THE SOCIAL DIMENSION OF CLIMATE CHANGE VULNERABILITY IN RURAL AND URBAN AREAS OF BOLIVIA

A comparative analysis of local perceptions

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The objective of this article is to contribute to the study of the effects of climate change in vulnerable communities. Using a comparative perspective of two communities in Bolivia, one urban the other rural, the research reveals how the local populations struggle with the effects of climate change events within different social and economic contexts. The investigation demonstrates the social dimension of the communities' interaction with their environments within the framework of social vulnerability. The vulnerability of individuals is analyzed in regards to access to resources and the political and economic environment which has a large part in controlling the local economy. The results of the study indicate that the vulnerability to climate change is partly owing to the political and governmental context, and that local individuals' perceptions reveal knowledge about how to improve the communities' capacity to react to and survive extreme climactic events and conditions.

INTRODUCTION

In recent years the impact of climate change on vulnerable populations has established the necessity to explore, analyze, and understand the lesser known social dimension of this vulnerability in Bolivia. Climate change is defined by the United Nations Framework Convention on Climate Change as "a change of climate which is attributed directly and indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCC, 1992). In Bolivia[1], this change is evident in the extreme climate events, and trends experienced in the last two decades[2], which include floods, slides, excessive precipitation, lack of precipitation, and retreating glaciers. The people most affected by these phenomena have been, and continue to be, populations living in vulnerable situations, usually in extreme poverty, in rural and urban areas. Due to this reality, in the last decade the Bolivian government has introduced a number of different initiatives[3] aimed at understanding and confronting climate change. As a result, research and knowledge of the effects of climate change on the natural environment has advanced considerably. However, despite the increase of climactic impacts on vulnerable populations, research has advanced very little in the area of the social dimension of vulnerability to climate change -*in and from*- the local community context. Consequently, in many parts of the country it is still unknown how populations are perceiving, interpreting, and responding to, the impacts of climate change.

Scientific studies at the global level confirm that the effects of climate change are going to interact with the multiple vulnerabilities to which populations are exposed; such as poverty, inequality, hunger, unemployment, and many other forms of oppression which result from socioeconomic and political structures (Kasperson & Kasperson, 2001). In Bolivia, particularly at the local level[4], there is little knowledge on how this interaction will affect or is already affecting people's response and adaptation to climate change, taking into account

[1] Previous studies confirm that Bolivia is country that is highly vulnerable to the effects of climate change (Oxfam, 2009; PNUD, 2011b).

[2] Prior studies (PNUD, 2011b) shows that the two most common and significant emergencies caused by climactic events reported in Bolivia between the years 1980 and 2010 are drought and flooding.

[3] Initiatives developed through public institutions such as the Ministry of Environment and Water and the now inactive National Climate Change Program (PNCC).

[4] According to UNDP (2011b), there still exist high levels of uncertainty and little relation with broader studies that describe the vulnerability of certain sectors of the population.

that frequently vulnerable populations in question are not involved in the popular societal, institutional, and governmental ways of understanding climate change. This is evident in vulnerable populations' limited understanding of climate change and the limited knowledge[5] in institutional, governmental, and private circles of the experience and understanding of climate change among vulnerable populations, both rural and urban.

In this context, the objective of this article is to examine, define, and understand the social dimension of the vulnerability of oppressed people to climate change in rural and urban areas of the highlands of Bolivia, by using a comparative analysis of the local perceptions and interpretations of two distinct communities; one rural, the other a semi-urban, both located in the Department of La Paz. To reach this objective, two aspects were defined initially. On the one hand, the hypothesis, premised on an understanding of vulnerability to climate change in the social dimension, as a stage for social interaction and human development, which is linked to well-being, security, and the local capacity to respond and adapt to climate change impacts. On the other hand, the methodology, aimed to build empirical knowledge based on a comparative research model, which permits the concrete and narrative based analysis of two different places and their distinct subjective local perceptions.

Therefore, the comparative analysis aids in demonstrating how poor and vulnerable populations perceive and interpret the vulnerability in the social dimension, the climatic impacts, and the interaction between the two; and how this interaction could affect the local response and adaption capacity to climatic impacts.

With the intention of addressing these questions, this article presents the study's research, analysis, and results in four parts: theoretical framework, methodology, analysis, and conclusions. The first part examines the theories that contribute to the definition and analysis of the social dimension of vulnerability to climate change, in search of appropriate ways to approach vulnerability and improve local level resilience in the face of climate change. The second part describes the methodology, the criteria of analysis, and the spatial context of the study. The third part presents the scope of the comparative analysis and the characteristics of the social dimension of vulnerability to climate change in urban and rural areas. The last part shows that the analysis, understanding, and reduction of vulnerability in its social dimension are vital to improving resilience and strengthening the capacity of local level response to climate change impact. This study confirms that reducing local social vulnerability in the subject communities begins with improving the access of each one to basic resources that promote well-being and increase the communities' security in response to the adverse effects of climate change.

The purpose of this article is to gather empirical data and provide analytical results in order to initiate discussion and reflections about how the social dimension of vulnerability to climate change is understood at the local level, and above all, on the opportunities and challenges which are implied in understanding it, approaching it, and reducing it *-in and from-*, the local community environment in rural and urban areas of the highlands of Bolivia.

THEORETICAL FRAMEWORK

The social dimension

In the recent decades, the studies about vulnerability to climate change have contributed enormously to the understanding of its effects, as much in the physical as in the social, economic, and political sense. In the social dimension, the definition and the analysis of vulnerability to climate change have been and continue being the central focus of the *human dimension* as a stage for social interaction and the construction of individual and collective experiences. Previous studies (Blaikie et al., 1996; Kelly & Adger, 1999), point out that the vulnerability in this dimension is equivalent to the 'condition and capacity' according to its definition[6] being "physically or emotionally hurt or injured". This state reveals previous damage and present condition which creates vulnerability to future harm. Therefore, the analysis of vulnerability must begin by identifying a preexisting state and possible damage. Following this statement, Kelly and Adger (1999) suggest that defining vulnerability to climate change in its social dimension, not individual but

[5] It is necessary for the vulnerable population to understand more about climate change, their level of risk to its impact, and the measures that should be taken to mitigate risk (PNUD, 2011b: 121).

[6] Definition of vulnerability by Collins Dictionary (cited by Kelly & Adger, 1999:4).

collective, permits an analysis of the social and economic well-being of a particular population and to identify the socioeconomic and institutional limitations that are in fact the weaknesses that define the population's capacity to cope with climate impacts. Additionally, it allows identify and define the spatial context where social vulnerability resides. Utilizing the concepts of this theoretical framework, this study defines vulnerability to climate change in its collective social dimension as "the condition and capacity of a specific population to respond to, recuperate, and adapt to climate stresses that affect its well-being and livelihoods".

