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## CASE STUDY

### The climate-development nexus: using climate voices to prepare adaptation initiatives in the Peruvian Andes

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What are the lessons from development practice that adaptation interventions can use to engage vulnerable people? To answer this question, the paper reviews field data on perceptions of environmental and climatic change in a Peruvian mountain community and discusses the possibilities and limitations of using local climate voices to prepare for climate change adaptation. The data comprise two complementary household surveys. The first survey provides information on the community's socio-economic situation, whilst the second survey documents the villagers' climate perception. The data reveal a paradox in the way the community understands global climate change. The villagers who live on the margin of the global world and belong to the poorest economic strata in Peru are deeply concerned about global climate change that is impacting their environment. Yet when locating the cause of climate change they point to their own community rather than the industrialized world and suggest mitigation actions rather than adaptation initiatives as answer to the problems it entails. The paper suggests that adaptation initiatives must understand this paradox within the larger socio-economic and discursive context that shapes the villagers' agency and climate perceptions. It proposes an informed participation approach that listens to the local voices but that also informs them about the global dimensions of climate change and engages them in a critical dialogue about the importance of sustainable development and the possibilities of taking advantage of the new opportunities that the changing environment offers.

**Keywords:** Climate change; community-based adaptation; development; participation; Peruvian Andes

## Introduction

Traditionally, professionals and experts have focused their work in the developing countries on issues such as agricultural production, poverty alleviation, gender equality and health problems. More recently, climate change adaptation has also entered on their agenda, which poses new challenges for development work. One of the lessons learned from development work is that involving the local population not only in the implementation but also in the preparation of development projects is critical for their sustainability (Gardner & Lewis, 2000; Green, 2009). As a result, it has become best practice in development work to consult the local population when designing projects and draw on their expertise to carry them out. In the words of Chambers (1994), professionals must 'put the last first', that is, to take inclusion literally. Recent works suggest that to follow Chambers' manifesto we must review the complex relationship between experts and locals (Long, 2001) and the difficulties the former encounter when engaging the latter in development projects (Crew & Axelby, 2013; Mosse, 2005). Adaptation initiatives are learning from this scholarship and the growing body of

literature that discusses the cultural dimensions of climate change and the possibilities of engaging local voices in adaptation initiatives (Adger, Barnett, Brown, Marshall, & O'Brien, 2012; Crate, 2011; Crate & Nuttall, 2009; Crona, Wutich, Brewis, & Gartin, 2013). Within this literature one group of scholars documents climate perceptions and climate concerns among farmers and other stakeholders in the Western world (Arbuckle et al., 2013; Endfield & Morris, 2013; Liu, Smith, & Safi, 2014). Another group explores how indigenous people anticipate climate change and how their knowledge can enter into dialogue with science-based knowledge (Green & Raygorodetsky, 2010; Orlove, Roncoli, Kabugo, & Majugu, 2010; Williams & Hardison, 2013) while a third group assesses the possibility of involving the local population in adaptation strategies (Heltberg, Gita, & Radhika, 2012; Roncoli, 2006; Sherman & Ford, 2014).

The paper contributes to this scholarship by investigating the difficulties that vulnerable people face when adapting to climate change and showing how their climate perceptions can help prepare adaptation initiatives. It brings the research one step further by not only

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documenting the climate voices of vulnerable people but also exploring some of the contradictions and tensions that shape their climate perceptions, environmental concerns and anticipatory practices and scrutinizing the challenges that these create for adaptation initiatives. Unlike traditional projects that aim to improve the living conditions of rural and urban poor, adaptation initiatives help vulnerable people to adjust to environmental and climatic change, a phenomenon that is caused by global forces and that they cannot reverse (Adger, 2006). Rather than changing the lives of the poor for the better as traditional development work does, adapting to climate change prepares people for the worse and helps them make the best out of a situation they had rather been without (Adger, 2001). As Adger and others point out, 'Building adaptive capacity is not synonymous with development' (2003, p. 193).

