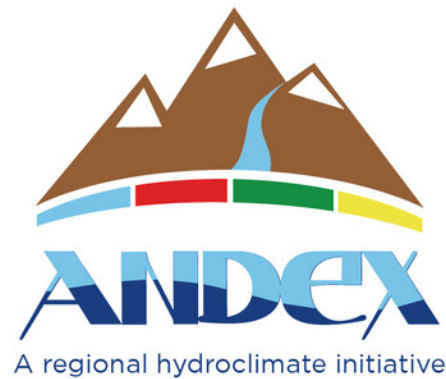


# HYDROCLIMATE RESILIENCE ADAPTATION





Improving water security  
for Andean populations.

Reducing the risks associated  
with high-impact hydroclimatic events.

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The background of the slide features a vertical strip on the left showing a mountainous landscape with a small town and dense forests. The top right corner has a blue sky with light clouds. The main content area is white.

# CONTEXT

The Andes constitute the most extensive mountain range in the world, spanning seven countries: Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina.

This mountainous region presents significant scientific and social challenges due to the increasing pressure of human populations on Andean natural environments.

Climate change is endangering the water and food security of around 90 million people in Andean countries.

Increasing human pressures and climate change threaten biodiversity throughout the Andes.

Espinoza, J.C., Garreaud, R., Poveda, G., Arias, P.A., Molina-Carpio, J., Masiokas, M., Viale, M. & Scaff, L. (2020). Hydroclimate of the Andes Part I: Main Climatic Features. *Frontiers in Earth Science* 8:64. doi: 10.3389/feart.2020.00064. In White Book, ANDEX.

"Sustainable development in the Andes face threats from local and regional scales (land use, migration, and deforestation) to global scales (climate change).

These multiscalar processes affect climate and water systems, resulting in glacial retreat, reductions in water supply, and disfunction of ecosystem services."

# CHALLENGES

There are significant advances in scientific research to understand the interactions between hydrological, meteorological, and atmospheric processes in the Andes. Technological advances have made it possible to improve hydrometeorological forecasting and climate prediction.

However, a comprehensive understanding of the Andean hydroclimate is still lacking, partly due to a weak hydrometeorological monitoring network along the mountain chain.

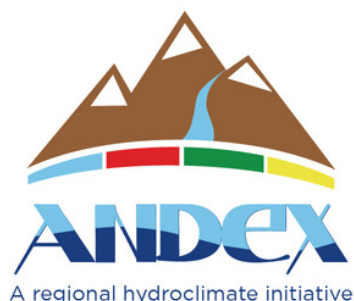
An integrated vision of hydroclimatic processes and climate variability is crucial to identify solutions to the challenges posed by anthropogenic climate change, land use change, and deforestation across the Andes.

ANDEX has identified two significant development challenges for the Andes, related to climate and hydrological systems:

- **Improving water security for Andean populations.**
- **Reducing the risks associated with high-impact hydroclimatic events.**

To address these challenges, it is crucial to design evidence-based tools and solutions to strengthen Andean countries' resilience and adaptative capacity and preserve their unique culture and biodiversity.





# PROPOSAL

ANDEX is the Regional Hydroclimatic Program for the Andes dependent on the Hydroclimatology Panel of the Global Energy and Water Exchanges Program (GEWEX), one of the central projects of the World Climate Research Program (WCRP).

The ANDEX program was created in 2018 with the general objective of improving the understanding and prediction of the climate and hydrology along the Andes with the participation of scientists from all the Andean countries.

ANDEX also seeks to promote scientific development in South America through (i) the promotion of regional cooperation between researchers and research programs;

(ii) the establishment of a research agenda focused on critical hydroclimatic issues of interest to the Andes region; (iii) the creation of a scientific framework that contributes to the decision-making process for the sustainable development of the region, and; (iv) the connection of Andean researchers with global and regional initiatives.

