few studies that analyse operational initiatives on adaptation in a developing country context by employing both primary and secondary data. Thus, it provides novel insights into 'reality' of the governance process as complex policy structures interacts with local structures and agency in a rural context. These findings contribute to the understanding of the complexity of interactions across and within

different scales of a multi-level adaptation governance process and how it shapes adaptation outcomes at local level.

Further this study is novel in its approach to map the influence of power and politics at the local level in multi-level adaptation governance process by using empirical data. Thus, it contributes to methodological reflections on understanding the underlying power structures and political dynamics of the adaptation process at local level. The conceptual approach taken by this research to understand politics in adaptation governance across and within scales lays foundation for novel methodological to emerge to for better investigation of the complexities of adaptation governance.

This research also contributes to the debate around the need for going beyond scale linkage and decentralisation for a better multi-level adaptation governance process. As such, this thesis adds evidences to current literature on the need to improving existing multi-governance approaches by fostering novel conceptualizations of risk and vulnerability within the local context and promoting institutional and policy design transformations.

8.4 Scope and practical implications of the study

This research also identified the implication of this study for the researchers, practitioners and policy makers which is discussed below.

8.4.1 For researchers

- This study demonstrated the top-down approach that marks the multi-level adaptation governance process in India. The adaptation planning in this case study is shaped by national and state agendas. Furthermore, research is required into multi-level adaptation planning process that are locally informed and/or more open to public driven agendas.
- The research demonstrated the existing dominant discourse around adaptation as an economic issue in India and hence the government focus on technocratic and infrastructure-based solutions. This reduces stakeholder participation and engagement in the state driven process. Furthermore, exploration of case studies focussing on soft path solutions like capacity building and long-term policy shifts could provide insights into how policy discourses around adaptations impacts the planning and implementation of adaptation in local context.
- Researchers have emphasized the need of understanding adaptation process through the lens of power and influence dynamics at local level. This research

explores the social, cultural and institutional structures which shapes this power structures and influence dynamics within a community. More research is needed on intra-household power and influence dynamic to understand how individuals are shaped by those factors.

- The patterns of interaction explored in this study at the interface of policy-practice is complex and provided insights into how actors negotiate social structures to maximize their livelihood and income opportunities. More research is required on temporal impacts on such interactions to understand how outcomes of such interactions influence future patterns of the interaction the actors within the same structure.

8.4.2 For policy planners

- The research illustrated the gaps in the policy design of the current multi-level adaptation governance. The policy design though multi-level is fragmented, elite-dominated and is constrained by institutional barriers. Thus, this research makes the case for a more poly-centric design that focuses on coordination and collaboration between institutions within and across scale and take into consideration socio-cultural structures of local context in developing a multi-level governance framework for adaption
- In geographical vulnerable locations like coastal regions of Odisha, climatic stressors are compounded by the contextual factors and they are inherently linked. The current focuses of government on risk management solutions fails to account for this *existing* household vulnerability. There need to be a shift to a long-term and contextual approach to adaptation from the current risk management approach. This could be facilitated by including mapping and analysis of social and political structures and dynamics of the community and creating platforms for discussion and decision-making at the local level.

8.4.3 For development practitioners

- NGOs in the research locations were found to be instrumental in opening channels of information and creating opportunities for innovation that enhances adaptation. However, being external experts, they have often failed to take into consideration the traditional knowledge and relying on the elites for the entrance into the community. This process reinforces the power asymmetries in the community and reduces the chances of the needy household to receive the relevant benefit. Thus,

a careful consideration of the socio-cultural dynamics and existing patterns of influence at every stage of the project or programme can help to meet the goals of reaching the needy and vulnerable households.

8.5 Future research scope

This study attempted to understand policy and practices of multi-level adaptation governance in the costal state of Odisha in India. The case study illustrated the constraints that hinders such governance systems in developing country context. Additional case studies comparing and contrasting Odisha's approach to adaptation governance with other states in India or other developing country contexts would enrich the understanding of adaptation governance in knowledge and practice. Furthermore, this study utilised a novel conceptual approach to map the power and influence dynamics within local adaptation governance system. More empirical studies on socio-political conceptualisation of adaptation process will create opportunities to develop actionable frameworks for evaluation and monitoring of adaptation governance. The study also reflected on impact of decentralization within multi-governance system and the barriers that it faces within Indian context. Furthermore, case studies focussed on local governance of adaptation from an institutional perspective are required to understand local level planning process of adaptation.