The social construction of vulnerability

To understand the social dimension of vulnerability implies also understanding its origin, its tendencies, and processes that diminish or increase it in time and which differentiates its level between populations (Kelly & Adger, 1999). Previous research (Blaikie et. al., 1996; Kelly & Adger, 1999), use the theoretical tools of *'economic politics'* and the *'theory of rights'*, to analyze and understand the social construction of vulnerability to external environmental stressors such as natural disasters and climate change. *Economic politics* can be understood as a system of guidelines which allows the State to regulate and orient the socioeconomic development of a country. The *theory of rights* is the availability and distribution of rights within a society, the reasons for which these are defined as they are, or disputed and therefore changed over time, and the broad economic politics of the distribution, establishment, and the ability of citizens to exercise these rights.

On the one hand, Blaikie et al. (1996), in the study 'Vulnerability: The social, economic, and political context of disasters', describes two theories in order to understand the social construction of vulnerability. The first, focused on the evolution of conditions of insecurity and their economic political context which limits development and vulnerable populations' security in regards to natural disasters. The second theory focuses on the access of these populations to resources which permit their security in the face of natural disasters. Both theories understand vulnerability as a consequence of social, economic, and political processes, which, although independent of natural disasters, determine the conditions of insecurity of these populations. This concept is applied to the understanding of social vulnerability to climate change, where vulnerability is independent of the natural event itself and yet defines the human capacity to respond to and adapt to these events.

On the other hand, Kelly and Adger (1999), in their *theory of rights* or *architecture of rights*, underline that the degree to which individuals or communities have the "right" to access and use resources, not only economic and material but also intangible resources such as knowledge, determines their capacity to respond to and adapt to climate change. This theory points to the tendency for vulnerability in a population to be a consequence of the changes to the politics of the distribution of resources which can strengthen security or exacerbate vulnerability. The tight link is therefore highlighted between the construction of vulnerability and institutional structure –such as the State, which promotes the availability of resources by the fulfillment of rights. Basic human rights, for example, are constituted in order to guarantee collective well-being with equality. The analysis of inequalities in terms of access to resources and fulfillment of rights that guarantee their availability in specific populations could permit an in-depth understanding of the social dimension of vulnerability to climate change at the local level in urban and rural areas of Bolivia.

METHODOLOGY

With the objective of examining, defining, and understanding the social dimension of vulnerability to climate change at the local level in rural and urban areas of the highlands, a qualitative methodology was built. A methodology based on a comparative analysis with a focus on local perceptions of two different communities, one semi-urban and the other rural. The purpose of the qualitative comparison was to bring to light the subjective nature of the empirical material of the investigation.

Methodology of research sites selection

The field work was done between June and August of 2010. The research areas were chosen according to the following criteria: one had to be urban and the other rural, they had to have experienced the impact of climate change during 2010, and they both had to be located in municipalities categorized as 'poor' in the highlands in the Department of La Paz. During the process of determining research areas, two municipalities were initially selected, El Alto and Cairoma, due to their being listed in a report of

municipalities affected by climate impacts in the Digital Magazine 'Municipalities on the Web' of the Federation of Municipal Associations of Bolivia (FAM), of February 2010. The municipality of El Alto is known for being the municipality with the second largest population in the Department of La Paz, and Cairoma is a rural municipality in the fifth section of Loayza Province in the same department.

Once the municipalities were identified, the municipal governments were contacted in order to introduce the research plan. As a result of introductions and orientations by the researcher with local authorities, two sub-areas were selected for fieldwork; Sector 7, a semi-urban community located in District 4 of El Alto, and *Tacopampa,* a rural community located in the municipality of Cairoma. Authorities from both municipal governments facilitated contact between the researcher and the communities in order to begin fieldwork.

Sampling and data collection

Using qualitative methodology, data collection took three forms: individual surveys, informal interviews, and observation. The individual surveys were defined as the empirical material that was most relevant to the study and were directed towards the "affiliates" of each location studied. The affiliates are the heads of household of the families that live in a certain community or area, named as such due to their being part of the local social organization. The informal interviews were directed at the community leaders in both locations, authorities of the municipal governments of El Alto and Cairoma, and specialists on climate change in Bolivia. The observation-based data collection continued throughout the two months of fieldwork. The investigation data was later complemented with secondary source information gathered through literature review.

With the objective of designing a basic structure for data collection, analysis and comparison of multiple and diverse indicators, an '*individual survey*' was designed and then used to interview inhabitants of both study locations (see appendix). The definition of content, including questions and indicators for analysis and comparison, was guided by the hypothesis and theoretical framework of the study. In addition, specific introductory indicators were collected from the people surveyed, such as gender and age range, in order to provide demographic and gender participation data for analysis. The survey totaled 19 questions (8 closed, 7 open-ended, and 4 semi-closed questions), organized in 4 groups of indicators. These indicators were also utilized as general guidelines during informal interviews with key informants and observation periods.

Planning survey methodology in the two research sites took into account the approximate number of affiliates in each community, due to the importance of the survey being done with the majority or all the affiliates -in order to have the broadest and most representative sample possible, which allowed for significant analysis of the collective in the results of the empirical material gathered.

The survey process was different in each local area. In the community of Tacopampa, surveying began by introducing the study to the community leaders, who approved it and collaborated by organizing a community assembly where all affiliates were asked to attend. The agenda of the assembly included doing the actual survey as well as an informative workshop about climate change, this last one organized in conjunction with community leaders. During the assembly 50 individuals were surveyed, which represented all community affiliates. External assistants aided in surveying community members. The surveying was followed by the climate change workshop.

Surveying in Sector 7 was also aided by coordination with local leaders (the directors of the neighborhood council) although the survey process was interrupted due to political changes that were taking place at the time. Between June and August the neighborhood council had an election which led to the postponing the introduction of the research objectives to the council. Despite efforts to overcome setbacks, the community meeting organized to survey affiliates attracted very few participants. Therefore the researcher visited the remaining homes of affiliates in order to complete the survey. In the following weeks the remaining homes were visited and surveys completed. As a result 16 individuals were surveyed. Despite the difference in the number of individuals surveyed between Sector 7 and Tacopampa, in both cases the majority of affiliates were reached and the research objectives completed.

In both communities the survey was introduced and completed according to the procedures established by the Institutional Review Board (IRB) of Clark University in the United States, given that the study

was designed and developed during the researcher's time at this university. The IRB's protocol demands that all affiliates who fill surveys remain anonymous at all times. Following this criteria, the researcher defined that all people surveyed be called *participants* and the research sites; *rural location* and *semi-urban location.*

Analytical Structure

The comparative analysis of the results of the study is tied to determined criteria. Firstly, analysis follows the comparative model, using the same interrogative tools in both cases. This includes the survey, where each question represents an indicator of analysis and comparison. There are 19 indicators in total which are divided into four chapters: demographic indicators, socioeconomic indicators, indicators that address climate change, and finally, indicators of local organization in the face of climactic events. Secondly, in order to identify and interpret the results in the different locations, the total number of participants surveyed represents 100%. Thirdly, in order to validate the study, a process of data verification was done with a focus on the empirical material by using secondary data and information gathered during observation and informal interviews. During the analysis in this article both observation and informal interviews are described as 'informal interviews' or as 'informal conversations. And lastly, given that analysis is defined by a focus on local perceptions, a narrative analysis is used in the presentation of results.

