

Migration as a Failure to Adapt? How Andean People Cope with Environmental Restrictions and Climate Variability

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Introduction

In discussions about climate change, environmental migration is often portrayed as a failure to adapt to a changing environment – a kind of worst-case scenario. The Intergovernmental Panel on Climate Change (IPCC) posited as early as 1990 that “the gravest effects of climate change may be those on human migration,” and many attempts have been made to estimate



the number of environmental refugees.¹ Forecasts of the number of persons having to move due to climate change and environmental degradation by 2050 vary between 25 million and 1 billion and largely depend on which of the climate scenarios materializes. While the exact magnitude may be uncertain, environmental degradation and resource depletion – often filtered through contexts of poverty, food deficiency, conflicts and inequity – will certainly affect population movement.² According to the International Organization of Migration, “[a]ddressing environmental migration in a context of heightened vulnerability is considered as a policy priority.”³

In efforts to help vulnerable and mobile communities cope with climate change, much emphasis is given to disaster risk reduction (DRR) and climate change adaptation (CCA) policies conducive to sustainable development.⁴ Improving public access to water (and other natural resources) is considered a crucial factor in achieving risk reduction and providing people with more space for adaptation. It is also viewed as central to increasing agricultural production (and thus incomes), improving health, and realizing the agro-ecological goals of sustainable land use.⁵

In the Andes, people are extremely vulnerable to increasing climate variability and drought. More than 20 million people are “living on the edge” in this region that stretches from Chile to Columbia. Given the natural limitations and difficulties for growing crops, the Andes

¹ Climate Change: The IPCC 1990 and 1992 Assessments, WMO/UNEP 1992, p. 103, para. 5.0.10., available at: http://www.ipcc.ch/ipccreports/far/IPCC_1990_and_1992_Assessments/English/ipcc-90-92-assessments-full-report.pdf.

² R. Black, “Environmental Refugees: Myth or Reality?” in *New Issues in Refugee Research*, Working Paper 34, 2001; S. Castles, “Environmental Change and Forced Migration: Making Sense of the Debate,” in *New Issues in Refugee Research*, Working Paper 70, 2002.

³ International Organization of Migration (IOM), *Disaster Risk Reduction, Climate Change Adaptation and Environmental Migration*, Geneva 2010.

⁴ IOM, *Disaster Risk Reduction* cit.

⁵ World Bank, “Bolivia: Poverty, Equity and Income: Expanding Earning Opportunities for the Poor,” unpublished paper, Country Operations Division I, Country Department II, Latin America and the Caribbean Region, Washington, DC 1996; United Nations, *Water for People, Water for Life*, World Water Development Report 1996, www.unesco.org/water/wwap.

can be considered a vertical frontier area for human occupation. Minor changes in water availability and temperature have huge implications for production and livelihood, including food security.

In the high Andes, climate uncertainty has always been a fact of life and Andean agriculture is strongly characterized by the ability to respond to variability and to build resilient systems in highly unpredictable agro-ecological conditions.⁶ Although communities have for a long time been highly adaptive and resilient, increasing climate variability is starting to push local water resource management systems beyond their adaptive capacity.⁷ Competition for water has intensified, “caused by endogenous demands linked to irrigated agriculture and urban population living in the Andean catchments and basins, and exogenous demands, especially from large urban centers and industrial, mining and energy-sector business.”⁸ In addition to growing water scarcity, Andean people have to deal with all kinds of environmental adversities and are increasingly under stress.⁹

This article assesses how Andean people cope with environmental restrictions and, more specifically, climate change. What role does migration play and what are its consequences for livelihood? The article is based on empirical research carried out in 1995-1997, 2002-2004 and 2010 in 17 communities in the departments of Chuquisaca and

⁶ C. Perez, C. Nicklin, O. Dangles, S. Vanek, S. Sherwood, S. Halloy, K. Garrett, and G. Forbes, “Climate Change in the High Andes: Implications and Adaptation Strategies for Small-Scale Farmers,” in *International Journal of Environmental, Cultural, Economic and Social Sustainability*, 6, 2010.

⁷ A. Chaplin, *Percepciones de comunarios y comunarias del Altiplano Boliviano sobre los cambios en el clima y sus efectos*, Creart Impresores, La Paz 2009.

⁸ “Concertación: Interdisciplinary Research and Capacity Building Program on Peasant and Indigenous Water Management in the Andes,” Project proposal, Sub Department Irrigation and Water Engineering, Wageningen University, Netherlands 2005, pp. 3-4.

⁹ H. McGray, A. Hammill, and R. Bradley, “Weathering the Storm; Options for Framing Adaptation and Development,” World Resources Institute Report, 2007; also R. Boelens and M. Zwarteveen, “Water, Gender and Andeanity: Conflict or Harmony; Gender Dimensions of Water Right in Diverging Regimes of Representation,” in *Imaging the Andes: Shifting Margins of a Marginal World*, T. Salman and A. Zoomers (eds), Aksant, Amsterdam 2003, pp. 145-66.

Potosí, as well as in six communities in Rio Chico (Chuquisaca).¹⁰

Chuquisaca and Potosí, two of the poorest departments in the southern Andes of Bolivia, suffer from harsh environmental conditions. In 1983, a prolonged drought struck the population, initiating a rapid inflow of NGOs organizing food support and, eventually, developmental programs. In spite of this, current environmental and economic conditions remain harsh and people still have to deal with many environmental adversities. Access to land is restricted to small and eroded parcels (collectively owned, but with individual user rights) and access to water is limited. Climate change has heightened the vulnerability of an already vulnerable people.