Moreover, vulnerable people's climate perceptions are often at variance with science-based knowledge. In the case of this study, people believe that climate change is a local phenomenon caused by their own actions rather than a global phenomenon caused by activities in other parts of the world. Accordingly, when asked how to cope with climate change they suggest short-term mitigation actions by reducing their own Greenhouse Gas (GHG) emissions instead of long-term adaptation initiatives to reduce their climate vulnerability and strengthen their sustainable development. Even though they recognize climate change as a major threat to their lives and livelihoods their responses to its impact therefore differ from the recommendations of professional experts. At the same time, the climate voices that come to the fore in the paper reveal a sense of urgency to act and a strong desire to contribute to solutions that may fuel adaptation initiatives. Inspired by Few and others, who argue that 'an honest, informed approach to participation will better enable agencies to tailor inclusive processes of decision-making to the task in hand' (2007, p. 56), the paper therefore proposes an informed participation approach that genuinely listens to the local voices as Chambers suggests in his 'put the last first' mantra but that also informs them about the global causes and effects of climate change and engages them in a critical dialogue about the importance of sustainable development and the possibilities of taking advantage of the new opportunities that the changing environment provides.

### The setting

The need to investigate local climate perceptions and make them available for adaptation interventions is particularly urgent in mountain regions that suffer from global warming (Beniston, 2003). Peru is a point in case (Bolin, 2009). It contains 70% of the world's tropical glaciers and is one of the world's most vulnerable countries to

climate change (Vuille et al., 2008). It has been calculated that within the coming 15 years all the glaciers below 5500 masl. are bound to disappear in Peru (Oré, del Castillo, van Orsel, & Vos, 2009), a scenario that represents a serious threat to a country where precipitation is seasonal and often irregular and where glaciers constitute a major source of freshwater (Gagné, Rasmussen, & Orlove, 2014). The disappearance of Peru's glaciers is particularly critical in the country's highlands, where farming and husbandry rely on irrigation and where water scarcity generates social conflicts in many places (Bury et al., 2011; Lynch, 2012). Furthermore, the growing water scarcity fuels out-migration that drains Peru's rural communities of their able-bodied members while exacerbating the vulnerability of the remaining population and its dependence on external help (Oliver-Smith, 2014; Paerregaard, 1997). In recent years, Peru's national and regional authorities and a broad range of NGOs have tried to meet this need by financing projects that improve the infrastructure and introduce new technologies in the country's communities. However, many of these institutions and organizations are poorly equipped to manage climate change and water conflicts (Boelens, 2009, 2015). To address these issues, the first thing they need to ask when building adaptation capacity in Andean communities is: what are their climate perception and how do they imagine the future?

One of Peru's many rural communities is Cabanaconde, which is situated at 3300 m. in Peru's southern highlands (Gelles, 2000) (Figure 1). The community has a population of 2842 (INEI, 2007) and more agricultural land than other communities in the area. Since Inca times the community has gained fame for its production of corn, a crop that requires intensive irrigation as rain is scarce and unpredictable. Up to recently, all water for irrigation came from the nearby mountain of Hualca Hualca (Figure 2), which the villagers believe is sacred and adore by making offerings (Paerregaard, 2013a). In the past three decades, Cabanaconde has received additional water from a channel (called Majes, built by the Peruvian state) that transports water from the Colca River to Peru's coastal desert (Figure 3). The channel has augmented the water volume of the community's irrigation system significantly and allowed the community to extend its agricultural land basis. However, it has also prompted the villagers to change their notion of water as a common good and to stop making offerings to the mountain deities, a practice that is still common in some of the neighbouring communities (Paerregaard, 2013b). More recently, Cabanaconde has become an important centre for trade, transport and international tourism and now the community has large migrant populations in Lima and Washington, DC that contribute to its development and occupy a dominating position in its cultural and religious fiestas (Paerregaard, 2010).



Figure 1. The community of Cabanaconde.

### **Methodology**

The paper draws on an anthropological research tradition that foregrounds ‘experience-near’ field data (Geertz, 1973) and uses the voices of native interlocutors to structure the ethnographic analysis (Mitchell, 2006). The

voices presented in the paper originate from ethnographic field research in Cabanaconde, which comprises two surveys: the first yielding data on the community’s socio-economic situation (Table 1) and the second survey on the villagers’ climate perception (Table 2). The two



Figure 2. Mount Hualca Hualca of Cabanaconde.





