BARRIERS AND BRIDGES TO ADAPTIVE CAPACITY:
A CASE STUDY ON WATER GOVERNANCE IN THE MIDDLE HILLS OF SOUTH CENTRAL NEPAL

A Thesis in
Geography
by
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Abstract

Observed climate change impacts are increasing pressures unevenly across space and amongst social actors who possess differential capacities to cope with and adapt to change. Governance of environmental resources plays an important role in this capacity to adapt, particularly in an era of unprecedented social and environmental changes. What is less known is the degree to which and the extent that environmental governance shapes differential adaptive capacities. Nepal has been identified as one of the most vulnerable countries to climate change, with availability of water resources a prime concern. Using qualitative methods conducted during a five-week span of fieldwork in two communities in the middle hills of central Nepal, this research examines how water governance provides a barrier or bridge for the adaptive capacity of socially diverse actors.

Findings from this research reveal that the temporal, spatial, and jurisdictional scales involved in water governance decision-making processes are mismatched for the scale and level of water scarcity experienced within study site locations. The repercussions of these mismatches are felt strongest along lines of caste/ethnicity. Additionally this thesis reveals that gendered, embodied practices of access of water also play a role in producing differential adaptive capacities.

Through the lenses of scale and level mismatches and embodiment, this work reveals the power dynamics embedded in water governance decision-making processes and
the everyday practices of water access, effectively producing barriers to adaptive capacity for some social actors, and bridges for others.

This work illuminates the biases and systemic inequities that are embedded in water governance decision-making processes. Furthermore these findings add greater understanding to the literature on adaptive capacity and environmental governance by tracing the scalar dimensions of water governance in its production of differential adaptive capacities. The results of this study can help inform more equitable climate change adaptation practices and water governance policies.
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1. Introduction

1.1 Background

The latest Intergovernmental Panel on Climate Change (IPCC) report has made it abundantly clear that the earth’s climate is indeed changing, anthropogenic (i.e. human-induced) greenhouse gas emissions are a significant driver for the changes in the earth’s climate, and impacts of such changes are currently being experienced across the globe (IPCC, 2014). However, the impacts are felt unevenly, and geography (e.g. physical location as well as socio-economic-political factors) plays a critical role in this dynamic. The impacts of climate change have disproportionally affected and continue to disproportionately affect those least responsible for anthropogenic climate change (Inderberg et al., 2015; IPCC, 2014; Thomas & Twyman, 2005). Furthermore, the populations around the globe that are least responsible for anthropogenic climate change often possess the least capacity to deal with the impacts of climate change (e.g. Marino, 2010; Marino and Ribot, 2012; Füssel, 2010, Dow, Kasperson & Bohn, 2006). Concerns regarding how to best facilitate climate change mitigation and adaptation across the globe are at the forefront of the global climate debate, and represent one of the most important concerns facing the world in this century (IPCC, 2014).

Populations within Nepal are currently experiencing profound environmental changes driven in part by climate change, such as increased variability in precipitation, as well more extreme precipitation events (Gurung and Bisht, 2014; Macchi et al., 2011). These environmental changes are anticipated to foster increased incidence of floods and droughts (IPCC, 2014). Considering current and anticipated future impacts for Nepal, the
The intersection of climate change adaptation and water resources seems to be a particularly salient concern for Nepal, and thus water governance a well-suited subject of study for the region.

The latest IPCC report included two major risks identified for rural livelihood populations across the globe: 1) “risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity” and 2) “risk of loss of terrestrial and inland water ecosystems, biodiversity, and the ecosystem goods, functions, and services they provide for livelihoods” (IPCC, 2014, p. 13). Thus, a focus on the experiences with water by rural populations is another important dynamic to include in understandings of climate change adaption. These risks produce real world challenges for Nepalese livelihoods, constraining opportunities and capacities to adapt. This study, as evident by the title “Barriers and bridges to adaptive capacity: a case study on water governance in the middle hills of south central Nepal”, examines how the processes and structures of governance of water resources constrain (i.e. act as barrier to) or enable (i.e. act as a bridge for) these capacities to adapt.

Importantly, observed impacts of climate change are unevenly distributed amongst different geographically and socially positioned actors. This is apparent across the globe, as well as in Nepal. Differential risk from climate change impacts depends on multiple factors, such as exposure level and vulnerability, which are each driven by both biophysical and socio-economic processes (IPCC, 2014, see Figure 1).
Figure 1. Climate-related risk as conceptualized by the IPCC. Climate and socioeconomic processes drive the interaction of hazards, vulnerability, and exposure which results in the risk of impacts from climate change (IPCC, 2014, p. 3).

Differential risk can also be unpacked further, by examining the multiple factors which contribute to vulnerability, known as multidimensional vulnerability (see Figure 2). Figure 2, a graphic produced in the IPCC chapter on Livelihoods and Poverty (Olsson et al., 2014) depicts how varying aspects of identity, such as gender, class, and race intersect to form axes of inequality, which, in the context of climate-related risk, form multidimensional vulnerability. A high level of multidimensional vulnerability translates to fewer capacities and opportunities to manage climate-related changes and responses and thus represents the individuals and populations at greatest risk for the climate change impacts.
Aspects of identity such as gender, class, race, etc. do not dictate how one can manage climate change, but systemic inequities and biases against particular identities can constrain opportunities and capacity to adapt. For example, Jones and Boyd (2011) conducted research in western rural Nepal and revealed that gender and caste discrimination work to constrain individuals’ access to resources such as credit lenders as well as limiting participation in decision making processes; ultimately placing pressure on individuals’ ability to deal with and adapt to climate change. Similarly, this thesis focuses on the multidimensional inequalities that shape differential adaptive capacities, by examining the how water governance operates and is experienced by Nepalese individuals. Water was selected as a resource to explore environmental governance in this study for its importance in the livelihoods of Nepalese individuals as well for the salient consideration it occupies in the reality of climate change adaptation.
The following research questions guide this study:

1) How do water governance structures and processes inhibit (i.e. provide barriers to) or facilitate (i.e. provide bridges for) adaptive capacities?

2) How do multidimensional inequalities interact with water governance and adaptive capacity?

Water governance structures and processes include both formal and informal mechanisms, including policies such as the Water Resource Act (WRA) 1992, state actors, non-governmental organizations (NGOs), social and cultural practices, norms, as well as formal and informal institutional arrangements.

Before I set out to conduct the fieldwork for this study, I anticipated that water governance structures and processes may favor or provide more access and opportunities to particular social actors, while limiting and inhibiting others, as studies on barriers or limits to adaptation have revealed such dynamics (Jones and Boyd, 2011; Moser and Ekstrom, 2010; Adger, 2009). Through an identification of how these barriers and bridges are formed, these research questions target an understanding of how to enhance adaptive capacity for not just individuals within the community who are better positioned to exploit beneficial opportunities (e.g. elites), but the whole community.
1.2. Structure of the thesis

Following the brief introduction to the study and the research questions provided above, I review the literature and present my theoretical framework that situates this research project. Following this framing of the work, I present background information and study site descriptions necessary to contextualize this study. I then discuss the research design for this work, including my methodology and methods. My results and a discussion of these results follow next. Finally, I provide a conclusion.
2. Literature Review and Theoretical Framework

This section discusses several literatures which help to situate this master’s thesis and help to provide the theoretical framework which guides this research.

As was discussed in the introduction, multidimensional inequalities interact to influence the capacities and opportunities to adapt to climate change (see Figure 2). Additionally, governance plays a role in the socioeconomic processes which mediate this dynamic (see Figure 1). This research aims to help in understanding how precisely the role of governance operates to shape capacities to adapt to climate change (i.e. adaptive capacities), taking into consideration the multidimensional inequalities that factor into this relationship. The literatures discussed below include: 1) adaptive capacity and its relationship with environmental governance; 2) political ecology and its attention to resource access and inequalities; 3) feminist geography and its attention to inequalities as well as the concept of embodiment.

The literatures on adaptive capacity and its relationship to environmental governance help situate this research within the greater scholarly attention to climate change adaptation. As will be discussed in the review below, climate change adaptation represents one of the most salient socio-ecological concerns of this century, and as such research efforts within this realm are appropriately called for.

The literature of political ecology calls attention to how collectively used resources are embedded in a larger web of socio-political relations. In particular, I draw upon Ribot and
Peluso’s (2003) ‘Theory of Access’ to situate this research. A large part of this section also importantly reviews the literature on inequalities and social power relations as they relate to resource use and access.

Finally, the literature review concludes with a section devoted to feminist geography and embodiment, a concept employed in this research to capture the micro-politics of resource access and use in rural Nepal. To achieve this, my work foregrounds the everyday by examining practices of access to water and the material, embodied, consequences of these practices on differently positioned social actors within the community.

2.1 Adaptive Capacity

This thesis embraces the IPCC’s understanding of adaptive capacity: “the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (Agard and Schipper, 2014, p. 1758). The concept of adaptive capacity was born out of understandings of resilience and adaptation, two broader concepts whose multiple understandings have changed with time and continue to attract a healthy scholarly debate.

Resilience

Originating in the fields of engineering, mathematics, complex systems analysis, development psychology and ecology in the 1960s and 1970s, the concept of resilience and its application spread into other fields and developed significantly during the 1980s (Folke, 2006; Brown, 2013). While resilience means literally to bounce back, conceptualizations
of resilience continue to shift within and across disciplines and sub-fields, its meaning varying considerably. Ecological resilience, as first described by Holling in 1973, refers to the ability of system to absorb disturbance without shifting into another state or phase (Gunderson, 2000). This framing of resilience has been applied to analyses of social systems, however this application is not without critique. Adger (2000) notes that the transfer of the concept cannot occur uncritically. Common criticisms of this framing of resilience include (but are not limited to): failing to account for agency of social actors (Miller et al., 2010) as well as politics, power relations, and cultural values (Beymer-Farris et al., 2012; Cote and Nightingale, 2012) and assuming a consensus on or existence of a ‘desired state’ (Brown, 2013).

Although some climate change scholars still fall prey to this apolitical framing of resilience, climate change scholarship has primarily (although not exclusively) linked ‘resilience thinking’ to social-ecological systems (SES) (as opposed to solely ecological systems or social systems) and thus has addressed some of the critiques mentioned above (Folke et al., 2010; Brown, 2013; see Table 1). Research on social-ecological resilience incorporates understandings of social learning, visioning and scenario building, the power of institutions, social networks, and transformational change, among others (Folke, 2006).
Table 1. A sequence of resilience concepts (Adapted from Folke, 2006).

<table>
<thead>
<tr>
<th>Resilience concepts</th>
<th>Characteristics</th>
<th>Focus on</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering resilience</td>
<td>Return time, efficiency</td>
<td>Recovery, constancy</td>
<td>Vicinity of a stable equilibrium</td>
</tr>
<tr>
<td>Ecological/ecosystem resilience</td>
<td>Buffer capacity, withstand shock, maintain function</td>
<td>Persistence, robustness</td>
<td>Multiple equilibria, stability landscapes</td>
</tr>
<tr>
<td>Social resilience</td>
<td>Interplay disturbance and reorganization, sustaining and developing</td>
<td>Adaptive capacity, transformability, learning, innovation</td>
<td>Integrated system feedback, cross-scale dynamic interactions</td>
</tr>
</tbody>
</table>

Adaptation

Adaptation refers to modifications to behavior, and is often conceptualized as deliberate, more long-term adjustment, and is typically based on a range of expected or predicted changes; this is in direct contrast to coping strategies, which are often portrayed as reactive to specific impacts, and are often a more short-term adjustment (Smit & Wandel, 2006; Agarwal & Perrin 2009; Nelson, Adger, & Brown, 2007; Adger et al., 2003). Three chapters of the Fifth Assessment of the IPCC Working Group II report are devoted to adaptation, thus, it remains an active topic interrogated by academics and practitioners today (IPCC, 2014).

As reflected in the Fifth Assessment of the IPCC Working Group II report, barriers and limits to adaption and transformative change are among the topics at forefront of the debate within climate change adaptation (Tschakert et al., 2013; IPCC, 2014). The literature on transformation (e.g. Inderberg et al., 2015; Clarke et al., 2014; O’Brien and Sygna, 2013; O’Brien, 2012; Pelling, 2011) provides an important evolution in the adaptation to environmental change debate. Although there is no single definition or understanding of
transformation, the concept can include radical or profound changes to the system, which is a departure from ‘business as usual’ adaptations that can perpetuate existing inequalities (Brown, 2013). Examples of ‘business as usual’ adaptations might include market or technology-based climate change ‘solutions’ such as ‘clean’ energy transitions (e.g. natural gas) or carbon trading, which do not address structural (e.g. socio-economic or political) causes of vulnerability, and often allow for structural processes and social practices that contribute to differential vulnerabilities and adaptive capacities to persist.

Adaptive capacity

Adaptive capacity, as defined earlier in this thesis, bridges ideas of resilience and adaptation, and in its most simplest terms, describes the ability to adapt and respond to changes (Engle, 2011). In the context of climate change, adaptive capacity is often employed in reference to anticipatory adaptation (Smit and Wandel, 2006; Tschakert and Dietrich, 2010), which refers to proactive adaptation that considers not only observed impacts of climate change but importantly, future risks (Engle 2011). In the midst of an increasing climate variability and global environmental change, research efforts in enhancing adaptive capacity provide an opportunity for answering a call for research on “the creation of alternative and desirable futures that involve humans as agents of change” (O’Brien, 2012, p. 537). Research efforts in enhancing adaptive capacity provide an opportunity for helping to facilitate the creation, and deliberate transformation, of more desirable, equitable futures dependent on a shared responsibility to act (Tschakert and St. Clair, 2013). For example, through an examination of what hinders and facilitates adaptive capacity, researchers and decision-makers across all scales and levels can work to identify
what interventions need to occur (i.e. what changes need to happen) and what social actors need to be involved (i.e. whose responsibility is it to facilitate these transformations) to enhance adaptive capacity and prepare for future changes.

Adaptive Capacity and Environmental Governance

In order to understand how to enhance adaptive capacity, more research is needed on what facilitates (i.e. acts as a bridge for) or hinders (i.e. acts as a barrier to) adaptive capacity. In 2006, Eakin and Lemos summarized the determinants of adaptive capacity (see Figure 2 below):

Table 2. Determinants of adaptive capacity (adapted from Eakin and Lemos, 2006).

