CIAT policy brief

Climate Change Adaptation in the Andes: What Do We Not Know Yet? Identifying and Prioritizing Knowledge Gaps

The Andes mountain range defines the topography of the South American countries of Bolivia, Chile, Colombia, Ecuador, and Peru and provides vital ecosystem services to the region. These mountains host more than 99% of the world's tropical glaciers and are essential in supplying water to regional watersheds that sustain significant portions of the South American population. In the coming decades, the Andean region will be strongly affected by climate change, which is projected to increase temperature and alter precipitation patterns, and the uncertainties of large-scale weather phenomena, such as El Niño Southern Oscillation (ENSO). These changes in weather and climate are already having an impact on regional ecosystems, as is evident by the significant losses in the size and distribution of mountain glaciers, as well as the decreased water availability for irrigation, agriculture, hydropower, and household and industrial uses. These trends, which will only be exaggerated in the coming decades, demonstrate a clear need for integrated management and regionally appropriate adaptation practices in the Andes. However, many adaptation strategies are constrained by a high level of uncertainty and by knowledge gaps. Identifying and prioritizing these gaps in knowledge is a crucial first step in order to develop and implement suitable adaptation measures.

Key messages

- The Andean region is very sensitive to climate change impacts and adaptation measures will be more successful if current knowledge gaps are closed. Knowledge that is generated and transferred should respond to user needs and knowledge gaps, therefore it is very relevant to use a systematic approach to identify knowledge gaps.
- The piloted methodology to identify and prioritize knowledge gaps was perceived by participants as efficient and effective and a tool that could be easily applied to other thematic sectors and regions.
- Holistic approaches, from the identification of the most urgent knowledge gaps to the development of policy, are necessary in order to increase the resilience of people and ecosystems.
- The three highest ranked knowledge gaps emphasize the urgency to focus research, policy, and adaptation efforts on:
  1. Climate change impacts on ecosystems and the resulting effects on human settlements and activities,
  2. Develop mechanisms to include climate change adaptation in current planning tools, and
  3. Identifying how climate change will affect human health in the Andes.

Knowledge gaps

The numerous knowledge gaps related to climate change adaptation pose challenges to the successful implementation of adaptation measures. These knowledge gaps are not necessarily due to insufficient or unavailable knowledge, but occur instead because information is fragmented, scattered, inefficiently transferred and used, and integration and collaboration are lacking.

If we aim to overcome climate risks and ensure the successful implementation of adaptation measures that are context specific, relevant, sustainable and equitable, it is imperative that we identify, prioritize, and fill adaptation knowledge gaps. Doing so also brings new opportunities to gather robust evidence and reduce the uncertainty of biophysical and socioeconomic data, which facilitates improved planning and management by national and regional stakeholders.

Improving the integration of adaptation measures into proactive planning processes and enabling policies can increase the resilience of communities and ecosystems to climate variability and change. Yet, what precisely are the current knowledge gaps in adaptation in the Andes region? Which gaps are of the highest priority to address? And how can we best respond to them? Those are key questions that the joint Adaptation Knowledge Initiative by UNEP and CIAT addressed at the workshop.

Approach for identifying and prioritizing knowledge gaps

As part of its Action Pledge to the Nairobi Work Programme (NWP) under the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP), through the Global Adaptation Network (GAN), took the initiative to develop a coherent methodology, known as the Adaptation Knowledge Initiative, to identify and prioritize knowledge gaps and response actions to climate change adaptation in the Andes.

In September 2014, a priority-setting workshop was held in Bogotá, organized and facilitated by the International Center for Tropical Agriculture (CIAT) and convened by UNEP, under the Nairobi Work Programme of the UNFCCC. Through the process of "prioritizing" knowledge gaps, using the new and well-defined methodology, the workshop participants, who were representatives from ministries, NGOs, international organizations, and universities, gathered to identify and prioritize the most important knowledge gaps in climate change adaptation in the Andean region and to identify response actions to these gaps and potential institutions with the capacity to close them.

