ADAPTATION AT ALTITUDE
KNOWLEDGE NETWORK

IMC Innsbruck 2025
International Mountain Conference

Adaptation at Altitude:
how can we exchange knowledge and share lessons of adaptation solutions in mountains?

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Agency for Development and Cooperation SDC

SEI

zoï environment network

UNIVERSITÉ DE GENÈVE

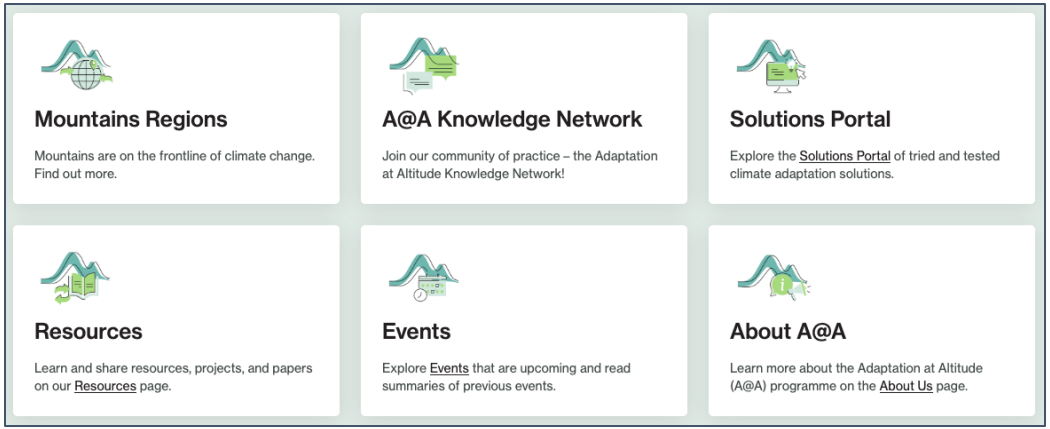
17 September 2025

The Adaptation at Altitude programme

- Mountains feature some of the clearest indications of climate change.
- Adaptation at Altitude aims to enhance the resilience and adaptive capacity of mountain communities and ecosystems to climate change, through:
  1. Improving data, information, and monitoring;
  2. Strengthening regional science-policy exchange and collaboration;
  3. Fostering knowledge generation and sharing;
  4. Advocacy and policy influencing.

How are we supporting knowledge exchange?

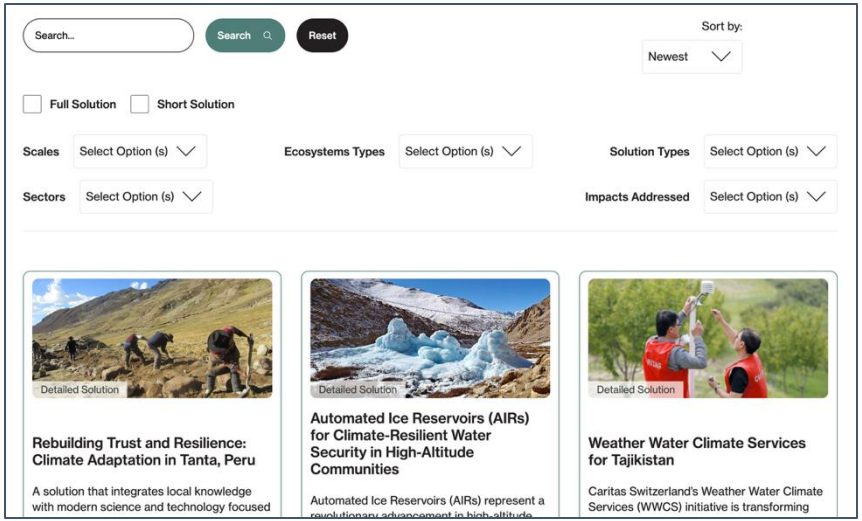
- The Adaptation at Altitude Solutions Portal
- ‘Climate change adaptation in mountains’ theme
- The Adaptation at Altitude Knowledge Network

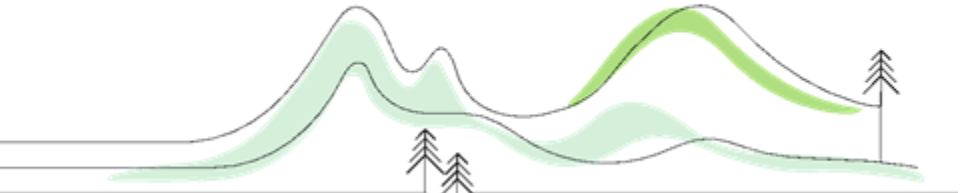


Adaptation at Altitude Solutions Portal

The Solutions Portal shares past or ongoing tried-and-tested solutions that can be scaled and replicated elsewhere.

‘Solutions’ are defined as technologies, approaches, and/or processes to adjust natural or human systems to actual or expected climate impacts, in order to reduce expected losses or harness benefits.





Explore the A@A Solutions Portal here

Adaptation at Altitude Solutions Portal

Our approach:

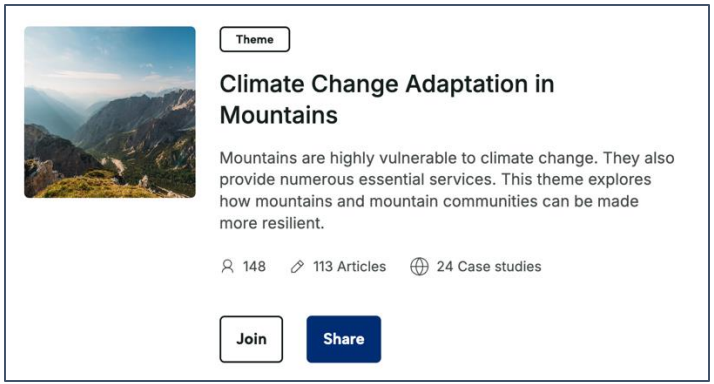
Create: we collaborate with solution contributors to collate relevant information

Review: expert editors review the solution to ensure it is of high quality

Promote: we share all solutions across our social media channels to support learning and knowledge exchange

weADAPT: ‘Climate change adaptation in mountains’ theme

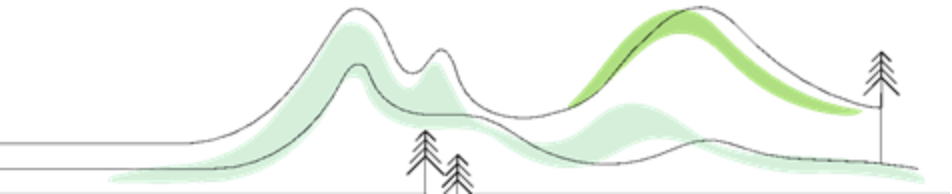
- Create a weADAPT account and subscribe
- Share your projects, papers, and case studies on adaptation in mountain regions
- Share news and updates in the dedicated forum space



The Adaptation at Altitude Knowledge Network

A **global community** through which we can share experiences and knowledge on adaptation in the mountains and collaborate to accelerate the uptake of innovative solutions. It aims to:

- **Encourage communication between stakeholders** working on and experiencing climate change adaptation in mountainous regions across the globe.
- **Support the sharing of successful solutions** for adaptation in mountains.
- **Foster the translation and uptake of solutions** for use in other locations.



Sign-up here!

Agenda for today’s session:

- 13:35 – 14:15: ‘marketplace’ of projects and solutions
- 14:15 – 14:50: breakout discussions
- 14:50 – 15:00: closing and synthesis

Thank you!

For more information, contact: rosie.witton@sei.org or kate.williamson@sei.org

MOUNTAIN RESEARCH INITIATIVE

CONDESAN
Consorcio para el Desarrollo Sostenible de la Ecorregión Andina

ICIMOD

SEI Stockholm Environment Institute

UN environment programme

UNIVERSITÉ DE GENÈVE

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ADAPTATION AT ALTITUDE
Taking Action in the Mountains

INTERNATIONAL MOUNTAIN CONFERENCE
SEPTEMBER 14 - 18 2025
>> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

WS 3.119: Solutions for adapting to climate change in mountains: an exchange of lessons learned and ways forward

Social-ecological vulnerability and adaptive capacity of small-scale agriculture to Global Environmental Change in Important Agricultural Heritage Systems in southern Chile.