Since the New Economic Policy of 1984, Bolivia has been dominated by structural adjustment aimed at stabilization and economic growth at the national level. Only recently have Andean populations become more visible in policy-making. The *Ley de Participación Popular* (LPP), introduced under the first presidency of Gonzalo Sánchez de Lozada (1993-1997), allowed greater participation in policy-making. Rural regions became part of an administrative system previously run by urban areas. This went hand in hand with policies of decentralization that supplied municipalities with funds to implement development plans with local communities. With the election of Evo Morales

¹⁰ Between 1995 and 1997, we carried out in-depth research among 136 families in 17 communities in order to analyze the resource base of the rural population in relation to their livelihood strategies. See A. Zoomers (ed.), *Estrategias Campesinas en el Surandino de Bolivia: Intervenciones y desarrollo rural en el Norte de Chuquisaca y Potosí*, KIT-CEDLA-Centro de Información para el Desarrollo La Paz 1998. Between 2002 and 2004, we collected additional information about the families' upward and downward social mobility by carrying out interviews in the communities. This second round of research focused on establishing the extent to which access to land and water – and other factors – is crucial for the capability of people to develop sustainable livelihoods and/or to escape from poverty. Finally, in 2010, we updated our information by carrying out research in nine communities. See A. Zoomers and J.W. le Grand, "Vivir Bien? Analysing Development Trends in the Bolivian Andes since the Reform Policies of the Mid 1990s," unpublished paper for the EADI/DSA General Conference 2011. Communities included in this analysis are Ovejerías, Pampas Águila Kasa, Mojtulo, Guadalupe, Cantu Molino y la Barranca, all located in Chuquisaca. See D. A. Wiegant, "Manejo de recursos naturales en un clima cambiante; La cuenca del Río Chico, Bolivia," Informe del trabajo de campo, Universidad de Utrecht.

in 2005, indigenous groups took center stage. Morales emphasized the particularities of Andean life by pushing the concept of *vivir bien*, which refers to a type of collective, harmonious well-being in balance with nature. However, current environmental and economic conditions are worsening. In addition to widespread poverty, increasing drought, extreme weather conditions, and land fragmentation are contributing to water scarcity and severe environmental degradation. The retention and storage of water has been reduced, while peak flow rates have increased during the rainy seasons. How do people cope with these changes? And what role does migration play?

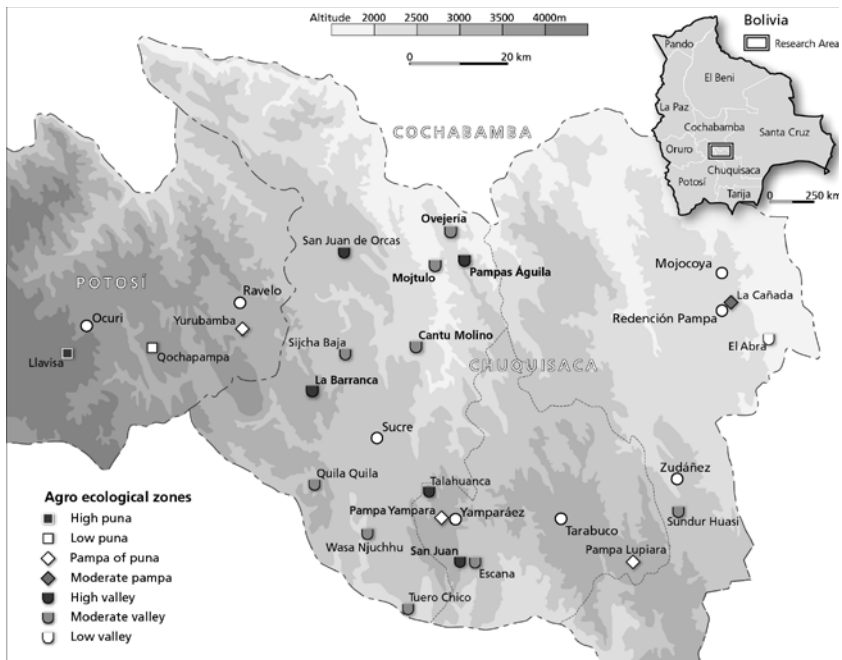
In this article, we first provide a description of the research area, followed by an overview of how Andean people cope with environmental restrictions. We then focus on issues of climate change. Specifically, we consider what kinds of environmental changes people experience and how they respond to them in terms of risk reduction and/or adaptation. Finally we turn to migration, giving an overview of how different types of migration play a role in sustaining livelihoods. We contend that migration – rather than being a flow of people moving away – should be perceived as people building webs of relationships to reduce their vulnerability at home. Migration allows them to engage in multi-local livelihoods, “catching” opportunities at various localities while remaining connected to their area of origin. Migration should not be seen as failure to adapt but rather as a way to stay.

Characterization of the Research Area

Located in the southern Andes, Chuquisaca and Potosí belong to Bolivia’s poorest regions and are inhabited by different groups of Quechua people. The majority of the rural population is chronically poor. Most live in villages and farm small parcels of eroded land. Despite the gains made since 1996, lack of infrastructure, such as roads, schools, and sanitation, has hampered both economic and social improvement¹¹ (Figure 1).

¹¹ As a consequence of the LPP, investments in social infrastructure have rapidly increased.

Figure 1. Research Area: Chuquisaca and Potosí



Source: Utrecht University Cartographic Laboratory

For a long time, the indigenous population played little role in civil society. Until the land reforms of 1953, the majority of the Quecha Indians worked as *peones* (semi-serfs) on the *haciendas* (estates). For usufruct rights to a small parcel of land, they were obliged to provide labor for the patron as well as all kinds of personal services.¹² Land reform did away with these feudal relations. The *peones* living in communities became the collective owners of the land, most of which was cultivated individually with family labor¹³ Between the

¹² C. Erasmus, "Upper Limits of Peasantry and Agrarian Reform: Bolivia, Venezuela, and Mexico Compared," in *Ethnology*, 6, 4, 1967, pp. 349-80; W. McEwen, *Changing Rural Society: A Study of Communities in Bolivia*, Oxford University Press, New York 1975, p. 448.

¹³ In the wake of the 1952 Bolivian revolution, the use of the term *indio* was officially abolished because it was considered discriminatory.