<table>
<thead>
<tr>
<th>Determinants of adaptive capacity</th>
<th>Encompasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital</td>
<td>Knowledge (scientific, ‘local’, technical, political), education levels, health, individual risk perception, labor</td>
</tr>
<tr>
<td>Information and technology</td>
<td>Communication networks, freedom of expression, technology transfer and data exchange, innovation capacity, early warning systems, technological relevance</td>
</tr>
<tr>
<td>Material resources and infrastructure</td>
<td>Transport, water infrastructure, buildings, sanitation, energy supply and management, environmental quality</td>
</tr>
<tr>
<td>Organization and social capital</td>
<td>State-civil society relations, local coping networks, social mobilization, density of institutional relationships</td>
</tr>
<tr>
<td>Political capital</td>
<td>Modes of governance, leadership legitimacy, participation, decentralization, decision and management capacity, sovereignty</td>
</tr>
<tr>
<td>Wealth and financial capital</td>
<td>Income and wealth distribution, economic marginalization, accessibility and availability of financial instruments (insurance, credit), fiscal incentives for risk management</td>
</tr>
<tr>
<td>Institutions and entitlements</td>
<td>Informal and formal rules for resource conservation, risk management, regional planning, participation, information dissemination, technological innovation, property rights, risk sharing mechanisms</td>
</tr>
</tbody>
</table>
These determinants refer to the most salient factors that contribute to the shaping of an individuals’ adaptive capacity. Many of the determinants identified by Eakin and Lemos represent components of or are dependent on what falls under the umbrella term of environmental governance. Governance, as defined by Bridge and Perreault “refers to the fundamental question of how organizations, decisions, order and rule are achieved in heterogeneous and highly differentiated societies” (2009, p. 476). Environmental governance then, refers to how these processes are involved regarding the uses of the environment. Lemos and Agrawal describe environmental governance as a “…set of regulatory processes, mechanisms and organizations through which political actors influence environmental actions and outcomes” (2006, p. 298). Pahl-Wostl (2009, p. 356) identified several major structural characteristics of governance regimes: formal and informal institutions, state and non-state actors, multi-level interactions, and what she terms ‘governance modes’ (bureaucratic hierarchies, markets, and networks). Environmental governance is concerned not only with the actors and institutional arrangements involved (and left out) of environmental decision-making but also how these rules are practiced and enforced (Bridge and Perreault, 2009). In other words, environmental governance involves the formal and informal processes and structures that negotiate resource use, access, and control.

In Eakin and Lemos’s table, the determinants identified as material resources and infrastructure, as well as institutions and entitlements all contribute to what could be broadly defined as environmental governance. Thus, while environmental governance is
not the only determinant of adaptive capacity, it does play an important role in shaping adaptive capacity.

Within the growing adaptive capacity literature Engle, (2011) has identified “an affirmation of the integral role that institutions, governance, and management play in determining a system’s ability to adapt to climate change” (p. 649). Despite the important role of environmental governance in shaping adaptive capacity, there is little empirical work examining how precisely environmental governance influences differential adaptive capacities (Hill, 2013). In order to improve climate change adaption efforts, and help work towards the design of more equitable and sustainable futures, more research is needed to address this knowledge gap. This master’s thesis fills part of this gap by exploring the governance of one particular environmental resource: water, in the context of Nepal. It is predominantly informed by the literature on political ecology and feminist geography.

2.2 Political Ecology

*Introduction to Political Ecology*

Political ecology has been utilized as a conceptual and theoretical framework by geography as well as other related academic disciplines including anthropology, rural sociology, and development studies. The term political ecology encompasses a range of definitions (see Robbins, 2012, p. 15-16), but a common element has been its counter to ‘apolitical’ framings of many historic and current, ongoing ecological problems, by demonstrating environmental change and ecological conditions are a product of political process (Robbins, 2012; Bryant and Bailey, 1997).
Geography’s roots in political ecology, first described by Piers Blaikie and Harold Brookfield in 1987, critically engaged with dominant narratives of environmental degradation (e.g. neo-Malthusian and ‘Tragedy of the Commons’ concepts) and provided evidence to support the existence of political-economic structures that constrain and enable resource use. They and others have argued social practices of resource use are shaped not only by ecological changes but also by structures and forces of the broader political economy (Turner, 2009). Robbins has described the five main theses of political ecology and their uses (see Table 3).

Table 3. Five theses of political ecology (Robbins, 2012, p. 22).

<table>
<thead>
<tr>
<th>Thesis</th>
<th>What is explained</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degradation and marginalization</td>
<td>Environmental conditions (especially degradation) and the reasons for their change</td>
<td>Environmental degradation, long blamed on marginal people, is shown in its larger political and economic context</td>
</tr>
<tr>
<td>Conservation and control</td>
<td>Conservation outcomes (especially failures)</td>
<td>Usually viewed as benign, efforts at environmental conservation are shown to have pernicious effects, and sometimes fail as a result</td>
</tr>
<tr>
<td>Environmental conflict and exclusion</td>
<td>Access to the environment and conflicts over exclusion from it (especially natural resources)</td>
<td>Environmental conflicts are shown to be part of larger gendered, classed, and raced struggles and vice versa</td>
</tr>
<tr>
<td>Environmental subjects and identity</td>
<td>Identities of people and social groups (especially new or emerging ones)</td>
<td>Political identities and social struggles are shown to be linked to basic issues of livelihood and environmental activity</td>
</tr>
<tr>
<td>Political objects and actors</td>
<td>Socio-political conditions (especially deeply structured ones)</td>
<td>Political and economic systems are shown to be underpinned and affected by the non-human actors with which they are intertwined</td>
</tr>
</tbody>
</table>
This study falls within Robbins’ “environmental conflict and exclusion” thesis as it is concerned with access and exclusion to a particular natural resource, namely water. Additionally, this research is attuned to the broader social relations in which environmental conflict takes place. Social power relations and the role they play in environmental governance is an important dynamic to which political ecologists are particularly attuned. Turner (2009, p. 187) argues that political ecology developed around the idea that “resource-related conflict is inherently social.” Political ecologists pay particular attention to the important role that social power differentials and institutional arrangements play in resource use, access, and control, where power is exercised through formal and informal governance structures (Bridge and Perrault, 2009).

Ribot and Peluso (2003) contribute to Robbins’ “environmental conflict and exclusion” thesis in their article “A Theory of Access.” In this article, they unpack the mechanisms of access, illuminating the ways in which access to collectively used resources is connected to social power relations. Their work helps to answer a question many political ecologists concern themselves with in regards to collectively used resources: what are the circumstances where some people benefit while others not? To help target this question, Ribot and Peluso provide guidance on performing what they refer to as an access analysis, which is “the process of identifying and mapping the mechanisms by which access is gained, maintained, and controlled” (p. 160).

Table 4 provides a summary of the mechanisms Ribot and Peluso have identified in the literature on collectively used resources. Ribot and Peluso’s work contributes to this
master’s thesis research in that it helps to address the second overarching research question on how multidimensional inequalities play a role in the processes and structures of environmental governance and its interaction with adaptive capacity. Several of the mechanisms Ribot and Peluso have identified are useful for this master’s research, including ‘access through social identity’ as well as ‘access via negotiation of other social relations’ (highlighted in Table 4).

Table 4. Mechanisms of access (adapted from Ribot and Peluso, 2003).

<table>
<thead>
<tr>
<th>Mechanisms of access</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to technology</td>
<td>Fences, electricity, weapons, roads</td>
</tr>
<tr>
<td>Access to capital</td>
<td>Wealth in the form of finances and equipment that can be utilized to derive benefits from people and things</td>
</tr>
<tr>
<td>Access to markets</td>
<td>Ability to commercially benefit from a resource – includes commodification of resources</td>
</tr>
<tr>
<td>Access to labor and labor opportunities</td>
<td>Ability to labor for oneself or maintain access to employment with others</td>
</tr>
<tr>
<td>Access to knowledge</td>
<td>Beliefs, ideological controls, discursive practices (e.g. “scientific or expert authority”)</td>
</tr>
<tr>
<td>Access to authority</td>
<td>Legal and illegal or informal access to state other authorities</td>
</tr>
<tr>
<td>Access through social identity</td>
<td>Gender, ethnicity, age, religion, status, profession, place of birth</td>
</tr>
<tr>
<td>Access via the negotiation of other social relations</td>
<td>Friendship, trust, dependence, reciprocity, patronage</td>
</tr>
</tbody>
</table>

As Ribot and Peluso and other political ecologists have argued, social power relations and multidimensional inequalities are an important component for environmental governance more broadly as well as the concept of access. Thus, a literature review examining the threads of scholarship which contribute to an understanding of social power relations follows below.
Gender and Intersectionality

Over the last two and half decades, scholars have substantially increased critical engagement with the relationship between gendered social power dynamics and the environment (e.g. Agarwal, 1992; Rochealeu et al., 1996; Nightingale, 2006). Feminist political ecologists have paid particular attention to the interaction of gender and environmental phenomena and concerns (Rochelea, Thomas-Slayter, & Wangari, 1996; Carney, 1993; Schroeder, 1993; Truelove, 2011; Sultana, 2011; Hawkins and Ojeda, 2011; Elmhirst, 2011; Nelson, 2013). “Feminist political ecology treats gender as a critical variable in shaping resource access and control, interacting with class, caste, race, culture, ethnicity to shape process of ecological change” (Rochealeau et al., 1996, p. 4). As a response to this scholarly attention to gender, development studies and even more recently, climate change initiatives, have begun to include a gender or women component (this has been referred to as ‘mainstreaming gender’). This ‘gender mainstreaming’ is an achievement that should not be dismissed; it is incredibly significant that these larger development programs are paying attention to women and gender. In many cases development agencies have made great strides: they are identifying that women face unique concerns, collecting gender-disaggregated data, focusing on issues that tend to impact more women than men, and attempting to assist in capacity building and empowerment of women. However, while “gender mainstreaming holds a significant promise for addressing inequalities […it…] has failed to deliver substantive change” (Alston, 2013, p. 2). Women, especially women of the ‘Global South’, are too often framed as a single, homogenous, vulnerable group, disregarding the heterogeneous nature of groups of women all over the
world, and the unique and distinct structural causes of vulnerability that impact individuals both across and within places of the world differentially (Mohanty, 2003; Arora-Jonsson, 2011). These efforts typically do not engage critically with how gender is socially and relationally constructed, nor do they examine the multiple socio-political and historical processes that interact to form the structural causes of vulnerability (Sultana, 2014; Eriksen et al., 2005; O’Brien et al., 2007).

Recent development paradigms, through the construct of the ‘feminization of poverty’, place the burden of alleviating poverty onto women (Chant, 2008). This ‘saving’ or ‘empowering’ ‘Third World women’ discourse permeates development programs focused on climate change adaptation also. In the context of the gender-development nexus and climate change adaptation, the discourse on the ‘vulnerability of women’ can lead to an increase in women’s responsibility without corresponding rewards (Arora-Jonsson, 2011). In mainstream climate change adaptation efforts, women are identified as a group that is particularly vulnerable to climate change, and thus adaptive capacity efforts increasingly include a women or gender focus. However, it is extremely important to recognize that men and women experience climate change impacts differently, and in some circumstances, women do experience the brunt of these differential impacts (Lambrou and Nelson, 2013; Campbell, Mitchell, & Blackett, 2009). Additionally, it must be commended that climate change development efforts are at the least paying attention to women. Nonetheless, it must be recognized that other axes of social difference can play an equal or more salient role in contributing to differential impacts from climate change (e.g. class, caste, race, (dis)ability, age). Additionally, these axes of social difference interact with each other to contest, reinforce, and negotiate power differentials (Sultana, 2013). For
instance Arora-Jonsson (2011) describes how an individual’s socioeconomic status or caste and class, rather than gender, can play a more important role in shaping an individual’s access to resources and social networks in the case of natural disasters. Arora-Jonsson (2011, p. 747) cites Bradshaw (2010, p. 3): “The idea of being able to say with certainty who is most affected by disasters is interesting given that the impact of any event will be time, place and person specific or depend on a mix of location, event and vulnerability.”

Focusing on the ‘vulnerability of women’ as the strategy for creating effective climate adaptation strategies does several disservices to women as it homogenizes the experiences of women, reinforces differences between men and women as given and unchangeable, and simultaneously removes agency from women (MacGregor, 2010; Manzo, 2010; Arora-Jonsson, 2011).

Gaps in this literature, although addressed by some, including the latest IPCC report (Olsson et al., 2014), still remain in regards to a deeper engagement with gender. There is a clear need for more nuanced scholarly work as well as development initiatives at large and those targeting climate change adaptation that engage with gender in the following ways: (1) recognize the intersection of gender with other axes of social difference, (2) gender as relational and socially constructed; 3) gender as one of many other important structural processes (e.g. wider socio-economic and political mechanisms) that may shape power differentials and thus capacities to adapt to climate change and general well-being (Nightingale, 2006; Jewitt, 2000).
In Nepal, 78% of all women practice agriculture as their main livelihood strategy (Gurung and Bisht, 2014). As such, their lives are most directly impacted by variability in environmental conditions, and thus warrant particular attention for understandings of sustainable and equitable natural resource management in the face of environmental changes predicted to affect natural resource availability and use. “As resource-dependent activities are directly dependent on climatic conditions, changes in climate variability projected for future climates are likely to affect women through a variety of mechanisms: directly through water availability and vegetation and fuelwood availability” (Adger et al., 2007, p. 730). As suggested above, gender does not exist in isolation; one is not only a woman. The ability to deploy assets and take advantage of beneficial opportunities to adapt to changes varies along lines of not only gender, but also caste or ethnicity, socio-economic status, age, religion, indigeneity, etc.

Gendered identities are not homogenous; additionally, gender intersects with multiple axes of social difference (e.g. class, race, sexuality) to (re)produce and contest power relations. This lens of analysis has been coined intersectionality (Crenshaw, 1993) (Figure 3). So far, little attention has been given to the application of an intersectionality lens to research on environmental change and adaptive capacity. Sultana (2013) makes a clear call for climate change scholars and policymakers to critically analyze and engage with gender and other intersecting social differentiations as climate change impacts are felt differentially across these identities, and thus should be incorporated in adaptation strategy discussions and policies (Olsson et al., 2014, p. 818-819). Research that homogenizes women, and that does not incorporate the multiple, intersecting, co-constitutive nature of identities may miss critical aspects of how environmental governance inhibits or facilitates adaptive capacity.
Failure to pay attention to the intersectionality of social actors can undermine the effectiveness of environmental governance structures and processes which seek to enhance adaptive capacity. Additionally, this disregard for the multidimensionality of social actors can perpetuate existing inequalities or even add additional hardship to the lives of individuals. Methodologically, it is not trivial to *a priori* know which axes of inequality will be most important, and thus incorporating an intersectionality lens represents an important, but complex challenge in the research design process.