Spatial context

Tacopampa is an agricultural community located in the Municipality of Cairoma in the Department of La Paz. The municipality itself wasn't created until 1988 but human settlement in the area dates from much earlier. The community is located between altitudes of 2540 and 3800 meters above sea level (Municipal Development Plan [PDM], 2006)[7]. The average temperature ranges between 10 and 15 ºC and in the lower mountainous region can dip down to 1.5 ºC, with freezing spells between the months of May and August. According to the 2001 Census, the community has a population of 152 inhabitants. Agriculture is the most important economic activity. Crops produced in the area include potato, oca (a root vegetable), squash, maize, wheat or barley, vegetables, and peaches. It is important to mention that the municipality of Cairoma is known for the production of the 'araca' potato, a special tubercle of fine quality used in the Bolivian gastronomy. The agricultural production in the municipality is consumed largely by the producers themselves and is sold at local markets and at fairs in El Alto. The agricultural technology used is largely traditional. The infrastructure of the community consists of houses located a fair distance from one another, constructed of adobe and thatch roofs, or in a few cases, corrugated metal roofs.

Sector 7 is a semi-urban neighborhood located in District 4 of El Alto, close to Dry River (Rio Seco), which runs through this part of the city. According to the 2001 Census, Sector 7 has a population of 51 inhabitants. The city of El Alto is situated at an altitude of 4050 meters above sea level, and experiences climatic variation ranging from moderate to cold temperatures and moderately humid to dry conditions. The time of year when most freezing spells occurs is between May and August (PDM, 2007). El Alto is characterized by its industrialization of raw materials and its diverse informal sector. According to CEDLA (2010), the average monthly labor earnings in the city are 1147 Bolivianos (BOB), or roughly $168 USD[8]. The observable infrastructure in this Sector consists of dirt roads, two room houses constructs mostly of adobe and brick with thatch or corrugated metal roofs.

ANALYSIS

I. Demographic Indicators

This study reached 66 participants total, 50 in the rural location and 16 in the semi-urban location. The participation of the women is similar in each case and is an important point to discuss. In the rural location, close to 50% of participants are women and in the semi-urban location the percentage of women is slightly higher. In the rural location, this result is linked to the characteristics of community organization in rural areas of the highlands in Bolivia. The researcher's work experience in the highlands highlights that Community affiliates, both women and men, participate in community assemblies organized by local leaders following local social organization tendencies, this is also confirmed by recent studies

[7] The Municipal Development Plan (PDM) is a municipal 5 year plan.

[8] Converted 17/04/2015, http://www.oanda.com/lang/es/currency/converter/

(Rustand, 2013). However, despite gender inclusive political procedures in community activities, this does not guarantee an equally important role in decision-making within communities where men's opinion and authority is often favored. In informal interviews in the rural location, a number of female participants indicated that they do not feel equally included in decision-making processes because they are women. Here it should be noted that because the researcher is a woman, female participants may be more open during interviews and conversations than they might be with a male researcher. Despite feeling left out, women in this location were eager to be involved. During fieldwork, a few days before implementing the survey the researcher asked a group of women in that location if they would be interested in providing prepared food during the community assembly and the group accepted the offer. Interestingly, this group had prepared snacks and lunch before the event began, which in conversations with the group was done in order to be able to participate in the entire event. This suggests that women do participate in community organization and social events in an important way and have a strong interest in processes of learning, decision-making, and local planning.

In the semi-urban location, during the introduction of the study and survey, the receptiveness of the women was actually greater than that of the men. The majority of women participants extended their participation beyond filling out the survey. Many showed interest in learning more about climate change, which initiated long informal conversations. Another interesting aspect of these dialogues was the trust and closeness between participants, which favored a productive exchange of individual and collective experiences on the topic of climate change.

The second demographic indicator which helped to differentiate and compare the data gathered from the two locations was the age range of the participants. In the rural location, the majority of the participants were between 30 and 55 years of age, followed by a large group of participants over 55 years, and lastly a smaller group of people younger than 30. In the semi-urban community, the age of the majority of participants is between 18 and 30 years, followed by the group between 30 and 55 years. According to statistics from the 2001 Census, the rural municipalities of the highlands have a high concentration of older and very young inhabitants, due to the migration of youth and young adults to the city. Therefore, in the semi-urban areas of El Alto there are typically a higher proportion of youth and young adults, which correlates with the country-city immigration[9] tendency taking place in Bolivia.

The demographic indicators – gender and age – show that the demographic composition of the participants is diverse and distinct according to its rural and urban location while showing a similar tendency of women to struggle for greater involvement in community organization in both locations. In spite of the differences between these two locations, in both places there exists a significant level of collaboration and local participation in this study as it broaches the subject of climate change and its relationship with the collective and individual well-being. In addition to participation in the study, participants also took part in processes of learning on the subject of climate change, a tendency common to all age groups and genders. Nevertheless, the results also indicate that women show greater receptiveness to the study and interest in the topic[10], especially relating to the impact of climate change on economic activities, livelihoods and well-being. This interest in the topic of climate change could be an advantage during the development of local initiatives in the reduction of social vulnerability to climate change from a gendered perspective.

II. Socioeconomic Indicators

Ways of life and access to basic resources

The theoretical framework which examines vulnerability to climate change in the collective social dimension allows for a fruitful analysis of the well-being of a population and the identification of the socioeconomic and institutional limitations which determine the capacity of the community to react when faced with a the negative effects of a climate event (Kelly & Adger, 1999). Following this line of thinking, in order to explore the socioeconomic well-being of each location, participants were asked to identify the economic activities in which they participate. Each location identified a distinct socioeconomic reality. In the

[9] According to Sandoval and Sostres (1989), the majority of the migrant population of El Alto is from the rural areas of the Department of La Paz (cited by Sánchez, 2007:97).

[10] The literature about climate change in the world indicates that women and children represent the sector of the population that is most vulnerable to climate change in poor regions (UNEP, 2007).

rural location, 98% self-identified as an agricultural producer. In the semi-urban location, on the contrary, economic activity is much more diverse. The principal economic activity is the extraction of sand and gravel which is later sold as construction materials in El Alto and La Paz. This material is extracted from Dry River which borders the neighborhood. In informal interviews, participants from this location indicate that owing to the economic situation of many families, individuals also work doing other activities during the day. Many men for example work extracting sand and gravel in the morning and in the afternoon working in construction, as taxi drivers, or as barbers. Women also divide themselves between economic activities, working in extraction and washing clothes in the morning, and in the afternoon as housekeepers, garment manufacturers, and in independent sales. Childcare and keeping their own homes is, for most of the women, takes place alongside other economic activities that contribute to the family income[11]. In this location, the majority of participants underscore that the main disadvantage of these kinds of economic activities is that it makes taking part in community meetings difficult due to scheduling conflicts and lack of time.