Fifty knowledge gaps were identified by participants during the workshop and sorted into five categories (see **Table 1**). Furthermore, the workshop participants identified and selected a set of nine criteria (see **Table 2**) by which they assessed and prioritized the knowledge gaps.

Table 1. Sorting categories of knowledge gaps chosen by participants.

Sorting categories
1. Scientific research and observation of climate change
2. Incidence on production sectors
3. Capacity building
4. Land-use, planning, and risk management
5. Public policy and institutionalism

Table 2. Criteria used in prioritizing the knowledge gaps chosen by participants.

Criteria
1. Urgency (rapidity for determining actions over the short term)
2. Influences policy-making and management procedures (includes cross-sectoral nature of the gap)
3. Supports ecosystem resilience
4. Sustainable short-term benefit
5. Positive effects on populations, goods, and public services with no major negative effects
6. Scale of impact on closing the gap
7. Additional benefits for other gaps (conditioning for closing other gaps)
8. Ease of filling the gap
9. Helps reduce uncertainty

Prioritized knowledge gaps

The 50 knowledge gaps identified cover a range of scientific domains, from the need to better understand climate change impacts on ecosystems and on human well-being, to applied planning needs such as the lack of tools and mechanisms for integrating adaptation into cross-sectoral planning and land-use. The ten highest ranked gaps were:

1. Lack of integrated research on the effects of climate change on ecosystem services and their relationship of these services with the quality of life of regional populations.
2. Mechanisms to include adaptation in current planning tools.
3. Lack of data and information relating to climate change impacts on human health in the Andean region.
4. Lack of economic information and cost-benefit analyses relating to climate change adaptation.
5. Absence of mechanisms for promoting processes for multi-sectoral adaptation.
6. Gaps in socioeconomic information for evaluating the impacts of climate change.
7. Scarcity of sectoral analyses on the costs of climate change and requirements for adaptation investment.
8. Information gaps on tools for territorial and land-use planning.
9. Gaps in the analysis of social variables and the supply of and demand for water under various climate change scenarios.
10. Scarcity of information and analyses on the impact of climate change on agricultural and livestock production systems.

Actions to address knowledge gaps

Adaptation knowledge gaps can be filled in different ways and by different stakeholders, and there have already been efforts to close some of these. An excellent example of how four of the top ten highlighted knowledge gaps have been addressed (Gaps 1, 6, 9, and 10) is a research analysis conducted by CIAT in the context of the UNEP-funded REGATTA initiative. CIAT conducted a vulnerability, impact, and adaptation analysis to evaluate the impacts of climate change on agriculture and water availability in the Andean region and explored the population's adaptive capacity to cope with the impacts. The outcome was an analysis that provided biophysical and socioeconomic information to inform decision makers to formulate and implement policies for the rural sector in the Andean region (see **Figure 1**).