1960s and 1980s the Bolivian state attempted to help these groups to become “modern” farmers through rural development programs, or by encouraging them to settle in the eastern lowland of Santa Cruz as the beneficiaries of colonization schemes. But the majority of the rural population in the Andes remained excluded from state policies and civil rights. Bolivia’s mainstream policy, deeply informed by neoliberal principles since 1985, did not offer much space for indigenous groups to participate in and/or benefit from neoliberal reforms.¹⁴

Since the mid-1990s, the position of the Andean population has improved. While neoliberal policies on pricing, privatization, and capital flow have persisted, the election of Gonzalo Sánchez de Lozada in 1993 initiated a series of landmark social, economic, and constitutional reforms.¹⁵ Most noteworthy were the redefinition of Bolivia in the constitution as a multiethnic and multicultural state and the passage of articles protecting indigenous rights. Other vanguard legislation included the *Ley de Participación Popular* in 1994 that decentralized the country by creating 311 (now 321) municipal governments. The law introduced direct, municipal elections for the indigenous population, and included direct decision-making on municipal spending for which 20 percent of federal spending was guaranteed to the municipalities on a per capita basis. In addition, the approval of the *Reforma Educativa* (1994) was meant to introduce classroom teaching in the local indigenous language and promote literacy. Finally, in 1996 land reform (INRA law) attempted to make land markets more transparent while also making provisions for the defense of indigenous rights.¹⁶

Since 2005, when Bolivians elected Movement Toward Socialism indigenous leader Evo Morales as president, major changes have taken place. Morales has promised to change Bolivia and to em-

¹⁴ P. van Dijck (ed.), *The Bolivian Experiment: Structural Adjustment and Poverty Alleviation*, Centre for Latin American Research and Documentation, Amsterdam 1998.

¹⁵ P.O. Gumucio, “Bolivia: Evolution of Poverty under Liberal Economic Policies (1985-2003) and Microfinance for Poverty Alleviation,” 2005, <http://www.nd.edu/~kellogg/students/grants/pdfs/ortega2.pdf>; van Dijck, *The Bolivian Experiment* cit.

¹⁶ Zoomers and le Grand, “Vivir bien” cit.

power the nation's poor majority, giving indigenous people more say. Under his presidency, indigenous issues have taken center stage in national policies, and since his election a number of anti-poverty policies have been enacted, helping indigenous groups become less vulnerable. In addition, Morales is trying to take a leadership role in global climate change negotiations by speaking out against the Copenhagen Accord at the 2009 UN Climate Change Conference, and hosting the World People's Conference on Climate Change (WPCCC) in Cochabamba in 2010. Among the ideas underpinning Bolivia's position to tackle climate change and defend "mother earth" (or *Pachamama*) is that of *vivir bien* or "living well." *Vivir bien* is an evolving concept emanating from indigenous peoples and refers to a type of collective, harmonious well-being in balance with nature that poses an alternative to capitalist accumulation.

Despite these discourses and the general improvement of the indigenous population, widespread poverty persists. Poverty, however, is not uniform. Within our research area of Chuquisaca and Potosí, there is an enormous variation in livelihood and production: harvest times, crop varieties, rotation schemes, and climatological indicators (local knowledge about when to plant, harvest, etc.) vary from place to place depending on altitude and the agro-ecological situation. There are relatively prosperous villages based on potato production (mainly in the pampas) or fruit and horticultural crops (in the higher valleys), especially where there is greater access to irrigation water and roads. In other communities, especially in the highest and the lowest zones, farming activity is rather marginal and income is mainly derived from migration or other non-agricultural activities. People in the higher zones often have less flexibility than the people in the lower zones, who enjoy longer growing seasons and more choices in planning their crops. Harvest dates of similar crops vary from community to community, with important implications for the market prices. In addition, inheritance patterns and gender relations vary from community to community. In some communities the land is left to the sons, in other villages to the daughters.¹⁷

¹⁷ For a detailed overview of the characteristics of these communities, see Zoomers, *Estrategias Campesinas* cit.

The “Andean” Way to Deal with Climate and Environmental Stress

The Andean population is well known for its ability to adapt to environmental and agricultural constraints. Much has been written about how Andean people cope with diversity and how they respond to their highly variable circumstances.¹⁸

Climate strongly influences life in the Andes. Not only are climatic conditions diverse, varying from place to place, but individual microclimates change from month to month and year to year. Andean people recognize two distinct climatic periods: a cold, dry period – during which the nightly minimum temperature can reach zero degrees centigrade and precipitation is minimal – and a hot, rainy period, during which the minimum temperature and the precipitation rise, making possible the growth and development of plants and animals. The timing of each period varies from area to area depending on the climatic characteristics of each year.¹⁹

According to PRATEC (*Proyecto Andino de Tecnología Campesina*), a group of Peruvian Andeanist academics, Andean people are highly adaptive and it is difficult to make a distinction between a good year and a bad year for a farmer. As Valladolid Rivera puts it: “In both he receives a harvest for himself [...] either by production, or through using reserves (from years with levels of production which allowed them to conserve food for several years) or reciprocal relationships between neighbors and/or communities between different agro-ecological zones.”²⁰

¹⁸ See P. Morlón (ed.), *Comprender la agricultura campesina en los Andes Centrales; Perú-Bolivia*, Institut Français d’Etudes Andines, Lima 1996; E. Mayer, *The Articulated Peasant: Household Economics in the Andes*, Westview Press, Boulder, CO 2002; and T. Salman and A. Zoomers (eds), *Imaging the Andes: Shifting Margins of a Marginal World*, Aksant, Amsterdam 2003.

¹⁹ E. Grillo Fernandez, “Development or Decolonisation in the Andes?” in *The Spirit of Regeneration: Andean Culture Confronting Western Notions of Development*, F. Apffel-Marglin (ed.), Zed Books, London and New York 1998, p. 222.

²⁰ J. Valladolid Rivera, “Andean Peasant Agriculture: Nurturing a Diversity of Life in the Chacra?” in Apffel-Marglin, *The Spirit of Regeneration* cit., pp. 53-54.