Encouraging local knowledge as a tool for better adaptation strategies

Dr. Carla Marchant; Dr. Tomás Ibarra; Dr. Marcelo Miranda; Mg. Camilo Oyarzo;
Dr(c) Paulina Rodríguez

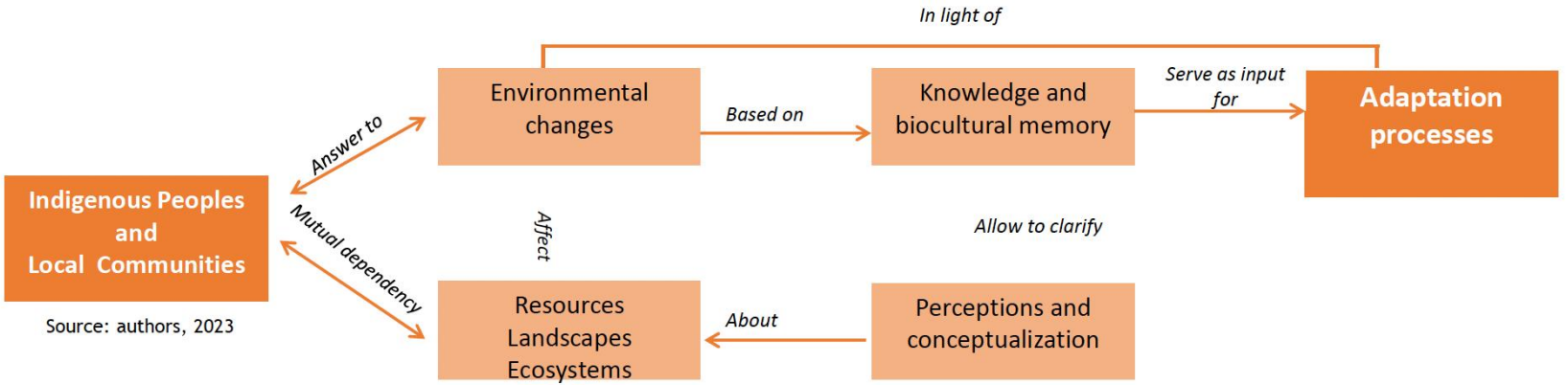
Fondecyt N°1231664

Outline

- Introduction
- Theoretical framework & research question
- Study area
- Methodological approach
- Results
- Conclusions

Introduction

IP & LC conceptualize climate and environmental changes through a relational approach



Source: authors, 2023






Theoretical approach

¿What is Social - Ecological Vulnerability (SEV)?

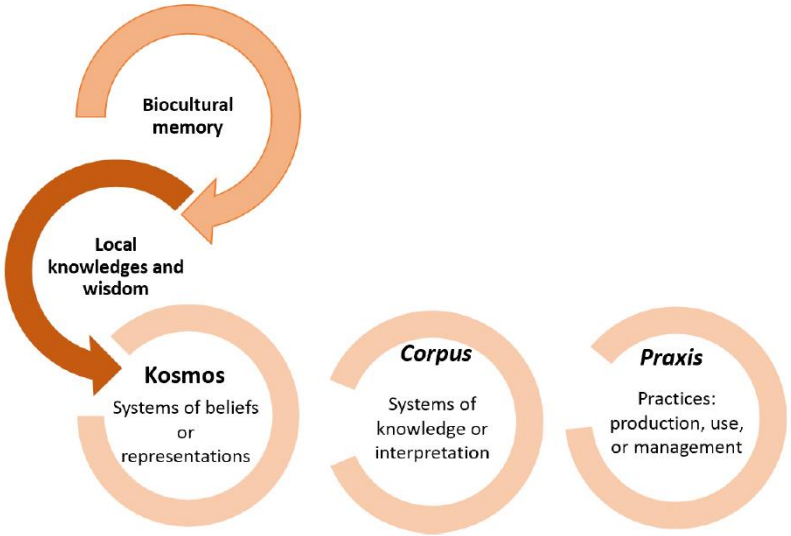
Propensity or predisposition of a social-ecological system to be adversely affected by the impacts of Climate Variability or Climate Change.

Vulnerability has been defined by the IPCC (2001; 2007; 2014; 2021) as a function of three dimensions: **Exposure** to climate variability and extremes, the **Sensitivity** of social systems, and the **Adaptive Capacity** of human groups.

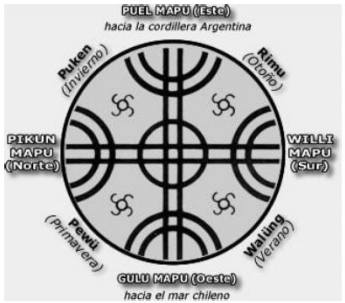
$$V = (E + S) - AC$$

Research question

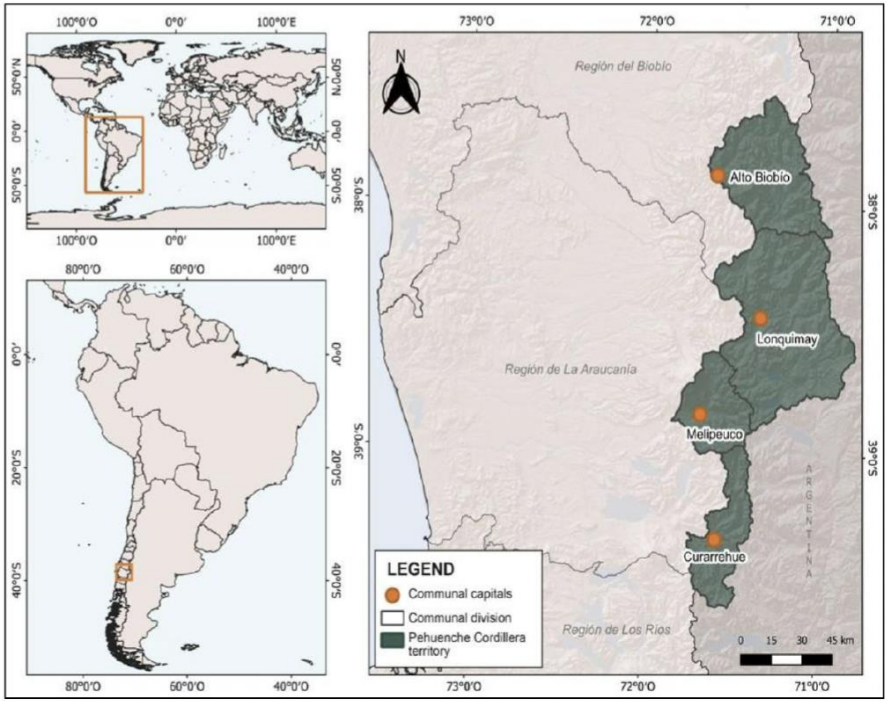
How do memory and biocultural knowledge contribute to adaptation and the reduction of social-ecological vulnerability?



Source: Toledo & Barrera Bassols (2009)



Study area: Southern Chilean Andes



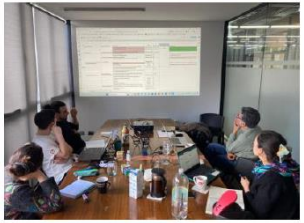
Methodological approach

Calculation of the Social-Ecological Vulnerability Index

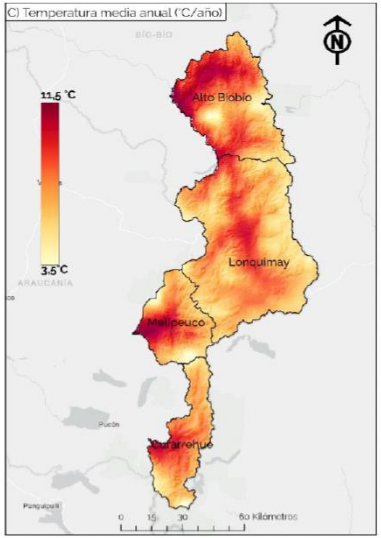
- Current CV models and future CC scenarios
- Sustainable Livelihoods Approach (DFID, 1999; Serrat, 2017)
- Social-Ecological Vulnerability Index (SEVI) based on the Livelihood Vulnerability Index (LVI) by Hahn et al. (2019)

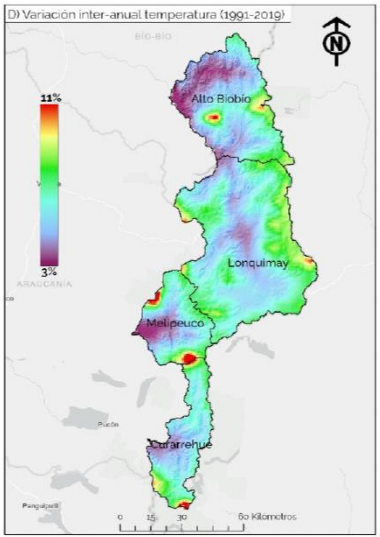
Identify adaptation practices, strategies, and local knowledge

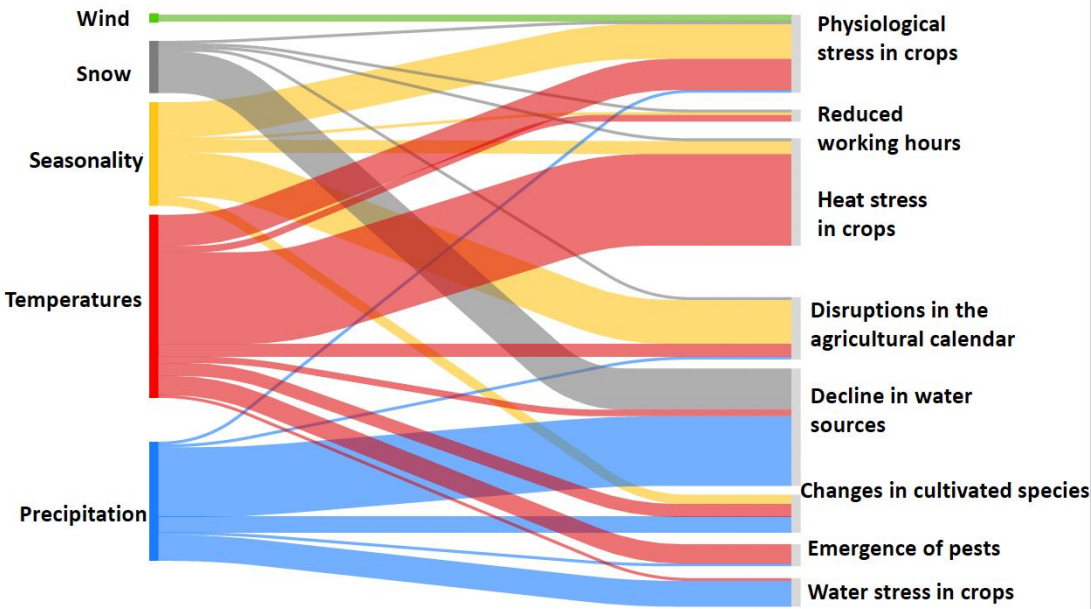
Proposals and recommendations for local public policy-making