Figure 3. The Majes channel.

surveys that were gathered by the author with assistance of a villager complement each other insofar as the data from former make it possible to examine the data of the latter in a broad context of modernization, development and poverty. Both surveys were conducted among the same household sample in *cartel cuatro*, one of Cabanaconde's four quarters and the residence of the villager assisting the survey, which facilitated the study's access to the interviewees. Formerly, the quarters reflected the community's division into social and ethnic groups, but today they merely serve as a reference point to indicate the villagers' residence. Similarly, both surveys are based on interviews with either the *jefe de familia* (head of household) or the spouse of the *jefe de familia*, a self-defined category in the Andes referring to the person who represents the household in community matters. Of the total number of interviewees, 65% were males and 35% were women. Their average age was 52, the youngest being 19 and the oldest 86. Even though the population is ageing due to out-migration and even though many households only have one, two or three members these continue to constitute

the basic organizing unit of the community representing its diversity in terms of age, gender and class.

The first survey was conducted in 2011 among 100 households that were selected arbitrarily and that represented 18% of the total number (549) of households registered as active members of the community. The survey aimed at establishing a general picture of the socio-economic situation of Cabanaconde's households and their vulnerability to social and environmental change, with a special focus on the water situation in the community. It also included a few preliminary questions on climate perceptions of use to plan and design the second survey. The second survey that was based on open-ended answers and allowed the interviewees to provide as many replies as they pleased was conducted in 2013. It included 50 households (representing 9% of the total number of households in Cabanaconde) that were selected arbitrarily among the same household sample used in the first survey. The aim of the second survey was to collect data on how the households of Cabanaconde understand climate change and account for its causes and

Table 1. Household survey on Cabanaconde's socio-economic context.

Migration and education		Economic and social activities	
Percentage of native born villagers	78%	Average annual household income	US\$ 976
Percentage of households with migrant members	78%	Principal livelihood: farming/husbandry	83%
Percentage of return migrants	86%	Principal livelihood: tourism and trade	9%
Percentage of villagers with elementary school	41%	Principal livelihood: construction, handcraft, other	8%
Percentage of villagers with middle school	56%	Percentage of households using Majes channel to irrigate	94%
Percentage of villagers with high school	2%	Percentage of households participating in community activities	86%

Table 2. Household survey on climate perceptions in Cabanaconde.

Questions	Answers
Has the climate changed in your life-time?	Yes: 100% (14% responding that it has changed radically)
Has water supply changed in the past 20 years?	Yes, it has diminished: 76%
	Yes, it has increased: 2%
	No, it is the same: 22%
How does climate change affect you and your family?	Bad health: 46%
	Damaged crops/life stock: 34%
	Extreme temperatures: 19%
	No reply: 1%
What is the cause of climate change?	Local contamination: 74%
	National contamination: 9%
	Hole in the ozone shield: 8%
	Global warming: 6%
	Nuclear tests: 1%
	Earthquakes: 1%
	Don't know: 1%
What is the solution to climate change?	Reforestation/organic crops: 26%
	Stop local contamination: 25%
	Recycling/save resources: 21%
	Information/education: 20%
	Control of chemical products: 8%
How do you vision the future?	Water scarcity/contamination: 76%
	Survival threatened: 18%
	More conflicts: 6%

effects. In the discussion the results from the survey are supplemented by the author's personal observations during several years of fieldwork in the region (Paerregaard, 1997; Paerregaard, Stensrud, & Andersen, 2016).