In the Andes it is not a matter of resigning oneself to alternations between good (rainy) years and bad (dry) years. The Andeans accept the year as it is. “They converse with it through a large repertoire of knowledge in such a way that they always obtain a harvest. If they were not so, Andean peasants would have disappeared from the Andes many years ago and with them the Andean Culture.”²¹

In analyzing how Andean people adapt, Gelles notes that “there are a broad number of indigenous Andean cultural orientations that are fundamental to rural life in the highlands.”²² These include vertical organization, the significance of reciprocity, complementarity in the gendered division of labor, and the importance of rituals and fiestas.²³

The vertical access to different lands is an important tactic used to overcome environmental constraints and climate variability. Andean people are well known for seeking complementarities between different production zones. In the highlands (*puna*), land uses include the cultivation of bitter potatoes and the breeding of sheep and llamas; in the middle section, or valley heads, most of the cultivation is carried out (commonly potatoes, and the standard subsistence crops of maize, peas, and beans); and in the lower valleys, hard maize for cattle feed, corn on the cob, squash, and other crops are grown, and some beef and dairy cattle are bred. Vertical orientation and complex cultivation schemes enable people to exploit a wide range of microclimates at different elevations and different times. For example, potatoes, maize, broad beans, and wheat are grown depending on the altitude and the microclimate. Some of these varieties are resistant to drought conditions, others to excess humidity. This mixing of crops helps protect against seasonal extremes. Analyzing the current environmental circumstances in Chuquisaca and Potosí, and taking into account current patterns of land and water tenure in the various

²¹ Valladolid Rivera, “Andean Peasant Agriculture” cit., p. 54.

²² P. Gelles, *Water and Power in Highland Peru: The Cultural Politics of Irrigation and Development*, Rutgers University Press, New Brunswick, NJ 2002, p. 256.

²³ I. Yépez del Castillo, “Debates about *lo Andino* in Twentieth Century Peru,” in *Imaging the Andes: Shifting Margins of a Marginal World*, T. Salman and A. Zoomers (eds), Aksant, Amsterdam 2003, pp. 40-63.

communities, what can we say about environmental restrictions and the “adaptability” of people to overcome these constraints?

Focusing on the environmental characteristics of the research area, we see that people have to deal with a rather hostile environment. Communities located in the higher zones, in particular, are confronted with all kinds of environmental limitations and risks, including unexpected frosts, hail, thunderstorms, drought, rocky soils, among other things. Yet the lower zones (moderate pampa and valleys) also face environmental constraints, for water resources for irrigation are limited and erosion (from both wind and water) is considerable.

There are seven identifiable agricultural zones within the 17-village research area, with altitudes ranging from 1,500 to 4,200 meters. In the highlands (up to 4,500 meters above sea level), most communities raise pasture-dependent llamas and sheep. In the low *puna* and its pampa, at a height of 3,000-3,800 meters, agro-ecological conditions allow for crops of potato, wheat, and barley. Animal husbandry is limited, primarily consisting of sheep and a small number of cattle. In the moderate pampa and the high and moderate valleys (between 2,000 and 3,300 meters) farmers grow cereals such as wheat and barley, often combined with maize and potatoes. Any irrigated land available is used for a variety of crops, including irrigated potatoes (*papa misk'a*, which are harvested early), maize, and fruits. Sheep and goats are raised in small flocks. In the lower and warmer valleys (2,000 meters or lower) there is a broad range of agricultural activities, especially on irrigable lands. There are *misk'a* potatoes, fruit, and horticultural crops; few families raise cattle or small animals.²⁴

Focusing in more detail on the resource base of households in the 17 villages, however, we find that the vertical orientation of farmers – and their capacity to reduce risks – should not be overestimated. The average area of land per family is very limited. The majority of the population has to cope with small areas of steep, stony, and

²⁴ A. Aramayo, “Cambios en la agricultura e influencia sobre las estrategias campesinas,” in *Estrategias Campesinas en el Surandino de Bolivia: Intervenciones y desarrollo rural en el Norte de Chuquisaca y Potosí*, A. Zoomers (ed.), KIT-CEDLA-Centro de Información para el Desarrollo, La Paz 1998, pp. 95-125.

eroded land, ranging from 5 to 23 parcels (2.7-7.4 ha) land). Most of the research area is relatively dry and the possibilities for irrigation are very restricted.²⁵

In spite of the existence of seven zones, the majority of families have access to only two zones, one lower (for farming) and one higher (for pasturing). While this vertical orientation helps people to spread the risk of a total harvest failure and to make efficient use of labor, it is increasingly under stress from a number of factors: land fragmentation (due to inheritance), climate change, severe droughts and desertification, and the privatization of many collective pastures due to increasing population pressure. The possibilities for acquiring additional land are extremely limited.

Vertical relationships are declining in production systems as well as in exchange relationships. Trading patterns and *trueque* (traditional exchange of goods *in natura*) between communities located in different agro-ecological zones are shrinking. *Llameros*, llama herders who reside in the highest villages, used to regularly spend a few months a year in the valleys with their animals to exchange salt and pottery for maize and cash. They once played a key role in trade between high mountain areas and valleys but land fragmentation and shifting cultivation patterns have reduced the frequency of their trips. Throughout the Andes, the traditional exchange of potatoes from high-altitude communities for maize from low-lying communities is dying out. The disappearance of traditional Andean crops such as *oca* and *lisa* (partly as a consequence of climate change), the introduction of new crops, shifts in harvest periods, motorized transportation, and progressive urbanization have all contributed to new trading and exchange patterns. Monetary commercial relations have replaced much of the traditional *trueque*.

In most communities, the hydrology, topography, soils, and micro-

²⁵ Irrigation systems tend to be small, supplying 0.1-2.7 ha and employing simple canals to bring the water to the *comunidad*. Most irrigation canals and reservoirs are made of earth and, occasionally, cement. They remain dry until a particular field needs irrigating. Access to irrigation water depends on the location of land and the particular rules and obligations inherent in each local irrigation system.

climate are not very favorable for farming and the possibilities for risk reduction and/or adaptation are rather limited (land fragmentation, no irrigation, etc.). Commercial agricultural is found only in a restricted number of niche areas: commercial potato production is concentrated in Pampa de Puna and Puna Baja (Yurubamba, Pampa Lupiara, Pampa Yampara, Qochapampa), while specialized fruits and horticulture are found in Valle Bajo and Valle Templada (El Abra, Wasa Nujchu, Escana, Quila Quila, etc.), which have sufficient possibilities for irrigation. In most of the other villages, however, the agricultural potential is low, and people are mainly dependent on a combination of subsistence farming and non-agricultural sources of income. Migration is an important source of income in almost all the communities.²⁶

What do People Notice Regarding Climate Change?