Results: climatic modelation & perceived impacts and effects







Results: 15 adaptation practices to droughts

Practices

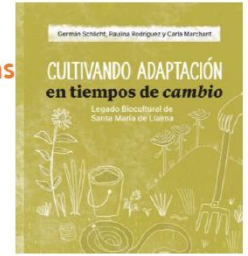
- Adjustments in the crop calendar
- **Rainwater harvesting**
- **Drip irrigation**
- **Reduction in homegardens size**
- Use of smoke in greenhouses
- **Shared use of water**
- Use of wells
- Use of Rural Potable Water systems
- Greywater reuse
- **Seed exchange: Trafkintu**
- Organic fertilizers and pesticides
- Shade mesh (Raschel mesh)
- Change in cultivated species
- Native trees around water sources
- Anti-Frost flowers (Maravillas Anti-heladas)

Conservation and Efficient Use of Water



Revitalization of Biocultural Heritage





Agricultural and spatial management of homegardens


Conclusions

- The challenges of Climate and Environmental Change, as a complex process, require an approach that **brings together diverse knowledge systems** and engages a wide range of local actors.
- Local knowledge, expressed through **biocultural practices**, provides essential input for the development of adaptive practices.
- It is therefore fundamental to integrate these wisdom into a **dialogue of knowledge** within local governance and management.

Luego de cinco años de trabajo entre instituciones y pueblos originarios

Chile inicia postulación para el reconocimiento mundial de sitios como Patrimonio Agrícola y prácticas tradicionales del país.

Los expedientes para obtener este reconocimiento fueron entregados por el Ministro de Agricultura a la Representante de FAO en Chile, en el marco del cierre del Proyecto SIPAN.

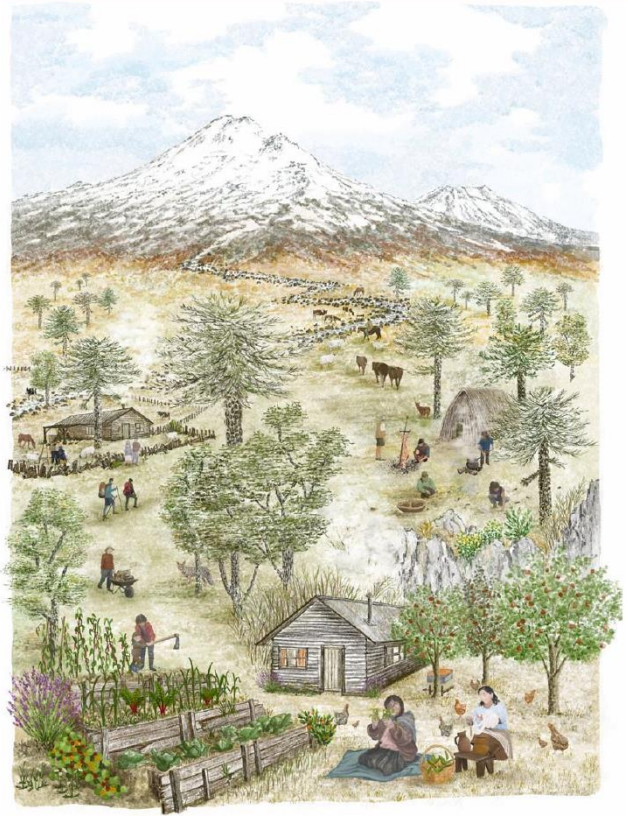
19 de Junio 2024 Equipo Redagricola

Luego de cinco años de trabajo entre instituciones públicas del agro, la FAO y las comunidades de los pueblos originarios aymara, quechua, licanantay, mapuche pehuenche y familias campesinas, el Estado de Chile, a través del Ministerio de Agricultura, hizo entrega a la FAO de los expedientes que sustentan la postulación de estos territorios al reconocimiento como Sistemas Importantes del Patrimonio Agrícola Mundial (SIPAM).

Globally Important AGRICULTURAL HERITAGE Systems

Conclusions

Thanks for listening and follow us!



ANDESDELSURLAB

www.andesdelsurlab.cl

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INTERNATIONAL MOUNTAIN CONFERENCE
SEPTEMBER 14 - 18 2025

>> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

WS 3.119

Solutions for adapting to climate change in mountains

The flux of climate information in mountain regions: an example from the Andes

Christine Jurt[1]; Sofia Foladori-Invernizzi1

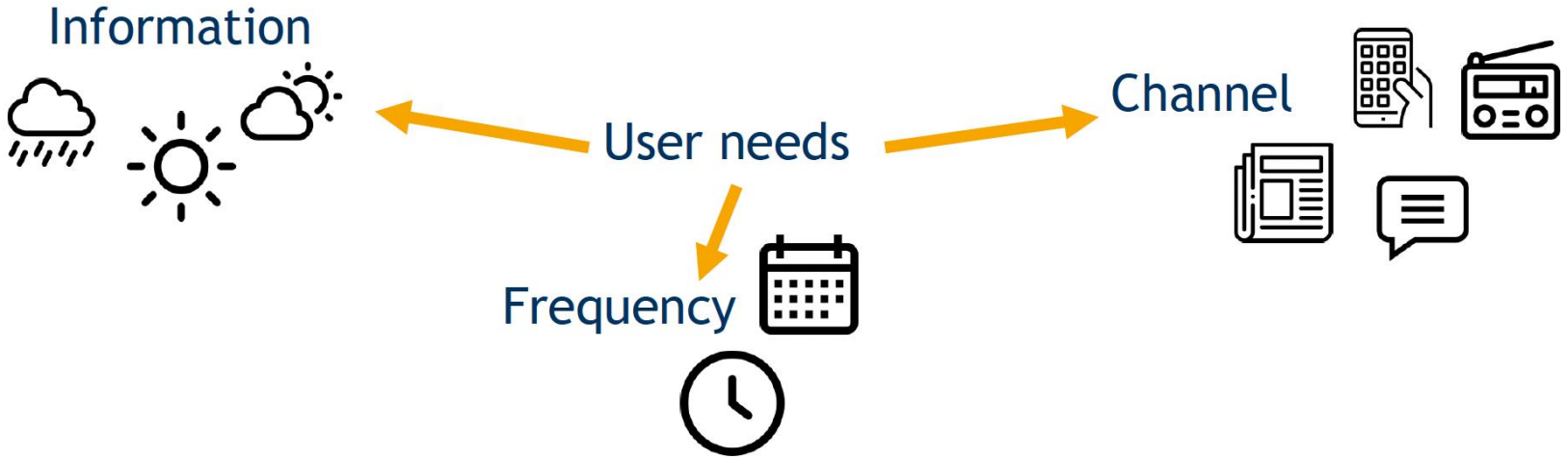
[1] Bern University of Applied Sciences, School of Agricultural, Forestry and Food Sciences (BFH/HAFL)

Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

ENANDES

What are weather and climate services?

Weather and Climate Services consist of tailored information regarding weather and climate to a specific user → supports decision-making, resilience and adaptation



The "Last Mile" in Climate Service

For a climate service to be effective, it needs a good forecast, but also, it needs to reach the end user, to **be understood**, **trusted** and **to lead to decision-making**

→ **Coproduction** of knowledge is key to enfold their **full potential**

(Brasseur and Gallardo, 2016; Kalafatis et al., 2015; Vogel et al., 2019)

The Andean Context

- **Geographic Scale:** >7000 km long, vast altitudinal gradients
- **Diversity:** 7 countries (6 in ENANDES+) with different cultural, political, and economic contexts

How does this diversity translate into different systems of climate information?

