Foro Internacional Glaciares

Challenges of research at society´s service in the framework of climate change

July 1 – 4, 2013 – Huaraz, Ancash, Peru

Dangerous Glacial Lakes in Apolobamba Protected Area, Bolivia: Monitoring Program and Management Perspectives

Dirk Hoffmann

Instituto Boliviano de la Montaña - BMI

Bolivian Mountain Institute

A new look at glacial lake monitoring

A multi-actor initiative, combining **monitoring**, **conservation** action and **science**.

Photo: Fawcett 1911

Preliminary considerations - 1

rapid retreat of mountain glaciers
is the most visible sign of global warming

Preliminary considerations - 2

what is happening with glaciers worldwide is probably also happening

– silently and largely invisible to the majority of the people –

to the ecosystems around the world

Preliminary considerations - 3

given the present rate of
climate change,
in 20 years time the world is
likely to look very different
than what we can now
imagine

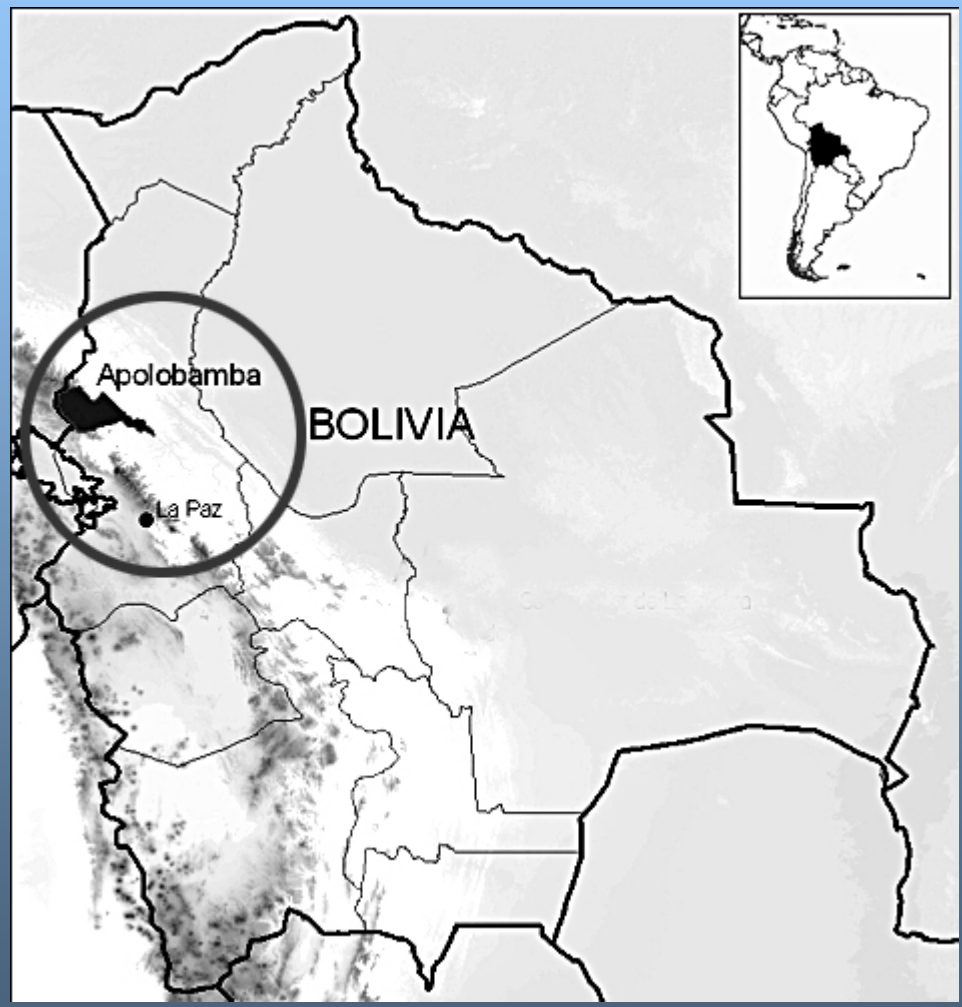
Part I

The Setting

The geographical setting:

Apolobamba mountain range

- Northernmost part of the Eastern branch of the Andean *Cordillera* in Bolivia; bordering with Peru
- **120 km long**
- About 250 km northwest of La Paz and north of Lake Titicaca
- One of the least explored mountain ranges in the Andes
- Various **peaks higher than 5,500 m**
- The whole region used to be **Caupolicán province** (today provinces of Franz Tamayo and Abel Iturralde)



Apolobamba Protected Area

Área Natural de Manejeo Integrado (ANMIN)

- Declared in 1972 as **National Reserve Ulla Ulla** for the protection of the vicuna (240,000 ha).
- Recognized as a UNESCO **Biosphere Reserve** in 1977.

- Expanded to Apolobamba Natural Area for Integrated Management in 2000 (**now 483,743 ha**).
- Altitudinal range from 800 to more than 6,000 metres.
- **GLORIA „target region“** for long term plant monitoring.

Photo: Hoffmann

Part II

Glacial retreat

Glacier retreat in Bolivia

- Due to global warming, the world's **tropical glaciers** are retreating at an unprecedented rate.
- According to the World Glacier Monitoring Service (WGMS), **Bolivia held 566 km²** of glaciated area (data from 80s).
- **Apolobamba mountain range** accounts for about **7.5% of the world's tropical glaciers**.
- **The accelerated melting of glaciers** - as in most parts of the world - **commenced around 1980.**

Glacier retreat in the Cordillera Real

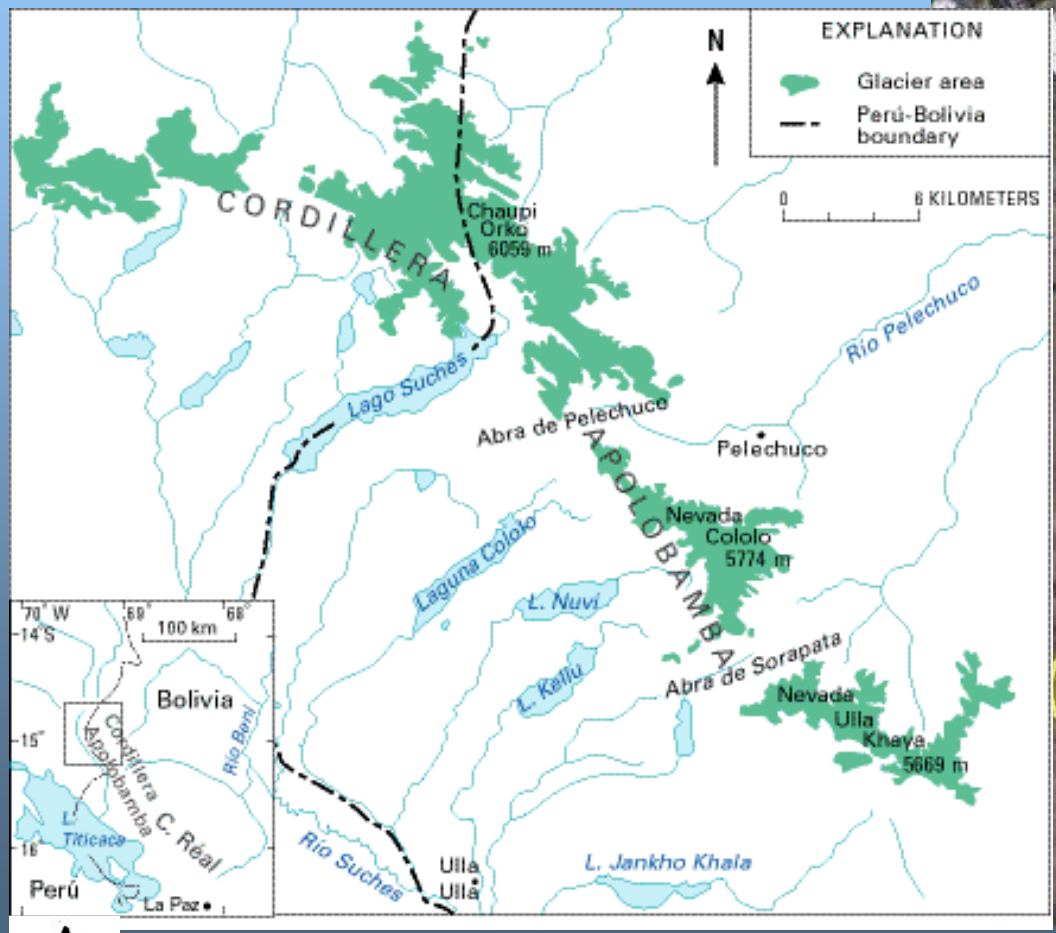
- The volume changes of 21 glaciers in the Cordillera Real have been determined between 1963 and 2006 using **photogrammetric measurements**.
- From this relationship, the ice volume loss of 376 glaciers has been assessed in this region.
- The results show that these glaciers lost **43% of their volume** and **48% of their surface** area between 1975 and 2006.