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Appendix A: Sample of Key Informant Guide

(Note: Key informant questions were adapted according to the respondent being interviewed)

Name:

Organisation:

Date:

1. What do you think are the different challenges that the community is facing currently and are they different than those the community faced in the past?
2. Do you think natural hazards (floods, cyclones and drought) are a risk to the community?
3. What are the other climate related threats to the community? Could you please tell me why?
4. Does the impacts of these challenges differ depending on the groups (caste, gender, wealth) in the community?
5. Have you noticed changes in livelihood patterns (agriculture, fisheries, migration) in the community in past 10 years?
6. What do you think about the different state level development policies? Does your organization particular focus on certain development policies? Could you please tell me which one and why?
7. Do you know about the different projects your organisation have in the concerned block? Could you please tell me about the planning and implementation of those projects? (for e.g., organizations and people involved and any timelines/important milestones)
8. What do you think about the different climate change initiatives taken by the government? Do you and your organization is planning to include them in projects?
9. What do you think about the different disaster management initiatives? Do you and your organization is planning to include them in projects?
10. Do you think planning and implementation of projects on climate change and disaster management is facing any problems in the community?
11. How is the participation of the community in these projects? Does different groups benefit in different ways (Gender, caste, poor and rich)
12. Anything else you would like to share on these topics?

Thank you for your time!

Appendix B: Household Level Questionnaire (as used for fieldwork)

Household level Questionnaire

Questionnaire (Ref) No.	**Village**
Time	**Notes**

Section 1: Background information

1a.Household Data

1. Name of the respondent_____ 2.Age of the respondent_____3. Sex of the respondent_____
2. Relationship of the respondent to the household head
3. Ethnicity/Caste/group type of the household
4. Household Type

1b. Demographic details

1. How many people are there in your household, including yourself? [ ]
2. What is the average annual income or income level of your household? [ ] INR
3. Can you please provide me some details of the members of your household?

No.	Name	Relationship to you	Age	Gender	Marital status	Education	Occupation

Gender: 1= Male , 2 = Female

Marital Status: 1= Single, 2 = Married, 3 = Divorced, 4 = Widow

Education: 0 = no education, 1 = primary, 2 = Secondary, 3 = Higher Secondary, 4 = Higher studies (please specify)

Occupation: 0 = unemployed, 1 = farming, 2 = casual labour, 3 = permanent labour, 4 = migrant, 5 = paid services (salaried) , 6 = others (please specify)

Section 2: Household-level Resources and Capitals

2a. Physical and natural resources

1. Do you own this house?
2. House type:
3. Do you own land?
4. How much land you own or rent?
5. How much of your land you rent for farming?
6. How much of your land is under irrigation?
7. What are the main sources of irrigation?
8. What crops you had sown and harvested in last five year?

Years	Type of crop	Season	Area covered (ha)	Cash crops
2010				
2011				
2012				
2013				
2014				

9. Do you have home gardens?
10. How much land you have under home gardens?
11. What varieties of trees or vegetables you grow in the home gardens?
12. How much land you use for aquaculture?
13. Could you please tell me about ownership of the major equipment or tools you use or need in your occupation?

Tools/Equipment's	Ownership	Time period of renting	Source of renting	Cost of renting

14. Do you own any livestock?
15. What livestock do you have?

2b. Financial Resources

1. What is your main source of household income? (Pie chart)

Sources of income	Contribution to HH income (%)
a. Agriculture	
b. Agro-forestry	
c. Fisheries (please specify type)	
d. Livestock rearing	
e. Household industry	
f. Others	

2. How long have you been in your main occupation (Agriculture/fisheries)
3. Do you have access to bank or insurance facilities?
4. In the past 5 years, have you taken any loans

Loans	Purpose	Source	Comments (Problems or facilities)

5. In the past 5 years have you taken any insurance

Insurance	Purpose	Source	Comments (Problems or facilities)

2c. Human and Social Resources

1. How many members of your household are involved in your family's main occupation (farming/fisheries)?
2. How would you rate their involvement in your family's main occupation?