Christine Jurt
Bern University of Applied Sciences (BFH)

Objectives

1. Examine the **flow of weather and climate information** in the different ENANDES+ case studies, from the National Meteorological and Hydrological Services until **the end user**

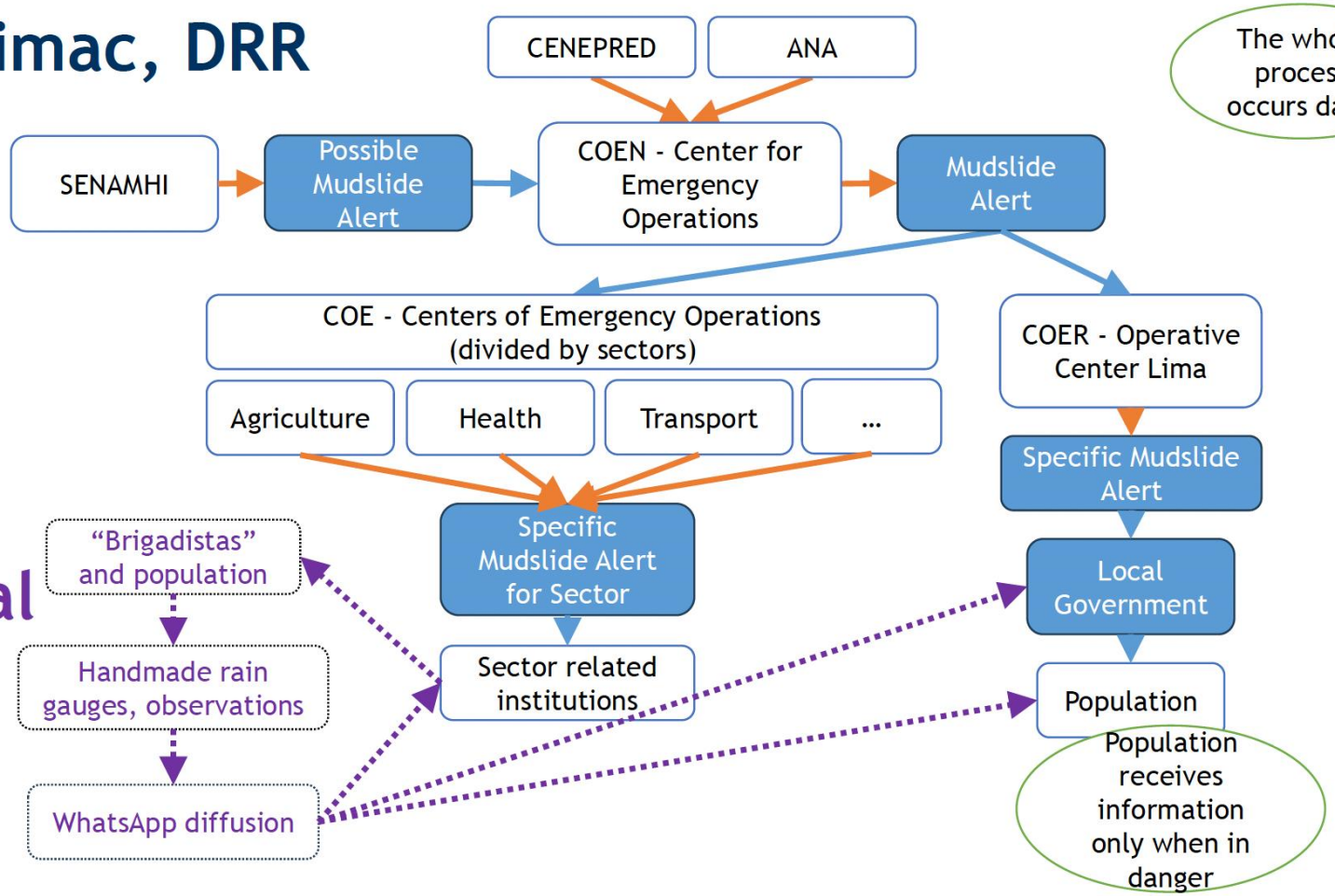
2. Understand how **co-production of knowledge** is considered or integrated in the climate information flow of the different case studies