Cordillera Real: 50 % reduction in surface area and volume over the last 35 years.

Soruco, A., C. Vincent, B. Francou, and J. F. Gonzalez (2009), Glacier decline between 1963 and 2006 in the Cordillera Real, Bolivia, *Geophys. Res. Lett.*, 36, L03502, doi:10.1029/2008GL036238.

Apolobamba glacier area

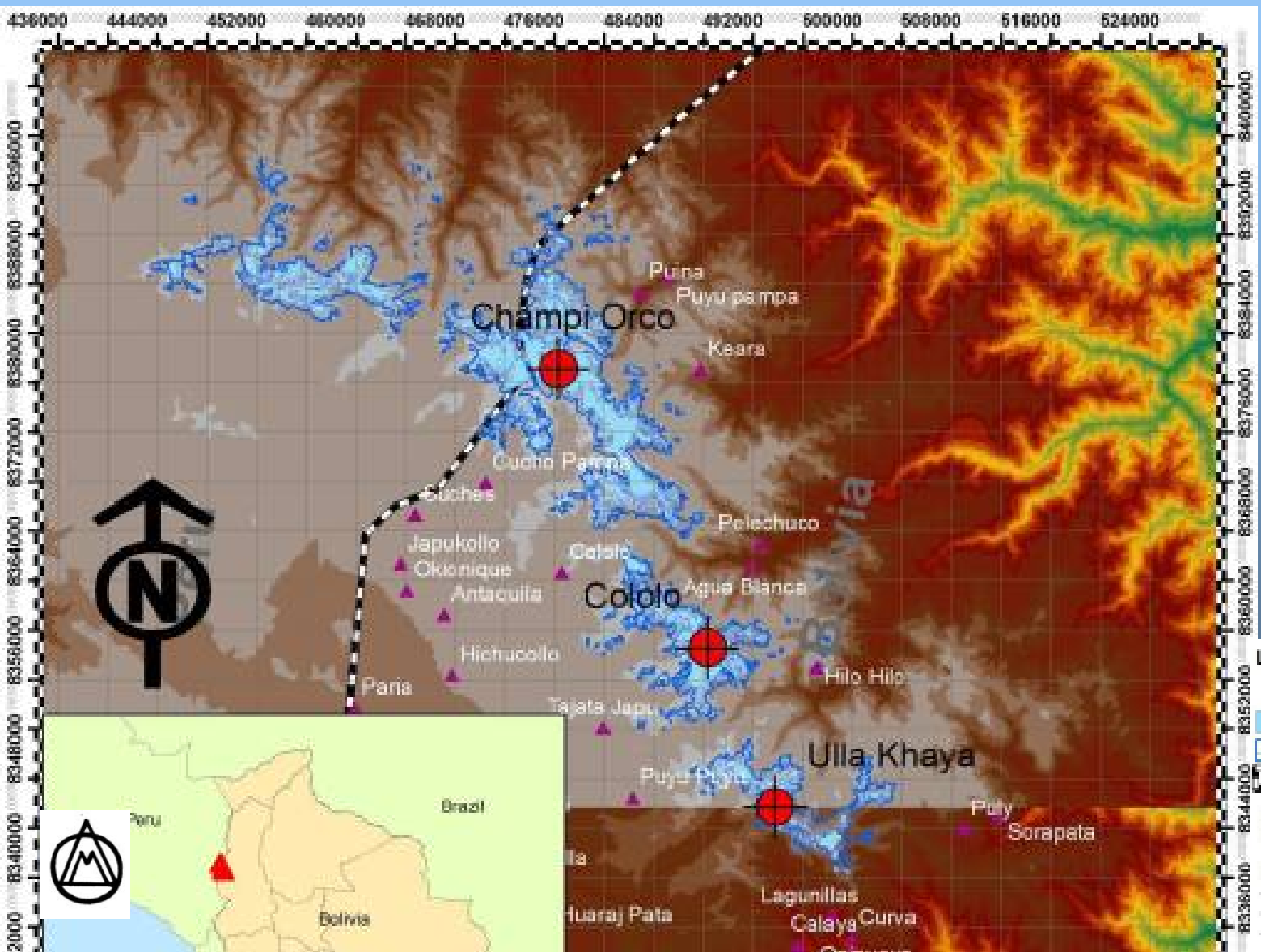
- Largest continuous glaciated area in Bolivia, with an extent of 220 km² (in the 1980s).