The analysis of this first indicator suggests that the dominant economic activity in the rural location could favor the collective understanding of climate change and its effects on agricultural activity, as the affiliates respond and adapt to weather variations. However in the semi-urban location, the diversity of economic activities could limit local organization, and participation in processes of understanding, response, and adaptation to climate change.

A second indicator which serves to relate the collective experiences to spatial context is the examination of the history of settlement, which demonstrates a distinct relationship between the land and the people in each case. For example, in the rural location 100% of the participants have always lived in the community, which suggests that there has been land inheritance over generations. In the semi-urban location, the settlements are recent, the result of a burgeoning city of El Alto, the immigration trend[12], and the movement of poor and vulnerable populations in semi-urban contexts[13] which lack urban planning.

Another important indicator is the availability of basic resources in terms of their impact on the individual and collective well-being. The availability of and residents' access to basic resources shows more similarities than differences between locations in this case. On the one hand, in each location 100% of the participants stress the lack of basic sanitation and clean water. In theory, urban areas should have access to basic services, and yet, this is not the case in the semi-urban location of the study. In the rural location the lack of access to these resources has been and continues to be part of community life. Despite the similarities in terms of basic sanitation and clean water services, in the rural location, 100% of the participants have access to electricity. In the semi-urban location, somewhat surprisingly only 19% of the participants have access to this resource. According to local interpretations of the issue, this is due to the nature of electricity infrastructure which only reaches main avenues without extending into residential neighborhoods. The municipal government has, to date, also failed to provide public lighting, which negatively impacts security. An additional barrier to residents gaining access to electricity is that many residents are unable to pay for the cost of installation and monthly service fees for electricity.

The situation in each location suggests that due to basic needs such as clean drinking water and basic sanitation going unmet, the lack of basic resources has become a point of vulnerability in both communities. This lack of services is limiting individual and collective well-being, in part by limiting the diversification of economic activities in the semi-urban location due to the lack of electricity.

Economic politics and its effect at the local level

Bolivian society presently has and has had for decades an extremely unequal socioeconomic structure (PNUD, 2011a). According to the 2001 Census, more than 63% of the population lives in poverty and over 38% in extreme poverty. In the municipalities of Cairoma and El Alto, more than 96%, and 66% respectively, live in poverty (INE,

[11] Previous studies show that economic activity in the city of El Alto has been characterized by its diversity and the family dynamic of the informal sector which is a response to the absence of economic opportunities and to difficulties obtaining employment in public and private institutions (Sánchez, 2007).

[12] Between 2007 and 2011, the immigration rate to El Alto was 18.5 (PDM, 2007).

[13] These results show that in Bolivia recent and past human settlement patterns, in urban and rural contexts, are vulnerable to the adverse effects of climate change.

2001). Another face of poverty in Bolivia is also manifested in the index of Unsatisfied Basic Needs (NBI)[14] such as the access to basic sanitation and water. While these basic resources are recognized as fundamental rights in the New Political State Constitution (2008), these rights are not met equally throughout the country[15]. According to the 2001 Census, only 34% of the population of Cairoma has access to clean drinking water and only 12% has access to basic sanitation; plumbing, septic tank, or latrine (INE, 2011). In the municipality of El Alto, close to 20% of the population continues to live without clean drinking water in their homes, and more than 14% lives without electricity (PDM, 2007).

In the last decade, the efforts of the State to correct the gap in basic services for vulnerable populations have not been sufficient; among other factors, due to the lack of correspondence[16] between the funding needed and the available funding to address the gap at different levels of government.

Research by CEDLA indicates that one of the sectors which attract most financial resources in the governmental bodies is infrastructure. Between 2005 and 2009, governments at the departmental level allocated 1.819 million BOB (256,141,000 USD[17]) on average annually, although only 3% of this was destined for basic sanitation projects (Espada, 2011). At the local level, the legal framework in Bolivia[18] establishes that water services and basic sanitation are the domains of municipal governments, and simply put, these governments have not been able to or have not put sufficient resources into investment and project execution in this area. According to the Statistic Dossier of CEDLA (2011), between 2005 and 2009, only 14 of 80 municipalities of the Department of La Paz had significant basic sanitation and water provision programs which had executed 80% of their budget. Within this framework, one law that has had a great impact on the decentralization of public resources from the central government to the municipal level in order to address basic resource provision has been the Law of Popular Participation – No. 1551. Due to this reorganization of monetary resources, the presumption is that these basic resources –basic sanitation and safe drinking water– is an area that municipal governments are familiar with, executing related projects on a regular basis, and that residents of the municipality highlight these needs during the deliberating processes of the municipality' annual operating plan. The question is, how are basic resource projects prioritized in the municipal budget? This is an important question which demands further study and discussion in order to explore this aspect of vulnerability.

In terms of electricity, despite the fact that in Bolivia coverage has continued to increase in recent years, more than 35% of rural inhabitants still lack access to this resource in their homes (INE, 2009). Previous studies on this issue (Espinoza & Jiménez, 2011), show that even in urban areas that have higher rates of coverage than in rural areas, there are significant gaps in usage between homes of differing income brackets[19].

Local survival strategies

In order to understand the social dimension of vulnerability, it is necessary to understand what it means for individuals and collectives to have unsatisfied basic needs by looking at the methods and knowledge that populations have and use to meet these basic needs in daily life. An indicator used to understand local strategies[20] to obtain the resources required, such as clean water, was a survey question about how they supply water for household consumption. In the semi-urban location, 100% of participants obtain drinking water from underground sources by drilling wells. In the rural location, 100% of participants obtained water from

[14] According to INE (2007), the poverty index calculated by the NBIs, or Necesidades Básicas Insatisfechas, indicates that homes which do not have basic needs met do not meet basic minimum conditions of housing habitability. The complete list of these conditions: a clean water source, sanitation, electricity, energy source used for cooking (usually natural gas), education, and health.

[15] In Bolivia, 25.5% of the population does not have clean drinking water infrastructure in their homes and 52.3% does not have basic sanitation (PNSB, 2009). The greater part of the people who do not have these needs met live in semi-urban and rural areas.

[16] According to a report on the water and sanitation market in Bolivia (Fernández, 2011: 10), in 2009 over 80 million USD was invested in basic resources, the state financing nearly 72%. The Ministry of Environment and Water (MMAyA) states that in order to advance towards the Millennium Goals, it would be necessary to increase annual investment by close to 100 million USD.

[17] Converted 17/04/2015, http://www.oanda.com/lang/es/currency/converter/

[18] Law 2066 Modifier of Law 2029 of Basic Sanitation; Law 1551 of Popular Participation; Law 031 Framework of Autonomy and Decentralization "Andrés Ibáñez".

[19] According to Espinoza and Jiménez (2011), the low electrical service coverage in low income households establishes the need to generate mechanisms to improve accessibility to poorer segments of the population.