Intersectionality moves beyond an analysis solely based on gender, to uncover how environmental governance mechanisms play out across other important identities (see figure below). Few scholars have fully engaged with an intersectionality perspective in the context of Nepal; Andrea Nightingale (2011) provides an important exception. Additionally, this is a lack of scholarship that engages with multidimensional inequalities as they relate to climate change adaptation in the context of Nepal, however Onta and Resurreccion (2011) provide such scholarship; their work incorporates not only gender but caste into their analysis of climate adaptation strategies of Nepalese community members.

In Nepal, and other parts of South Asia, gender and caste/ethnicity are two social institutions in particular which contribute to clearly defined norms, rules, and values (Nightingale, 2006; Nightingale, 2011; Onta and Resurreccion, 2011). Norms, rules, and values represent informal processes and structures of environmental governance, and thus this research will consider gender and caste/ethnicity when examining the contributors to differential adaptive capacities.
Figure 3. Intersectionality illustrated through multiple, intersecting identities.

To further examine multidimensional inequalities and the informal processes and structures of environmental governance, I turn to the literature on feminist geography and the concept of embodiment.

2.3 Feminist Geography and Embodiment

Feminist geographer Kwan (2002) has stated that “feminist geographers share a commitment to progressive social change that reduces social inequality and oppression of marginalized groups in general and gender inequality in particular” (p. 646). An important contribution by feminist scholars is their questioning of the delineating of boundaries and scales, as well as the privileging of larger scales and boundaries (e.g. global or national scales, nation-state boundaries). Mountz and Hyndman (2006), citing Philip Kelly, argue that “it makes little sense to privilege any scale as a primary referent for analyzing particular social processes. Social relations are in fact played out across scales rather than
Feminist analyses seek to make connections between power relations at multiple scales but also foreground the everyday through perspectives of lived experiences (Dowler and Sharp, 2001; Sharp, 2011; Laliberté, 2013).

Feminist scholars link the seemingly banal to processes occurring at larger scales, making visible how people and place influence one another across geospatial and temporal scales by including in their analyses special attention to the sites and scales that are often left out by other scholars (e.g. the home or the body). Enloe claims that, “no place is too mundane for the alert feminist gender investigator” (2013, p. 185).

To examine the seemingly ‘apolitical’ and mundane, a feminist geographical analysis often employs an embodied approach. Truelove (2011) and Sultana (2011) employ embodiment to explore issues of resource access and use. Truelove’s analysis of what she calls *practices of access* is based in Dehli. In her 2011 *GeoForum* article she argues that urban political ecologists studying water inequality have largely focused on water governance at the level of the city and power relations’ effects on city-wide inequalities. Rather than an analysis of power and inequality at the city-wide level through the lens of ‘access and control’, Truelove examines the embodied effects of water and sanitation practices in Delhi: “A sole focus on access, control, and distributional difference is insufficient for capturing the scope of inequalities related to water in the city” (2011, p. 150). Truelove’s study is conducted at the level of the body, and makes visible the power and inequality dynamics (e.g. gender, class, and other social differences) that are (re)produced through everyday water practices. Despite the state’s efforts to improve water quantities and access points, Truelove’s
analysis illuminates how and why social inequality continues: gendered and classed social differences, and even criminality at times, are re-enforced onto economically disadvantaged women through embodied consequences of water and sanitation practices. These inequalities can actually increase and become much worse even as water sources are legalized and ‘improved’ (2011). She argues that an embodied approach to practices of access can provide a more attentive analysis of how policies and interventions are experienced both materially and symbolically through the everyday.

In a similar vein, Sultana (2011, p. 171) examines the gendered subjectivities that are (re)produced through embodied practices of navigating contaminated drinking water sources in Bangladesh, noting that “conflicts over water are lived, felt, embodied by variously situated subjects in their daily struggles for safe water.” Sultana calls for the importance of examining beyond just the more public and overt conflicts and resource struggles, and calls for a focus on the more hidden and nuanced aspects. Both Sultana’s and Truelove’s case studies provide inspiring examples of how the lived, everyday experience can be captured through an analysis that focuses on embodied practices of access. The concept of embodiment helps capture how “the material practices, conditions, conditions and encounters of the body are firmly tied to the symbolic experience of difference” (Truelove, 2011, p. 148).

Drawing on inspiration from these embodied works of feminist geography this work provides a methodological interrogation of adaptive capacity in the mid-hills of rural central Nepal. This research examines adaptive capacity, in particular how resource
management decision-making processes and embodied social practices related to resource access and use shape adaptive capacity.

2.4 Theoretical Framework

My theoretical framework for exploring what facilitates (or acts as a bridge) and inhibits (or acts as a barrier) to adaptive capacities through an examination of water governance in Nepal consists of three major threads: access, inequalities, and embodiment. In what follows below I describe how these threads, informed by the literatures discussed in the previous sections, come together and inform this research.

Access

The literature on environmental governance has identified access as an important dimension of human use of the environment. It concerns how environmental decision-making is practiced and enforced (Bridge and Perreault, 2009). Political ecologists in particular, have interrogated this concept. Robbins’ (2004) “environmental conflict and exclusion” thesis is relevant to this research as it is concerned with access and exclusion to a particular natural resource. Ribot and Peluso’s (2003) mechanisms of access are useful for the theoretical framework that guides this research, specifically the mechanisms they identify as ‘access through social identity’ and ‘access via negotiation of other social relations.’ Incorporating access into my theoretical framework allows my work to more carefully examine the greater social context in which access to water takes place, as well as how and under what conditions access is granted to particular social actors at the expense of others.
Inequalities

Both political ecology and feminist geography work to inform the thread of my theoretical framework that guides my analysis of multidimensional inequalities. These literatures provide a lens attuned to the socio-politically produced nature of ecological problems such as water scarcity. Additionally, this thread helps to unravel and examine the multiple, intersecting, co-constitutive, and uneven social relationships that mediate interactions between individuals and groups, as well as institutional arrangements. These literatures shed light on the implicating role of structural and systemic biases and inequalities in environmental decision-making.

Embodiment

Feminist geography guides another piece of my theoretical framework: embodiment. I use embodiment to analyze practices of access within my study, to unpack, at the level of the body, individuals’ material, everyday experiences with water.

These threads come together to inform my overarching research goal of understanding how environmental governance shapes adaptive capacity. See Figure 4 below for a visual representation of this dynamic.
Figure 4. Theoretical framework
3. Background Information and Study Site Descriptions

3.1 Context for this study

This study was conducted in collaboration with the Himalayan Climate Change Adaptation Programme (HICAP). HICAP is a five-year, integrated program that is a partnership between three organizations: the Center for International Climate and Energy Research (CICERO), based in Oslo, Norway, the International Centre for Integrated Mountain Development (ICIMOD), based in Kathmandu, Nepal, and UNEP GRID-Arendal, which is also based in Norway. The project is “aimed at contributing to enhanced resilience of mountain communities, particularly women, through improved understanding of vulnerabilities, opportunities, and potentials for adaptation” (“HICAP,” 2015). The HICAP project has study sites in several locations throughout the Himalayan region (see Figure 5), however the sites of engagement for this study were based exclusively in the Koshi River sub-basin of Nepal (see blue box in Figure 5).
HICAP is composed of several interlinked components with specific foci, one of which is the role of women and gender, component six (see Figure 6).
HICAP, and the fieldwork supporting this thesis project, is funded by the Norwegian Ministry of Foreign Affairs, and my advisor, Petra Tschakert, is a CO-PI for the HICAP project. HCIAP collaborators assisted with the site selection process for this project as well as with initial contacts with community members in sites of engagement (see 3.4 Study site selection).

3.2 Background Information: Nepal

Nepal is characterized by high geological, biological and cultural diversity, with a great range of landscapes and habitats for a diverse set of flora and fauna, as well as an impressive diversity of peoples and livelihoods. The country is widely known for its claims to some of highest peaks of the Himalayan range, including Mt. Everest. Nepal is divided into three major ecological zones: the Terai, the Middle Hills, and the High Himals. In Figure 7, the Terai is pictured in green, the Middle Hills in brown, and the High Himals in white.

Figure 7. Topography of Nepal (“Nepal Topo,” 2015).
Depending on the altitude, Nepal’s climate varies from tropical to arctic, with an altitudinal range of 70 meters in lowest parts of the Terai to 8848 meters at the peak of Mt. Everest (Central Bureau of Statistics, 2013). All regions of Nepal experience a dry and wet (monsoon) season. Roughly 80 percent of Nepal’s precipitation falls during the monsoon season which takes place during June through August (McCoy, 2003). Agriculture in Nepal is mostly rain fed, thus heavily reliant on favorable environmental conditions. Rural communities across Nepal consist of many individuals whose livelihoods are directly dependent on natural resources. Water stress during the dry season and frequent floods during the monsoon season represent a significant challenge for people in Nepal, particularly for those whose main livelihood strategy is agriculture, which is two-thirds of the population, and 78 percent of women in Nepal (Agarwal et al., 2014; Bisht, 2014).

The predominant framing of the vulnerability of Nepal to climate change is attributed to its broad topographic diversity (complicating access to roads and other infrastructure for many rural areas) and the high degree of poverty (more than 70% of the population lives on less than 2 USD per day) (Pilot Program for Climate Resilience, 2012; ADB, 2009). The most critical climate risks identified for Nepal are: (1) quantity and quality of water, (2) food security (3) ecosystem health (Gurung, 2013).

Nepal is divided administratively into 75 districts. Districts are divided into smaller administrative units called Village Development Committees (VDCs) and Municipalities. Nepal contains 3915 VDCs and 58 Municipalities. Municipalities are urban areas, whereas VDCs are rural areas. Municipalities and VDCs are further delineated administratively into
wards; VDCs consist of nine wards, while the number of wards in a given municipality depends on the population (Central Bureau of Statistics, 2013). Table 5 provides the hierarchy of jurisdictional levels in Nepal. For purposes of this study, I discuss an additional informal jurisdictional level below the ward level: neighborhoods. This level is based on observations and conversations with interviewees. Neighborhoods range from a set of five households up to twenty-five households.

Table 5. Hierarchy of jurisdictional levels in Nepal

<table>
<thead>
<tr>
<th>Jurisdictional Levels</th>
<th>Study Site 1</th>
<th>Study Site 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>District</td>
<td>Sindhuli</td>
<td>Kavre</td>
</tr>
<tr>
<td>Village Development Committee or Municipality</td>
<td>Kamalamai</td>
<td>Mathurapati Fulbari</td>
</tr>
<tr>
<td>Ward</td>
<td>Five</td>
<td>Six and Eight</td>
</tr>
</tbody>
</table>

3.3 Background Information: Caste and Ethnicity

Approximately 80% of the population of Nepal is Hindu, thus the Hindu caste system is present in the lives of many Nepalese (Central Bureau of Statistics, 2013). The Hindu caste system in Nepal is rooted in socially constructed ideas of ‘ritual impurity’, which can be possessed by particular people and objects (Cameron, 1998). Caste is conceptualized most commonly as a ‘high’ to ‘low’ hierarchy, with lower castes deemed more ‘impure’ than higher castes. The lowest castes were historically referred to as ‘untouchables’, although this term is not as widely used today for its explicit discriminatory connotation. People are born into their caste, and children of mixed caste parents take on the ‘lower’ of their parents’ caste (Nightingale, 2011). The notion of this impurity derives from a historical association of materials handled by lower caste laborers such as metals and leather, as well
as acts performed by those within the lower castes such as ploughing and eating beef (Cameron, 1998).

In Nepal, caste intersects with ethnicity in such a way that these two terms are often used interchangeably. For example, in the latest National Population and Housing Census (2011) conducted by the Government of Nepal, caste and ethnicity are not differentiated, instead they are simply connected with a forward slash to indicate their interchangeability (caste/ethnicity). I adopt this convention in this thesis from here on. The latest census recorded 125 different caste/ethnicity groups and 123 mother tongue languages (Central Bureau of Statistics, 2012c). Today caste-based discrimination is prohibited by law (“Nepal: UN welcomes new law on caste-based discrimination,” 2011); however, despite the illegality of discrimination and exclusionary practices based on caste, caste remains an important axis of social power that intersects with other axes of social difference (e.g. gender, socioeconomic status, (dis)ability) and works to constrain and limit, as well as provide room to contest and renegotiate power dynamics (Parish, 1996; Jones and Boyd, 2011; Onta and Ressurecion, 2011; Nightingale, 2011).

In Nepal, material and spatial practices such as performing agricultural work, occupying particular spaces (such as the hearth, forest, and water tap) and food consumption provide opportunities for individuals to both (re)produce and contest norms as well as the bounds of identities (Nightingale, 2011). As will be discussed further in the Results and Discussion parts of this thesis, norms and rules regarding identities such as caste and ethnicity represent informal structures and processes of environmental governance which work to
constrain or provide opportunities, and as such represent barriers and bridges to adaptive capacity.

3.4 Study site selection

Key collaborators for this study, Dr. Suman Bisht and Dibya Gurung assisted with study site selection and initial introductions to communities. Dr. Bisht is affiliated with the HICAP project through the International Centre for Integrated Mountain Development (ICIMOD), and Ms. Gurung is affiliated with the HICAP project through Women Organizing for Change in Agriculture and Natural Resource Management (WOCAN). These contacts were instrumental in the facilitation of this research.

For this study, two sites of engagement were chosen not to compare and contrast but rather to explore and identify a range of experiences with environmental governance structures and processes that may represent obstacles to successful and sustainable adaption. I conducted this research over the course of five weeks (mid May to end of June 2014) in two districts located in the central Mid-Hills of Nepal, Kavrepalanchowk (also known as Kavre) and Sindhuli. Both districts are shown in red in Figure 8a and 8b. My study sites within these districts included Mathurapati Fulbari VDC (primarily Wards Six and Eight) in Kavre and Kamalamai Municipality (primarily Ward Five) in Sindhuli.
3.5 Study site descriptions

Figure 9. Ward Six, Mathurapati Fulbari VDC, Kavre District. Photo by author.
Mathurapati Fulbari

Mathurapati Fulbari is a VDC of 973 households and 4,458 individuals as of the last census in 2011 (Central Bureau of Statistics, 2012a). Average temperatures range from 0°C to 16°C, and average precipitation ranges from 10mm to 350mm throughout the year (See Figure 10).