In order to gain a better understanding of how people perceive ecological risks and adversities, specifically climate change, we carried out a pilot study in Rio Chico, doing focus group discussions in six representative communities all located in Chuquisaca.²⁷ The selected communities are located at elevations between 1,500 and 3,800 meters; annual precipitation ranges from 500 to 1,000 mm, and evapotranspiration rates are between 400 and 600 mm per annum. The cultivated crops are most commonly maize, potatoes, wheat, barley, and – in lower irrigated areas – fruit. Most of the producers also keep some goats and sheep. The communities are all within three hours of the city of Sucre.

In order to better understand local perceptions of climate change, Wiegant asked villagers – most of whom had access to small parcels of marginally productive land – to compare present conditions

²⁶ Zoomers, *Estrategias Campesinas* cit.

²⁷ Wiegant, “Manejo de recursos” cit.; see also D.A. Wiegant and A. Zoomers, “Subsistencia en un clima cambiante,” in *Seguridades Hídricas Disputadas en los Andes*, J. Hoogesteger and P. Urteaga (eds), IEP, Lima forthcoming. Communities included in this analysis are Ovejería, Pampas Águila Kasa, Mojtulo, Guadalupe, Cantu Molino y la Barranca,

to those of earlier decades.²⁸ It became clear that most informants perceived environmental degradation. According to Wiegant, all communities reported problems of increasing drought. As one informant from Pampas Aguila Kasa noted, the “[f]irst challenge is the drought. Before we had rains... [N]ow it is no longer raining. Without rain, there is no life.”²⁹ In Ovejerías, Pampas Águila Kasa, and La Barranca, droughts led to declining levels of crop productivity; similar problems occurred in the lower valley (Mojtulo, Cantu Molino, Guadalupe) despite access to irrigation. Here, drought hurt crop farming but also reduced available pasture and, as a consequence, the availability of dung for horticulture.

In the higher zones, people indicated that water scarcity had increased; part of the year they are completely dependent on lower areas for access to river water. Temperatures are reportedly rising – the sun is reportedly more “burning” than before – resulting in higher levels of evapotranspiration. Higher temperatures have sometimes resulted in better opportunities for crop farming, such as in Llavisa, where potatoes are now grown alongside traditional llama raising. The perception of rising temperatures is particularly notable among local inhabitants. One villager from Guadalupe recalled that “[w]hen I was young the climate was not like this. The heat was not so strong; temperature was moderate. It was simple, the sun was not burning like now. Things have changed and work is now more difficult.”³⁰ In Ovejerías, another local testified that “[s]ince the moment that the drought started everything has changed. The heat is more intense. It seems that the sun is sinking – would it? Only when we have rain for three days the soil remains humid. This is doing harm to agriculture.”³¹

²⁸ Wiegant, “Manejo de recursos” cit. Quotations from Wiegant’s informants in the following paragraph are all taken from the 2010 study and have been translated into English by the author. The original quotations are included in footnotes.

²⁹ “Primer desafío es la sequía. Antes llovía sin más, ahora ya no llueve. Cuando no hay agua, no hay vida.”

³⁰ “Antes cuando yo era pequeño el clima no era así. El calor no era tan fuerte; era suave más bien. Era simple, no te quemaba como ahora. Eso ha cambiado y perjudica hartito en el trabajo.”

³¹ “Desde el momento que empezó la sequía todo ha cambiado. Ahora más

Another perceived problem linked to climate change is the rapidly rising water levels in the rivers during rain showers and thunderstorms (*riadadas*). Due to intensive floods, crops planted near the rivers are washed away and infrastructure is destroyed. Storms also intensify erosion and, especially when hail appears, damage crops. At Cantu Molino, an informant related that “[I]ast year we had rain, but also a hail storm came. It was heavy for our zone. It destroyed everything; only the stalks remained; no leaves left. Nothing was left, not even the irrigated part. We were left with nothing.”³²

Given that erosion is extreme, with significant losses of natural vegetation, recuperation can take a long time. One inhabitant at Pampas Aguila Kasa pointed out the increased intensity of floods and erosion: “Before the rains came quietly. Today they come with thunderstorms. All the vegetation that we have is dragged into the river. No vegetation is left. We are losing our soil and no production is left. The nutrients are gone. This is why the plants can no longer feed themselves, isn’t it?”³³ These concerns over increased erosion were echoed at La Baranca: “We used to have good potato harvests and we sustained our families all year long. But not any longer – we support ourselves for some months and then have to get potatoes from the market. We used to have good soil and we could cultivate large tracts of land. But not anymore; with the erosion cultivation is no longer possible.”³⁴

According to local sources, river water levels in the valleys have in-

fuerte es el calor. Parece que el sol se ha bajado ¿qué será? Cuando llueve por sólo tres días se mantiene húmedo el suelo. Eso perjudica la agricultura.”

³² “Aunque el año anterior ha llovido, también una granizada ha venido. En este sector fue grave. Ha destrozado todo; las plantas han sido descascaradas. Palo ha quedado, ya no había hoja. Ha raspado totalmente, hasta el bajo riego. Sin nada nos ha dejado.”

³³ “Antes la lluvia era con calma. Ahora hay tormentas. Toda vegetación que hay, se lo arrastra al río. No deja ahí la vegetación. Entonces se pierde la tierra y no produce nada ya. La capa nutritiva se lo lleva. Con qué se van a alimentar también las plantas ¿no?”