[20] Previous studies (Blaikie et al., 1996), note that survival strategies are vital to understanding the social dimension of vulnerability.

an agricultural irrigation canal fed by the Araca River[21], located 8 km from the community. In this location, participants mentioned that their access to this resource is only 4 days a week; the other 3 days it is used by a neighboring community. Many participants in this location note that there has been a disagreement with the neighboring community over water due to them also having access to natural springs and a cistern, while Tacopampa depends solely on the irrigation canal. Currently, there are ongoing disputes with this community regarding water and boundaries[22].

In the semi-urban location the situation is quite different. Each family drills their own well on their property, which has dimensions of approximately 1.5 meters deep and 1.2 meters in diameter. One problem residents have with water is that, as noted by many participants, during rainy seasons Dry River tends to flood into residents' land. Others perceive that flood water which flows through the clandestine cemetery (which is close to the area), contaminates the groundwater when they flood the location. The analysis of the El Alto Municipal Development Plan (PDM, 2007), notes that the rivers which flow through the city, including Dry River, are contaminated by the effluence of garbage, home and commercial plumbing, and industrial and hospital waste. Therefore, even while there may be water in the wells, it may be hazardous to the population's health. In informal interviews, participants from both locations indicated that their families often become ill from ingesting water from these sources.

The knowledge generated from these indicators suggests that while the lack of clean drinking water[23] is a variable of vulnerability in the social dimension, this vulnerability is augmented to a degree by the local alternatives that residents are forced to choose between in order to acquire this most basic resource. The consumption of unfiltered water puts residents' health at risk, which increases these populations' exposure to the adverse effects of climate change, that is flooding and poor water quality. In the rural location, the unequal access to water could become a point of conflict which could also become a variable of vulnerability, especially during a water crisis.

Why basic needs are not being met

With the purpose of examining why basic needs go unmet, this study takes a close look at why there is a lack of clean water in each location, according to local perceptions. In the rural location, the greater percentage of participants perceives that the main reason for the lack of a reliable water source is the geographic distance between the community and the Araca River. Many of these participants indicate that if there were other sources, such as plumbing connected to a cistern system constructed with the support of the municipal government, there would be less water insecurity. A smaller portion of the participants perceives the lack of water to be a result of a lack of support from the local government, mentioning for example the failure of the municipal government to maintain the irrigation canal. Explaining a little more, another, much smaller number of participants indicates that they receive less municipal support than other communities due to the isolated location of the community. In the semi-urban location the greatest number of participants mentioned that the supply of clean water in the location is the responsibility of the Sector's neighborhood council, indicating that the lack of water is due to inaction on behalf of local leaders. A smaller number of participants perceived a number of other important reasons for the lack of water, such as: the lack of unity among residents, the insufficient support by the municipal government, and the poor coordination between the municipality and neighbors.

The analysis of this indicator suggests that the rural location does not include the role of the community or its leaders as a reason for the lack of water, and instead relate their water problems to external factors. The semi-urban location on the other hand, does include its leaders as one of the main causes of the lack of clean water, and also include the dynamics of local social organization. Despite the differences in perceptions between the two locations, both communities stress the role of the municipal government in letting their water insecurity continue. Neither location relates the lack of water to the effects of climate change.

[21] The Araca River is fed by the glaciers of the Cordillera of the Three Crosses (PDM, 2006).

[22] The inequality in the access to clean water in Bolivia has been and continues to be a cause of conflict. The Water War, which took place in the city of Cochabamba in the year 2000 and in El Alto in 2004 against the privatization of this most important and basic resource, illustrates the historic struggle for equal access, and against its commoditization, by poor and vulnerable populations.

[23] In 2010, the Assembly of the United Nations recognized the access to clean drinking water and basic sanitation as a human right (ONU, Resolution 64/292).

What can be learned from the series of socioeconomic indicators confirms that vulnerability in the social collective dimension can have diverse variables relating to unsatisfied basic needs. These variables are mutually relatable and generate other variables such as the lack of clean water impacting the health of local residents. While the populations of the two locations are individually and collectively fighting for survival in the face of this vulnerability, they perceive and identify the socioeconomic and institutional limitations that worsen their own vulnerability, such as the lack of political will to respond to unsatisfied basic needs. At the same time, the analysis also confirms that the economic politics of distribution and availability of basic resources at the local level has an effect on the socioeconomic well-being of the individual and the collective. Institutional limitations tend to increase vulnerability at the community level. In effect, the vulnerabilities found in these locations are defining basic security and individual and collective capacity to respond and adapt to climate change.

III. Indicators related to climate change

Local knowledge about climate change

The theory of vulnerability suggests that the resources that increase a population's security in the face of external environmental stressors such as climate change are not limited only to economic and material resources, but include others, such as information and knowledge[24]. Therefore this study includes an indicator which measures local knowledge about climate change, a simple question whether or not participants have heard of climate change or know anything about it. In each location about 50% of participants respond that they are aware of climate change. Upon receiving a positive response, participants were asked to expand on what knowledge they had of the subject. In the rural location, participants related climate change to its "causes", commenting that it was an effect of environmental pollution by industrialized countries, big industry, and foreign corporations. In the semi-urban location, participants related their knowledge of the "effects" of climate change, mentioning global warming, the lack of water, frequent heavy rains and flooding, and the death of animals due to drought. The participants' answers show that knowledge of climate change differs between these two communities. This suggests that the partial knowledge that each location has is a result of receiving information by different means at the local level and access by the participants to this information.

At an international level, in the last decade Bolivia has been recognized as a country that defends the environment and promotes the issue of climate change. Nevertheless, to date there is no public institution that spreads free, unbiased, and specific information about climate change at the local level. With the purpose of providing information about climate change in this study's locations during fieldwork, the researcher searched for but was unable to find informative material provided by the government on the subject that is meant for reading by the general population. The only low-cost materials found were pamphlets by a Non-Governmental Organization (NGO).

The next indicator, used to demonstrate the informational resources available to participants, was a question about the way in which they learned about climate change. In both locations participants mentioned the radio as the main mode of receiving information; the television was also mentioned, but only in the semi-urban location. Informal interviews with participants revealed that they had seen informative programming about climate change on the television, during their work days, and in shops. In the rural location, participants note that, despite the fact that the radio is the only means of mass communication, not all have access even to a radio and are able to find informative radio stations broadcasting in Aymara, being the most spoken in Cairoma. In the semi-urban location, participants also mentioned the disadvantage of only finding informative radio stations broadcasting in Aymara early in the morning. This suggests that the availability of information in the local language is also limited in semi-urban areas of the city of El Alto, taking into account that 34% of the population of the municipality of El Alto speaks mostly Aymara in day to day life (INE, 2001). In this location, other participants indicated having heard about climate change from their children who attend primary and secondary school.

[24] The report Perspectives of the Global Environment from the United Nations Program for the Environment (UNEP, 2007), indicates that the construction of knowledge and the bridges of knowledge are necessary for understanding climate change, improving resiliency and supporting processes of adaptation in vulnerable populations.