Member Name	Full Time	Part time	Occasional

3. Do you or any of your household members' part of any community groups or organizations?

Household member	Name of the Organization	Level of organization	Type of organization	Degree of participation

4. Have you received any kind of assistance or materials from these organizations

Name of the Organization	Materials/assistance received	Reason/s for requirement
Community		
Government		
Non- Governmental		

5. Which organizations is most important to your family? Could you also tell me why?

(Name of organization and codes)

a. Group 1: [ ]

Because _____

b. Group 2: [ ]

Because _____

c. Group 3: [ ]

Because _____

6. What is the composition of these groups? Are the members same or different in these groups?

Name of the Organization	Composition of members

Section 3: Perception of climate variability and response strategies

1. Do you think there is any change in weather patterns in the past 10 years?
2. What kind of temperature have you noticed during the following months as compared to 10 years before?

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Higher Temperature												
Low temperature												
No changes in temperature												
Temperature variable												

3. Do you feel the monsoon season has shifted since past 10 years?

If yes, then does the monsoon,

Starts early	[ ]	Starts late	[ ]
Ends early	[ ]	Ends late	[ ]

4. Do you feel any change in the amount of rainfall in monsoon?

Increased	[ ]	Decreased	[ ]
No change	[ ]	Variable	[ ]

5. How does monsoon now differ from 10 years before

Monsoon	10 years before	Present
Start month		
End month		
Months with most rainfall		
Months with average rainfall		

6. Do you think there has been changes in rainfall amount in the past 10 years? How has rainfall changed for the following months?

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
10 years before												
Present												

Intensity scale: 0= no rainfall; 1= low ; 2= Average ; 3= Heavy rainfall

7. How do you think the changes in climate related events is impacting your livelihood resources?

Climate related event	Biophysical Impacts	Socio-economic impacts
Longer summer season		
Shorter winter season		
Shorter monsoon season		
Low rainfall (less than usual)		
Heavy rainfall (more than usual)		
Early monsoon		
Late monsoon		

8. What are the measures are you taking to reduce these impacts on your livelihood resources?

9. Do you think you were better able to take these measures now than 10 years before?

Section 4: Perception of risks of natural hazards and response strategies

1. Do you think your household is currently under risk from natural hazards?
2. Which of these hazards your household has experienced in the past 10 years?

	Type of hazards	Yes/No and date
1.	Tropical Cyclone	
2.	Floods	
3.	Salt-water intrusion	
4.	Storm surge	
5.	Drought	
6.	Sea level rise	
7.	Earthquake	

10. How would you rate the hazards in the past 10 years on the following scales, based on your personal experience

Hazard type	Frequency 1 = low 2 = medium 3 = high	Severity of the hazard 1 = low 2 = medium 3 = high	Negative impact on your household 1 = low 2 = medium 3 = high	Your ability in coping with this hazard 0 = No difficulty 1 = low 2 = medium 3 = high
Tropical Cyclone				
Floods				
Salt-water intrusion in fields/gardens				
Salt-water intrusion in wells				
Storm surge				
Drought				
Sea-level rise				
Earthquake				

11. How do you think the hazards are currently impacting your livelihoods (farming/fisheries)?

Hazard type	Biophysical Impacts	Socio-economic impacts
Tropical Cyclone		
Flood		
Salt-water intrusion in fields/gardens		
Salt-water intrusion in wells		
Storm surge		
Drought		
Earthquake		

12. Did you receive any external assistance during that period?
13. Who provided you with external assistance during that period and in what form?

Received assistance from	Form of assistance	Comments
Neighbours/Community		
Community based organisation		
Government		
NGOs/Other organizations		

14. What measures did you take during that period? How will you score them on effectiveness?
15. Have you taken any measures after the hazard to protect your household from such kind of hazard next time?
16. Do you think you are currently better able to deal with such hazards than 10 years before? Could you please point out some reasons on why you think so?
17. Where there any conflicts in your community during or after the hazard? If yes, were you involved?

Section 5: Livelihood Constraints and coping responses

1. What are the different factors that you identify as limiting your crop production? (score)
2. What are the different factors that you identify as limiting your fishing/ aquaculture? (score)
3. What are the different factors that you identify as limiting your livestock rearing? (score)
4. What changes have you made in your farming/agriculture practices in the past 10 years?