Source: World Glacier Monitoring Service (WGMS)

Source: Google Earth

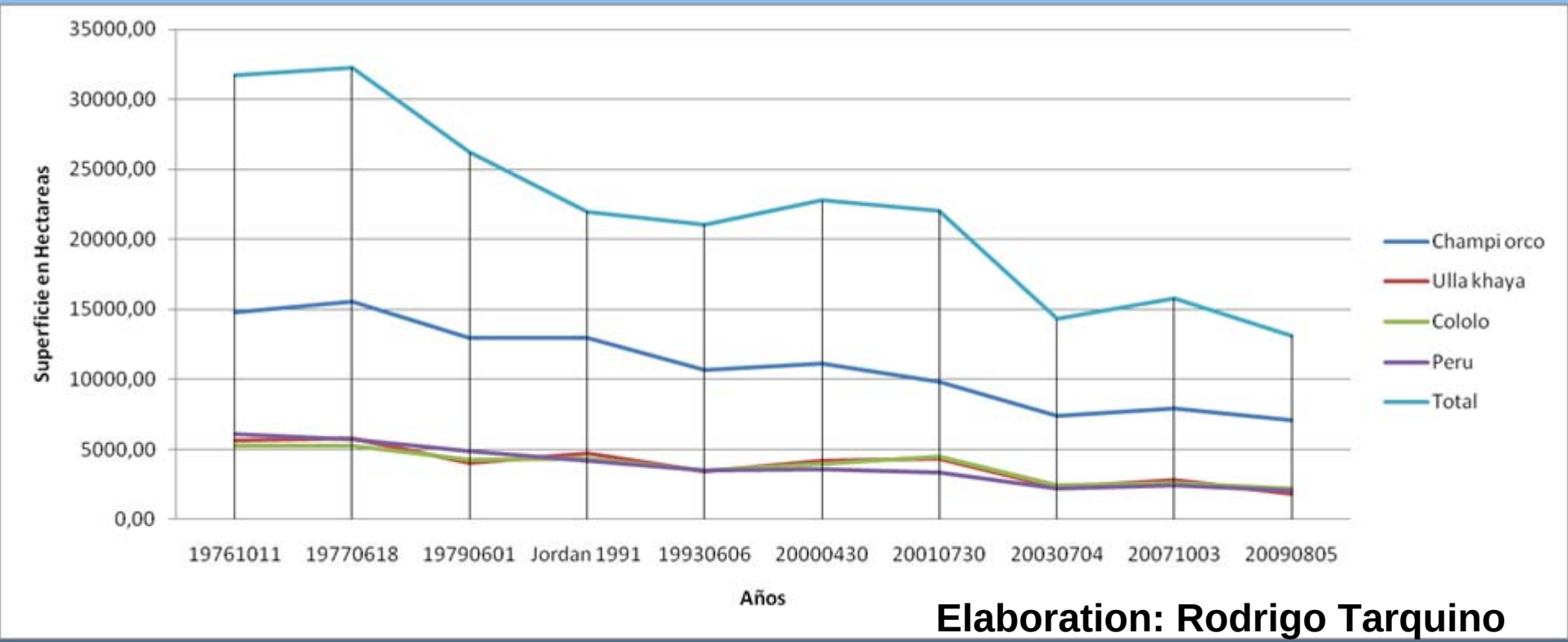
Glacier area loss in the Cordillera Apolobamba 1976 - 2009