Contrasting Pathways of Climate Information

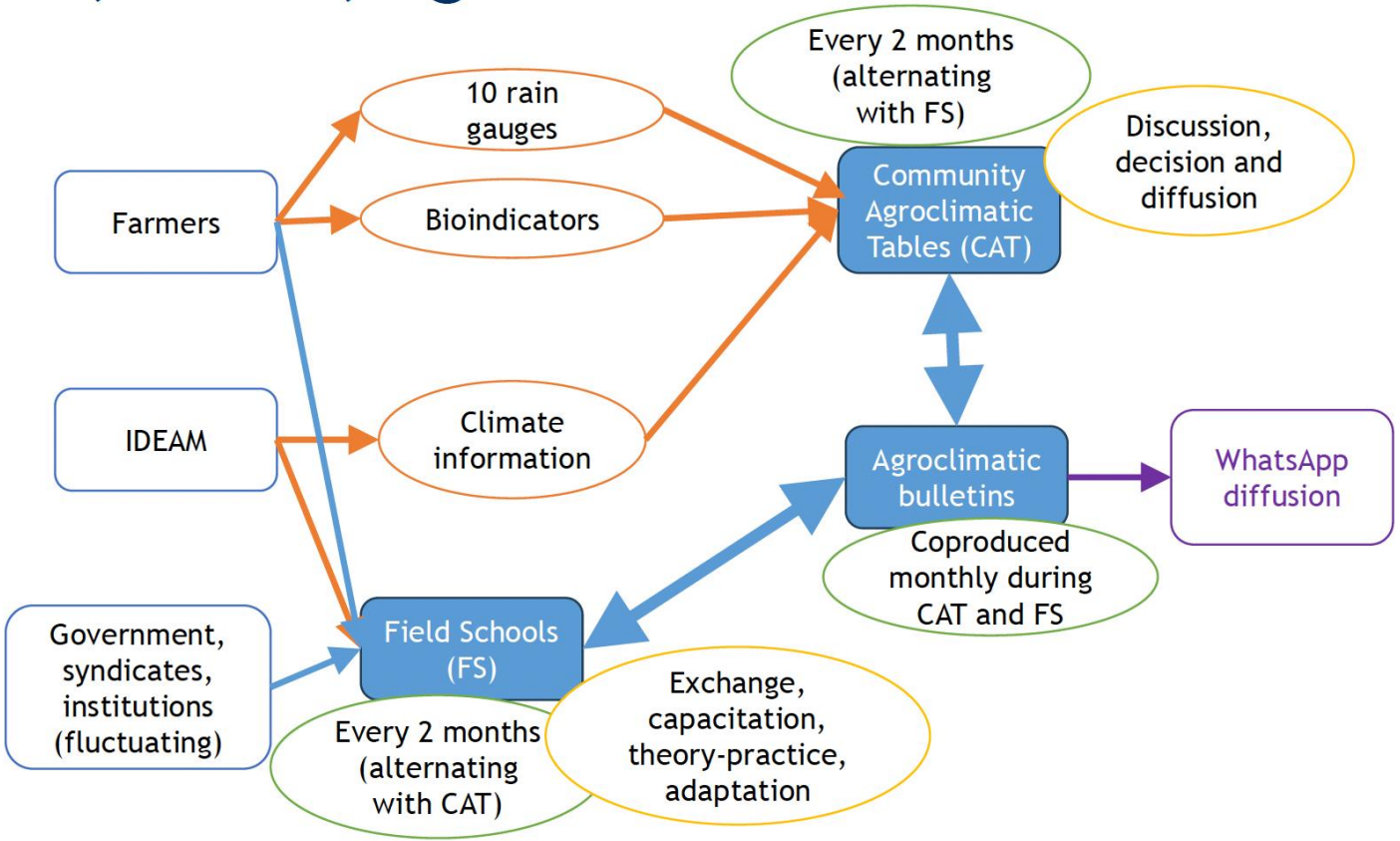
Model 1. Direct delivery

Model 2. Complex network with intermediates

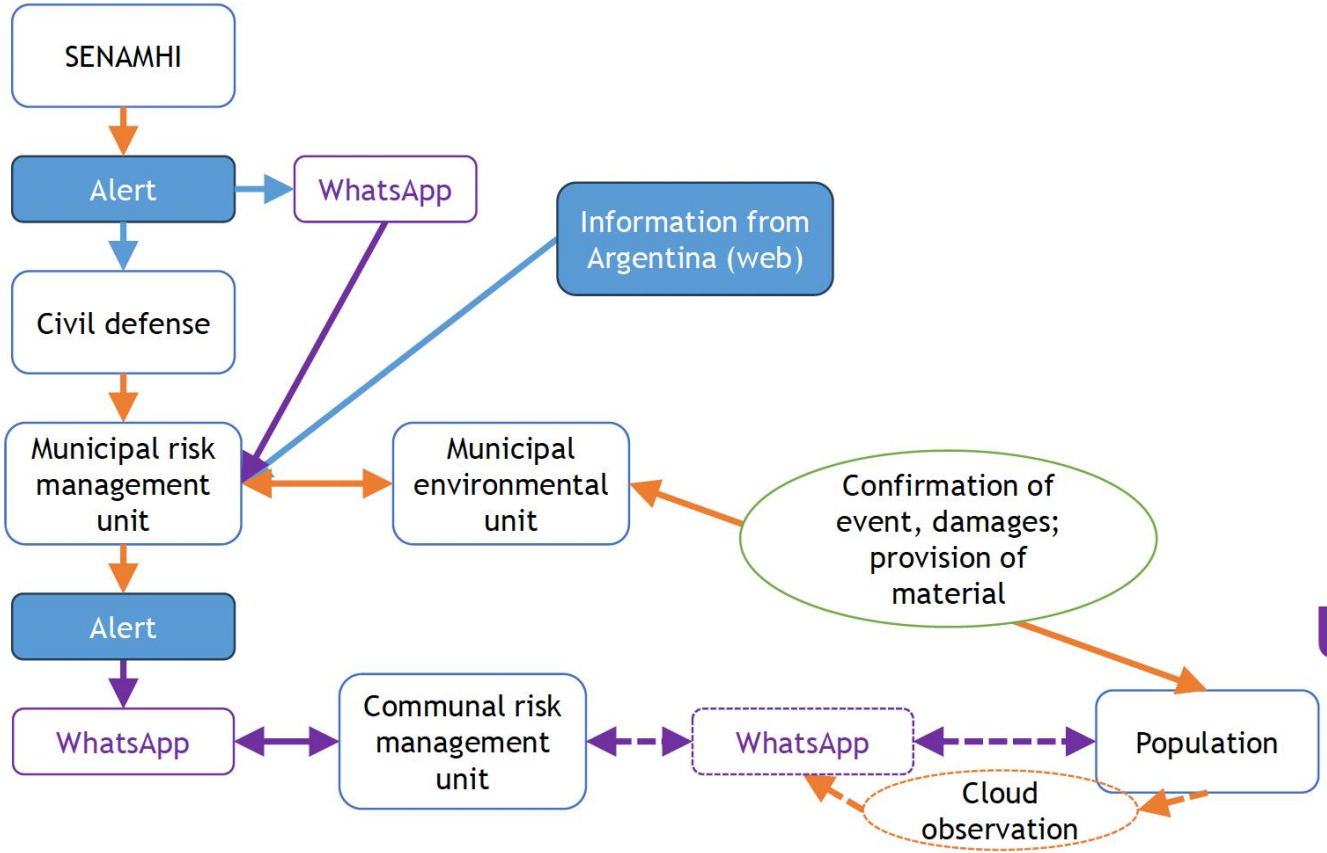
Peru, Rimac, DRR



Colombia, Cauca, Agriculture



Bolivia, Uriondo, Agriculture



Unofficial

Why Does the Flow Matter?

Accuracy: intermediaries can add value

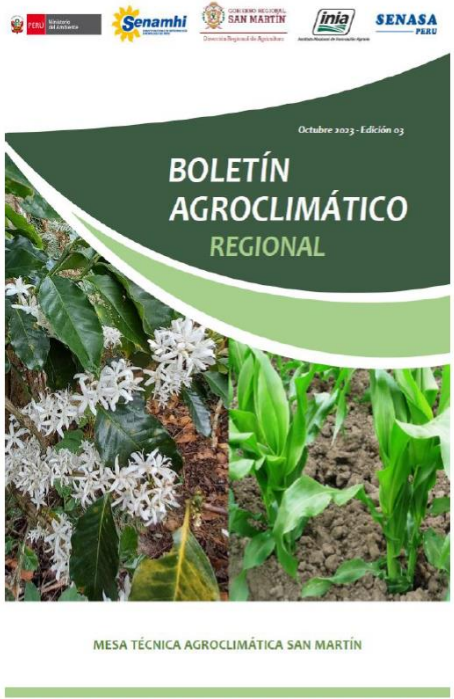
Timeliness: complex chains can cause delays

Trust: users may trust local institutions more than a distant government agencies

Tailoring: final product needs to be contextualized to local needs

Co-production: the more complex the flow, the harder it is to integrate the users from the beginning →**reduced tailoring and maybe reduced trust**

Key Takeaways



- → **Mapping the information flow is a prerequisite** for designing effective climate services that fit to local realities
- → **Communities are interested and value** information, as can be seen by the parallel systems and WhatsApp channels
- → **WhatsApp has a key role** for delivering information in the official and unofficial flows of all countries

ADAPTATION FUND

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

ORGANIZACIÓN METEOROLÓGICA MUNDIAL

Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

Thank you!

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ENANDES

Servicio Meteorológico Nacional
IDEAM
Senamhi
senamhi SERVICIO NACIONAL DE METEOROLOGÍA E HIDROLOGÍA
INAMHI TIEMPO, CLIMA Y AGUA ECUADOR
CIIFEN
CRC OSA
CRC - SAS
MeteoSwiss
Berner Fachhochschule Haute école spécialisée bernoise Bern University of Applied Sciences

MOUNT RESILIENCE

MountResilience

Testing innovative frameworks for climate change adaptation practices at a regional scale: the Solution Database

Stefano Sala, Dario Pezzotti, Anna Giorgi
UNIMONT – University of Milan

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor CINEA can be held responsible for them.

Swiss partners have received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

Horizon Missions – Climate Adaptation

- The project, led by **UNIMONT – University of Milan** is funded under the **Horizon Europe – Miss-2022-Clima-01**
- The project involves **47 partners from 13 European Countries**
- The project will run for **54 months** from **1 September 2023 until 29 February 2028**
- The **total project cost is €15,970,687.50** with a requested **EU Contribution of €15,169,196.25**

MOUNT
RESILIENCE

MountResilience - Core Objective

Support European regions and communities located in mountainous areas in increasing their climate change adaptation (CCA) capacity and their transition to a climate-resilient society by developing, testing and scaling up multi-level, multidimensional and re- applicable innovative CCA solutions in their regional and local settings.

MOUNT RESILIENCE

European area

MountResilience aims to accelerate the climate resilient transformation of mountain areas of 9 EU countries.

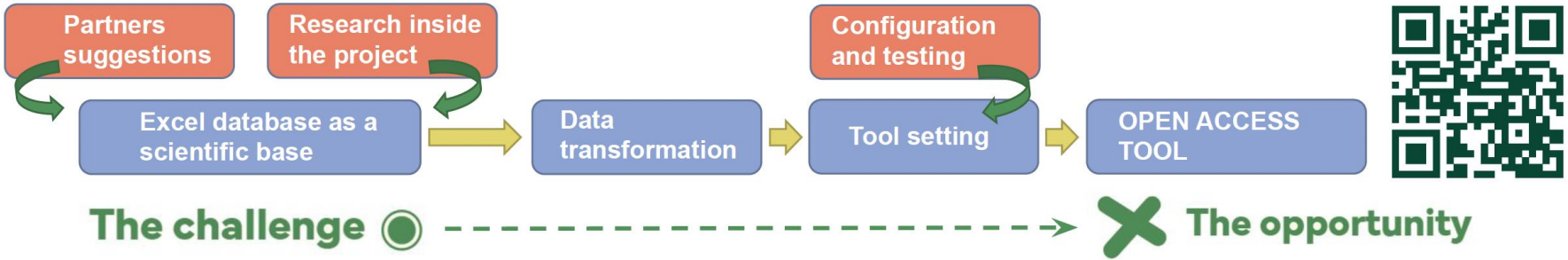
6 Regional demonstrator sites

4 Regional replicator sites

MOUNT RESILIENCE

What?

The MountResilience Solution Database is a space developed within the project site to **collect good practices** for **climate change adaptation**, through useful project and articles, promoting knowledge and suggestion for stakeholders, particularly for mountain areas.



MOUNT RESILIENCE

The tool

MountResilience / Solutions-database

Solutions database

In the design phase, the tool was composed to provide material to the replicator and demonstrator regions in **co-design and decision-making phases**.

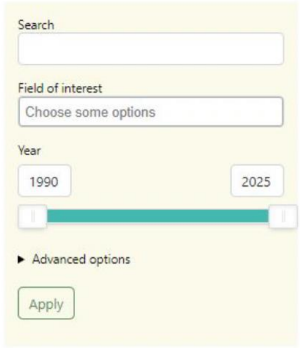
Actual database composition: 465 solutions

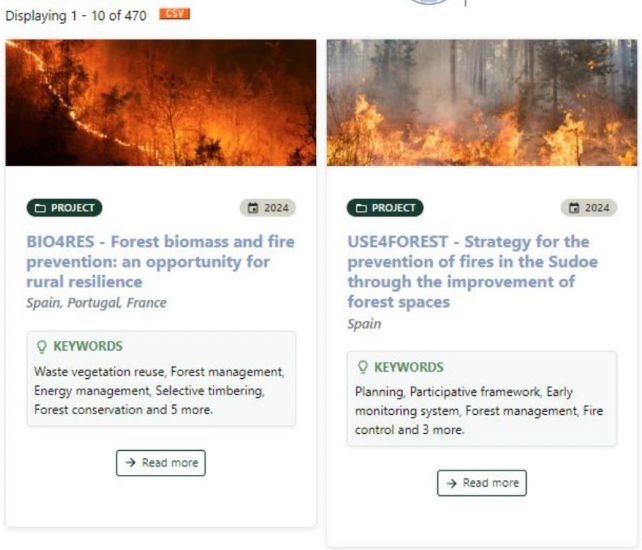
170
EU projects

295
scientific papers

10
Fields of interest
(e.g. Tourism, Natural Hazards, Forest Management)

55
Keywords





You can participate by suggesting material to add to the solution database, using the website contact information.

MOUNT RESILIENCE

Some cases – Natural hazards

PROJECT 2023

Flash Flood Prediction and Prevention System

Slovakia, Poland

KEYWORDS

Water management, Water monitoring, Rainwater collection, Urban greenery, Monitoring techniques and 5 more.

Challenge analysed	Flash Floods
Solution proposed	Develop and pilot a smart Web GIS-based system
Chosen why…	It developed a smart Web GIS-based system which enables end users to access, analyse and model different hydro-meteorological scenarios for simulating and predicting their impact in particular locations (e.g. storms, flash floods, floodplain restoration). Now a company offer geovisualization and cartographic production of interested areas, also developing and implementing desktop or web and mobile map GIS.

BUT ALSO NEW TECHNOLOGIES!

MOUNT RESILIENCE

Thank you for your attention!