The indicators of local knowledge about climate change confirm that access to legitimate informational resources is still limited in the research sites. Nevertheless, local perceptions have been proven to be indispensable to identifying the appropriate resources necessary to broadening local knowledge of climate change at the local level. Understanding how information can and should be spread about climate change, by taking into account language and technological barriers, is vital to supporting successful learning about climactic impacts on vulnerable populations at the local level. It is firstly necessary to identify how knowledge is reaching the populations in question, and secondly, how the means of information transmission is impacting interpretation and assimilation. It can be assumed, for example, that the participants of the semi-urban location relate their knowledge about the effects of climate change to the visual informative transmission they received via television. Lastly, the results of the research suggest that information about climate change may be successfully spread by being taught in primary and secondary schools and later transferred from child to adult. Understanding how knowledge spreads organically within the social web is an important part of the strategic education and communication planning when reaching out to vulnerable populations.

Local experiences confronting the effects of climate impacts

With the aim of understanding local experiences responding to extreme climactic events, participants were asked to explain perceived emergencies caused by weather in the last 12 months. In both locations, drought and flooding were perceived to be the most important extreme events.

Participants were then asked about the consequences of these impacts on the individual and collective at the household level. In the rural location, participants indicated that the drought had affected the crops and the health of their families. Some mentioned that the drought changed the type of agricultural production possible. Owing to the lack of water they abandoned peaches in favor of potatoes. Participants also mentioned that their crops were affected by the flooding that destroyed part of the irrigation canal, which resulted in not being able to irrigate crops or use water for household consumption. In the semi-urban location[25], the flooding of Dry River in February of 2010 contaminated the groundwater and as a result many residents became ill. Some participants indicated that they also lost crops due to the flooding. Although Sector 7 is semi-urban, small-scale agriculture is still practiced in some areas of El Alto.

The information gathered by these indicators shows that, on the one hand, participants do perceive the climactic impacts on their locations, and also interpret how these events impact their well-being and household's livelihoods. On the other hand, the participants' responses demonstrate that the local interpretations of events link the consequences of the environmental impacts to the variables of vulnerability found in the socioeconomic indicators. For example, participants in the rural location relate drought to a lack of water and changes in crop production. These findings confirm that the importance of local perceptions and interpretations can lead to a deeper analysis of the resiliency and adaptation to climate change at the local level.

After gathering data on the perceptions of the consequences of climate change, participants were asked about the reaction of the municipal governments during the droughts or flooding, in order to understand the local mechanisms in place to aid in times of difficulty. In response, 100% of the participants stated that the municipal governments had taken no action. Many participants also mentioned that during these emergencies however there was mutual support within the communities. Analysis of these results suggests that the collaboration of municipal governments with residents in times of extreme climactic impacts or natural disasters is still very limited if not non-existent which may cause relationships between municipal governments and communities to become more fragmented. The recent emergencies caused by the effects of climate change in municipalities of Bolivia have demonstrated that the technical and institutional capacity of local governments to respond to these events is very limited. A previous study by Cruz et al. (2012:140), points to the lack of knowledge about climate change in municipalities which translates into limited allocation of resources to bolster technical and institutional capacity.

[25] El Alto is among the municipalities which have been repeatedly affected by flooding between 2006 and 2010 (PNUD, 2011b).

An indicator which complements the previous question about municipal aid examines the perceptions of participants of their individual and collective capacity to respond to climate events in the future. In both locations, 100% of the participants answered "not to be prepared to respond". Participants were then asked what they would need in order to be prepared. In each location the majority of participants perceived that the most important way to be prepared would be to have access to basic services such as sanitation and clean water. Some participants also mentioned the role of municipal governments in attending to diverse local needs. For example, in the rural location, participants pointed to the government's role in maintaining the irrigation canal and roads. In the semi-urban location, participants also mentioned that the municipal government needs to build a health clinic and improve access to public transportation.

Given the local understanding recorded in the indicators of this study, it is clear that both locations have the capacity to evaluate their own living conditions and to identify the resources necessary to make improvements which will increase their capacity to react to climate change related events. An important local perception in both locations links the lack or poor quality of resources to insufficient support from the municipal governments or will to make changes.

In summary, the indicators of local experiences facing climatic impacts reveal that the consequences of the extreme climate-related events are interacting with the social individual and collective vulnerability, and that this interaction is having an adverse effect on the socioeconomic well-being and livelihoods in these locations. In this analysis, a suggestion offered many times by participants to reduce social vulnerability to climate change and strengthen resiliency, is for improvements to be made in terms of access to basic resources. Given the insecurities felt by the local populations, while basic needs are left unmet, the residents of these locations will not feel completely prepared to face the effects of climate change.

IV. Indicators of local organization as an effect of climate change

The theoretical analysis concludes that the vulnerability of a population to climate change is defined by its condition and present capacity to respond to and adapt to its impacts. An indicator which is used to explore the quality of local organization is a question posed to the participants asking if their community is organized in order to combat the effects of an extreme weather event. In the rural location, 100% of the participants responded "no". In the semi-urban location, 62% responded "no" and the remainder "yes". When participants were asked why they answered in this way; in the rural location participants indicate that they don't feel organized given that their basic needs are not taken care of. In addition they perceive other barriers to successful and productive organization, such as the absence of support from the local government and local conflicts about water distribution. In the semi-urban location, participants perceive the function of local leaders to be an important reason for the lack of local organization. The percentage that perceives that they are organized attributes this to the fact that the community has a neighborhood council. The results found by this indicator show that there is a common tendency between locations, where the local organization, as well as being a collective mechanism to respond to climactic impacts, also promotes well-being and security at the local level.

With the intention of deepening the analysis of the data found in the research, participants were consulted about how their community should be organized in order to confront local climate related emergencies. In the rural location, participants attributed the importance of their members' roles, in terms of unity, dialogue, and women's participation, as valuable contributions to local organization. In the semi-urban location, participants perceived that in order to be organized it is necessary to strengthen the leadership role in the location, to improve the coordination between members and leaders, and to promote the unity between members. In both locations, the participation of local government was not included in these processes.

What can be understood from the last indicators is that, on the one hand, both locations can interpret the state of local organization and the resources and mechanisms necessary to strengthen the quality of organization at the local level. On the other hand, the results of the indicator suggest that local organization and collective capacities are organic components of community life that must be strengthened in order to confront climate change and its adverse effects at the local level. The

importance of local organization should also be taken into account during the planning process of public policies aimed at reducing social vulnerability when confronting the effects of climate change. This indicator also shows that the absence of interaction between the local governments and the residents of the locations constitutes a framework for social vulnerability, not only to environmental stressors such as climate change but also to possible social conflicts due to needs which are not satisfactorily met.

CONCLUSIONS

The United Nations Development Program in Bolivia (2011b: 18) states that "the extreme climate events that are occurring today in Bolivia are real, and therefore it is of primary importance to incorporate this theme of climate change into political and development agendas, as soon as possible." With this in mind, the present study shows that it is in fact vital for the public policy and development agenda in Bolivia to include analysis, understanding, and reduction of social vulnerability to climate change, beginning in poorer sectors of society and in remote and vulnerable areas of the country. With the purpose of improving the resilience, diminishing the level of insecurity and increasing the local capacity to respond and adapt to climate change impacts, in rural as well as urban areas. This section draws the previous analysis to a close with a number of conclusions and recommendations.