³⁴ “Nuestras papas daban muy bien y la familia sostenía todo el año redondo. Ahora ya no, aguantamos unos meses y tendremos que sacar del mercado nosotros mismos. Las tierras eran buenas y grandes parcelas se podían cultivar. Ahora no, con la erosión no se puede cultivar.”

creased one and a half to two meters over the past three decades. Floods and increased sedimentation are blamed for the loss of good agricultural land, natural vegetation, and infrastructure. At Ovejerías, one inhabitant lamented: “It has been raining for months – then a thunderstorm comes and everything is dragged into the river. The water level in the river increases rapidly, taking everything. Now the erosion gullies are deeper than the horticultural lands. Before, the river was lower than the gardens. When the water level rises, the gardens are inundated.”³⁵

In addition, important changes have taken place in the agricultural calendar. Rainy seasons have become more irregular, making it harder for farmers to anticipate. Asking people to compare present conditions with the “normal” start and end of the rainy season, it is clear they believe that droughts have intensified and that rains are now more scattered and unexpected. The rainy season, which used to occur between September and April, now has considerably shortened, lasting only from January to March.

Focus group discussions made clear that drought and extreme rain are linked, and that the climate overall has become more variable and extreme. Many stressed that before 1983 – when Chuquisaca was confronted with an extreme drought – rainy seasons were more regular and harvests more regular and abundant. Two testimonies from Mojtulo reflect this sense of recent degradation:

People used to maintain the soil fertility. There were also regular rains. Sowing the land gave some guarantees for having a harvest. People had enough to live on. Almost everybody had a quiet life and did not think of migrating to other places. There was enough food to sustain the family and to sell products through the year.³⁶

³⁵ “Llueve muchos meses y luego una tormenta viene y se lo lleva todo. El río mucho crece y se está levantando. Ahora las huertas se ven más profundas, las quebradas son más altas que las huertas. Antes el río era más bajo que las huertas. Cuando crece el agua se sube a ellas.”

³⁶ “Se mantenía el alimento en el suelo. La lluvia también continuamente había. Entonces lo que sembrábamos daba sin más. Suficiente vivía la gente. Cualquiera vivía tranquilo y no pensaba en emigrar a otros lugares. Había alimento para mantener la familia y vender todo el año.”

Twenty-eight years ago, we had enough rain and production was sufficient. And when you have production you also have money. There was no need for migration. But the time goes by and times are changing. We have less rains and the sun is more intensive.³⁷

Climate change means that the old climatological indicators are increasingly difficult to use, and that people are more adversely affected than before by droughts and strong winds, especially in the higher zones. Predicting the weather seems more difficult than before. People in the lower zones complain about the incidence of pests, which nowadays seem to occur more frequently than in previous periods.

In conclusion, we found through our research that region vulnerability due to environmental degradation and climate change has generally increased and that, as a result, agricultural productivity has in many cases deteriorated. Soil degradation and erosion are apparent everywhere, and plagues and disease are increasingly common. Since the onset of prolonged drought in 1983, land use patterns have changed dramatically. High altitude communities produce less *oca* and *lisa* and more broad beans. At the same time, extreme drought has diminished higher elevation farming. As agricultural land became increasingly scarce, more and more pasture was turned towards cultivation. Land fragmentation and progressive erosion further reduced pasture. Lack of sufficient animal feed reduced the number of livestock and affected the balance between animal husbandry and agriculture. Only in the communities oriented towards potato production and in villages specializing in horticultural crops was the shortage of manure compensated in part by purchasing fertilizers. Rising demand seemed to be leading some communities to specialize in manure production.

Overall, farming appears to have become riskier. Vertical orientation, a long-standing coping mechanism for Andean society, is no longer a viable tactic as few farmers have retained their traditional

³⁷ “Hace veinticinco años, había bastante lluvia y producción. Cuando había producción había también recursos. Uno no tenía el interés de migración. Pero pasa el tiempo y viene cambiando. Más pocas son las lluvias y más fuerte es el sol.”

access to land in different agro-ecological zone.³⁸ In the vicinity of the Pilcomayo River, serious water pollution from mining threatened agricultural production and worsened health problems. Deforestation made firewood collection progressively more difficult. Gathering firewood required more time and money, as it had to come from farther afield, and many people had switched to gas or purchased firewood from transport agents.

During our final visit to the region in 2010, the situation had further deteriorated.³⁹ There is now widespread concern over the severe impact of climate change, especially in places such as San Juan, Tuero Chico, and Ovejerias in Rio Chico. In almost all communities, the productivity of the land has decreased. Increasing erosion and extreme weather conditions such as drought, flooding, and storms are the main culprits. At higher elevations, the abandonment of agricultural land is accelerating as people migrate to lower regions (Ovejerias, Talahuanca, San Juan).⁴⁰ The community of Ovejerias has practically disintegrated; only a few of the originally more than 100 families still remain.⁴¹ Irrigation systems designed to boost market-oriented agricultural development continue to be limited by small plot sizes and lack of technical assistance.

Livelihood, Well-being, and Social Mobility

In order to understand whether environmental degradation and climate change have a direct impact on livelihood and well-being,

³⁸ J.V. Murra, "The Economic Organization of the Inca State," PhD dissertation, University of Chicago 1956; id., "El Control Vertical de un Máximo de Pisos Ecológicos en las Sociedades Andinas," in *Formaciones Económicas y Políticas del Mundo Andino*, Instituto de Estudios Peruanos, Lima 1975.

³⁹ People hardly invested in cattle, due to the lack of pastures and water access, but also because of lack of labor force (children go to school and/or people are absent due to migration, e.g. Escana). Less cattle also means less fertilizer and therefore fewer possibilities to keep dry land agriculture productive.

⁴⁰ This happened often in combination with *doble residencia* with urban areas and/or migration.

⁴¹ Zoomers and le Grand, "Vivir bien" cit.

we analyzed the link between access to natural resources (such as land or water) and social mobility.