To get in touch:

Anna Giorgi
Full Professor – Project Coordinator and Principal Investigator
Università degli Studi di Milano - UNIMONT
Anna.giorgi@unimi.it

Stefano Sala
Project Manager
Università degli Studi di Milano - UNIMONT
Stefano.sala1@unimi.it

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ADAPTACIÓN EN LAS ALTURAS
En Acción por las Montañas

Adaptation solutions and climate resilience: a comparative analysis across the Andes

Luis Daniel Llambí, Alejandra Melfo, Ma. Andreina Salas

Adaptation at Altitude – CONDESAN
Universidad de Los Andes - Venezuela

CONDESAN
Consorcio para el Desarrollo Sostenible de la Ecorregión Andina

Schweizerische Eidgenossenschaft
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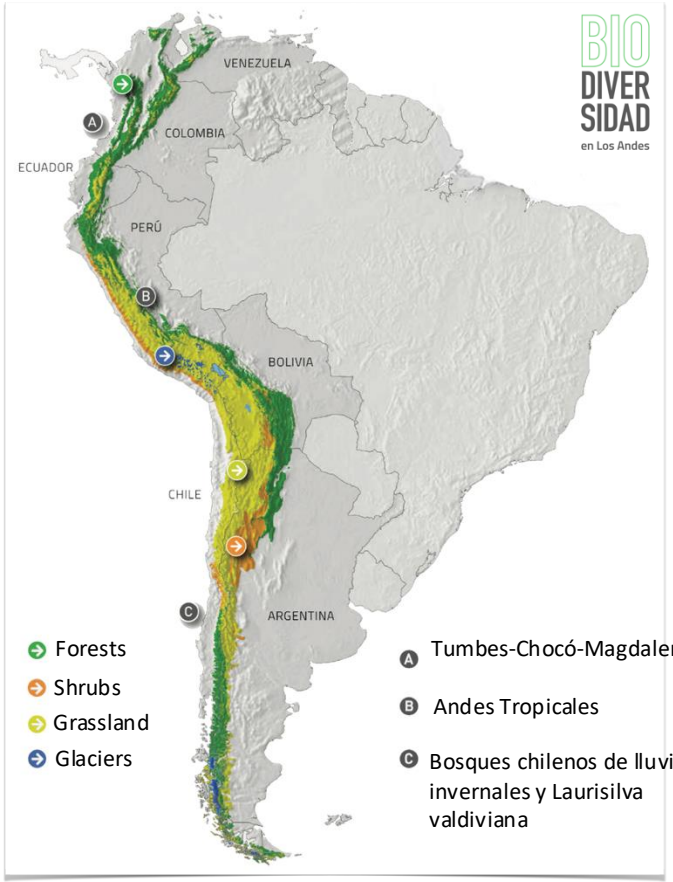
Swiss Agency for Development and Cooperation SDC

The Andes:

a region with endangered biodiversity

- One of the most biodiverse regions on the planet
- 8500 km latitudinal range, 6000 m of altitudinal range
- Ecosystem services for the whole continent
- Cultural and socio-economic diversity
- High vulnerability to climate change

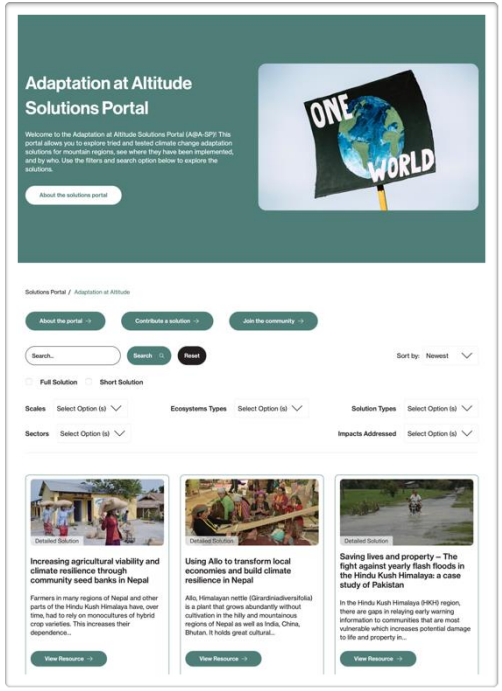


IAM 2021

A@A Solutions Portal

WeAdapt

https://adaptationataltitude.org/solutionsportal/



More than 40 adaptation solutions documented in the Andes

Where and how they are implemented, details, results, possibility of replication...

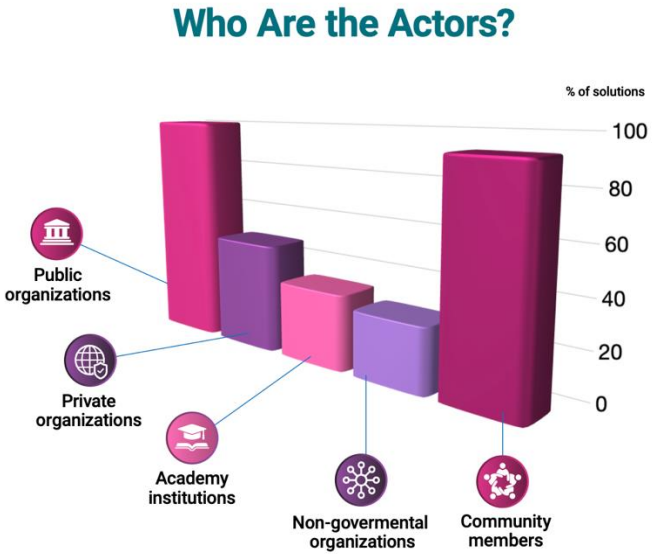
IAM 2022

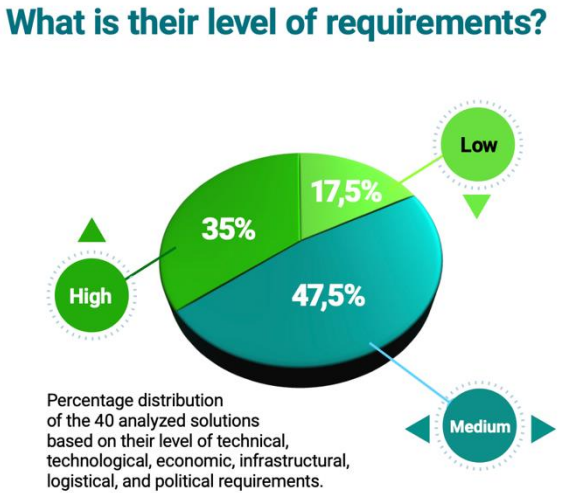
ADAPTACIÓN EN LAS ALTURAS

Adaptation Solutions in the Andes

Salas-Bourgoin, 2024

Characteristics



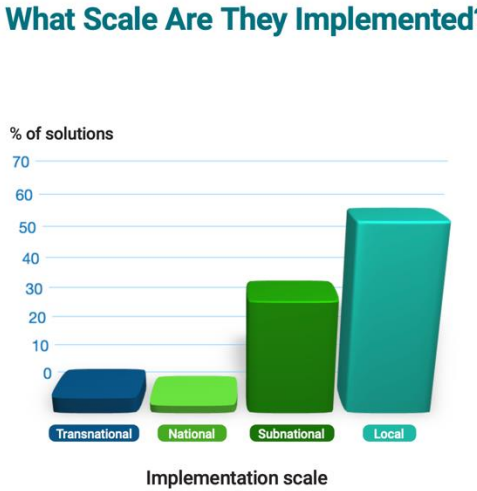


- Both community actors and public bodies are involved
- They require few specialists, and technologies/infrastructure that community members can handle or build

Characteristics

Local work scale:

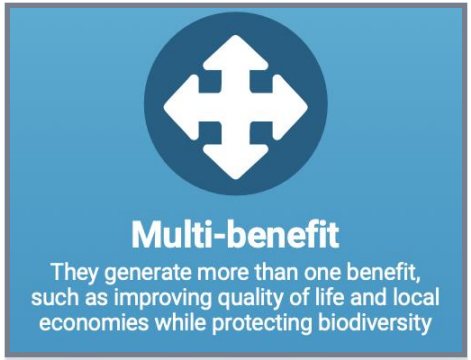
- Addressing several communities/localities at the same time
- Integrating community and governmental actors



- All adress three or more themes
- Focused on **water resources and…**
- Training/strengthening community livelihood strategies

Strengths

ADAPTACIÓN EN LAS ALTURAS



Gaps

ADAPTACIÓN EN LAS ALTURAS

Monitoring limitations

Reliable and continuous data is needed to assess the real impact of solutions

Short-term planning

Many initiatives are only supported in the short term, which does not ensure their permanence or follow-up

Weak connection with the land

Insufficient consideration of how land-use regulations influence the implementation of solutions

Greater emphasis on gender than generational inclusion

It is crucial to integrate the knowledge of elders while also involving youth

Low attention to risk management

One of the most important consequences of climate change is the increase in disaster risks

Thank you!

IMC Innsbruck 2025
International Mountain Conference

ADAPTATION AT ALTITUDE
Taking Action in the Mountains

UNIVERSITÉ DE GENÈVE

CONDESAN
Consorcio para el Desarrollo Sostenible de la Ecorregión Andina

Assessing climate adaptation solutions in the Andes

Perspectives from beneficiary communities on effectiveness and sustainability

What remains after projects end?

