

**Title:**

Observations and perceptions of climate change among mountaineers in Huascarán  
National Park, Peru

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## **Introduction & Methods**

The Cordillera Blanca in the Ancash Region of northern Peru serves as a climate-change sentinel, a metaphorical “canary in a coal mine”, in terms of high-altitude regions and equatorial mountain ranges. At a global scale, the Cordillera Blanca serves as precedent for the consequences of accelerating environmental change when the span of three decades the range has lost 30% of its ice mass. With 33 major peaks over 5,500 meters (18,040 ft.) high in an area 21 kilometers (13 mi) wide and 180 kilometers (112 mi) long, the Cordillera Blanca range, which is predominantly located inside of Huascarán National Park, has a density of high-altitude peaks and treks rivaled by only a few locations in the world. The size and density of peaks also serves to attract some of the highest number of annual high-altitude mountaineers and trekkers. Because of this popularity, mountaineers and trekkers are likely exposed to the cumulative effects climate-change is levying on the Cordillera Blanca. These high-altitude recreationists represent a population of observers who are able to provide valuable data concerning climate-change from high-altitude regions where scientists are not likely to have accurate first-hand data. With accurate data an imperative for conservation at local and regional scales, we must understand how a scientific analysis aligns with direct observations of environmental change. The purpose of this study was to identify and understand mountaineers’ observations and perceptions of climate-change specific to the Cordillera Blanca and generally to experiences in other regions. Primarily, this study aimed to understand (1) if mountaineers and scientists observe similar environmental change, (2) how well their observations align (3) and what phenomena either group might be overlooking.

I utilized semi-structured interviews to glean information from mountaineers to form the beginnings of a dataset for the American Climber Science Program (ACSP). Participants were selected by convenience as the ACSP traveled extensively throughout the Cordillera Blanca for the duration of this research. The interview explored questions related to individuals' climbing experience(s) in high-altitude and glaciated areas, perception(s) of climate change, personal observation(s) of climate change's effects in high-altitude areas and other areas of recreational interests to the individual, and their recreational and household behavior(s) related to pro-environmentalism and sustainability. The remaining questions dealt with socio-demographics and a single open-ended question intended to encourage further thoughts and opinions among participants. The semi-structured nature of this method ensured that a predetermined set of questions guided the interview while allowing for an organic exchange of ideas and opinions between the interviewer and participant. The participant was not beholden to any of the questions and could deviate from the initial focus of the question(s) with the caveat that the interview will ultimately be focused on the issues of climate-change perception(s) and observation(s).

## **Results & Discussion**

A total of 16 interviews with 20 participants were conducted during June and July 2013 in Huascarán National Park and Huaraz, Peru as part of the ACSP. Participants encompassed a range of nationalities, experience, and professions. Of the 20 participants, 10 nationalities were represented, 14 males and 6 females were interviewed, 7 were members of the ACSP, 1 was a professional mountain guide, and half of participants had a background in science. The age of participants ranged from 31-70 with an average of 43.2.

Mountaineering experience ranged from 1-40 years with an average of 14.26 years. Attempts and summits of peaks over 4267.2 meters (14,000 ft.) or those of lower elevation with glaciation averaged 11.16/participant with a range of 1-50+ mountains. What follows is a qualitative analysis of participant responses gathered from semi-structure interviews. Responses were analyzed in the context of both the Cordillera Blanca and individual's experiences in other high-altitude environments.