![Figure 10. Average rainfall and temperature for Mathurapati Fulbari from 1990-2009 (World Bank Group, 2015a).](image)

According to the latest census more than half of all households have access to a water tap or piped water for drinking water, and the majority have electricity for lighting but still use firewood as the main fuel source for cooking (Central Bureau of Statistics, 2012a). The literacy rate for Mathurapati Fulbari’s population aged five years and older is 81% for men and 63% for women. Primary caste/ethnicities present in Mathurapati Fulbari include Brahman – Hill, Tamang, Newar, Chetri, and Damai/Dholi (Dalits), representing a mix of privileged (Brahmin, Chetri) and marginalized caste (Dalit) groups, and those in between (Tamang and Newar) (Central Bureau of Statistics 2012a). Data collection was conducted
solely in Wards Six and Eight of the Mathurapati Fulbari VDC. Ward Six consists of 299 households and Ward Eight consists of 197 households, representing a population of 2,238 individuals combined (Central Bureau of Statistics, 2012a).

Table 6. Population of Mathurapati Fulbari VDC and Wards Six and Eight.

<table>
<thead>
<tr>
<th>Jurisdictional level</th>
<th>Number of households</th>
<th>Number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathurapati Fulbari VDC</td>
<td>973 households</td>
<td>4458 individuals</td>
</tr>
<tr>
<td>Ward Six</td>
<td>299 households</td>
<td>2238 individuals</td>
</tr>
<tr>
<td>Ward Eight</td>
<td>197 households</td>
<td></td>
</tr>
</tbody>
</table>

Kamalamai Municipality
Kamalamai Municipality is comprised of 9,304 households and 39,413 individuals as of the last census in 2011 (Central Bureau of Statistics, 2012b). Average temperatures range
from 3°C to 18°C and average precipitation ranges from 5mm to 320mm throughout the year (see Figure 12).

Figure 12. Average rainfall and temperature for Kamalamai Municipality from 1990-2009 (World Bank Group, 2015b).

According to the latest census, approximately 65% of all households have access to a water tap or piped water for drinking water, 14% of households get their water from an uncovered well (*kuwa*), and 1.5% of households primarily access rivers and streams for their drinking water. In the chapter five of this thesis I will interrogate how these statistics obscure the experiences of households and individuals living within the municipality. Similar to Mathurapati Fulbari, the majority of households in the Kamalamai Municipality have electricity for lighting, but still use firewood as the primary fuel source for cooking (Central Bureau of Statistics, 2012b). The literacy rate for Kamalamai Municipality’s population aged five years and older is 82% for men and 66% for women. Primary caste/ethnicities present in Kamalamai Municipality include Chetri, Tamang, Brahmin – Hill, Newar, and
Magar; however, the 2011 census collected data on individuals in this municipality from 43 different caste/ethnicities (Central Bureau of Statistics, 2012b). While lower caste individuals do not make up a large percentage of the population in the entire municipality, Ward Five, where this study was conducted, has a high population of both Chetris (high caste) as well as Dalits (low caste). Ward Five of Kamalamai Municipality consists of 511 households, with a population of 2,289 individuals (Central Bureau of Statistics, 2012b). Although contained within the Kamalamai Municipality (which indicates an urban area), Ward Five has characteristics of a more rural area. While inhabitants of Ward Five can make an approximately 30 minute walk to the district headquarters, where one can visit markets, shops, the District Water and Sanitation Office, or catch a bus to Kathmandu, Ward Five remains an area for primarily agriculturalists.

<table>
<thead>
<tr>
<th>Jurisdictional level</th>
<th>Number of households</th>
<th>Number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamalamai Municipality</td>
<td>9,304 households</td>
<td>39,413 individuals</td>
</tr>
<tr>
<td>Ward Five</td>
<td>511 households</td>
<td>2289 individuals</td>
</tr>
</tbody>
</table>

### 3.6 Water Governance in Nepal

According to the definition provided by UNDP, water governance refers to “the range of political, social, economic and administrative systems that are in place to regulate development and management of water resources and provisions of water services at different levels of society” (cited in Pahl-Wostl, 2009). Environmental governance refers to the informal and formal structures and processes that create and enforce rules of access, control, and use of environmental resources. This section describes some of the formal (in this case legal) structures that govern water resources in Nepal.
The Water Resources Act (WRA) of 1992 is the primary regulatory regime that articulates general principles of water governance in Nepal, including provisions related to water resource management and use, ownership of water resources, and the establishment of Water User Associations (WUAs). WUAs are local level institutions and are comprised of individuals who use a particular water resource collectively (Allan, 2004). The WRA stipulates that “[t]he ownership of the water resources available in the Kingdom of Nepal shall be vested in the Kingdom of Nepal” (Water Resources Act, 1992 § 3). This includes all surface and groundwater and water in any other form, such as rainwater (Allan, 2004).

The WRA also lists the priority of uses for water resources found within the Kingdom of Nepal (Water Resources Act, 1992 § 7):

1) drinking water and domestic use  
2) irrigation  
3) agricultural use such as animal husbandry, fisheries  
4) hydroelectricity  
5) cottage industry (e.g. water mill or grinder), industrial enterprises and mining  
6) navigation  
7) recreational use  
8) other uses

Importantly, drinking water is listed as the top priority. Additionally, section 4(3) of the WRA states, “[a] person or corporate body making use of water resources shall make its beneficial use without causing damage to other[s]” (Water Resources Act, 1992 § 4(3)). However, entities responsible for allocating registration of water resources are determined by political boundaries (e.g. jurisdictional boundaries such as district or municipality) instead of hydrological ones (Allan, 2004) posing a challenge to authorities to effectively regulate and enforce such priorities and stipulations.
Despite the fact that the 2011 Nepal Demographic and Health Survey recorded that 88% of rural Nepali people have access to potable water (Ministry of Health and Population, 2012), it is commonly accepted that such data does not reflect the lived experiences of Nepali people (UNDP, 2010). In fact, a 2004 WaterAid study found that 56% of potable water projects in Nepal are in need of major repairs (UNDP, 2010). Additionally, wealth affects access to potable water, where the “richest quintile is eight times more likely to have access to sanitation, and 13 times more likely to have a household water connection” (UNDP, 2010, p. 4).

3.7 Water User Associations (WUAs)

Water User Associations are local level institutions, comprised of individuals who collectively utilize a particular water source, and are allotted the power to make management decisions about said resource. WUAs must first register with and receive approval from the District Water Resource Committee before gaining access to a particular water resource. The Water Resource Regulation (WRR) of 1993 provides more details on this process: “[p]ersons, who desire to use the water resources on [an] institutionalized basis, may form a consumers’ association consisting of a least seven persons as officials and members” (Water Resources Regulation, 1993, R. 3). The WUA submits an application for use of the water resource to the District Water Resource Committee, which decides if a proposed project is economically and technically viable and appropriate before approving an application by issue a certificate of registration (WaterAid, 2005). As is stipulated in the Drinking Water Regulation of 1998, for drinking water projects, the
following criteria are prioritized and considered in this decision-making process (WaterAid, 2005, p. 9)

1) geographical location
2) population
3) quantity
4) capacity of the structure
5) other technical factors

Despite the decision-making power assigned to WUAs, there is confusion regarding allocation of enforcement responsibilities. Allan elaborates:

“Lack of enforcement is partly a result of the insufficiency of regulation, and is compounded by the dearth of available resources and the unwillingness of WUAs to accept the responsibilities for operation and maintenance the legislation imposes upon them. Such reluctance is understandable to some extent because the legislation sets out the responsibilities of the WUAs, but neither offers correlative duties to be adhered to by any of the licensing or registering authorities, nor provides the WUA with commensurate rights and powers to carry out these responsibilities” (2004, p. 597).

UNDP reports that show that there are major limitations to effectiveness of local-level water management, both technically and financially: “The breakdown rate remains high and community-level financial management remains weak” (UNDP, 2010, p. 9).

As a potential solution to the challenge posed to WUAs, Manor (2004) argues for the integration of user committees like WUAs into multi-purpose councils comprised of elected representatives. Manor’s argument is made for more broadly conceived decentralized local-level institutions, and it is unclear if his solution would work in the case of Nepal, since the lack of elected officials at the VDC level problematizes this scenario.
The sections above have situated this research project within the study sites, as well as within the broader socio-political context of Nepal. Next, I will further contextualize the sites of engagement and how climate change impact studies and adaptation efforts attempt to frame and target vulnerability.

3.8 Obscuring experiences

Vulnerability assessments have been an important part of climate change impact studies since the 1980s (Tschakert et al., 2013). Vulnerability assessments are a common tool employed by many researchers and development agency studies to identify particular regions, sectors, or populations which are more ‘vulnerable’ and thus should be the target of climate change adaptation funds, as well as future studies and projects (Hinkel, 2011). Yet individuals and populations of individuals (e.g. women, Nepalese people) are not inherently more vulnerable than another. An assumption of inherent vulnerability implies a homogenization of a group; additionally it ignores the intersection of identity and other forms of social power relations, which contest or reinforce multidimensional vulnerability. Vulnerability assessments often represent “an overemphasis on inherent vulnerability that obscures underlying inequalities” (Tschakert et al., 2013). Indeed, “vulnerability does not fall from the sky” (Ribot, 2010) and vulnerability assessments and indicators may mask structural and systemic factors that produce vulnerability (Barnett, Lambert, & Fry, 2008; Hinkel, 2011). The literature review in this thesis on political ecology, and in particular gender and intersectionality helps to guide this understanding.
In Nepal, many vulnerability assessments are conducted at the district level (for examples, see Nepal’s National Adaptation Plan for Action, GON/MoE, 2010). However, these assessments obscure the diversity of experiences within the district. For example, a specific district may be identified as not particularly vulnerable. This might result from a majority of the households within that region scoring higher on a particular resilience-vulnerability index, which is typically crafted by external researchers. However, what this score may conceal are structural vulnerabilities that differentially affect individuals and households within the region.

In the context of this study, the Kavre district, for instance, scores quite high (0.520) on the UN’s Human Development Index (HDI) (see Figure 13); yet, this assessment does not accurately reflect the multidimensional and dynamic experiences of those who inhabit these areas. It obscures severe differences in experiences with water scarcity within the district that were observed through this research. Findings from this research revealed that some households and individuals within the Kavre district rely on the same source for water all year round, whereas others may walk over an hour in hopes of getting water at an unreliable source.
Figure 13. HDI values across districts, 2011 (UNDP 2014, p. 15).
The HDI value assigned to the district of Sindhuli, which ranks quite low (0.445), falling into the second to lowest HDI value category, is more aligned with the experience of the individuals I spoke to in Ward Five of Kamalamai Municipality. However, Figure 13 seems to suggest that the spatial distribution of factors measured to construct an HDI value are evenly distributed within districts, and this is not supported by on-the-ground evidence. My data supports a variation and range of different experiences with water scarcity within Ward Five of Kamalamai Municipality. The HDI value map (Figure 13), as well as vulnerability maps produced at the district level (see GON/MoE, 2010), conceal the spatial distribution (both physically and socially) and temporal dynamics of such experiences.

Methods in data collection can also obscure the realities of lived experiences. Many UNDP studies, like the HDI index, are conducted at the household level but often rely on survey data that does not disaggregate the household, masking the experiences of the individual, and in particular, the different experiences of women and men within the household. Even when the household is disaggregated, survey data frames the responses of participants in the researcher’s understandings and categories instead of allowing participants to express their views in their own understandings and their own words. While the results derived from these methods (i.e. vulnerability assessments and surveys) are not inherently false, there remains much that is masked by these tools, particularly with respect to lower-level impacts and dynamics. I draw upon a feminist participatory methodology to unpack the lived experiences of water scarcity by community members, and to more fully understand the material, embodied repercussions of water governance. The following section describes in more detail the methodology and methods adopted in this research.
4. Research Design: Methodology and Methods

4.1 Methodology

This research employs a feminist, participatory methodology and is informed by the work of feminist geographers as well as geographers who employ participatory research methods. I chose this particular methodology to more fully explore the lived experiences of water scarcity by community members, and to more fully understand the material, embodied repercussions of water governance. I also chose this methodology to enhance the voice of individuals that may not be heard or recognized in predominant forms of environmental decision-making (e.g. Fazey et al., 2010). A more in-depth discussion of the two anchors of my methodology – feminist geography and participatory research – follows below.

Feminist geography and methodology

Feminist geography does not claim one methodology or approach, but rather “a perspective” (Reinharz and Davidman, 1992). Feminist geographers have engaged with the politics of research, reflexivity, relations with ‘subjects’, representation, and voice; and interwoven with all of these discussions, they have been particularly concerned with power (Monk, Manning & Denman, 2003). In that my research involves cross-cultural studies conducted in the Global South, I am most interested in the debates regarding methodological interventions by feminist scholars in this area of scholarly work.

Mohanty has argued that western feminists have been quick to depict women of the Global South as vulnerable, passive, and victims of oppression (1988). Yet humanitarian projects
and human rights discourse in the 21st century continue to rely on these stereotypes (Abu-Lughod, 2013). Spivak has been equally critical of the knowledge production of Western feminists, arguing that despite their critique of hegemonic processes of knowledge production, much of earlier feminist writings are grounded in the “imperialist vision of redemption” (Spivak, 1986; 1987 cited in Chowdhry and Nair, 2013, p. 14). Tsing describes the “deep irony” that is the universalism “implicated in both imperial schemes to control the world and liberatory mobilizations for justice and empowerment” (2011, p. 9).

The question, according to Abu-Loghod, is: can we find a balance between cultural relativism, where we say it’s not my business to judge or interfere, and a transnational sense of social justice? Abu-Loghod elaborates. “We should want justice and rights for women, but can we accept that there might be different ideas about justice and that different women might want, or even choose, different futures from one that we envision as best?” (Abu-Loghod, 2013, p. 43). It is these interventions into feminist research that my research seeks to build upon and that guide my methodology.

**Participatory research**

Participatory research has grown out of an attempt to overcome power asymmetries in development practice and research (Schurr and Segebart, 2012). Collaborating with research participants in a key part of participatory research. However, like all methodologies, even in participatory processes, power relationships and inequalities can be reinforced or enhanced (Cooke and Kothari, 2001; Guijt and Shah, 1998). The extent to which this occurs depends on how the method is implemented (Martin and Hall-Arber, 2007; Parfitt, 2004). Participatory research methodologies can *confront* this limitation,
through critical self-awareness, constant reflection, reflexivity, and actively considering and accounting for power relationships and power asymmetries (Schurr and Segebart, 2012; Fazey et al., 2010). In “Can the subaltern speak?” (1988) Spivak calls for constant engagement with the historical and geographical relationships that connect the researcher and research participant. Participatory methodologies, combined with a feminist methodology, are well suited to perform these topographies, and thus I have chosen them to guide this work.