Aguilera-Rodríguez J. J., Allen S., Llambi L. D., Salas-Bourgoin M. A., Rodríguez-Molano L. M., & Sulbarán E.

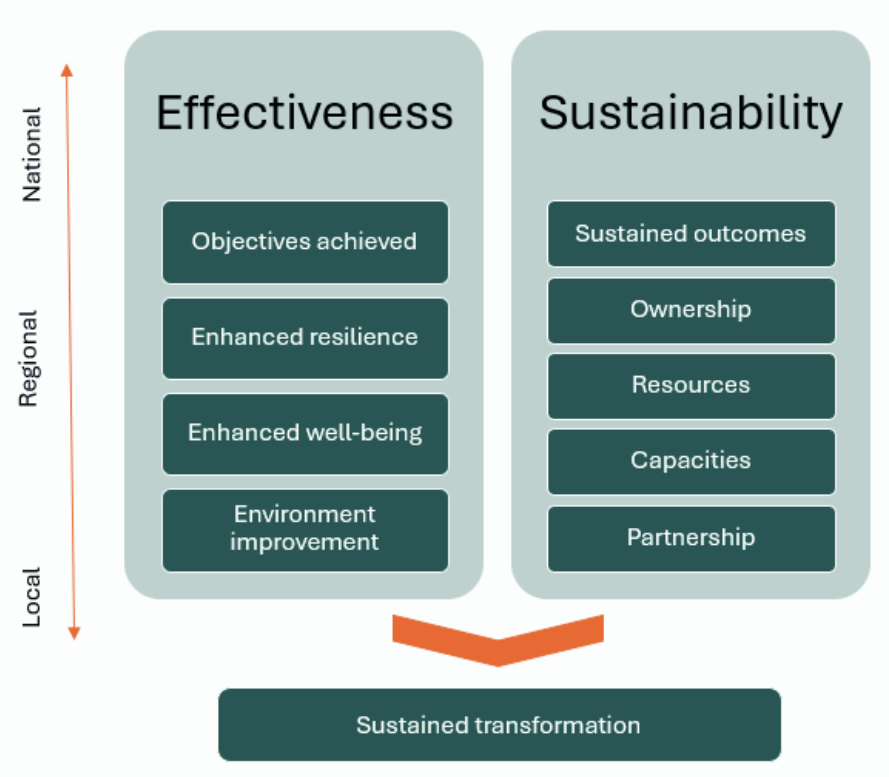


Fig. 1 - Conceptual framework to assess the effectiveness and sustainability of adaptation solutions.

Objectives

To evaluate the effectiveness and sustainability of climate adaptation solutions **as perceived by beneficiary communities.**

Determine the impacts the solutions have had and are continuing to have at the ground level

To identify the factors that have enabled or hindered both their effectiveness and sustainability.

Five projects assessed in Chile, Colombia, Ecuador, Peru and Argentina through the conduction of semi-structured interviews (and field visits)

Lessons from Ecuador & Argentina

Ecuador: Greenhouses in Cuyuja & Papallacta

Implementation period: **2020 - 2022** Scale: Local

Problem:

- Open-field farming impossible (frosts, rains)
- Expansion of grazing threatening buffer zones of Cayambe-Coca & Antisana NPs
- Low-productivity cattle; food security highly vulnerable

CCA Solution:

- 42 family-scale high-quality greenhouses (160 m², drip irrigation)
- Complemented by: rural credit funds, water supply systems, sustainable cattle practices
- AICCA project implemented by MAATE and CONDESAN

4 remote interviews

Effectiveness

- Empowered women, improved governance relations
- Significantly improved incomes
- Diversified production and diets
- Reduced grazing pressure the buffer zones of the Cayambe-Coca and Antisana national parks

Sustainability

- Most greenhouses still active and in good conditions 3 years after the project's closure
- Local GADs and national actors are now financing the installation of new structures
- Integrated into parish schools and planning

Implementation period: **2017 - 2024** Scale: Local

Argentina: Wetland management and conservation in the Pozuelos Biosphere Reserve

10 interviews and field visit

Effectiveness

- 84+ ha of high andean wetlands restored; 20,000 ha under improved grazing practices
- Reliable water access for ~180 Kolla families
- Women's participation strengthened

Sustainability

- Communities maintain works & pumps
- Knowledge embedded via Indigenous governance and training manuals

Problem:

- High Andean wetlands degraded by mining, water diversion, overgrazing
- Rural Indigenous families vulnerable to drought & water scarcity

CCA Solution:

- Community-led wetland restoration (replanting, water retention trough check dams, wetland management and restoration plan)
- Sustainable grazing (rotational use, closures, llamas instead of sheep, solar water pumps)
- Implemented by Wetlands International and Fundación Humedales in collaboration with provincial and local authorities, and local indigenous organizations

Lessons learnt

Social dimensions matter as much as technical ones

- Trust-building with local institutions created enabling environments
- Women's empowerment boosted adoption and sustainability

Integration across scales is critical

- Local livelihood benefits directly linked to ecosystem services (páramos, wetlands)
- Adaptation gains are more durable when connected to broader governance and conservation agendas

Ownership drives sustainability

- Communities sustain practices that improve daily life (food, water, income)
- Institutional embedding (e.g., parish plans in Ecuador, indigenous governance in Argentina) secures continuity

Adaptation legacies provide as much evidence as project outputs

- What communities maintain after closure reveals true effectiveness
- Conventional evaluations risk overestimating sustainability if they don't track post-project continuity

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Challenges

- Dependence on political cyces and budgets generates risk of discontinuity
- Technical and operational gaps in remote mountain communities
- Demographic shifts could reduce long-term capacity for collective actions
- External pressures (e.g. mining activities in Argentina)

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Mountains ADAPT:

Learnings from piloting a small grants scheme in mountain communities

Innsbruck, IMC, 17 September 2025

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The Mountains ADAPT project

Mountains ADAPT is an Austrian funded project implemented by UNEP in partnership with the Albertine Rift Conservation Society (ARCOS), EAC Secretariat and Sustainable Caucasus.

The project aims at :

- Promoting innovative mountain adaptation action in the S Caucasus and E Africa
- Providing needs based and easily accessible financial support to catalyze concrete solutions at local scales
- Establishing small grant schemes that aim at answering the needs of local communities

Small grants stock-take analysis

Objectives of the stock-take :

- Identifying existing programs that channel small grants or payments to communities
- Documenting key attributes and parameters of the various existing grants schemes, including analysis of practical operations
- Analyzing small grant transfer mechanisms and country specifics in the South Caucasus region
- Identifying potential shortcomings and main issues to consider when developing a Mountains ADAPT small grant funding scheme

30 programs identified, 14 programs analyzed and 18 projects screened

Small grants stock-take results

30 programs identified, 14 programs analyzed and 18 projects screened

5 key recommendations

1. A project for communities by communities
2. Simplify document requirements, and application processes to allow communities to apply – use of national languages
3. Use technology to ease monitoring processes
4. Find the most cost-efficient routes to disburse grants
5. Involve national and local governments

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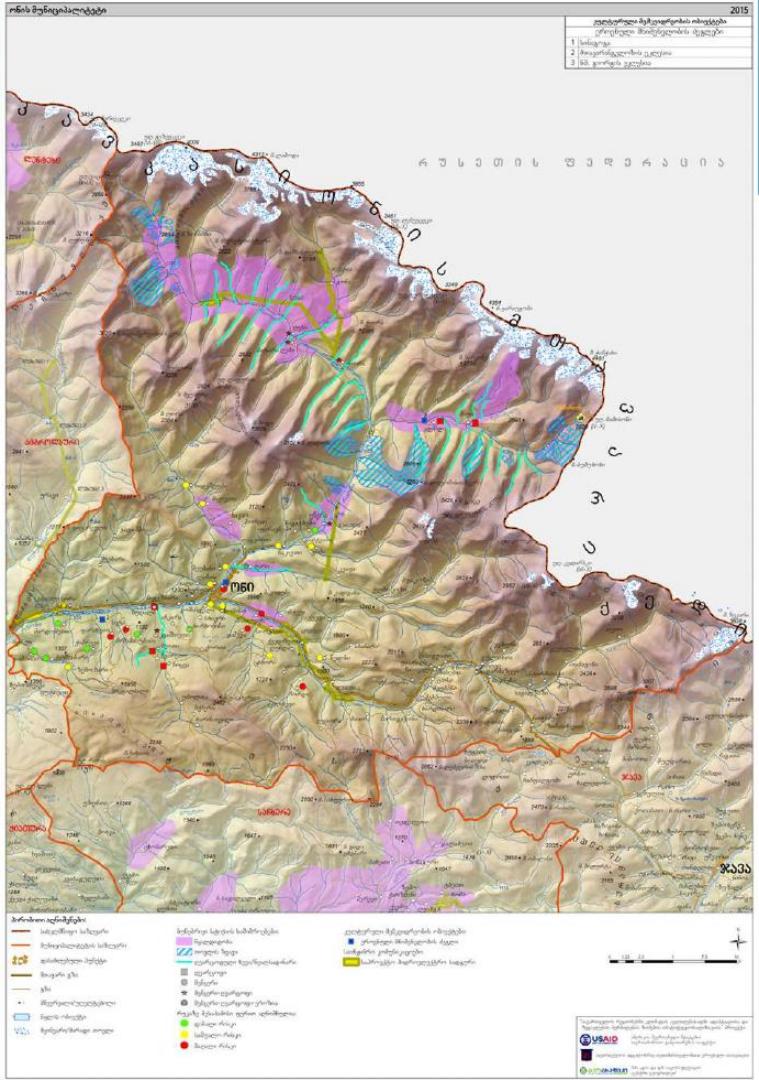
Criteria for selecting the pilot testing sites