Elaboration:
R. Tarquino

Glacier retreat in Cordillera Apolobamba

1976 - 2009



Elaboration: Rodrigo Tarquino

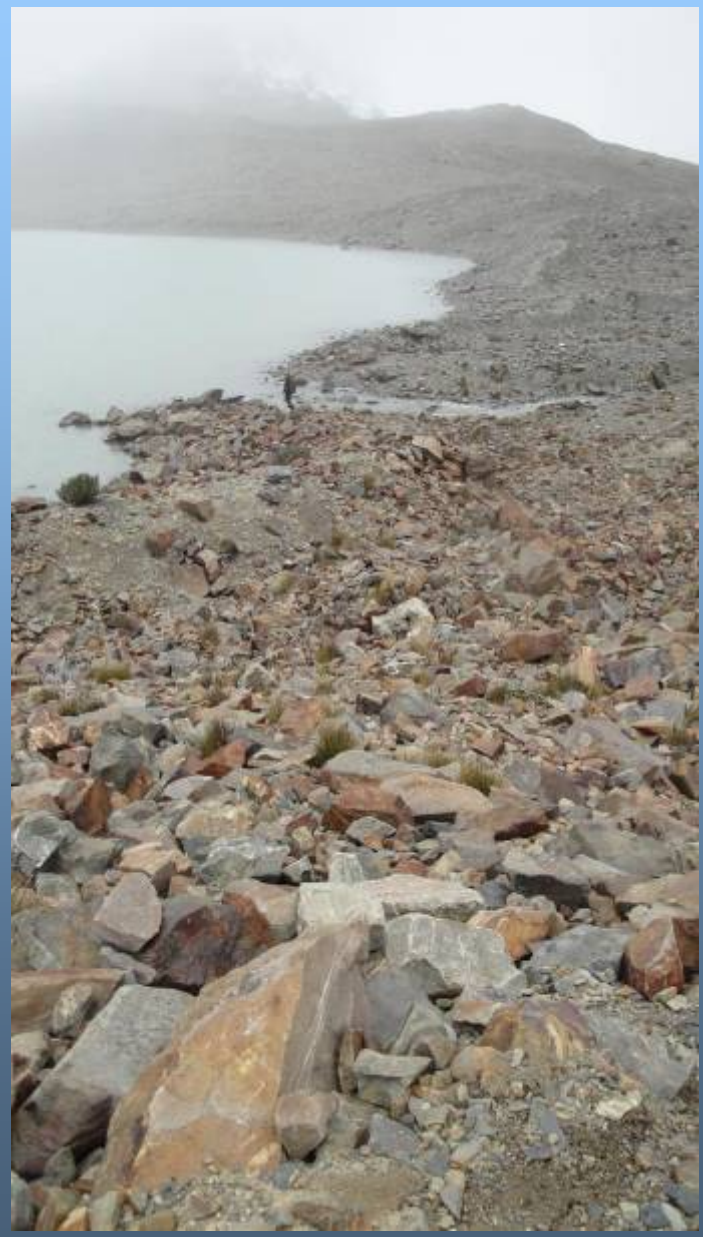
Area loss more than 50%

Part III

Glacial lakes and GLOF inicdent

Imagen satelital de glaciares de Apolobamba (región Cololo)