**Positionality**

I subscribe to Donna Haraway’s concept of situated knowledge and seek to avoid the ‘god-trick’ of disembodied research (i.e. knowledge which claims to be universal, from nowhere and from no one). Haraway’s situated knowledge recognizes all knowledge comes from somewhere, and is shaped by someone, and thus is necessarily partial (1988). Writing positionality into our research practice can help to facilitate the recognition of the embodied nature of our vision (Rose, 1997). I employed a fieldwork diary to practice critical reflexivity (Dowling, 2010, p. 31-33) constantly reflecting on my power, position, and identity in relation to my research process and design and making modifications when appropriate. Through this project I have sought to conduct research that is accountable (locatable) and as transparent as possible. However, this study has been shaped and influenced by my position(s) in the world, and although these subjectivities are relationally produced and continually shifting, feminist objectivity recognizes that the lenses I use to view and interpret the world are thus necessarily partial and imbued with power imbalances (Nightingale, 2011; Haraway, 1988). I acknowledge the scholarship that is produced
through my work is embodied and heavily shaped by my gaze, however my hope is that this research can and will serve the interests of Nepalese community members involved in the project through dialogue, reflection, and an identification of what changes to environmental governance processes and structures can further enhance adaptive capacity.

4.2 Methods

Semi-structured interviews (n=31) and focus group discussions that incorporated participatory mapping (n=2) comprised the methods utilized for this research and were conducted over a five week span (mid May to late June 2014) of fieldwork in two different study sites in Nepal. IRB approval was received prior to commencement of fieldwork (Penn State IRB protocol ID 45456). As I am not a fluent Nepali speaker, all data was collected with the help of a research assistant who is a Nepali native speaker. The research assistant translated all interactions with interviewees and focus group discussion participants. I chose to use semi-structured interviews and focus group discussions so that the participants have more space to contribute to the construction of knowledge. These methods attempt to allow for the participants to talk about issues of most importance to them, the information and conversations most useful to them, and the gaps that need to be addressed, according to participants.

**Semi-structured interviews**

Two different groups of participants engaged with this study in semi-structured interviews. One group consists of individuals (community members) living in the study site locations.
The other group consists of individuals who work for administrative offices and NGOs within Nepal.

Semi-structured interviews are organized and content-focused, yet they allow for flexible questioning (Dunn, 2010, p. 110). These individuals were identified through purposive sampling so as to include a range of individuals according to age, gender, and caste/ethnicity residing within the communities. I relied on contacts established through key collaborators for HICAP (Dr. Suman Bisht, ICIMOD and Dibya Gurung, WOCAN), and am fully cognizant that these connections impact how the researcher is perceived, and thus influence and impact my research process. See Table 8 for a breakdown of demographic data of the semi-structured interview participants.

Table 8. Demographic data on semi-structured interview participants

<table>
<thead>
<tr>
<th></th>
<th>Mathurapati Fulbari community members</th>
<th>Kamalamai community members</th>
<th>Administrative officials and NGO representatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>4</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Females</td>
<td>6</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>26-45</td>
<td>4</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>46+</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Caste/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brahmin</td>
<td>2</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Chetri</td>
<td>0</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Dalit</td>
<td>6</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Janjati</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The content of the interviews conducted with community members centered on everyday experiences with water use, access and control. Key research questions of my study are included below, with a full list of questions in Appendix I.
• How do you obtain your water?

• What are the structures and processes of water governance (both formal and informal)?

• Who is involved/left out of these structures and processes?

• How do these structures and processes impact lived experience? How do these structures and processes impact capacities and opportunities?

Semi-structured interviews were also conducted at the district headquarters for each study site. Dhulikhel is the district headquarters for the Kavre district and Sindhulimadhi is the district headquarters for the Sindhuli district. Interviews lasted between one and two hours, and all interviewees were higher-caste males.

Interviewees at the district headquarters included representatives from the following administrative offices:

- District Soil Conservation Office
- District Drinking Water and Sanitation Office
- District Development Committee Office – Energy and Environment
- District Agriculture Extension Office
- Kamalamai Municipality Office
Interviews were also conducted with representatives from non-governmental organizations (NGOs) that are involved in water development projects in the study site locations:

- Shanti Jana Aadarsha Sewa Kendra (SIASK)
- Integrated Effort for Development Nepal
- Resource Management and Rural Empowerment Centre (REMREC)

Key research questions that comprised these interviews are listed below, with the full list of questions in Appendix II.

- How is your organization involved in water governance in this region?
- Who participates/is left out of these water governance processes and structures?
- How does climate change, and specifically climate change adaptation factor into your organization’s mission and efforts?

**Focus group discussions and participatory mapping**

Focus group discussions allow for interactions between participants, providing a space to explore different views, opinions, and experiences as well as the social production of knowledge (Cameron, 2010). Purposive sampling was conducted at the community level to include a diverse range of participants from different caste/ethnicities, ages, and genders. A focus group discussion was conducted in each of the study site locations, one in Mathurapati Fulbari and one in Kamalamai Municipality. Focus group discussions lasted between two to three hours and involved 14 (Kamalamai Municipality) to 25 (Mathurapati
Fulbari) individuals respectively. Demographic data on participatory mapping participants is indicated in Table 9.

Table 9. Demographic data on participatory mapping participants

<table>
<thead>
<tr>
<th></th>
<th>Mathurapati Fulbari</th>
<th>Kamalamai Municipality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>16</td>
</tr>
<tr>
<td>Caste/ethnicities</td>
<td>Dalit, Brahmin, Janjati,</td>
<td>Chetri, Dalit</td>
</tr>
</tbody>
</table>

Each of these focus group discussion meetings was organized around the theme of water scarcity and access. Each meeting began first with a participatory mapping activity. Participatory mapping is part of a growing body of participatory research. Participatory mapping recognizes the geospatial knowledge of local people and aims to produce “maps of, by and for the people” (Herlihy and Knapp, 2003). This method, like all research methods, is not without critique. Critical geographers rightfully continue to question the extent to which participatory research can truly be participatory, and have called attention to power imbalances that persist even in this participatory format (Pain, 2004). However, despite limitations, the participatory mapping activities utilized in the focus group discussions provided a powerful visualization tool to stimulate further discussion about water use, access, and control.

Participatory mapping protocol for this study:

1) Before beginning each mapping activity, I drew a landmark on the butcher paper the participants would then use to create their map. After consulting with participants, this landmark ended up being the roads that served the surrounding wards.
2) After I had drawn the initial landmark to situate participants, and community members were familiarized with what the activity entailed, they began the mapping of the community, using colored markers to add houses, trees, water sources and infrastructure (e.g. water taps, water tanks) to the map (see Figures 14 and 15 below).

Figure 14. Participatory map of Ward Five, Kamalamai Municipality, Sindhuli District. Photos by author.
Figure 15. Participatory map of Ward Six and Eight, Mathurapati Fulbari VDC, Kavre District. Photo by author.
In both instances, participants identified the location of currently utilized water sources, as well as the locations of sources used in the past, but have since dried up (e.g. a dry well), or the infrastructure is no longer functional (e.g. a water tap that is in disrepair). Thus, the map produced by participants incorporated both a spatial and temporal dimension.

3) Mapping inevitably encouraged discussion about water access and use as participants discussed what sources and infrastructures should be mapped, and where. Participatory maps above include some or all of the following water sources or infrastructures (Table 10):
Table 10. Participatory mapping features

<table>
<thead>
<tr>
<th>Rivers (<em>kholas</em>)</th>
<th>Houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streams (<em>kholsas</em>)</td>
<td>Agricultural terraces</td>
</tr>
<tr>
<td>Private taps</td>
<td>Forests</td>
</tr>
<tr>
<td>Neighborhood taps</td>
<td>Roads</td>
</tr>
<tr>
<td>Uncovered wells (<em>kuwas</em>)</td>
<td>Schools</td>
</tr>
<tr>
<td>Tubes that connect taps</td>
<td></td>
</tr>
</tbody>
</table>

Where water sources and infrastructures should be located on the map was often discussed in relation to where people lived. Many participants insured that their home was included in the map, as well as the source(s) and infrastructure(s) that they used throughout the year (for participants in Ward Five of Kamalamai Municipality, this was particularly salient as most everyone I spoke to used different sources in the dry season and the wet season).

4) After the mapping was completed, the more focused and in-depth group discussion commenced. Although the maps served to illustrate important aspects of water access and use throughout the process, it was only during the in-depth group discussion that the nuances of power dynamics and control over water and decision-making processes emerged.

Key topics discussed during post-mapping de-brief included:

- Environmental changes, in particular water scarcity
- Social changes
- Uneven access to water within community
- Causes of water scarcity, uneven access
- Solutions to address scarcity, unevenness
4.3 Data Analysis

Notes from interviews and focus group discussion with participatory mapping activities were analyzed via in vivo and analytic coding using NVivo 10. Strauss’s four types of coding themes (conditions, interactions among actors, strategies and tactics, and consequences) were helpful for this analysis (Cope, 2010). As this study aims to tease out how these social power relations interact with environmental governance processes to shape adaptive capacity, characteristics of participants (gender and caste/ethnicity) also informed the coding structure. A list of all codes used in this analysis are located in Appendix III.
5. Results

In what follows below, I present my findings, organized by three major themes: water scarcity, scalar mismatches, and embodiment.

5.1 Water scarcity

Water scarcity is unevenly experienced within each of the study site locations for this research. What follows in this section is an attempt to capture the diversity of experiences shared by the people living in both localities. These empirically grounded results help to interrogate the scales and levels, including the level of the body, involved in the governance of water.

“Water scarcity has worsened to a great extent. We used to have springs here and there during monsoon. But these days we rarely have springs even during monsoon. We used to collect water at them” - Chetri woman, Kamalamai Municipality

“We had the kholsa (stream). It used to be a permanent source, but gradually it got thinner and thinner. We thought that this source would serve us for a longer time in the future. But the source got thinner and then we made a request to use the neighborhood tap. We would pay a portion of the cost of construction if we could use it, but they rejected our request. We didn’t want to engage in further disputes. My husband said please don’t quarrel with people, better to go to the khola (river).” – Chetri woman, Kamalamai Municipality

“The government invested in a drinking water project. Some people got assistance, others did not. As a citizen, we have the same government, we should have equal access. It should not matter if you live at the top of the hill or the bottom. We all have the right to water.” – Janjati woman, Mathurapati Fulbari

There is insufficient water for community demands in both study site locations. However, water scarcity is felt unevenly among members of each community. The experiences with water access and use in Mathurapti Fulbari range from households who have to seek water
year-round from a public tap (see Figure 17) which takes a half hour walk, to households who share a gravity-fed neighborhood tap (see Figures 18a and 18b) which is a minute’s walk away, to others who have access to an electric pump-powered private tap at their home.

In Ward Eight of Mathurapati Fulbari, there are a total of 496 households, but only 35 households have access to a gravity-fed neighborhood tap, of which there are 16. In contrast, there are 22 Brahmin households in Ward Six of Mathurapati Fulbari that receive their water from a private tap system that is fed by an electric pump (as opposed to the gravity fed systems of taps that have been described up until this point). This example suggests unevenness experienced along lines of caste/ethnicity.

In Ward Five of Kamalamai Municipality, a majority of interviewees (nine out of twelve) stated they have access to a neighborhood tap, however it only provides water during the wet season (i.e. in runs dry in the dry season), and thus water must be carried from the closest river (*khola*), or stream (*kholsa*), or uncovered well (*kuwa*) during the dry season. However, it became apparent through conversations in semi-structured interviews that there are a number of households (out of the 511 households in Ward Five) who, although they may technically have access to a neighborhood tap, are unable to get water from it even in the wet season. I do not have a concrete number to say how large or small this population is, but several interviewees informed me of entire neighborhoods (who are positioned at a lower altitude) that are unable to get water from their tap year-round because the water has been ‘used up’ by users higher up on the hill who are more directly connected
to the source of water that feeds the gravity tap system. Additionally, I was informed that these neighborhoods are primarily Dalit. This example reinforces unevenness of water scarcity along caste/ethnicity lines.

The uneven experience of water use is also evident in the sharing of neighborhood taps. Shared neighborhood taps in both communities ranged from a collective source shared by as few as five households to up to fifteen households, with an average of between four and six members in each household. Every interviewee who either regularly accessed a public tap or neighborhood tap at some point in the year spoke of waiting in queues to fill their gagris (Figure 21).

Figure 17. Public tap. Photo by author.
Figure 18a. Neighborhood tap. Photo by author.

Figure 18b. Neighborhood tap. Photo by author
Figure 19. River (*khola*) during dry season. Photo by author.

Figure 20. Uncovered well (*kuwa*). Photo by author.
“Our taps are not sufficient. Disputes arise in course of filling gagris. There is inequality.” – Dalit woman, Kamalamai Municipality

In Ward Eight of Mathurapati Fulbari, no matter how many individuals make up one household, a person may only take 100 L per day per household from the gravity-fed neighborhood tap. This 100 L would be used for all purposes: cooking, drinking, cleaning, etc. Interviewees spoke of the struggle managing only 100L.

“100 L was hard when my kids lived here, but it’s still hard” – Dalit woman, Mathurapati Fulbari

The households in each study site who did not have access to any kind of tap (private, neighborhood, or public) have to collect water from a nearby river (khola) (see Figure 19) or stream (kholsa), or uncovered well (kuwa) (see Figure 20). During the dry season, this experience represents most households inhabiting Ward Five of Kalamalai Municipality, however there are households who are unable to get water from the tap even during the wet
From the interviews conducted as part of this study, uncovered wells often take at least half an hour to walk to, and any of these sources may require up to an hour of waiting in a queue at the source due to a slow trickle of water at the source and the demand of other households.

“All the villagers from [this area] depend on the kuwa (uncovered well) when they have scarcity. Almost every year during the dry season we need to go to the kuwa, but this one was especially dry; it was a long drought. It was extreme this time. There were lots of people at the kuwa. There was a long queue. We had to sometimes wait for one hour” – Dalit woman, Kamalamai Municipality

While not the predominant experience of the individuals I interviewed, there were a couple of households who rely on water that does not technically ‘belong’ to them. For example, a household that is not associated with a neighborhood tap may request to fill a gagri at the source. Depending on the relationship between users, sharing may occur without incident. However, if the ‘owner’ of the source does not wish to share, the requestor may be denied, and may even be shamed by the owner. In certain circumstances, some households may take water from a source for the use of which they have not been granted permission.