	10 years ago	**Present**
Area under cultivation		
Crops grown		
Labour		
Farming season (field preparation, sowing and harvesting periods)		
Irrigation practices		
Cash crops		
Other farming practices (Fertilizers, seeds, farming equipment)		

5. What changes have you made in your fishing/aquaculture practices in the past 10 years?

	10 years ago	**Present**
Fishing periods		
Fishing preferences (Areas covered, preferred catch)		
Aquaculture practices (Preferred aquaculture, timing, resources used)		
Labour		
Other fishing practices (equipment and resources)		

6. What changes have you made in your livestock keeping/rearing practices in the past 10 years?

	10 years ago	Present
Type of livestock		
Number of livestock		
Labour		
Purpose of livestock keeping		

Section 6: Perception and experience of local development programmes

1. Are you aware of current development plans that the government and non-government organizations (NGOs) are implementing in your region (community/village level)?

Sectors	Plans (and any comments)
Farming	
Fisheries	
Health	
Education	
Infrastructure (Roads, electricity)	
Business	
Financial (Bank, credit or insurance schemes)	

2. Which plan or schemes is most relevant to you and your household? Score them in terms of how important/relevant they are to you and could you please tell me why?

3. Do you feel you or any of your household member have benefited from any of these plans and schemes?

Plans and Schemes	Householder member benefited	Benefits received

4. Do you know who are main individuals and organisations involved in the planning and implementation of those development plans in your region (community/village level)

Sectors	Organizations involved	Individuals involved
Farming		
Fisheries		
Health		
Education		
Infrastructure (Roads, electricity)		
Business		
Financial (Bank, credit or insurance schemes)		

5. Are you satisfied with the individuals and organizations involved in the planning and implementation process in your region? How would you rate them?

Organizations and individual	Your level of satisfaction	Reasons (Why?)

6. Do you know of any community-led development initiatives?
7. Are you or any of your household members is active in the planning and implementation process of those plans? Please mention roles.
8. Suppose, you were put in charge of the planning and implementation of development plans in your community. Would you like to make changes in the process? If yes, what do you think you will like to do?

Section 7: Household decision-making dynamics

1. Who takes decision on the different farming/fishing activities in your household (Male/Female)?

Activity	Decision maker

2. Who normally have access and take decisions in your household on following matters :

Resources	Access to the resources		Decision makers	
Land	Gender	Member	Gender	Member
Labour				
Agricultural / fishing equipment				
Agriculture training/information				
Farming/fishing subsidies				
Formal education				
Health facilities				
Ownership of assets				
Savings				
Credit				
Other sources of income				

3. Do you consult anyone outside your household when taking decisions on following household matters:

Resources	Individuals/organizations consulted
Farming/fishing plans	
Farming/fishing equipment	
Labour	
Formal education	
Health	
Investment (assets or savings)	
Credit	

4. How is decision taken in your household when there is any problem or difficult situation like floods and cyclones? Who is the default decsion-maker? Could you tell me in detail the steps you and your household took during the last flood/cyclone you experienced?
5. Do you have community level plans in place for emergencies like floods or cyclones? Who are individuals/organizations involved? How decisions are taken?
6. Do you receive any weather related (rainfall, temperature) information? What are the sources? How does it affect your decisions relating to farming/fisheries?
7. In the past 10 years, have you received warnings on approaching extreme events? What are the sources? How does it affect your decisions in preparing for such emergencies?
8. In case of floods or cyclones, who are the individuals or organizations you think you can depend on or ask for help?
9. In case of a seasonal loss in your occupation (a period of failure of crops or failure in enough fish catch/aquaculture) who are the individuals or organizations you think you can depend on or you can ask for help?
10. How do you think your community has changed in the past 10 years in terms of social and economic conditions?