Firstly, the methodology and analytical comparative model of the study has permitted an empirical construction of the knowledge garnered from the research. In this construction, the analytical narrative has offered an opportunity to know and understand the daily life of vulnerable populations and their efforts to survive and thrive in the face of numerous socially constructed vulnerabilities and the challenges created by the effects of climate change related weather events.

Secondly, this research has demonstrated that the knowledge inherent in local perceptions and interpretations is its own framework, through which it is possible to examine, understand, and define the social dimension of vulnerability to climate change at the local level in urban and rural areas. The comparative analysis confirms that there are diverse similarities and differences between the two locations studied, and it is possible to conclude that both locations have been and continue to be exposed to multiple variables of vulnerability, which influence different aspects of security negatively. Variables linked to indicators of well-being such as Unsatisfied Basic Needs, which have an impact on the socioeconomic well-being and security of vulnerable populations confronting extreme environmental stressors such as climate change. In this scenario, the social construction of vulnerability at the local level denotes the importance of examining the economic politics in Bolivia with a focus on the availability and distribution of resources, within the framework of rights and the ability of populations to exercise these and therefore fulfill basic needs. Given the information gathered, this study recommends defining politics and mechanisms to address and reduce the vulnerability in the locations studied and others experiencing a similar situation. The first and foremost course of action should be to assure access to basic resources such as clean drinking water, which will increase security and promote collective well-being. The effects of such change would be more secure and resilient communities which are better prepared for the negative effects of climate change.

Thirdly, in relation to the local knowledge about climate change at the local level in rural and urban areas, it has been demonstrated that although knowledge is incomplete in both locations, it represents an important step forward in the understanding of the subject in vulnerable areas. Therefore a further recommendation is to take into account the local dynamics of learning and production of knowledge in order to plan and conceptualize effective practices to support building and strengthening the local knowledge about climate change and its effects in Bolivia.

The fourth conclusion taken from the results of the study is that participants perceive the effects of climate change and its consequences at a local level, where the local interpretations relate the effects to variables of vulnerability found in the socioeconomic indicators. This confirms that on the one hand, in each location the impacts of climate change are interacting with social vulnerability and that this interaction is augmenting the rate of insecurity and exposure to the adverse effects of climate change. On the other hand, it also confirms that in both locations the capacity to respond and adapt to weather related impacts are being defined

by the level of vulnerability. It is possible to assume that adaptation to climate change in these locations is made more difficult by unaddressed vulnerabilities than by the actual climatic impacts. Therefore, the social vulnerability in these locations is considered a legacy of the vulnerabilities that continue to affect generation upon generation of residents of underserviced and isolated areas.

The fifth conclusion offered by this study stems from the fact that local perceptions are able to evaluate the state of local organization as a means of confronting the challenges of climactic impacts, as well as identify the mechanisms and resources necessary to strengthen the quality of local organization. Therefore it was found that the local organization is perceived by the participants as a collective component that improves the capacity of the community to respond to and adapt to climate change as well as to promote the reduction of social vulnerability at the local level. This suggests that in order to improve communities' resiliency to climate change it is important to support local efforts to organize, in rural as well as urban areas. These actions can be implemented by the municipal governments, NGOs, or government entities interested and invested in supporting initiatives of self-organization on the ground.

In conclusion, the analysis of this study's results recommend that all processes of analysis, understanding, and social vulnerability reduction to climate change at the local level must be bottom-up and based in places that are experiencing vulnerability. This implies becoming involved in and strengthening active participation in communities and vulnerable groups that presently live in vulnerable conditions in the country. This process of organization must include women's participation in decision-making. The present research made note that despite some political exclusion in the communities, female participants are capable of and interested in proposing changes in the social and economic context in their location in their own distinct ways, which suggests that social vulnerability could be addressed by using a gender specific lens. It is also important to be able to count on the support, will, and commitment of local governments, given that municipalities are the primary stage in which to address the analysis and understanding of vulnerability at the local level.

The empirical knowledge constructed through this study confirms that the reduction of social vulnerability will require broader work and collaboration between decision-makers at all levels of government, local actors, and outside aid from entities such as NGOs to make a difference and improve the capacity of vulnerable populations to respond to the effects of climate change.

BIBLIOGRAPHY

Andersen, L. E., & Verner, D. (2009). A Municipal Level Analysis of the Effects of Recent Climate Change on Life Expectancy, Consumption, Poverty and Inequality. Policy Research Working Paper 5092. The World Bank. October, 2009.

Asamblea General de las Naciones Unidas. (2010). Resolución Aprobada por las Naciones Unidas. 64/292. El derecho humano al agua y el saneamiento. Agosto, 2010.

CEDLA - Centro de Estudios para el Desarrollo Laboral y Agrario. (2010). Dossier de Empleo y Condiciones Laborales - Encuesta urbana de empleo 2008 -2010.

CEDLA - Centro de Estudios para el Desarrollo Laboral y Agrario. (2011). Presupuesto e Inversiones Municipales en Bolivia 2010: Dossier Estadístico. Serie Transparencia Fiscal. La Paz, 2011.

CORCONSUL SRL. (2006). Plan de Desarrollo Municipal de Cairoma 2006-2010. Empresa Consultora CORCONSUL SRL. Gobierno Municipal de Cairoma. 2006.

Cruz, Daniel. (2012). Cambio Climático y Políticas Municipales. Acciones en las Comunidades de Aiquile, Challapata y Padcaya. Daniel Cruz Fuentes; Fernando Canedo; Helga Gruberg; Fabiola Luján; César Pérez; Erika Zelada. La Paz: Embajada Real de Dinamarca; Fundación PIEB, 2012.

Espada, J. L. (2011). Financiamiento y Gatos de las Gobernaciones: Autonomía Sin Reforma. Centro de Estudios para el Desarrollo Laboral y Agrario - CEDLA. Serie Transparencia Fiscal. La Paz, 2011.

Espinoza, L., & Jiménez, W. (2011). Equidad en la prestación de servicios en Bolivia: Tarifa dignidad en electricidad. LAJED No. 17. Mayo, 2012. 135-168.

ENLARED MUNICIPAL. (2010). Suman 44 municipios los afectados por las inundaciones en todo el país. Retrieved March 19, 2011, from http://www.enlared.org.bo/portal/default.asp?cg2=6572

ENLARED MUNICIPAL. (2010). Declaran a un barrio del Alto como Zona de Desastre. Retrieved March 19, 2011, from http://www.enlared.org.bo/portal/default.asp?cg2=6652

Fernández, I. (2011). El Mercado de Agua y Saneamiento Básico en Bolivia. Oficina Económica y Comercial

de la Embajada de España en La Paz. Instituto Español de Comercio Exterior ICEX. 2011.

UNEP – United Nations Environment Program. (2007). Global Environmental Outlook (GEO4) – Environment for Development. 2007.