Glacier lake Ulla Khaya



Glacier lake Laguna Isquillani

El incidente „GLOF“ de Keara, noviembre de 2009

Todas las fotos: Martín Apaza Ticona


Today

Today


Today

Today


Today


Today

Part IV

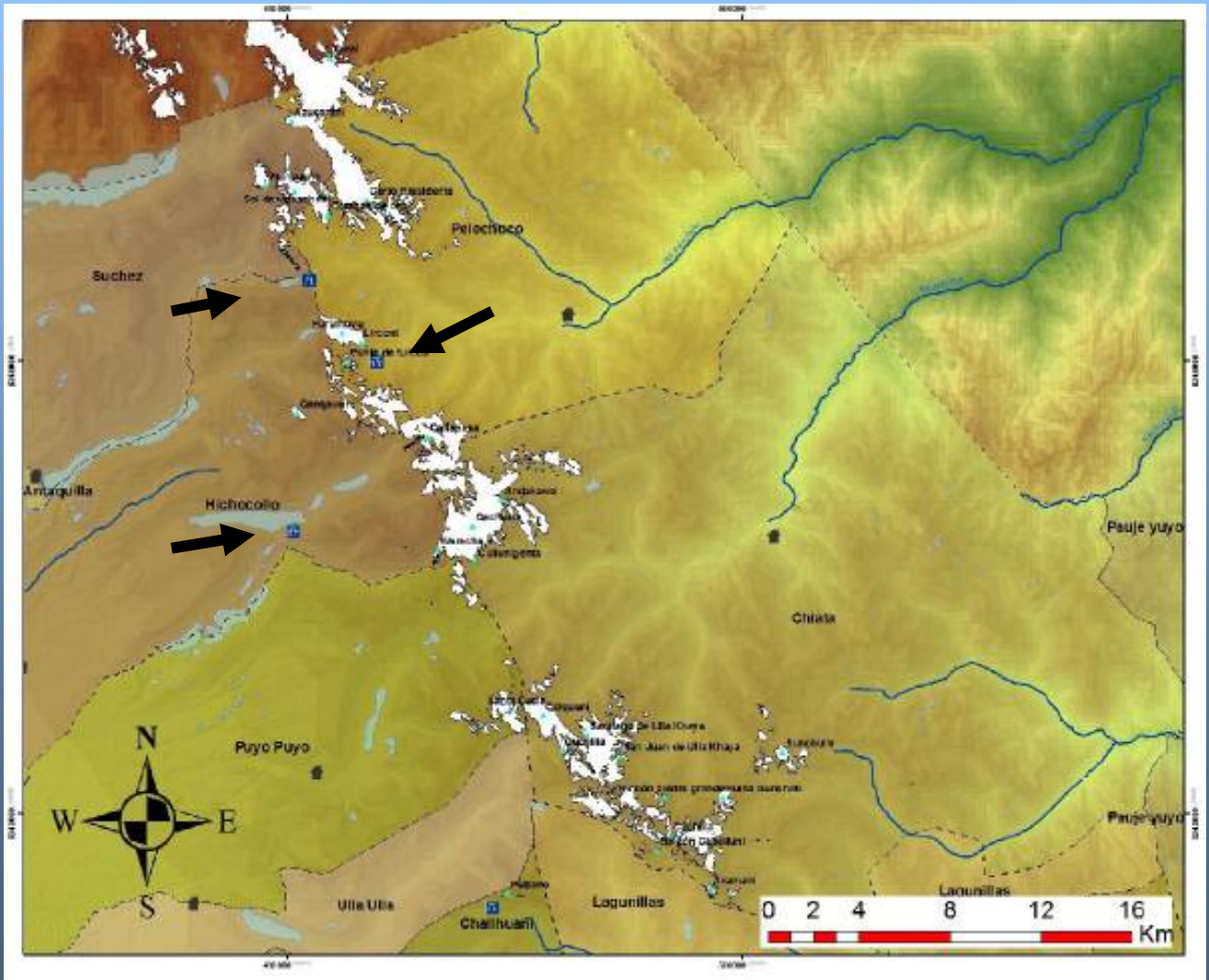
The monitoring program

Monitoring approach of ANMIN Apolobamba

- Monitoring as an essential **tool of park managment.**
- **Monitoring "by the people of the protected area"**, i.e. park wardens and local population.
- Assistance from **NGOs** and **university**.
- What is being monitored: Water bodies, **glaciers**, **glacier lakes**, traditional types of potatoes, fauna, peat bogs (*bofedales*), climate, conflicts with wild life, mining, knowledge about traditional plants, tourism, project management, education, financial management...