In most communities, people have diversified livelihood patterns: they mix farming with all kinds of non-agrarian activities, such as wool production, handicrafts, wage labor, migration, and so forth. Most of the activities are mutually linked, such as farming and cattle holding; others are linked in a more substitutive way, as when migration is spurred by harvest failure; yet others are linked in a complementary way, like when milk production is combined with cheese production. New opportunities, such as tractor driving, have arisen in some villages. Yet, at the same time, other sources of income have disappeared, such as weaving or the sale of firewood. In some respects, activities based on the natural surroundings or on traditional knowledge are being replaced by activities based on modern knowledge and information.

In order to better understand the link between environmental circumstances and people's socio-economic status, we asked people in the 17 villages to classify the local population into four groups: the poorest, the poor, the intermediate rich, and the rich. From this we collected information about their resource base. It is interesting to see that there is no direct link between access to land and water and well-being. Whereas in some villages people with less than two hectares appear as "rich," others working the same amount at other locations are considered "poor." Rather than expressing well-being (or poverty) on the basis of plot size, socio-economic status is in the first place a reflection of agro-ecological situation (which determines what can they grow, when can they harvest, etc.). Access to water was not mentioned as an indicator of well-being, simply because irrigation did not exist in the majority of cases. In the communities that do have irrigation, water use is usually a reflection of land ownership.

The "rich" and "intermediate rich" do have larger areas of cultivated land at better locations, but differences in welfare are expressed mainly on the basis of other criteria. The rich are characterized as having more animals, having higher levels of education, and having the capacity to work hard, performing communal tasks (*cargos*) and being a responsible community member. Poverty is not so much a reflection of having less land, but lacking land at the right locations, without having

possibilities to compensate. Poor families tend to have fewer animals (lack of dung and dependency on renting labor and/or tractor services reduce production); they are considered to be incapable of working hard (they often accused of being “uneducated,” “lazy,” or “drunk”); and/or they are excluded from social relations. In other words, in the Andes the differences in well-being are primarily a reflection of access to land and water, since within the community people are more or less in the same circumstances. Differences in well-being are mainly reflected in human capital (people’s capacity to work hard, their level of education), produced capital (ownership of cattle, a tractor, etc.), and financial capital (mainly originating from migration).

The importance of hard work and human capital is also reflected in the kind of social mobility that families often experience during their lifetime. Households develop along a scale of relative wealth. As a household expands and children grow, labor capabilities and consumption needs change, contributing to improvements in well-being and expansion of development options. For a family, the development cycle begins with marriage of a couple with a limited amount of production potential and low consumption requirements. As children are born into the family, consumption needs rise without an immediate increase in the household’s labor supply. Only after a few years, when the children are old enough to help with the production and exchange activities, does the household reach its peak in both production potential and consumption needs. As children marry, availability of labor power gradually diminishes. Finally, with the division into new households, resources dwindle, especially if the children demand their inheritance early.⁴²

In order to analyze in greater detail whether people – according to their own criteria – had experienced upward or downward mobility, we compared the majority of the population (65 percent) who did not experience social mobility between 1998 and 2004 with two groups that did: those who experienced an improvement of their situation (20 percent) and those whose situation deteriorated (15 percent).⁴³

⁴² Zoomers, *Estrategias Campesinas* cit., pp. 42-43.

⁴³ Between 1995 and 1997, we analyzed in detail the livelihood strategies of

Here again we see that factors other than access to water and land play a more important role in determining whether people can or cannot escape from poverty. Even though upward mobility sometimes started with inheriting sufficient land at the right location (especially in zones with agricultural potential), in most of the cases upward mobility started by earning money through migration.⁴⁴ After this first accumulation of resources, whether or not people will experience further upward mobility very much depends on subsequent patterns of investment.⁴⁵

Looking more specifically at the investment behavior of the successful group after the first accumulation, we see that some people focus on buying additional land and/or an irrigation pump. The majority, however, have no access to water or more land; in other words, they have no opportunities for upward mobility without leaving. Among these people, a very common strategy is to purchase an urban plot in Sucre and to give their children a good education. In this case, upward social mobility seems to be linked to outward-oriented strategies, in

136 families in 17 villages (Zoomers, *Estrategias Campesinas* cit). Between 1998 and 2004, we continued our research by making a selection of the people who experienced upward and downward mobility (i.e., those families whose situation had improved or deteriorated, according to their own criteria). During this follow-up, we interviewed about 65 families in Zudañez, Yamparaéz and Oropeza (Chuquisaca) and Chayanta in the north of Potosí.

⁴⁴ In the research area, each community seems to have its own rules of inheritance: in some cases, all the children (i.e. both sons and daughters) receive an equal share of each parcel and the accompanying irrigation rights; in other communities the sons receive the best part of the land, while in others the best land goes to the oldest children or remains with the youngest child. There is no fixed, local, or indigenous “rule”: the inheritance system is largely dependent on location and varies in the extent of land inherited.

⁴⁵ It is important, however, to acknowledge that, like poverty, social mobility is relative: in communities where the average situation has improved, people whose situation has remained the same will be inclined to say that their situation has deteriorated (in comparison to others). The reverse is also true: in those cases where the majority of the population has moved into poverty, those whose situation has remained the same will have the feeling that their situation has improved. Processes of social mobility were perceived in close relation to mainstream development (what happened in comparison to the neighbors).

which parents give priority to facilitating the departure of their children; rural life without links to the city is often seen as non-viable. Only a few still have the desire to become full-time farmers.

In comparison, downward mobility is often due to personal misfortunes, such as illness or the death of a family member, and goes hand in hand with high costs of basic needs, such as medicine. There are a number of resources that are required in order to overcome misfortune: the possession of livestock, which can be sold in an emergency; flexibility in reallocating labor (e.g. migration); educational level (which very much determines a person's ability to find a job); and social networks. The majority of those who are trapped in a vicious downward circle are older people and single-head households (small and "incomplete" families) without animal reserves and available labor to compensate for the loss.