Table 11 and 12 below attempt to present a simplified portrait of the unevenness of water scarcity by indicating what water sources were utilized by interviewees in each study site, with primary, secondary, and at times, tertiary sources listed. This table does not represent the full range of experiences with water scarcity, as many other factors help determine this experience, such as practices of access, time spent in a queue waiting for water, and the number of people living in a particular household; these are factors that came up in discussions following the participatory mapping activities. Additionally, this table only
presents water sources utilized by the individuals I interviewed, and thus captures only a partial glimpse at the experiences of individuals inhabiting the area (neighborhood or ward). However, during interviews, participants provided information about the experiences of those they have social connections to (such as neighbors, friends, other individuals within the ward or neighboring wards). These conversations help to construct a more full picture of experiences with water. Nonetheless, Tables 11 and 12 provide information regarding what interviewees utilized what water sources, helping to indicate the range and unevenness of experiences with water source utilization.

Table 11. Water sources utilized by interviewees from Mathapurati Fulbari.

<table>
<thead>
<tr>
<th>Demographic information</th>
<th>Water sources utilized (primary, secondary, tertiary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dalit, older woman</td>
<td>Neighborhood tap, but must go to public tap for cattle, washing, bathing</td>
</tr>
<tr>
<td>Dalit, young woman</td>
<td>Public tap, sharing from neighbor, neighborhood tap disconnected</td>
</tr>
<tr>
<td>Janjati, middle aged woman</td>
<td>Neighborhood tap</td>
</tr>
<tr>
<td>Janjati, older woman</td>
<td>Neighborhood tap</td>
</tr>
<tr>
<td>Dalit, middle aged woman</td>
<td>Neighborhood tap</td>
</tr>
<tr>
<td>Brahmin, middle aged man</td>
<td>Electric pumped neighborhood tap system</td>
</tr>
<tr>
<td>Dalit, young woman</td>
<td>Public tap, take without permission</td>
</tr>
<tr>
<td>Dalit, older man</td>
<td>Kholsa</td>
</tr>
<tr>
<td>Dalit, young man</td>
<td>Neighborhood tap (only for drinking), public tap, kholsa</td>
</tr>
<tr>
<td>Brahmin, middle aged man</td>
<td>Neighborhood tap</td>
</tr>
</tbody>
</table>

Table 12. Water sources utilized by interviewees from Kamalamai Municipality.

<table>
<thead>
<tr>
<th>Demographic information</th>
<th>Water sources utilized (primary, secondary, tertiary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chetri, middle aged woman</td>
<td>Neighborhood tap, but goes to khola for washing and bathing</td>
</tr>
<tr>
<td>Dalit, middle aged woman</td>
<td>Neighborhood tap, but not enough in dry season, must dig a kuwa</td>
</tr>
<tr>
<td>Chetri, older woman</td>
<td>Neighborhood tap, but dig kuwa near khola in dry season</td>
</tr>
<tr>
<td>Chetri, middle aged woman</td>
<td>Neighborhood tap, sufficient all year round</td>
</tr>
<tr>
<td>Chetri, young woman</td>
<td>Neighborhood tap, but khola in dry season and all year round for washing</td>
</tr>
<tr>
<td>Dalit, older woman</td>
<td>Kholsa</td>
</tr>
<tr>
<td>Dalit, older man</td>
<td>Neighborhood tap, but in dry season khola</td>
</tr>
<tr>
<td>Chetri, middle aged women</td>
<td>Neighborhood tap, but in dry season khola</td>
</tr>
<tr>
<td>Chetri, older woman</td>
<td>Neighborhood tap, but in dry season kholsa</td>
</tr>
</tbody>
</table>
Chetri, older woman | Kholsa, sharing from neighbor, then khola if not sufficient
---|---
Chetri, middle aged man | Personal tap, well, during drought or emergency share with neighbors
Dalit, middle aged woman | Neighborhood tap, but we don't get as much as others, in dry season kuwa

This section has demonstrated the range of experiences with water scarcity, calling attention to the unevenness experienced by individuals. This unevenness is experienced among those within the household in that those who conduct the practice of fetching water are differentially exposed to embodied consequences of water scarcity (see 5.3 Embodiment and practices of access for more detailed explanation of this finding). Additionally, uneven experiences among users of different castes/ethnicities was observed through this study.

In the next section, I further explore how this unevenness is produced in part through social power relations that are embedded into the scalar dimensions of processes and structures of water governance.

5.2 Scalar mismatches

Using the analytical lens of scalar mismatches, my research findings suggest that the temporal, spatial, and jurisdictional scales involved in water governance are mismatched for the water demands and water scarcity concerns of the communities that reside in this study’s site locations. Before discussing the findings, I describe my analytical lens, scalar mismatches.
Analytical lens: scalar mismatches

It is widely acknowledged that the unit of analysis can have profound effects on the scope, extent and the understanding of the findings of research. Political ecologists are particularly perceptive to scale as a unit of analysis, as well as the social construction, and politics of scale (Swyngedouw and Heyen, 2003; Neumann, 2009; Norman et al., 2012): “there’s nothing inherent about scale” (Brown and Purcell, 2005). This research embraces a critical perspective of scale, which is one that is often explored by political ecologists (Bulkeley, 2005; Neumann, 2009). A critical perspective of scale is one that treats scales as not given but instead dynamic, socially constructed, and contested through interactions with social actors (Özerol and Bressers, 2015; Brown and Purcell, 2005; Silver, 2008; Neumann, 2009).

I draw from scholars in the field of social-ecological systems (Cash et al., 2006; Cummings et al., 2006) to build one of the analytical lenses I use to discuss my results: scalar mismatches. Cash et al. (2006) articulate the importance of the delineation of scale and levels in the context of research on the governance of socio-ecological systems. Some geographers and other scholars use scale and level interchangeably, but this research project embraces the distinction between scale and level also made by Özerol and Bressers (2015): scale is “a dimension of an object or process” and level is “the unit of analysis on a given scale” (p. 1). Özerol and Bressers’ conceptualization of scale and level contribute to a characterization built by the earlier contributions of several other scholars (Cash et al., 2006; Turner et al., 1989; Gibson et al., 2000: Silver, 2008). To clarify the distinction between scale and level, I provide an example: the temporal scale represents a dimension
of the process of time, whereas days, months, and years represent possible levels along this scale. This study aligns with the conceptualization of scale and level as separate and distinct. The scales examined by this research project are the spatial, temporal, and jurisdictional dimensions of water governance. Within each scale, this study looks at the different levels as units of analysis positioned along each scale. For illustration, see Figure 22.

Figure 22. Levels of analysis positioned along spatial, temporal, and jurisdictional scales (adapted from Cash et al., 2006).
Within the literature on scales and levels, Cumming et al. (2006) review a series of case studies wherein scale and level mismatches occur in the governance of socio-ecological systems. Their working definition is as follows:

“Scale mismatches occur when the scale of environmental variation and the scale of the social organization responsible for management are aligned in such a way that one or more functions of the social-ecological system are disrupted, inefficiencies occur, and/or important components of the system are lost” (3).

Scales and levels of units of analysis are particularly salient in the context of water governance because of scalar mismatches that have been described relating hydrological and jurisdictional boundaries (Özerol and Bressers, 2015; Lebel et al., 2005; Norman et al., 2012). This research project does not explore this particular mismatch; instead it uses the concept of mismatches as an analytical lens to identify scalar misalignments along the temporal, spatial, and jurisdictional scales to show power relations embedded in decision-making processes of water governance.

In this section, I argue the following:

1) Temporal, spatial, and jurisdictional scalar mismatches exist within water governance processes and structures;

2) These mismatches reveal social power dynamics that constrain (provide a barrier) or help facilitate (provide a bridge) to adaptive capacity for particular social actors.

I argue that scalar mismatches help produce new and exacerbate existing uneven experiences with water scarcity, and thus differential adaptive capacities. These
mismatches work to shape power imbalances within communities, which prevents sustainable and equitable water governance.

**Temporal scale mismatch**

A temporal scale mismatch means that the temporal scale of social organization responsible for management is misaligned with the scale of environmental variation. In the context of this study, the social organization responsible for management includes both formal and informal governance structures and processes. An important component to the social-ecological system in this study is the ability to provide water to inhabitants of the area. This important component of the social-ecological system, as it is supported through the results of this study, has been lost over time (e.g. people’s needs for water is insufficiently addressed). Despite interventions via water development projects to meet this demand, these projects are unable to satisfy the community’s needs over time. I argue that this represents a temporal scale mismatch. Results gathered during the participatory mapping activities, where community members indicated what water sources had provided sufficient water in the past but no longer supply water year-round or at all support this claim.

Whereas Cumming et al. 2006 solely examine environmental variation and is misalignment with social organization, my study supports social variation as well as environmental variation as factors that shape this mismatch. Focus group participants and interviewees spoke of social and environmental changes occurring in the landscape that outpace the capacity of water development projects. Social changes such as population growth,
migration, election cycles, changes in household dynamics (e.g. marriages) and environmental changes such as deforestation and climate change all put pressure on water resources. These pressures work to constrain the capacity for water development projects to satisfy the needs of community members over time. Two case studies below help to further illustrate this dynamic.

Case study 1: Kamalamai Municipality

A gravity-fed neighborhood tap system came to Ward Five of Kamalamai Municipality 14 years ago. When the tap system was first installed, everyone connected was able to obtain sufficient water. Interviewees informed me that over time the water source simply became so thin that presently, water no longer reaches the taps located downstream on the hill (i.e. further from the source), and thus users of these taps are unable to obtain water from the tap year-round. All interviewees expressed concern over the sources getting thinner and thinner, even in the wet season, and cited droughts and deforestation as potential causes for the decline. These results suggest that environmental variation occurs on a temporal scale that does not match the social needs of this social-ecological system. The water tap system represents a product of social organization used to manage and utilize the source; however, over time, a breakdown in its ability to serve a key function (e.g. provide water) has been observed. Thus, I argue that this represents a temporal scale mismatch. Overwhelmingly, in Ward Five of Kamalamai Municipality, the taps where water no longer reached, even during the wet season, were located in Dalit neighborhoods.
Through this case study, we can see that the water source and water infrastructure cannot sustain the needs even at the neighborhood level over time (much less the ward or municipality level) and this dynamic differentially impacts individuals within the community, illustrating gaps between high and low caste inhabitants.

**Case study 2: Mathurapati Fulbari**

A neighborhood in Ward Eight was able to gain access to a gravity-fed neighborhood tap system through an agreement by a political party leader running for election. The individual ended up being elected and followed through with his promise. Yet, just a couple years later, the individual was no longer a party leader, and the tap system was disconnected since this individual no longer had jurisdictional power over the tap system.

Through this example, we can see that, due to social changes such as individuals elected to or removed from positions of formal political power, water access was impacted. Over the course of political elections, individuals might gain access or lose access to water. Because people’s needs for water exceed the time span of elections, I argue that water access tied to political elections represents a second type of temporal mismatch. In this case, the inhabitants of the affected neighborhood are primarily Dalit. As the individuals experiencing the brunt of the impacts of this temporal mismatch are of lower caste, this case study further illuminates the constraints or barriers to adaptive capacity along caste/ethnicity lines.
Both these case studies support the claim that the level at which water is temporally governed is mismatched for the water demands of the communities. Additionally, current water governance processes and structures are unresponsive to temporally dynamic social and environmental changes taking place at these sites of engagement. Importantly, the repercussions from this temporal scale mismatch are unevenly experienced within the communities of both study site locations. A disproportionate amount of Dalit neighborhoods are the predominant recipients of this unevenness. Figure 23 represents a simplified and abstracted scenario that was observed in both communities. The figure is meant to visually demonstrate how access or ability to utilize water taps changes over time and is differentially experienced. Water taps represent only one component which facilitates water resource access and use (other sources of water and water infrastructure represents other components), and thus this figure shows a very partial representation of a more nuanced interaction with water resources and water use infrastructure that was observed in this study’s sites of engagement. For example, this figure does not account for other forms of water sources and water infrastructure such as *kholsas* and *kholas* and public taps. Nonetheless, the figure helps to illustrate the existence of a temporal scalar mismatch, and that this mismatch impacts lower caste individuals to a greater extent.
Spatial scale mismatch

A spatial scale mismatch means that the spatial scale of the social organization responsible for management is misaligned for the scale of environmental variation. Water development projects in both study site locations are very fragmented, as projects and water sources serve only portions of any community (e.g. a particular project may serve only one or two neighborhoods in a ward). Water development projects can improve a user’s access to water, and serve to alleviate or reduce experiences of water scarcity, however, they do so in an uneven and spatially fragmented way. Additionally, this uneven, spatial fragmentation seems to align with caste/ethnicity.
While both study sites are mixed in regards to socioeconomic status and caste/ethnicity, I observed and confirmed through interviews that there is a spatial component to the distribution of these households. Many (Dalit) interviewees stated ‘we are a Dalit neighborhood here’. For example, one woman, from Ward Eight of Mathurapati Fulbari: “We are a Dalit community. High caste people live down there. We are closer to the source, but we are not allowed to use it.”

The case study below suggests that caste/ethnicity plays an important role in spatially defined boundaries that separate access, use and control of water.

Case study 1: Mathurapati Fulbari

A deep-boring water project was recently implemented in a neighborhood of twenty-two Brahmin (high caste) households. This type of water development project relies on an electric pump that pulls water from groundwater sources and fills a tank. Tubes connected to this tank are fed to each of the twenty-two households to provide private taps.

An interview with a Brahmin man from this neighborhood who has access to this source of water infrastructure elaborates on the project:

“We didn’t have the money to build the infrastructure until now; it took five years....We run the electric pump every other day for two hours. We don’t feel scarcity of water now....We have sufficient water.”

This project was implemented through investments by the households who use the water source, as well as through grants obtained from the district and national level agencies. However, the adjacent neighborhood, which is primarily Dalit and
Tamang (marginalized caste/ethnic groups), did not come to know about this kind of water development project and the means to obtain it until after it was constructed in the predominantly Brahmin neighborhood.

This elitist and exclusionary dynamic was also supported by interviews with NGO representatives and officials at Kavre district headquarters:

“Communities typically find out about programs [e.g. plastic pond, deep-boring water development projects] because the Agriculture Development office holds an orientation at the VDC office. These meetings are dominated by males and higher caste, more well-off individuals. Often, lower caste and poor find out about the program because it is implemented at elite’s homes. Then they make their demands at the Agriculture Development office. But ultimately, elites more regularly come to the office.” – District level representative from Agriculture Extension office.