**“IT’S GOING TO BE ALL OVER THE WORLD. IT’S GOING TO HAPPEN. EITHER HUMAN CAUSED OR NATURALLY, WE DON’T KNOW. PEOPLE WILL HAVE TO ADAPT. IT’S GOING TO BE DIFFICULT ALL OVER THE WORLD.”**

*-South African participant*

*Defining Climate-change:*

The definitions of climate-change maintained by participants varied from general and casual definitions to more specific formal definitions. Likewise, participant's attitude(s) towards climate-change varied across the spectrum. Whether mountaineers were referencing the Cordillera Blanca or other mountainous regions the themes that arose from their definition(s) of climate-change revolved around an understanding that the issue of climate-change was scientifically complex and a complicated social issue, rendering participants' abilities to define it more difficult. Participants expressed an understanding that climate-change was a long-term and natural process that currently and previously has occurred on the planet (i.e., warming periods, ice ages). Owing to its complex nature, it is a change that occurs because of and due to cumulative effects. For mountaineers that believed

climate-change over the past century had exacerbated by human-caused influences, their definitions were formal and based on scientific definitions, irrespective of an educational backgrounds in science. For example, one participant defined climate-change as “a phenomenon in which there is a warming in the average temperature of Earth over the course of centuries... but in the past 100 years it has been augmented and we have observed unprecedented melting of polar ice caps and depletion of the ozone layer.” Those who expressed human-caused influence as less plausible questioned the ability of human’s to perceive long-term changes and process (i.e., changes in climate), even through the lens of scientific data. They were also hesitant to acknowledge changes in climate, stating that perceived changes were more likely due to arbitrary weather and seasonality, e.g. one participant stating, “I am not able to distinguish between climate-change and those changes that may simply be local weather patterns or regional variation.” Generally, participants expressed ambivalence in their definitions of climate change, perhaps stemming from the complexity and subtlety of the issue. That is, most participants were not decisive and offered tentative opinions about climate-change as a “real” phenomenon that was “difficult” to define.

**“THE MOUNTAINS LOOK SICK; TALKING WITH A LOCAL HE TELLS ME HOW MUCH THINGS HAVE CHANGED OVER THE PAST 40 YEARS.”**

*-American participant*

*Climate-change Observation(s):*

A number of salient anecdotes concerning climate-change were offered by participants. Many mountaineers observed glacial retreat, glacial lake formation, declining snow accumulation, and decreased predictability of weather and mountain conditions coupled with an increase in objective hazards. Floral and faunal fluctuations and declining water quality were also mentioned. These observations carried weight among mountaineers referring to both Huascarán National Park and other high mountain regions across the globe. Specific to Peru, one participant stated “there seems to be an augmented seasonality because the weather patterns in the mountains are not as predictable as the once were”. A global perspective was offered by another participant, “snow is disappearing in the Alps and there are also place without glaciers that 5-10 years ago had them.” Some participants were not able to offer any personal observations of what they would term “effects of climate change” either because they did not feel as though they had the expertise or experience to do so or because they had simply not observed anything they would define as effects of climate change. In these instances some were able to recall photographic evidence they had observed of glacial retreat and glacial lake formation but nothing observed directly. In either case, it seems mountaineers interviewed as part of this study observed and understood the consequences of climate-change that scientists have articulated and their data have forecasted. Although mountaineers are not likely to notice the long-term consequences and projections of climate change, they seem to be aware of changes occurring over the past two decades. Additionally, their continued access to these high-altitude mountainous environments provides a longitudinal sample of on-the-ground conditions that can be corroborated with more technical information.

**“I’M AFRAID THE NEXT GENERATION WON’T BE ABLE TO DO WHAT I GET TO DO.”**

*-Chilean participant*

*Climate-change Anxiety and Caution:*

Existing data and observations indicate mountain conditions may become less predictable and therefore more dangerous, aside from the inherent danger in mountaineering. Participants seemed keenly aware of this issue and expressed, to varying degrees, an increased level of anxiety and caution during their logistical planning and glacial ascents. One participant offered a concise observation, “I am more anxious; there are more moraines, more crevasses, and more objective hazards than I have experienced at any other time.” They expressed less confidence in guide books and beta (knowledge from others who have previously climbed a route) from other mountaineers. Participants with the less experience expressed fewer feelings of anxiety and cautiousness, perhaps owing to their minimal experience with mountain conditions. More experienced mountaineers stated that even though conditions and routes change from year to year based on snow accumulations that the increase in the number and size of crevasses, bergschrunds, and other objective hazards creates an atmosphere of uncertainty and anxiety. Coupled with direct observations of decreased predictability of weather and mountain conditions alongside an increase in these objective hazards, mountaineers expressed a need to be prepared for anything and everything while attempting a mountain, regardless of its size or time spent on the glacier. This anxiety was echoed from mountaineers and guides who had extensive experience climbing outside of Huascarán National Park.