Criteria 1: Mountain community

Criteria 2: Vulnerability to climate change risks

Criteria 3: Existing community structures/capacities

Criteria 4: Existing adaptation policies/strategies in mountain communities



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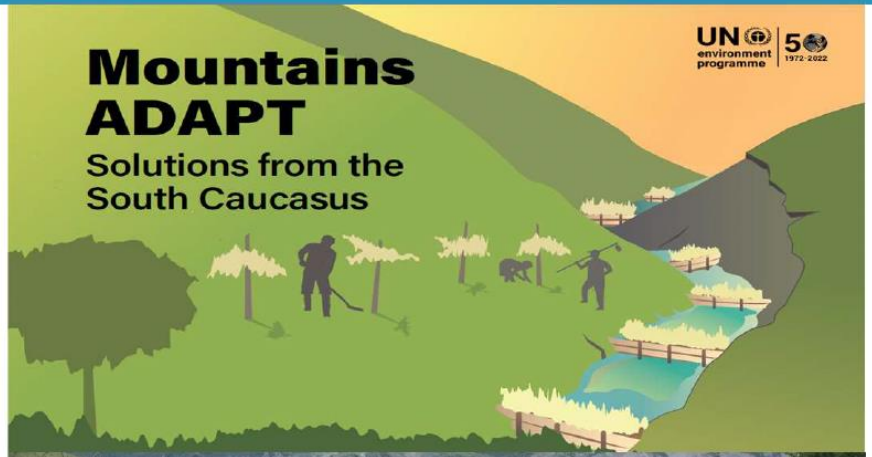
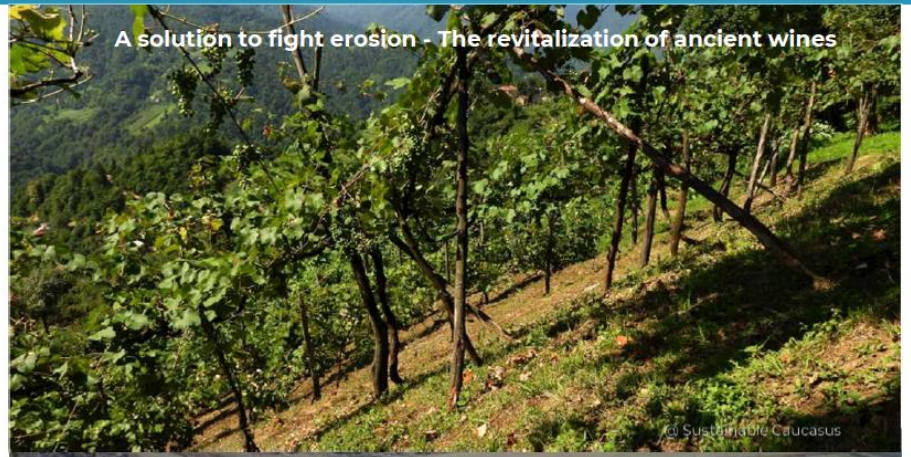
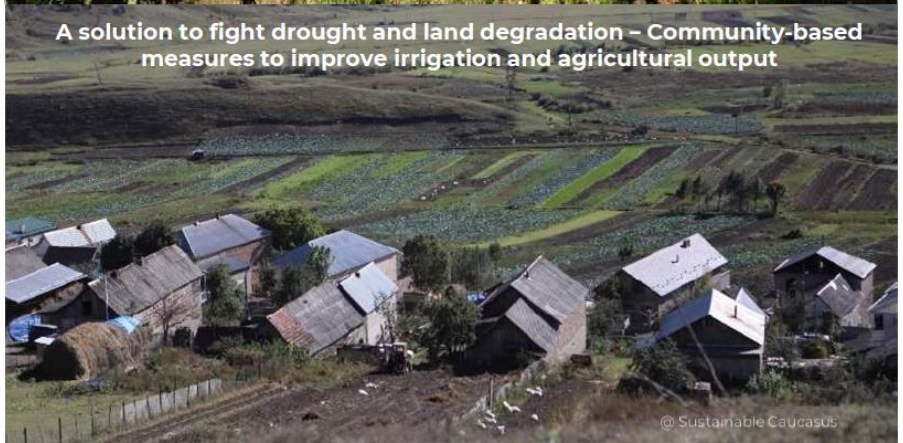
Adaptation in Mountain regions – Tested Solutions







Learnings from Pilot Phase (2023-25)

- Strong need for community-based accessible climate finance for mountain adaptation solutions
- High awareness of (projected) climate change impacts
- Existing barriers with international funding
- Challenges in funds transfer and due diligence
- Variety of community- and nature-based solutions planned and implemented
- Acknowledge different human and technical capacities of CBOs and practical implications – provide training and assistance
- Use visual material for reporting and monitoring
- Consider Sustainability of interventions beyond small grant funding – buy in of authorities required

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Mr. Piranto engaged the participants in smart agriculture training, as they followed attentively

Growing fruit trees to diversify incomes and address nutrition

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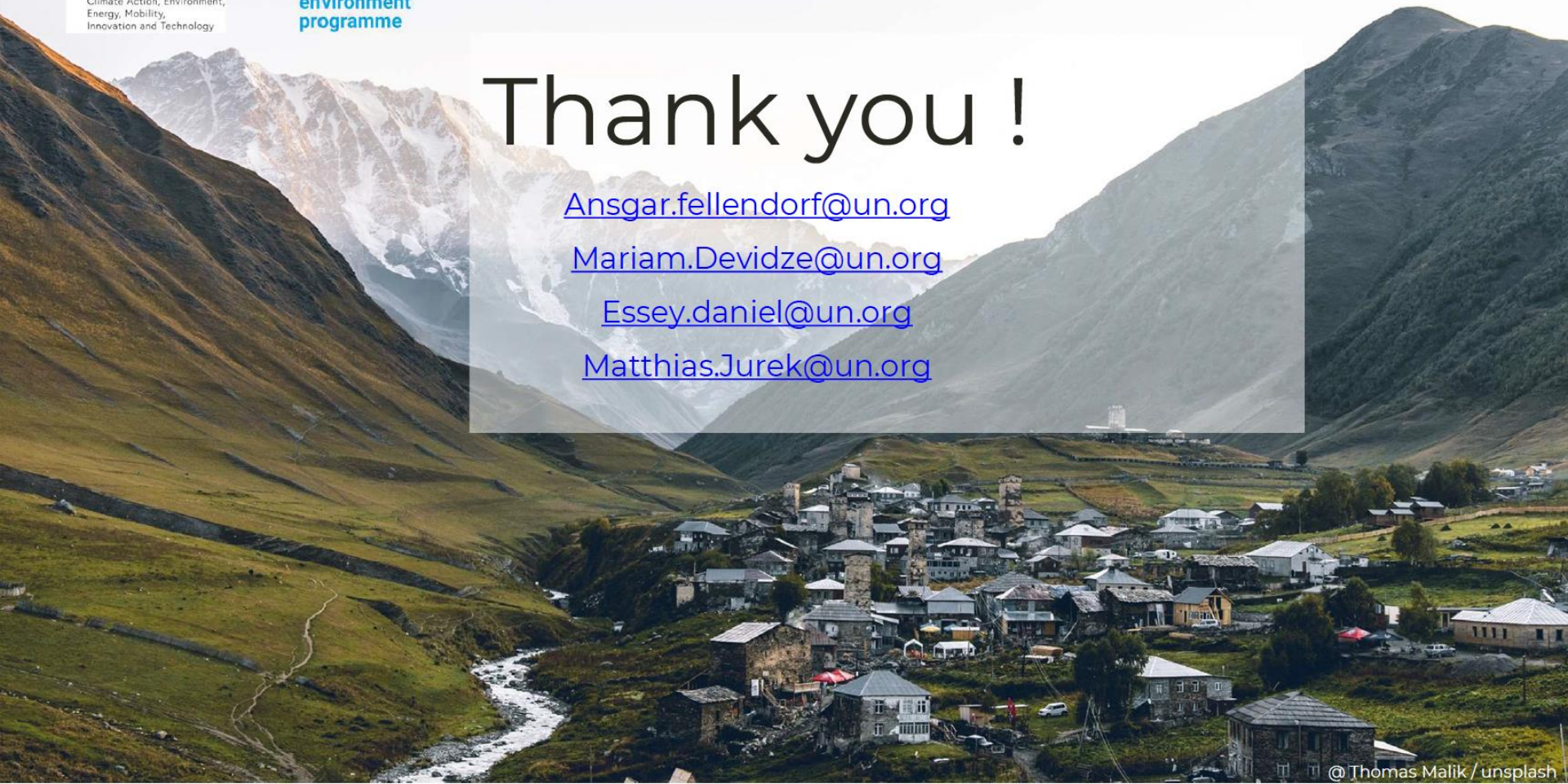
Thank you !

Ansgar.fellendorf@un.org

Mariam.Devidze@un.org

Essey.daniel@un.org

Matthias.Jurek@un.org



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