Interviewees from Dalit neighborhoods spoke of not having time – because of domestic chores, agricultural work, or employment – to attend WUA and other local level committee meetings as well as traveling to VDC/municipality or district headquarters to make demands; thus they expressed frustration with not being able to voice their concerns and not being able to take advantage or even learn about opportunities.

If the level of interest for comparison was the neighborhood level, then the case study above would show that the inhabitants of a particular neighborhood do indeed benefit from this spatial scale delineation. However, if we scale up to the ward level, we would see an adjacent neighborhood which does not benefit similarly from these water development project interventions. The spatially fragmented nature of water development projects, as supported by interviews with district level administrative office and NGO representatives,
is a product of one of the more striking processes of water governance, the demand-driven process. Those that most often make demands are not always the ones with the most need, but in fact they simply are the ones better positioned to make such demands. Those that are better positioned to make these demands tend to characterized by more financial capital, more abundant spare time, and/or more political connections to make these demands while those in more desperate situations do not enjoy the same luxury, and consequently lose out.

My argument is that the level at which water is spatially governed is mismatched for these sites of engagement. Specifically, processes and structures of water governance (e.g. how communities are exposed to and can voice demands for water development projects) are executed at spatial resolutions that are inappropriately matched for what is needed to sustainably and equitably govern water resources. For example, the finest spatial resolution at which the Nepali Census assesses water and sanitation need, is the ward level (although this data is based on household surveys). Additionally, the demand-driven approach that district level administrative offices and NGOs use to facilitate their water project development work feeds a spatially fragmented and I argue, privileged-approach. So, what emerges is need assessed by the Census at the ward level, and projects implemented at the neighborhood, or clusters of neighborhood level (i.e. not the ward level). Confounding this situation is the ‘on the ground’ experience of water scarcity (see section 5.3 Embodiment and practices of access).

Results from my study show water development projects do not necessarily target those with the most need; instead, they seem to target those who can demand it most forcefully. Additionally, as shown in the discussion of the temporal scale mismatch, even when
development projects have intervened and attempted to alleviate or eliminate water scarcity, over time, all or part of the user community may not continue to feel such effects. In the case study 1 of the temporal scale mismatch discussion, I described how a part of the user community was no longer able to obtain water from the gravity-fed neighborhood tap system. The case study also applies to this discussion of spatial scale mismatches because again, caste/ethnicity seem to play a role in the creation of spatially defined boundaries of water access. In this case study, those further from the source (primarily Dalit neighborhoods) were no longer able to obtain water from the tap even during the wet season. However, the Chetri (higher caste) neighborhoods higher up on the hill (and closer to the source) were still able to obtain water from the tap, although only in the wet season.

Incorporating finer levels of spatial analysis into water governance, through perhaps a neighborhood-level assessment of water resource need, would potentially help to disaggregate the community, and may help to render visible the people whose water resource needs are of greatest concern.

Jurisdictional scale mismatch

Water Use Associations (WUAs) are required by current water governance legislation of Nepal such as the Water Resource Act (WRA) 1992 and Water Resource Regulation (WRR) 1993 to implement water development projects at the local level. Responsibilities and duties for the implementation, facilitation, and maintenance of such local level water development projects are shared amongst the WUA and other levels of jurisdictional bodies, such as the Village Development Committee (VDC) or Municipality, and the
District Development Committee (DDC), as well as international and national level non-governmental organizations (NGOs). Typically, the relevant DDC or VDC/Municipality will bear some of the financial costs for new water development projects and require the WUA to facilitate the acquisition of required labor and materials. The WUA is also mainly responsible for maintenance of such projects.

I argue that the WUAs constitute a jurisdictional scale mismatch, in that they represent a social organization that lacks the capacity to fulfill what they are asked to perform. Thus a key functioning of the social-ecological system – the ability to provide water to users – is lost. The WUAs in the study sites for this project seemed to be unable to provide effective lasting governance of the water resources utilized under their jurisdiction. Interviews with community members who also serve on the local WUA revealed that despite that fact that a system of maintenance and repair was in place through the WUA, many of the taps remain in disrepair. Water development projects fall into disrepair due to dysfunctional materials or construction or flooding and extreme precipitation events, or they simply cannot meet the demand of the users (i.e. they provide inadequate and unreliable amounts of water). Interviews with community members revealed that the WUA possesses insufficient resources, capital, technology, and know how to repair damage done to existing projects and to implement new projects. Interviewees commonly spoke of not only the WUA’s insufficiencies related to maintenance and repair work but also their lack of capacity to enforce regulations. A case study below helps to illustrate this point.
Case study 1: Mathurapati Fulbari

When representatives from the Ministry of Environment came to Mathurapati Fulbari to discuss with community members the installation of plastic ponds to capture rainwater as a measure to deal with water resource needs, the expectations from the Ministry was that community members would decide who would receive the plastic for the fifteen ponds for which the Ministry would provide the materials. The representative from the Ministry stated that it was the community that needed to adapt to climate change, and it was up to them to decide who should receive the plastic for the project. The representative stressed that community members should consider lower caste and marginalized people as recipients of the plastic. However, the representative did not discuss how this process could be facilitated and provided no means for community members to carry this out.

Interviews with other district level officials provided similar findings:

“We have no direct involvement in providing equal access. What we can do is request that people are equal.” – District level official from Water Supply Division of Drinking Water and Sanitation Office

Interviews also revealed that WUAs lack the capacity to ensure adequate oversight and transparency of water development projects.

“When development projects come in, they are low quality. The money for the projects goes into the pockets of people involved.” – Chetri woman, Kamalamai Municipality

Community members expressed frustration with this lack of oversight and transparency:
“All we know is that development projects are not done properly. We can’t tell exactly what has gone wrong.” – Brahmin man, Kamalamai Municipality

An interview at the municipality level supports the claim that the municipality level is also constrained. The interviewee elaborates:

“Key challenges are budget constraints, and so there is a limit on a number of projects. Because of this, there is often a compromise on quality of building materials, like tube. But if the quality is less, it’s not durable.” – Municipality level official

The creation of the WUAs is a product of decentralization. Decentralization represents the legislative response by states to pass off decision-making power to lower jurisdictional levels with the accompanying logic that this move allows individuals closest to natural sources the opportunity to make decisions about that resource (i.e. decentralization empowers local communities). However this global movement has been critiqued for the corresponding lack of human and financial capital that exists at these lower levels (Goldin, 2013). Goldin elaborates: “Too often decentralization and devolution by state actors constitutes nothing short of an uncomfortable shifting of the state’s responsibilities and a failure to commit the financial and human resources required for participatory practices” (2013, p. 385). The Local Self Governance Act 1999 and Local Self Governance Regulation 1999 represent legislation passed by the Nepalese government to assign powers to local bodies at the village, municipality, and district level to plan and manage services (e.g. drinking water, irrigation, sanitation and conservation of water resources) (WaterAid, 2005). Among the rights and powers of the District Development Committee (DDC), one is the power to transfer drinking water projects to WUAs, wherein the WUA is then
responsible for the project’s operation, maintenance and repair (WaterAid, 2005, p. 28). This transfer of power was witnessed in both the communities that were engaged with this study.

This research does not argue against ‘empowering’ local jurisdictional bodies with decision-making power over their resources. However, it finds that water governance processes taking place in these study sites are occurring at a level on the jurisdictional level that is ineffective for sustainable and equitable water governance. The findings from this research support that the WUA is insufficiently outfitted for their mandate. I argue that this jurisdictional scale mismatch constrains, and hence, provides a barrier to adaptive capacity for local communities. Higher jurisdictional levels with the resources, capital, technology, and know how should be involved in adaptive water governance to alleviate the burden from those least equipped to deal with the challenges of water scarcity.

The previous sections have discussed the findings of this study in terms of water scarcity and scalar mismatches. Embodiment and practices of access represent the third and final theme that frames the findings of this thesis in relation to multidimensional inequalities that are shaped through the relational dynamics which mediate access to collectively used resources. In particular, this final finding contributes to two of Ribot and Peluso’s (2003) mechanisms of access: ‘access through social identity’ as well as ‘access via negotiation of other social relations.’
5.3 Embodiment and practices of access

This research utilizes embodiment as an analytical lens to examine how resource management decision-making processes and social practices related to resource access and use shape adaptive capacity. This foregrounds the everyday by examining practices of access to water resources and the material, embodied, consequences of these practices on differently positioned social actors within the community.

The embodied practice of fetching water has traditionally been a role assigned to women, not only in Nepal, but also in many countries of the Global South (Upadhyay, 2005). Men will sometimes assist with water collection, however, even today, women primarily carry out this task. These generalizations are supported through interviews conducted as a part of this study. Almost all interviewees responded that women were the primarily individuals within the household who collect water, and demonstrated considerable knowledge of local water resources and their availability throughout the year (e.g. sources that are available in the wet season or the dry season) as well as over time (e.g. sources that were available in the past, and sources that are currently utilized).

One woman discussed how she is able to get water from the tap only during the monsoon season:

“Today I got water from the tap. Once it started raining, we could get water from the tap. We can only rely on the tap until November and then we have to wait until mid May/June.” – Dalit woman, Kamalamai Municipality
“It takes longer to fill the gagris now than it used to. The source used to be big and we filled the gagris quickly. But these days we have to wait in a long queue.” – Dalit woman, Mathurapati Fulbari

There is a wide range of experiences with water collection. Some women are able to collect water from a household private tap whereas others share a neighborhood tap with five to six households, or even 12-15 households. Others have to walk for thirty minutes to access a trickle of water or dig to find a useable source:

“I went to the khola and used the very small collections of water in between stones. After the rain started falling, then the khola fills up.” – Chetri woman, Kamalamai Municipality

“Sometimes we can’t get water at the kuwa. Then we look at damp areas nearby the kuwa. We don’t have to dig during the monsoon. But sometimes the kuwa gets buried from a flood or from cattle walking on them.” – Dalit woman, Kamalamai Municipality

Others rely on utilizing the sources ‘belonging’ to their neighbors or friends, or neighboring villagers who may or may not be aware that the source is be utilized by non-designated users.

One villager describes the sharing of sources:

“Some people rely on water that is given, for example [name omitted] may give one to two gagris to households beyond their neighborhood. It depends on generosity.” – Dalit man, Mathurapati Fulbari

What is felt and experienced at the level of the body is an aspect not often considered in discussions of water access, use, and control. Survey data, which are often collected to tell the story of water access, particularly by research conducted by development agencies and the Nepalese government, paint a very incomplete picture. The relationship with water is
not simply a matter of having access to a water tap or stream. It is a complex and nuanced relational dynamic, one that the concept of embodiment helps to uncover. Missing from census data listing how many households in a given ward have access to a particular water source is the embodied, material *practices of access*. These *practices of access* include both positive (e.g. generosity, close relationships) and negative (e.g. fear, shame, humiliation) embodied consequences. I discuss both below through the narratives of two young women, Sita and Sunita.

*Sita’s story [name has been changed to protect identity]*

Sita is a nineteen year-old Dalit woman. She is the primary collector of water for her immediate family, which consists of her husband and young son, all of whom share a household with 16 additional people. Sita collects water from the public tap, which is accessible via a stone path that is a 10-minute walk down a hill. Twelve other households share this public tap. The public tap does not always provide sufficient water, especially during the dry season. Sita must seek out alternative sources. There are tubes that connect to other neighboring villages’ taps further down the hill, so Sita disconnects the tube to take water from their source. However, she does not have permission to use this source, and although she reconnects the tube after use, if neighboring villagers see her collecting water from this source, she is humiliated.

She explains: “The closest source is our first choice, but if there are many people or if there is no water in the tank, then we go to the next one further down the hill, or even the next one further down. But when we don’t get water at the first source, we have a sense of fear that the village down there will see us and shout at us. We
always have that feeling. The problem is the harsh words. They say you didn’t invest money or labor, why did you turn a deaf ear, why were you indifferent, don’t you feel ashamed? When we hear these harsh words we feel broken, sad, and we don’t like to go.”

While entire families and households are affected by insufficient water supplies, individual members of a household differentially experience the embodied consequences of insufficient water, with the individuals engaging in the practice of water collection – typically women – being disproportionally exposed to these consequences. In Sita’s case, the embodied effects of water collection include shame and fear.

When the public tap in Ward Eight of Mathurapati Fulbari was installed years ago with the help of funding from several Nepal-based non-governmental organizations, it was hailed as a success story. While the public tap has helped to relieve some water access constraints within the community, and on paper looks as if it resolved inadequacies, the embodied consequences of practices of access have not yet been resolved. The placement of infrastructure does not solve all problems of resource use. Concerns at the level of the body, such as those described in Sita’s story, are typically overlooked when emphasis is placed on infrastructure placement alone and hence should be considered in decision-making processes regarding water governance.

Sunita’s story [name has been changed to protect identity]

Sunita’s story represents another practices of access to water. Sunita is 28, Dalit, married, with two young sons. She utilizes the public tap as her main water source; however it has been providing less water in more recent years, and is less reliable of a source. Sunita is good friends with a neighborhood nearby her house, and they
have an agreement wherein Sunita is allowed one *gagri* for drinking water, and in emergency situations, Sunita may be allowed two *gagris*. Sunita expresses that it is her close relationship with the neighborhood that allows for this agreement to work.

In Sunita’s case, she and her family currently experience water scarcity. However, it is Sunita who utilizes her relationship with the neighbors to assure sufficient drinking water for the family. This social tie allows for Sunita and her family to cope with insufficient water supplies. Water collection has an embodied connection to Sunita’s social relationships with others. As long as Sunita’s relationship with her neighbors is close, the agreement works to secure water for Sunita and her family. However, the family’s water security is dependent on Sunita’s social ties to other individuals within the community.

While Sunita’s story demonstrates some of the positive embodied consequences resulting from her practices of access to water, her adaptive capacity is constrained, as she has less control over the water security for her and her family. She is dependent on a social relationship to provide sufficient resources to her livelihood.

Government and NGO water and sanitation efforts do consider the time it takes to obtain water (e.g. Ministry of Health and Population, 2012; UNDP, 2010), however what is missing from the execution of these efforts is the embodied consequences that occur during this journey and the effective implications resulting from them. *Practices of access* suggest that adaptive capacity cannot be easily or adequately measured at the individual level but
instead requires attention to relational dynamics, for instance at the community level. Sunita’s story helps illustrate why *practices of access* to a particular source are important, in discussions of water security, but also adaptive capacity.
6. Discussion

6.1 Situating the findings

This study has been guided by two primary research questions. The first research question seeks to understand how water governance works to inhibit or facilitate adaptive capacities for Nepalese community members, enabling opportunities for certain actors and constraining others. This study’s findings suggest several striking barriers and opportunities for bridges to adaptive capacity within processes and structures of water governance, particularly in relation to the scalar dimensions of space, time, and jurisdictional bodies involved.