**“LOT OF SPIN OUT THERE WITH CLIMATE CHANGE, WHAT’S REAL, WHAT’S NOT,  
HOW FAR CAN YOU PUSH DATA?”**

*-New Zealand participant*

*Climate-change Information and Data:*

News media (print or online), peer-reviewed scientific publications, and the ACSP were the most common sources of mountaineers’ information and data concerning climate change. However, not all participants were able to articulate sources of climate-change information and data. Those that were not able to provide this information stated that news, peers, or other causal exposures to the issue of climate-change were likely how they formed opinions about climate-change. In terms of climate-change perceptions and observations, there was no association between those who did not have formal sources of information/data and those that expressed anthropogenic influence as a less plausible mediator of accelerated climate change. Many who perceived climate-change as a significant threat globally and within high-altitude mountain regions in particular, also had no substantial sources of formal data and information. There were additional concerns that even with the vast amount of data scientists and the public have at their disposal vacillations in data interpretations demonstrates that scientists do not necessarily know what is happening with the climate (i.e., increased data equated to conflicting interpretations).

**“BE PROACTIVE; FOCUS ON DOING SOMETHING TO HELP THE ACTIVITIES THAT YOU  
HAVE A PASSION FOR.”**

*-Brazilian participant*

### *Recreational Behavior:*

With regards to mitigation of and adaptation to climate change, participants explored pro-environmental behaviors that they performed while recreating. These behaviors consisted of a leave-no-trace mentality, minimalist-style logistics and trekking, and packing out more than you packed in with regards to waste. Being an independent mountaineer or trekker close to home and using a guide service when abroad was also a theme that emerged during the interviews. With regards to recreation and the household and political behavior sections that follow, participants expressed feelings of powerlessness, that they were only an individual who was incapable of mitigating climate-change to any extent with their own actions. This aligns well with other aspects of the interview considering a majority of participants found climate-change to be a global phenomenon whose cumulative causes and effects are not obvious. In this they are not alone; many feel their individual action, when not part of a socially normative behavior, has little, if any, impact.

**“WE HAVE KIDS, SO WE HAVE INFLUENCE OVER OUR KIDS, CAN INFLUENCE THEIR OPINIONS AND BEHAVIOR, I HAVE INFLUENCED THE NEXT GENERATION.”**

*-American participant*

### *Household Behavior:*

Recycling was a commonality among all participants as a household, pro-environmental and climate-change mitigation behavior. Reducing energy usage and increasing automobile fuel efficiency were also mentioned by participants. Becoming energy

independent and living off-grid from municipal electricity suppliers were views expressed by some participants. For example, one participant stated “I am installing wind-turbines to become 100% wind-powered” or another participant stating “I sell the excess energy I produce back to the electric co-op.” Educating and informing others about climate-change mitigation and pro-environmental behaviors was important to some. One participant stated that “doing nothing creates a norm you can become habituated to and I try to avoid that by doing what I can and encouraging others to follow suit.” Interestingly, the juxtaposition of these pro-environmental behaviors weighed against the need to fly to Peru and elsewhere to climb was stated quite often. Participants felt this was perhaps the most important issue they faced, personally, in trying to remain environmentally conscience while still pursuing their passion to climb and trek. Dilemmas similar to this faced by mountaineers affect many individuals faced with pro-environmentalism on-the-one-hand and their day-to-day activities and responsibilities on-the-other.