Socio-economy changes	10 years before	Present
Community composition - wealth		
Community composition - ethnicity		
Migration		
Community conflicts		
Community cohesion		
Income opportunities		
Hospitals/clinics		
Roads – new/upgrades		
Schools		

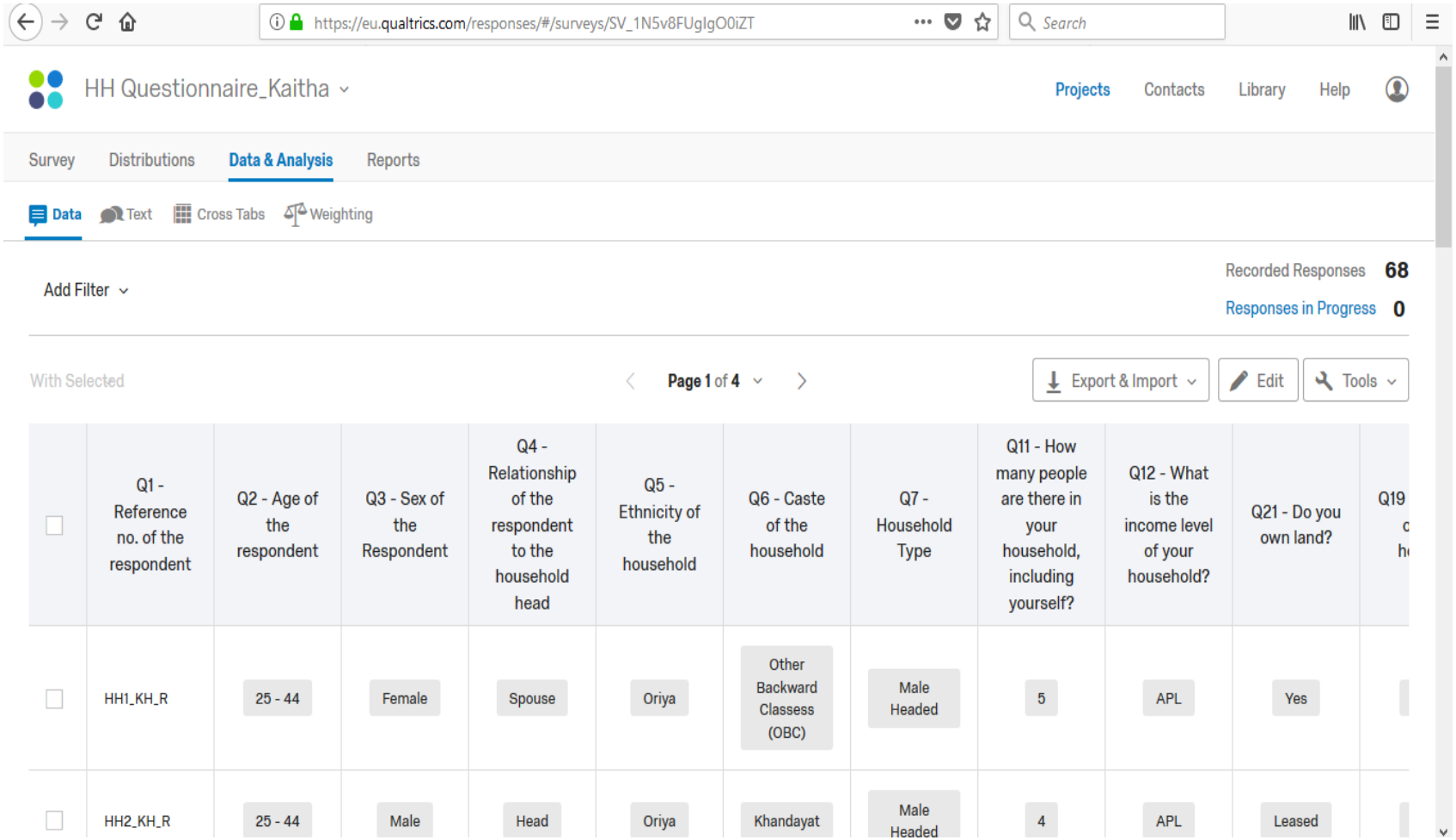
Community based organisations		
Electricity		
Water facilities		
Health facilities		
Market facilities		

11. What do you think you will do if you have unlimited resources? How will you invest it?

Any other comments:

Appendix C: Screenshot of quantitative data analysis in Qualtrics

Data collected from the household level questionnaire were inputted to the survey software Qualtrics. The software was used to arrange the data, to carry our statistical analysis of quantitative data and for generating graphs and charts to represent the results of the analysis.



Appendix D: Cyclone vulnerability map of Odisha

Source: Odisha State Disaster Management policy, 2013