The second question seeks to reveal what role, if any, multidimensional inequalities play in the dynamic between environmental (water) governance and adaptive capacity. This study suggests that multidimensional inequalities do indeed play a role in this dynamic, and that processes and structures of water governance benefit particular actors at the expense of others. Utilizing the analytical lenses of scalar mismatches and embodiment, this study shows the unevenness in experiences with water scarcity and the persistence of inequalities in water access, despite intervention by water development projects.

The results discussed above have situated the findings into three major themes: water scarcity, scalar mismatches, and embodied practices of access. Water scarcity is unevenly experienced within the sites engaged within this study. To understand this unevenness, this research utilized scalar mismatches as an analytical lens. My findings revealed that the temporal, spatial, and jurisdictional scalar dimensions of water governance constitute sites
through which social power relations provide barriers and bridges to adaptive capacity for particular actors. This study has suggested the following:

- Temporal, spatial, and jurisdictional scalar mismatches exist within the study sites.
  - The level at which water is *temporally* governed is mismatched for the water demands of the communities. Current water governance processes and structures are unresponsive to temporally dynamic social and environmental changes taking place at these sites of engagement. Importantly, the repercussions from this temporal scale mismatch are unevenly experienced within the communities of both study site locations. A disproportionate amount of Dalit neighborhoods are the predominant recipients of this unevenness.
  - The spatial level of analysis currently employed in processes of water governance obscures people’s needs, and seems to benefit higher caste neighborhoods. Caste/ethnicity play a role in the creation of spatially defined boundaries of water access. Incorporating finer levels of spatial analysis into water governance (e.g. neighborhood-level assessment of water resource need) would potentially help to disaggregate the community, and may render visible the people whose water resource needs are of greatest concern.
  - Water User Associations are insufficiently equipped and overburdened; they lack the resources and capital to adequately address sustainable and equitable water governance. Higher jurisdictional levels, outfitted with
greater resources, capital, and power, should not be alleviated from the responsibility to provide water security at the community level.

- Caste/ethnicity play a role in whether a bridge or barrier to adaptive capacity is constructed. Higher caste neighborhoods are often those better positioned to demand water development projects. The demand-driven process by which NGOs and Nepalese government offices solicit requests for water development projects favors those better positioned to do so. This process does not target those most in need, as those most in need are the least equipped to make such demands.

Scalar mismatches provide a lens to unravel power differentials that may otherwise get overlooked or appear to not exist. Decisions about what level of temporal, spatial, and jurisdictional scales of water governance may be mistaken for an apolitical process. However, these decisions have real, material repercussions. “Scale [is] an inherently political and unstable spatial manifestation of socio-environmental relations” (Bridge and Perrault, 2009, p. 485); scale and level mismatches represent my approach to make visible the power dynamics embedded in the processes and structures of environmental governance. These mismatches produce differential experiences with water scarcity, constraining individuals’ abilities to adjust to, take advantage of and respond to changes. They effectively produce barriers to adaptive capacity for some social actors, and bridges for others, primarily along the lines of caste/ethnicity.
Additionally, through the concept of embodiment, this research has called attention to the importance of the level of the body, and *practices of access* to water. This study has demonstrated the following:

- Embodied *practices of access* constitute an important relational dynamic that mediates access to water. In addition to infrastructure placement, these relational dynamics should be considered by efforts that seek to address water security.
  - Negotiations of access to water via social identity such as gender, and other aspects of social relations such as neighbors or dependents constitute important mechanisms of access identified in this research. As women are the primary individuals within households who perform the embodied practice of water collection, women are often the ones most burdened by faulty water development projects, and who are most at risk from dangerous and potentially emotionally damaging water collecting scenarios. Other studies support this finding (see Sultana, 2011; Upadhyay, 2005). Additionally, water security granted through the relationships between social actors may represent an equally or more important route to water (in)security than infrastructure placement.

In applying the analytical lens of embodiment, this research traces where inequalities persist, despite water development project interventions. *Practices of water access* are typically inexistent in the discourse that guides actions toward water security. UNDP (2010) has reported that the data collected by the Nepalese government on water access (e.g. how many people have access to a water tap) do not reflect the actual lived experiences
of Nepali people. Thus, actions or interventions performed to help make a given community more water secure, may impact individual actors within the community differentially, with inequalities in access to water persisting, as has been the case in the study sites associated with this research.

Consequently, if adaptive capacity enhancing efforts are to succeed, they must consider the relational dynamics amongst community members as well as experiences at the level of the body. If this aspect is ignored, what may seem like facilitating or enabling mechanisms of adaptive capacity may in fact constrain or inhibit the adaptive capacity of those most vulnerable.

*Connections to broader literatures*

This empirical case, while situated in Nepal, helps to advance more broadly an understanding of the relationship between environmental governance and adaptive capacity, engaging with global connections to climate change adaptation debates, such as those addressing the limits to adaptation (Adger et al., 2009, Klein et al., 2014). It also complements the critique of the overwhelmingly technocratic framings of proposed adaptation plans, such as Nepal’s National Adaptation Plan of Action, which places an emphasis on apoliticalized processes of adaptation that are heavily dependent on infrastructure placement and other purely technical solutions (Nightingale, 2015). This project supports the argument that efforts to address adaptive capacity must recognize scalar dimensions of governance as well as the relational dynamics of social power that shape multidimensional inequalities, and mediate mechanisms of access to collectively used resources.
The results from this study reinforce one of the dominant narratives in political ecology, the “environmental conflict and exclusion thesis” (Robbins, 2012; see 2.2 Political Ecology). This research adds to an understanding of how access and exclusion to a particular natural resource (water) is produced and differentially experienced, through informal and formal environmental governance structures and processes (i.e. socio-political forces). This research holds, as many studies of political ecology have shown, that there are winners and losers, and that differential power produces uneven social and environmental outcomes (Robbins, 2012).

This work, through its exploration of embodiment and practices of access also contributes to what Ribot and Peluso (2003) term “A Theory of Access.” The findings from this study reinforce several of the aspects they identify as mechanisms of access, in particular, ‘access through social identity’ and ‘access via negotiation of other social relations.’ The research described in this thesis helps illuminate the ways in which access to a collectively used resource, water, is mediated through relational dynamics.

6.2 Shortcomings and future work

Both water governance and adaptive capacity are complex phenomena, which are comprised of multiple, interacting components. The results discussed above, while helpful in understanding this relationship, still only represent a partial understanding of this dynamic. Further inquiry could fill remaining gaps in the dynamic of environmental (water) governance and adaptive capacity, as is described below.
This study has not captured the full range of informal and formal structures and processes that mediate the relationship between users and water resources. In particular, it has not attended to an important mechanism of environmental governance: markets. This mechanism has been more broadly explored through debates within political ecology on the ‘neoliberalism of nature’ (Heynen et al., 2007; Bakker, 2010). In a next step, this project may want to investigate the role of markets and the neoliberalism of water in the context of Nepal.

The feminist, participatory methodology embraced in this study helped produce results that are grounded in the experiences of the everyday. This was a deliberate focus of this study, as it is a lens often left out of predominant framings of resource use. This is particularly true for Nepal and potentially for similar contexts globally, where government and NGO publications tend to conceptualize vulnerability and the need for intervention at the district level, obscuring experiences of individuals within households, neighborhoods, and wards that comprise these districts. This study has additionally called attention to the level of the body, a unit of analysis that is rarely accounted for, but has profound implications.

Despite this study’s foregrounding of the experiences of the everyday, it has shortcomings in regards to the methodology’s reach for representation and generalization of a broader population. I have described my empirical results through case studies and narratives, and provided contextualization through direct quotes from interviewees. These results speak to larger literatures on climate change adaptation and theoretical framings on adaptive
capacity and environmental governance. However, I am careful not to suggest that my results represent or generalize the experiences of a broader population or geographic area. Nonetheless, caste/ethnicity and gender are aspects of identity that have historically and continue to face constraints through oppression and marginalization in Nepal (Gurung, 2013; Jones and Boyd, 2011; Onta and Resurreccion, 2011; Nightingale, 2011), as well as in other locations across the globe (for examples, see Olsson et al., 2014, p. 809-810). While my results are narrowly defined, they can be placed within a broader understanding of how multidimensional inequalities shape adaptive capacity by highlighting how primarily caste/ethnicity and other aspects of social relations (e.g. gender, neighbor, dependent) represent relational dynamics that mediate access to water, as well as opportunities to make demands.

My study embraces a participatory methodology which seeks to include a more diverse range of voices in the research process. Yet, my methods were not conducted free of power imbalances. I would be skeptical of any study that claimed to be. Subjectivities are relationally produced, and as such, the power dynamics at play at any point in time during my research continually shifted and were renegotiated. Yet, there are particular power imbalances that I recognize could have played a role in my results: mainly my identity as a white, “Western”, researcher. Additionally, the identity of my research assistant/interpreter (educated, high-caste, male) could also have impacted what and how people relayed stories and experiences with us. Finally, the need for an interpreter, as I cannot speak Nepali, is another shortcoming of this work. There is no doubt in my mind that a fully fluent Nepali speaker would have been able to capture more richness in the
stories and experiences shared by the individuals in this study. However, despite this limitation, I feel confident that my research assistant and I engaged with interviewees and focus group discussions in a productive way, and that my results do justice to their words.

As both water governance and adaptive capacity are very intimately tied and sensitive to time, further research which examines more long-term adaptive responses as well as changes and impacts from water governance processes and structures would help illuminate the nuances of the topics explored in this research project. Additionally, the embodied practices of water access that I examined could be further explored through a study that adopts a longer time frame. While the results from this study help illuminate these critical aspects of the lived experiences of Nepali people, an extended fieldwork component could help strengthen these understandings, particularly as everyday experiences with water differ so dramatically in the wet and the dry season. My fieldwork component began in the last weeks of the dry season and the first weeks of the wet season. However, fieldwork over an entire year could better capture the full range of experiences with water throughout both the wet and dry seasons.
7. Conclusion

Inadequate access to water resources is a concern faced by many people all over the globe. In 2012, 748 million people world-wide lacked access to what the UN terms an ‘improved’ source of drinking water (UN Millennium Development Goals, 2015). This challenge is becoming particularly salient as global climate change, along with other social and environmental changes, puts increased pressure on already stressed social-ecological systems. Research efforts on the capacity to adapt are critical in the midst of an era of unprecedented change. This research project contributes to a greater understanding of what shapes differential adaptive capacities by examining the scale and level dimensions of water governance as well as the embodied everyday practices of access to water in Nepal.

Findings from this research reveal that the temporal, spatial, and jurisdictional scales involved in water governance decision-making processes are mismatched for the scale and level of water scarcity experienced within study site locations. The repercussions of these mismatches are felt strongest along lines of caste/ethnicity. Additionally, this thesis reveals that gendered, embodied practices of access to water also play a role in producing differential adaptive capacities.

Through the lenses of scale and level mismatches and embodiment, this work makes visible the relational power dynamics embedded in water governance decision-making processes and the everyday practices of water access, effectively tracing where barriers and bridges to adaptive capacity are occurring. Findings from this thesis include the following: temporal, spatial, and jurisdictional scalar mismatches exist within water governance
processes and structures; these mismatches differentially impact actors of marginalized caste/ethnicities, suggesting caste/ethnicity plays a role in whether a bridge or barrier to adaptive capacity is constructed; and embodied practices of access constitute an important relational dynamic that mediates access to water, with social relations such as gender and neighbor providing a mechanism to negotiate access, water security, and hence, capacities to adapt.

While more work remains to be done to more fully explore environmental governance and adaptive capacity dynamics, the results of this study can help inform more equitable climate change adaptation practices and water governance structures and processes. This examination of what hinders and facilitates adaptive capacity can aid researchers and decision-makers across varying scales and levels to better identify what interventions need to occur and what social actors need to be involved to enhance adaptive capacities for all and facilitate the transformation toward more sustainable and equitable futures.
Works Cited


Truelove, Y. (2011). (Re-)conceptualizing water inequality in Delhi, India, through a feminist political ecology framework. *Geoforum*, 42 (2), 143-152.


Appendix A. Interview questions for community members.

<table>
<thead>
<tr>
<th>Resource use</th>
<th>Where are water source and water infrastructure locations? Who uses which sources, and for what purpose (irrigation versus drinking water)? When are different sources used? What happens when one or more sources go dry? What happens where there is too much water?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource access</td>
<td>What water source/infrastructure is available to whom? How does access water source/infrastructure differ within the community? How does access change during times of water scarcity or extreme precipitation/flooding events?</td>
</tr>
<tr>
<td>Resource control</td>
<td>How does water governance decision-making occur? Who is included/excluded from this process? Do you participate in the Water User Association? How do you or the WUA interact with other levels of water management? What informal or unsaid rules control use of water? What happens when there is conflict?</td>
</tr>
<tr>
<td>Water development projects</td>
<td>How do water development projects come to be here? Who participates in this process? What is their/your role in this process? The WUA’s role?</td>
</tr>
<tr>
<td>Broader impacts</td>
<td>How does water scarcity affect your everyday life? Does it impact other aspects of your livelihood? How?</td>
</tr>
</tbody>
</table>
Appendix B. Interview questions for administrative officials and NGO representatives.

- What is organization/office and how is it involved in water governance?
- What is your role within this organization/office?
- What other actors/organizations/offices are involved in the process of bringing water development projects to communities?
- How does your organization/office work with other jurisdictional levels/organizations?
- How do you select what communities to work with?
- What is your relationship with those at the community level? Who do you interact with? Who participates/is left out?
- What level of engagement persists after implementation of a project?
- What accomplishments are you proud of?
- To what extent does climate change enter the mission and efforts of your organization/office? Climate change adaptation?
Appendix C. Data analysis codes

<table>
<thead>
<tr>
<th>Rules and regulations</th>
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<tr>
<td>Struggle for water</td>
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<td>Inequalities in water access</td>
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<tr>
<td>Embodiment</td>
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<tr>
<td>Caste/ethnicity discrimination</td>
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<td>Gender discrimination</td>
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<td>Inclusivity</td>
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<td>Water User Association</td>
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<td>Environmental changes</td>
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<td>Leadership</td>
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<tr>
<td>Corruption</td>
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<td>The future</td>
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Demographic codes utilized in NVivo data analysis

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<td>Kamalamai Municipality</td>
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<tr>
<td>Mathapurati Fulbari</td>
</tr>
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