## Results

According to the first survey, the villagers' average annual income is 2928 Peruvian Soles (US\$ 976) and while one-third do not have a regular money income at all, only 30% make more than 5000 Peruvian Soles (US\$ 1,667) a year. The survey shows that farming and husbandry are the principal occupations of 83% of the households and that only 3% live entirely off non-agricultural activities. All the interviewed household leaders state that they irrigate their fields, with 94% affirming that they use water from the Majes channel. Only one interviewee reported the use of chemical fertilizers. The survey also indicates that 78% of the population were born in Cabanaconde and that most of the remaining 22% come from neighbouring villages. In terms of education, the survey shows that 41% of the adult household members have completed or partly completed *primaria*, 56% have completed or partly completed *secundaria* (equivalent to middle school) and 2% have completed *estudios superiores* (equivalent to high school). Furthermore, in the survey 86% are return migrants of whom 2/3 have lived outside the community for longer periods of time and 1/3 have worked in nearby places for shorter periods of time. Similarly, the survey reveals that 78% of the interviewed have children living

outside Cabanaconde. The survey also shows that the villagers' medium age is 38.5 and that the average household has 3.1 members. Finally, it demonstrates that 86% of the households participate in the activities organized by Cabanaconde's community and that 40% of the household heads are or have been active members of its irrigation committees.

Summing up, the first survey shows that: (1) Cabanaconde belongs to the poorest strata of the Peruvian population, (2) farming and husbandry are still the principal livelihoods and the community is predominantly self-subsistent, (3) all the households rely on irrigation supplied by melt water from nearby mountains and the Colca River, (4) the community's population is aging and the households lack able-bodied members and (5) the majority of households participates in Cabanaconde's community organization.

The second survey documents climate perceptions. It reveals a unanimous consensus that climate change is real in Cabanaconde, 14% of the interviewed even asserting that the climate has changed radically in their life time. A vast majority (76%) affirms that the drinking water supply has diminished in the last two decades while 22% find that it remains the same and only two state that it has increased. In terms of the effect that climate change has on the villagers' lives, several of the interviewed give more than one reply. In 52% of the replies the interviewed state that their health suffers. In particular, many say that their skin is more exposed to the sun and several also complain that they are afraid of cancer and viral diseases. One

interviewed even contends that her blood pressure has gone up because of climate change. In 34% of the replies the interviewed point to the economic effect that climate change has on farming and animal raising, which they claim are less productive than before due to irregular rain-falls, frost, new crop diseases and other environmental changes. Also, in 19% of the replies complaints are made that the temperatures are more extreme now, making the days too warm and the nights too cold. One interviewed did not offer any explanation to climate change. The causes of climate change can be many if we are to believe the interviewed, who in many cases provide not just one but several replies. Of these, 74% claim that the cause of climate change is the villagers' own contaminating activities such as sewage outlet, the burning of waste, tree cutting, the use of chemical products, the disposal of plastic items and the displaying of fireworks during Cabanaconde's annual fiestas. A female villagers even asserts that her use of perfume is causing climate change. Only a small percentage of the interviewed locates this outside Cabanaconde. Thus 9% of the replies point to Peru's mining industry and the explosive number of cars in the country's cities while 6% of the replies refer to global warming and 9% to the hole in the ozone shield. One interviewed claims that it is the nuclear tests of the world's big powers which trigger climatic change, while another says it is Peru's many earthquakes. As to solutions to climate change, 26% of the replies suggest more reforestation and organic production, 25% a stop of contaminating activities in Cabanaconde, including tree and trash burning, 21% more recycling and better use of natural resources, 20% more information and better education of the villagers and 8% better control of their use of chemical products. Finally, as many as 76% state that there will be less water in the future, and 18% even claim that it is not likely humans will survive the growing water scarcity, providing answers such as 'we'll all die' and 'humanity will not survive'. Six per cent also anticipate more conflicts and wars in the world as a consequence of climate change.

Summing up, from the second survey it is evident that (1) there is consensus among the villagers that climate change is seriously impacting the environment in Cabanaconde, (2) the vast majority of the villagers thinks that the drinking water supply in the community is diminishing, (3) many villagers are concerned about the effect that climate change has on their health and their livelihoods, (4) there is a general agreement that it is the villagers' own activities that cause climate change, (5) very few villagers locate the cause of climate change in other places in Peru or outside the country, (6) the villagers overwhelmingly agree that the impact of climate change must be mitigated by local initiatives such as reforestation, recycling and the improvement of the villagers' education and (7) the majority worries about the future water situation in Cabanaconde and some even think that climate change jeopardizes life

in not only the community but also other places in the world.