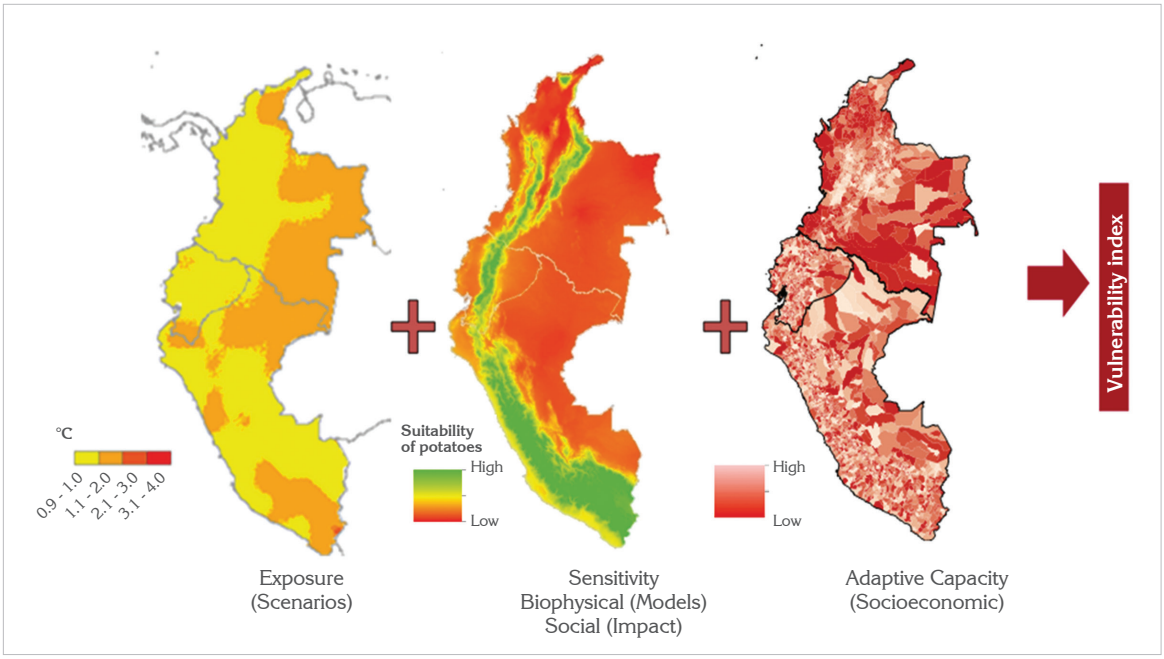

Figure 1. Components and results of the vulnerability, impact, and adaptation analysis of the REGATTA initiative.

The workshop is another source of finding ways to fill knowledge gaps in adaptation. Workshop participants elaborated a set of potential response actions to the identified gaps, which can be considered by decision makers. Some key outcomes are highlighted in **Table 3** below.

Table 3. Selected actions to address knowledge gaps as elaborated by workshop participants.

	Research intervention by sector	Intervention action points
Climate change and ecosystem observations	• Conduct research on the demand and supply of ecosystem services and the impacts of extreme events on these. • Conduct research on techniques for rainwater harvesting and storage as well as on the water dynamics of high altitude Andean ecosystems.	• Systematize, share, and transfer perceptions, practices, and local knowledge on adaptation between local communities and national and international entities. • Promote continuous communication and interaction between all stakeholders and maintain consistency with the agenda's themes. • Strengthen multi-sectoral adaptation through the identification and creation of legitimate spaces for dialogue.
Socioeconomic aspects	• Conduct cost-benefit analyses of adaptation measures and studies on the impacts of climate change on sectoral and national economies. • Study the occurrence, distribution, and existence of genetic diversity of in-situ Andean crops and landraces.	
Land-use and planning	• Explore sectoral planning tools and their up-scaling potential. • Systematize experiences and mechanisms for adaptation and develop tools to assist this process, which could include the mapping of legitimate institutional spaces, networks, and actors.	

Next steps

In addition to the workshop's outcomes of proposed action points to close the knowledge gaps in the Andean region, CIAT and UNEP's Joint Action Pledge to the Nairobi Work Programme is a step further in removing barriers to the upscaling of adaptation actions in other regions and on other themes. The Joint Action Pledge, together with CIAT's vulnerability, impact, and adaptation analysis, and the proposed action outcomes from the workshop, all highlight a variety of methods and approaches that can be considered when responding to prioritized knowledge gaps in order to improve climate change adaptation measures.

Recommendations for the identification and prioritization of knowledge gaps

A stakeholder-driven approach to identifying key knowledge gaps has been developed. The following elements should be considered for the identification and prioritization process:

- The identification and prioritization of knowledge gaps and solutions should be conducted by a diverse and well-balanced group of stakeholders that represent all sectors.
- Gaps exist not only in knowledge. Additionally, identify the mechanisms needed to influence structures for improving public management processes.
- Consider the lessons learned from past work that successfully closed knowledge gaps.

For effective adaptation, these knowledge gaps must be addressed in the region, either explicitly through prioritizing of actions by actors in the region, or through adaptation measures that explicitly fill gaps in knowledge through action research approaches.

Further reading

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Correct citation

CIAT (Centro Internacional de Agricultura Tropical). 2014. Climate change adaptation in the Andes: What do we not know yet? Identifying and prioritizing knowledge gaps. CIAT Policy Brief No. 21. Cali, Colombia. 4 p.

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