# MISSION

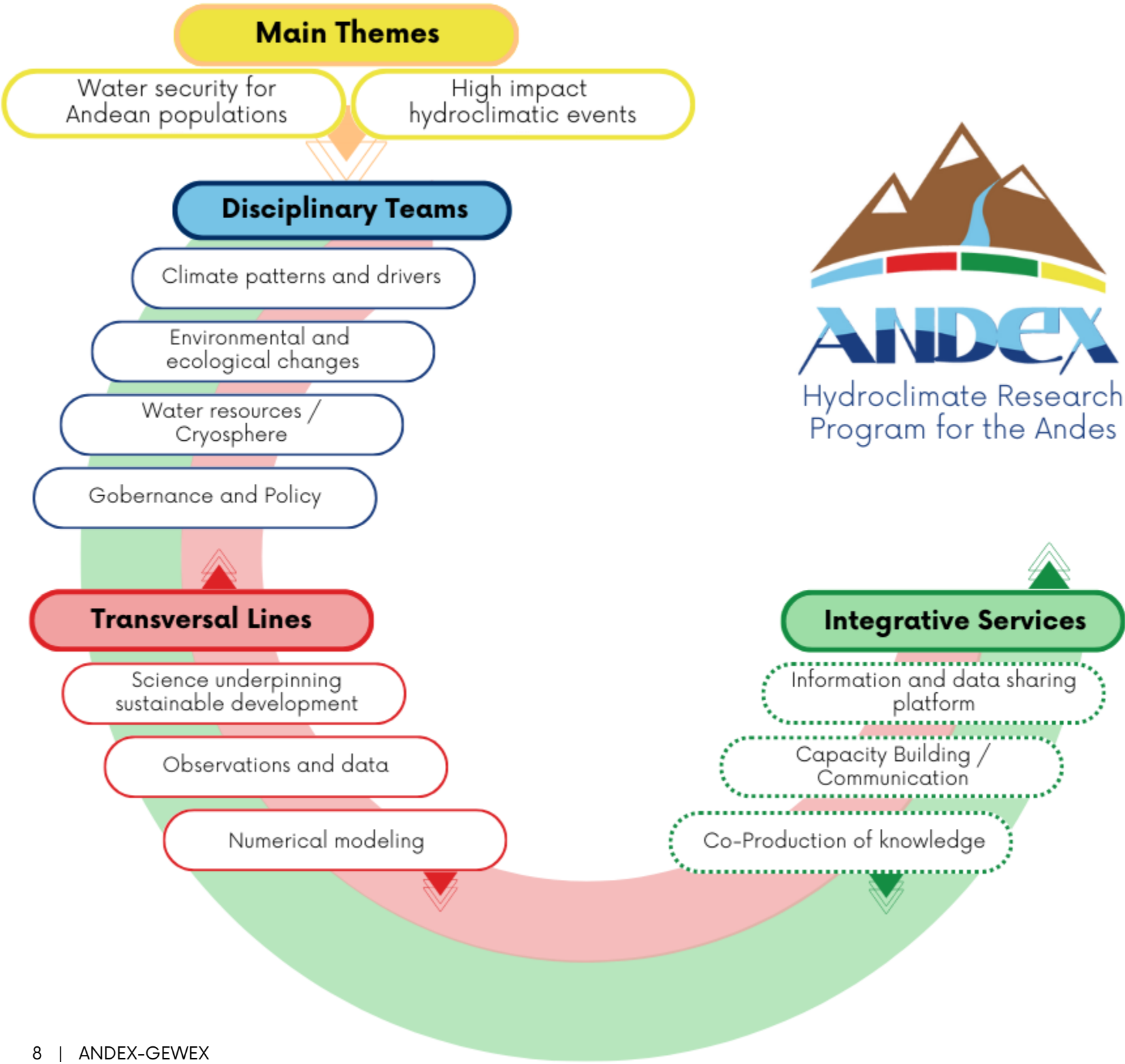
ANDEX is an interdisciplinary scientific network that seeks to strengthen the resilience of Andean societies through the production and dissemination of knowledge and information on regional hydroclimate and the impacts of environmental changes on Andean populations and ecosystems.

# VISION

ANDEX seeks to become a regional hydroclimatic program of reference, constituted by a consolidated and articulated scientific community that responds to the needs of society and contributes to planning and decision-making for the sustainable development of the Andean countries.



# RESEARCH





# FIRST RESULTS

Publications - White Book & scientific articles 

Webinars - Online conferences

Scientific meetings

ListANDEX - Dissemination and discussion group

JovenANDEX - Network of young researchers

Condom, T., Martínez, R., Pabón, J.D., Costa, F., Pineda, L., Nieto, J.J., López, F. & Villacis, M. (2020). Climatological and Hydrological Observations for the South American Andes: In situ Stations, Satellite, and Reanalysis Data Sets. *Frontiers in Earth Science* 8:92 doi: 10.3389/feart.2020.00092. In White Book, ANDEX

"Since one of the main challenges in the region is the sustainability of the meteorology & hydrology observation networks and the increase in available data for applications and research, potential activities should be focused on promoting and facilitating meeting points between the operational community and the scientific community in the region.

ANDEX could support this approach by discussing together the relevance and urgent need to address the societal needs, save lives, reduce the adverse impacts of hydrometeorological hazards, and adapt to a changing climate."

# OPPORTUNITIES

ANDEX promotes training and capacity development under a coordinated vision and empowerment of specialists from the Andean region as part of the international scientific community.

The program also intends to integrate biophysical and social scientists and non-academic partners to co-produce information and tools that can increase the resilience and adaptive capacity of the region's countries. The two Main Themes of the program are:

## Water security for Andean populations



### Actions:

- Characterize the water cycle in the Andes.
- Examine the scope of regional hydrometeorological forecasts (tools/models, accuracy, uncertainty, end users).
- Create a user-friendly interface/tool for researchers and decision-makers that facilitates using available data to monitor and forecast the Andean hydroclimatic.
- Estimate future water supply and demand projections by integrating information on the retreat of glaciers, Amazon deforestation, climate change, and demographic trends.

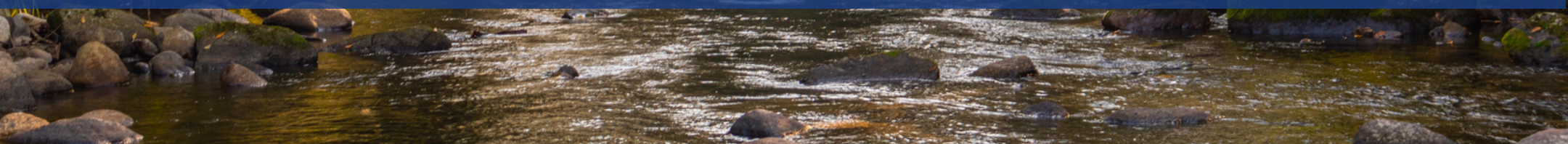
## High-impact hydroclimatic events



### Actions:

- Improve diagnostic, forecast and prediction tools for hydroclimatic hazards and transfer these tools to national and regional hydrometeorological services to reduce the vulnerability of Andean populations.
- Measure the magnitude, frequency, and direction of future changes in climate and water-related hazards throughout the Andes to improve socio-environmental resilience to climate change.
- Evaluate socio-environmental vulnerability to hydrometeorological hazards by developing and applying a framework for all the Andean countries

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A regional hydroclimate initiative

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In collaboration with::