## Discussion

The two surveys reveal a paradox in the climate perception of rural poor people (Paerregaard, 2013c). On the one hand, they demonstrate that Cabanaconde's population is aging and predominantly self-subsisting and that it belongs to Peru's poorest and most marginal social strata. This finding is supported by Peru's latest national census from 2007, which shows that Cabanaconde's poverty rate is higher (46%) than the national poverty rate (39%) (INEI, 2007). Moreover, even though a state-built channel has enhanced Cabanaconde's water supply and made the community more resilient to water scarcity, its agriculture is still very vulnerable to environmental change. On the other hand, Cabanaconde is globalized in a number of ways. It has big migrant colonies both inside and outside Peru that organize its annual fiestas and invest large sums of money in building hotels and new homes in the community. It also receives a flow of national and international tourists on a daily basis who engage in contact with the villagers and offer them a new perspective on the world. Yet even though they are familiar with the global discourse on climate change and are adept in employing its glossary (e.g. global warming, holes in the ozone shield, smog, contamination and recycling), the majority locates its cause within the community. Thus, many attribute current climatic change and the water scarcity it causes to their own agency – for example, trash burning, the use of perfume and the burning of fireworks. Some also point to modern chemicals as the cause of climate change even though farm-yard manure is little used in Cabanaconde. Rather than referring to the developed world when identifying the cause of global warming they blame themselves; likewise, rather than suggesting national or global solutions to solve its problems, they believe this should be addressed locally through measures such as recycling, reforestation and better education. In other words, the villagers believe that the answer to climatic change is to moderate their own newly acquired modern lifestyle. Finally, the disillusion and despair prevailing in the answers to the last question of the second survey ('we'll all die', 'humanity will not survive', etc.) suggest that many villagers feel abandoned and helpless when imagining the future world. The answers highlight the contrast between the villagers' socio-economic status and their climate perception and suggest that even though they attribute current climatic change to their own activities and assume the responsibility of mitigating its impact, they feel uncertain whether it is in their hands to save Cabanaconde and the rest of the world.

Interestingly, there are few variations in how the interviewed explain climate change and its consequences and how they vision the future. Thus age and gender have

little importance for the replies except that those who replied that climate change is caused by national or global forces such as mining industry and nuclear tests were males and those who said it was their own consumption of personal items such as perfume were women. The answers' uniformity is evidence that the villagers by and large (old as well as young, women as well as men) have adopted the global discourse on climate change, which they now use to account for the environmental change they are experiencing. Yet as the author's personal conversations with the villagers of Cabanaconde (and some of its neighbouring communities) show, few make sense of the terms associated with this discourse (Paerregaard, 2013a, 2013c). Thus, when asked what causes global warming and holes in the ozone shield, many simply replied: 'it's because of climate change' (*es por el cambio climático*) or 'it's because the climate has gone mad' (*es porque el clima ha vuelto loco*). It could also be viewed as proof that the villagers recognize the gravity of the situation and that they indeed are aware of the need to take action even though few actually try to live up to their own suggestions how to solve the community's environmental problems. As the adaptation and agriculture development literature shows, recognizing a problem does not necessarily induce someone to do something even though it is a first step in that direction (Bunch, 1999; Grothmann & Patt, 2005). Different cognitive and socio-economic factors as well as the type of external intervention that prepares the communities to adapt to climate change might influence their agency. As Grothmann and Patt assert, 'it may be possible to make better predictions about future adaptation and vulnerability by including socio-cognitive indicators, such as perceived adaptive capacity' (2005, p. 209). They conclude 'in taking actions to promote particular adaptations, it would be worthwhile for policy-makers to focus on the cognitive barriers that may exist' (Grothmann & Patt, 2005, p. 209). In the case of Cabanaconde, two such barriers could be the global terminology the villagers employ to account for environmental change and their conflation of mitigation actions and adaptation initiatives.