**“I OFTEN FEEL IMPOTENT ABOUT WHAT I CAN DO, LACK OF POLITICAL VOICE.”**

*-Canadian participant*

*Political activism:*

Being politically active, both in general and specific to conservation issues, was not a common feature of mountaineers’ behaviors. Six participants stated that they were active within the political sphere, advocating specifically for conservation and climbing issues whereas other participants conveyed an awareness of their lack of political activity. For example, one participant stated “I know I should be more politically active but I’m not.”

Similar to environmentally-oriented behavior, political activism was not seen as being able to significantly mitigate the effects of climate-change or change others' behavior. There might be a need for larger and more recognizable or mainstream organizations dedicated specifically to climate-change in mountainous areas to propel more political engagement among mountaineers, similar to the initiatives of the ACSP but with more political and policy focus.

**“CLIMATE-CHANGE IS SUCH A BIG THING, CUMULATIVE THING; WE CAN'T MAKE A BIG IMPACT ON IT. DOING THE AMERICAN CLIMBER SCIENCE PROGRAM IS MY WAY OF TRYING.”**

*-Swiss participant*

*ACSP vs non-ACSP:*

The ACSP consists of volunteers concerned with utilizing sound science to improve conservation efforts in high-altitude mountain regions. Considering that it is a volunteer program it should not be assumed that participants of this program are dissimilar from mountaineers not involved in the program. Seven out of twenty participants were members of the 2013 ACSP-Peru team and, in general, there were little dissimilarity between ACSP and non-ACSP participants. ACSP members had more formal definitions of climate change, more observations of climate-change impacts within Huascarán National Park (more than likely owing to their participation in the program prior to being interviewed), and were more politically active than other participants. ACSP members were also more likely to be independent mountaineers or trekkers, whether at home or abroad. In all other aspects of

the interview ACSP members were similar to non-ACSP individuals. The differences between ACSP members and other participants stems from the nature of the conservation orientation of the program and required membership to the American Alpine Club (AAC) whereas the commonalities should be a product of what is shared among all mountaineers, passion for the mountains.

**“THERE’S A LOT OF POTENTIAL TO DO A LOT OF GOOD HERE.”**

*-American participant*

**“IT IS NOT A SALIENT ISSUE; THEY HAVE FOOD AND CLOTHING AND THAT’S ALL THAT MATTERS FOR THEM.”**

*-Peruvian participant*

## **Conclusion**

To understand any phenomena more thoroughly it behooves us to gain a broader perspective from others, their attitudes and interpretations of important phenomena such as climate-change. The ability of mountaineers to observe environmental change in the high altitude mountain regions provides scientists with that broader perspective. Mountaineers involved in this study provided anecdotal evidence of about climate-change impact from across the globe and specific to the Cordillera Blanca. Additionally, participants expressed their perceptions of climate-change, their spectrum of behaviors associated with pro-environmentalism, and reveal the mind-set of mountaineers in this unprecedented era of change in high-altitude mountain regions.

Other important implications from this study concern future research directions. There is an undeniable need to include professional mountain guides operating in the Cordillera Blanca. More crucially, local communities and elder generations of Peruvians should be respectfully engaged and placed squarely in the conservation research and policy framework. Critical environmental change has occurred over the past two generations; the knowledge and experience of these two groups is readily available given it is recognized and utilized.

In conclusion, the range of knowledge and experience encapsulated by participants provides a strong starting point to develop a broader and more comprehensive dataset to compliment biophysical understandings of climate-change. Furthermore, because their recreational interests place them in these high-valued locales, mountaineers represent a powerful tool that has the potential to be honed into a reliable and accurate source of information and data. Further studies may reveal mountaineers as practical citizen scientist and para-climate-change scientists, expanding the mission and scope of the ACSP with a broader network of mountain stalwarts.

**“WE HAVE TO WORK TOGETHER. EVERYONE HAS THE CAPACITY BUT WE NEED TO  
WORK COLLECTIVELY TO MAKE ANY CHANGES, TOGETHER.”**

*-French participant*

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