People in need who experience downward social mobility are usually not helped by the lucky group of social climbers, but will normally be supported by relatives and neighbors, thereby depending on good will. The willingness to help varies from case to case, and depends on the reputation of the person involved (is it a drunkard, or a good worker who contributed much to communal life?). The Andean community serves as a safety net, but not under all circumstances. Solidarity is something that needs to be earned, and support is not given under all circumstances. Solidarity is expressed particularly at moments of death and illness. In case of death, the community will come together for a ceremony, bringing an egg (helping the deceased person to pay off his/her debts), candles, and matches, as well as maize and something to drink (which he/she will need during the journey). If someone is ill and is behind with working on the land, the community helps with the harvest.

Challenging the Assumption of Environmental Migration

It is clear that mobility and migration are strategies Andean people use to cope with environmental degradation and climate change.

Traditionally, within the *ayllus* (connecting villages from the highlands and lowlands), people were extremely mobile and exchanged their products between agro-ecological zones, enabling access to the whole range of available products. People in Llavisa (located at 4,200 meters) still belong to the *llameros* – a semi-nomadic group travelling between the high *puna* and the valleys who play an important role as intermediaries in exchanging highland salt for lowland crops. In addition to this vertical type of mobility, people have also developed horizontal mobilities, especially since the land reform of 1953 and the abolishment of the hacienda system. In the 1970s, the Bolivian government started to promote agricultural colonization and large numbers of people migrated to lowland areas to become colonists. Others moved to these regions as temporary migrants, working in the eastern region to complement their income for a couple of months during the year. In the course of time, with the urbanization of Santa Cruz and Sucre, the numbers of seasonal migrants has increased, with migrants being drawn to the construction industry (men) or domestic service (women). In addition, others have migrated to Argentina and, since 2005, Spain.

In the Andes, rather than focusing on agriculture, many *comuneros* are increasingly interested in migration. With the exception of a small group of people with good agricultural land, migration plays a crucial role in people's lives as a strategy for accumulating financial capital, sometimes used for adaptation (satisfying urgent money needs), but mostly used for more structural changes. When people have access to more money due to migration, it is hardly ever invested in the home community.⁴⁶ After their first accumulation, most people do not buy additional agricultural land or invest in irrigation, but buy an urban plot in Sucre and invest in the education of their children. The majority of the "rich" show patterns of double residence; they keep their land in the community while investing in their Sucre life. Leaving the village is the ideal sought by the majority of the people who are experiencing upward mobility.

⁴⁶ Some do try to buy land, but most of it is rather marginal and water scarcity is a limiting factor.

After arriving in the city, however, many are still confronted with a difficult situation, and keep their land as a safety net. In some cases the parents remain behind in the community to take care of the land and animals; in other cases the whole family moves to town and the land is temporarily rented to other members of the community (mostly under conditions of sharecropping). Family members who remain behind look after the family's interests and fulfill community obligations, such as attending meetings or providing labor for communal tasks. This practice helps the migrants to avoid penalties and to retain access to the land. People consider migration the most effective way of accumulating money. It is striking that the majority stress that they hope their children will be able to build a life outside the community, but also emphasize the importance of maintaining contact with the community.

It is clear that, in the Andes, dealing with environmental stress, climate change, or the urgent need for cash are important forces pushing people to new places. But rather than a strategy to cope with adverse circumstances, migration is viewed by most as a tactic for capital accumulation while they expand networks and establish patterns of double residence. In the context of the Andes, migration is not a linear process from A to B. To the extent that people move, they often do so selectively, for different reasons and in different directions, often without losing the ties with their area of origin. Communities compensate for this horizontal mobility and (temporary) loss of population: if *comuneros* cannot be present at the local assembly, they can compensate by paying fines or sending a representative to take their place. Since communities' budgets depend on the number of registered people, municipalities do their best to bring people home during census periods, and have started to implement policies that encourage migrants to remain involved.

Conclusions

This article has assessed how people in the southern Andes of Bolivia cope with environmental restrictions and climate variability. Specifically, it has examined the role of migration as an adaptation to

climate change. The Andean population is well known for its ability to adapt to adverse agro-ecological circumstances. But Andean tactics of adaptation are increasingly unable to solve structural limitations such as drought and *minifundio* and provide few opportunities for upward mobility. Access to land is often fragmented and most people do not have access to water resources. People are faced with both scarcity and degradation.

Current policies for risk reduction and climate adaptation, as well as municipal plans formulated in the context of the *Ley de Participación Popular*, emphasize the need to expand irrigation. But the possibilities for irrigation are restricted. Many villages, experienced in dealing with droughts, have little experience with irrigation. Irrigation, often presented as a technical solution, is a highly sensitive matter requiring many sophisticated institutions, and irrigation projects are often accompanied by conflicts and contrasting interests. It is only in a few places that irrigation systems are feasible from the economic point of view (i.e., in the areas with agricultural potential).

In recent decades, the fragmentation of land plots and water rights have eroded the capacity of people to adapt. This capacity is not going to magically reappear in response to the need to adapt to climate change. In Chuquisaca and Potosí, the opportunities for agricultural intensification are extremely limited; rather than investing in land or water, people prefer to invest in a future elsewhere by giving their children a good education and/or buying an urban plot in Sucre while often maintaining contact with their home community.

In Chuquisaca and Potosí, migration should not be portrayed as a failure to adapt to a changing environment or as a worst-case scenario. True, in the Bolivian Andes there is more out-migration than before, and cities such as Sucre have rapidly expanded; however, presenting this as environmental migration would be an oversimplification. In this case, migration cannot be presented as a forced and environmentally-driven flow of people moving from A to B. In addition to temporary intra-rural and rural to urban migration, increasing numbers of people opt for double residency, maintaining one home in the city and one home in the countryside. At the same time, long-distance migration to Argentina (and, more recently,

Spain) is increasingly important. Migrants often maintain relationships with those left behind, and retain their status as a *comunero*. To the extent that people receive remittances or return with funds, the majority prefer to use these funds for coping with cash needs, or buying a plot in Sucre.

Hence, in the Andes, migration should not be seen as a manifestation of acute vulnerability due to environmental factors. Along with the erosion of vertical relationships, migration has become a capital, providing people with possibilities to endure and to expand their livelihoods horizontally. Here, migration is a way to stay.

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