One way external interventions can help Cabanaconde bridge the gap between their own suggestions and the actions they need to take to adapt is to translate the global vocabulary of climate change into a language that explains how it affects the community's environment and to encourage Cabanaconde to reduce its vulnerability and strengthen its sustainability by taking advantage of the possibilities that climate change creates. As the second survey demonstrates, many villagers believe that the only answer to climate change is to reduce their own GHG emissions. While this might help reducing their vulnerability to climate change it will not stop it. Making this clear to the community is critical to prepare it for not only the negative consequences of climate change but also the new

opportunities it provides to change the land use practice, plant new crops, introduce modern irrigation technology, improve water management, create new livelihoods, etc. A third step is to link the community's adaptation strategy to its general sustainability by introducing environmental protection of its watershed and new farming practices that discourage tree burning and encourage the use of farmyard manure, modernizing the sewage system and the waste and recycling management, implementing a sustainable and fair drinking water system with high-water tariffs in tourist hotels and low-water tariffs in private homes and, more generally, strengthening of Cabanaconde's own sense of agency and awareness of future environmental challenges. These activities are not likely to reduce Cabanaconde's vulnerability to increased water scarcity caused by climate change but they will help it to make better use of whatever water is available.

Even though the villagers' answer to climate change is to reduce their own GHG emissions their suggestions encompass some of the activities referred to above, including reforestation, recycling, organic production, a stop of tree and trash burning and other forms of contamination, better use of natural resources and more control of the use of chemical products that all may help strengthening Cabanaconde's adaptive capacity. These actions are all measures to counteract the environmental impact of Cabanaconde's recent modernization and the introduction of new lifestyles in the community that have improved its living conditions but also created more pollution. The urgency of addressing this problem is reflected in the recommendations of several of the respondents who point to better education and more information as the answer to climate change. Assuming that these suggestions aim to enhance the villagers' environmental mindfulness and prevent further contamination in Cabanaconde, they reveal a growing understanding of the problems that modern life entails and a quest for initiatives that generate long-term sustainable development. What appear as socio-cognitive barriers at first glance, then, can be viewed as adaptive capacity at closer inspection and used as building block in the villagers' struggle to improve their living conditions while adapting to climate change.

## Conclusion

Development work has traditionally focused on improving poor people's living conditions. An important lesson from this work is to recognize that people know best what is good for them. Adaptation initiatives can learn from this lesson by listening to local climate voices but as the findings of this paper suggest, these must be read within the socio-economic context that moulds people's lives, the global discourses that shape their climate perception and the limited options they have to adapt to climate change. Unlike conventional development that changes people's



lives for the better, adaptation implies changes that people did not ask for but that nevertheless are inevitable. Moreover, as Few and others point out (2007), the long-term and uncertain nature of climate change and the complex social and political dimensions of decision-making processes on climate adaptation pose particular challenges to adaptation initiatives that need to find new ways of engaging the people they try to help (Burch, Shaw, Dale, & Robinson, 2014; Girabaldo et al., 2014).

This paper suggests an informed participatory approach that follows the mantra of development work which ‘puts the last first’ and listens to the climate voices of vulnerable people but that also informs them about the cause and effect of global climate change and engages them in a critical dialogue about the barriers that keep them from adapting to it. The paper has identified two such barriers. One is Cabanaconde’s understanding of its own contribution to climate change, and the other is its conflated perception of mitigation actions and adaptation initiatives and the sense of despair and inability to act that this perception fosters. The paper suggests that in order to help Cabanaconde overcome these barriers, adaptation initiatives must link their climate perception and visions of future to the steps the community have taken to build its adaptive capacity and exploit the opportunities to grow new crops, change livelihoods, etc. that emerge in the wake of climate change. However, the climate voices of Cabanaconde also disclose an urgent concern for the environmental problems that the community’s economic and social development is causing and a strong sense of responsibility to contribute to the solutions of global climate issues. It concludes that adaptation initiatives can make use of this awareness to tailor an informed participation that at one and the same time includes the community in the planning and implementation of its future development and challenges its ideas of climate change, adaptive capacity and sustainability.

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