INE – Instituto Nacional de Estadística. (2007). Estadísticas e Indicadores Económicos y Socio demográficos de Bolivia. NOTA DE PRENSA, 64, 1-87.

INE - Instituto Nacional de Estadística. (2009). Anuario Estadístico. Instituto Nacional de Estadística. 2009.

IPCC – Intergovernmental Panel on Climate Change. (1997). The Regional Impacts of Climate Change: An Assessment of Vulnerability. In R. Watson, M. Zinyowera, R. Moss, D. Dokken (Eds.) Chapter 6: Latin America. (pp 1-38).

Kasperson, R. E. & Kasperson, J. X. (2001). Climate Change, Vulnerability, and Social Justice. Risk and Vulnerability Programme. Stockholm, Sweden: Stockholm Environmental Institute. 2001.

Kelly, M. & Adger, N. (1999). Assessing Vulnerability to Climate Change and Facilitating Adaptation. Climate Research Unit and the Centre for Social and Economic Research on the Global Environment. University of East Anglia and University College London. CSERGE Working Paper GEC 99-07.

Oxfam International. (2009). Bolivia: Climate Change, Poverty and Adaptation. S. Ticechurst, S. Urgel & S. Best (Eds.). La Paz, Bolivia: Oxfam International in Bolivia.

PDM. (2007) – Plan de Desarrollo Municipal 2007-2011. Gobierno Municipal de El Alto. Unidad de Planificación Estratégica. 2008.

PNSB. (2009). Plan Nacional de Saneamiento Básico: 2008 – 2015. Ministerio de Medio Ambiente y Agua. Estado Plurinacional de Bolivia. Actualizado entre Agosto y Noviembre 2009.

PNCC - Programa Nacional de Cambios Climáticos. (2007). Mecanismo Nacional de Adaptación al Cambio Climático. Ministerio de Planificación del Desarrollo. Viceministerio de Planificación Territorial y Ambiental. In O. Paz & I. Arana (Eds). La Paz, Bolivia: OGP Internacional.

PNCC - Programa Nacional de Cambios Climáticos. (2009). Segunda Comunicación Nacional del Estado Plurinacional de Bolivia ante la Convención Marco de Naciones Unidas sobre Cambio Climático. Ministerio de Medio Ambiente y Agua. Viceministerio de Medio Ambiente, Biodiversidad y Cambios Climáticos. In O. Paz Rada (Ed). La Paz, Bolivia: Artes Graficas COLOR.

PNUD - Programa de las Naciones Unidas para el Desarrollo. (2011a). Informe Nacional Sobre el Desarrollo Humano en Bolivia: Los Cambios detrás del Cambio. 2011.

PNUD - Programa de las Naciones Unidas para el Desarrollo (2011b). Tras las huellas del Cambio Climático en Bolivia. Estado del Arte del Conocimiento sobre adaptación al cambio climático agua y seguridad alimentaria. Proyecto de fortalecimiento de las capacidades de Sistematización e información del Cambio Climático en Bolivia. Abril 2011.

Rustand, A. (2013). Participatory Agency: Redefining development processes in CED initiatives on the Bolivian altiplano. MA thesis. Simon Fraser University, Burnaby.

Salas, M. (2007). Glosario de Terminología Estadística. Terminología Empleada en el INE para la difusión de la información. Instituto Nacional de Estadística. Proyecto de Interacción Social INE-UMSA. Primera edición. La Paz, Bolivia: Julio 2007.

Sánchez, Rolando. (2007). Capital Social y Posibilidades de Desarrollo en los Municipios. Las condiciones socioculturales y el desempeño económico y político. Plural Editores. Junio, 2007.

UNFCCC - United Nations Framework Convention on Climate Change. (1992). Full Text of the Convention. Article 1: Definitions. Retrieved March 17, 2011, from http://unfccc.int/essential_background/convention/background/items/1349.php

Laws and revised decrees

Nueva Constitución Política del Estado. (2007). Versión oficial aprobada por la Asamblea Constituyente 2007, y compatibilizada por el Honorable Congreso Nacional (2008).

Plan Nacional de Desarrollo. (2007). 'Bolivia Digna, Soberana, Productiva y Democrática para Vivir Bien': Lineamientos Estratégicos 2006 – 2011. D.S. 29272.

Ley No. 031 – Ley Marco de Autonomías y Descentralización 'Andrés Ibáñez'. (Del 19 de Julio del 2010)

Ley No. 300 – Ley Marco de la Madre Tierra y Desarrollo Integral para Vivir Bien. (Del 15 de Octubre del 2012).

Ley No. 2066 – Ley Modificatoria a la Ley 2029 de Saneamiento Básico (Del 11 de Abril del 2000).

Ley No. 1551 – Ley de Participación Popular (Del 20 de Abril de 1994).

APPENDIX

Survey – Model of Comparative Analysis with a Focus on Local Perceptions

Comparative Indicators	No.	Survey questions - Specific indicators	Analytical Categories	Type of question	Rural location	Semi-urban location
I. Demografic indicators	1	Participant - gender	Female/Male	Closed		
	2	Participant - age	55+/45 a 55/30 a 45/18 a 30 años	Closed		
II. Socioeconomic indicators	3	Livelihoods - What is your occupation?	Agricultural producer/vender/other	Semi-closed		
	4	How long have you lived in this location?	Always/more than 5 years/less than 5 years	Closed		
	5	Basic services - Which basic services do you have in your home?	Clean water - YES/NO Basic sanitation - YES/NO Electricity -YES/NO	Closed		
	6	If you do not have clean water, where do you obtain water from for home consumption?	Well/Irrigation canal/Public basin/ Cistern/other	Semi-closed		
	7	If you do not have clean water in your home, what do you believe the reasons are for the lack of access in this area?	Local perceptions	Open		
Climate change Indicators	8	Do you know about climate change?	YES/NO	Closed		
	9	What do you know about climate change?	Local perceptions	Open		
	10	Where do you have heard or learned about climate change?	Radio/Television/other	Semi-closed		
	11	What are the climate related emergencies that have affected you in the last 12 months?	Drought/river flooding/hail/flood/landslide/freezing temperatures/other	Semi-closed		
	12	How have these emergencies or climate impacts affected your household?	Local perceptions	Open		
	13	Have you received some for of aid from the municipal government during these emergencies?	YES/NO	Closed		
	14	Do you feel prepared for future climate related emergencies?	YES/NO	Closed		
	15	If the response to question 14 was 'No'- What would you need to feel prepared for such emergencies?	Local perceptions	Open		
IV. Indicators of local organization to confront climate impacts	16	Do you think that residents in your location are organized sufficiently to confront climate related impacts?	YES/NO	Closed		
	17	If the answer to question 16 was 'No'- Why do you believe your community is not sufficiently organized?	Local perceptions	Open		
	18	If the answer to question 16 was 'Yes'- How is your community organized to confront climate impacts?	Local perceptions	Open		
	19	If the answer to question 16 was 'No'- How do you think the residents in your location should be organized?	Local perceptions	Open		