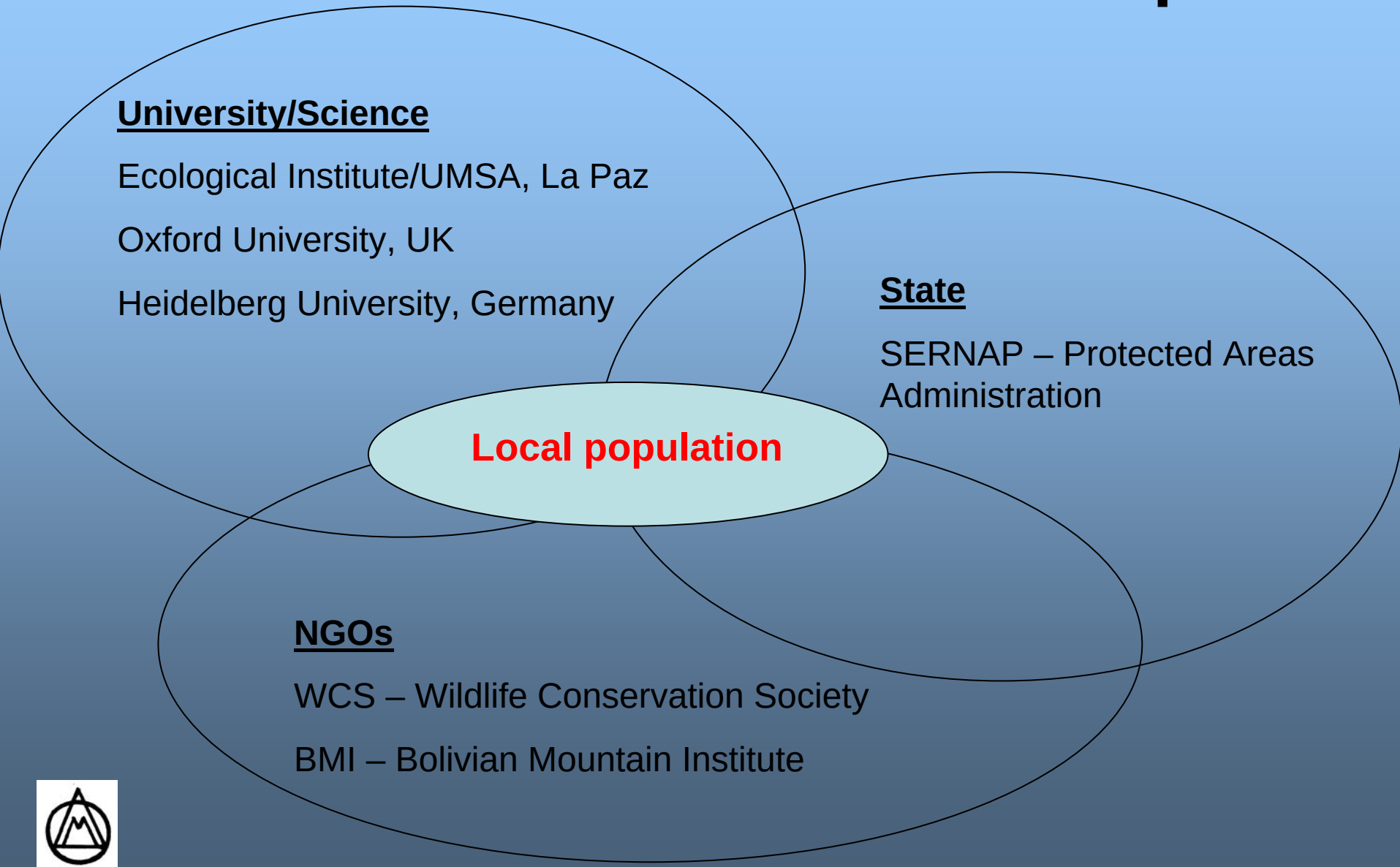
Glacier monitoring points

6 points selected in each of the three sub-regions:
Ulla Khaya, Chaupi Orco y Cololo



Source: Tarquino, 2010

Institucional set-up



„Success criteria“

- Sustained external financial assistance
- Technical assistance
- Mechanisms for inter-institutional coordination
- Continuity of key personnel
- Increased involvement of local authorities
- Continuous scientific input

Perspectives

- **Long term glacier and glacial lake monitoring** as integral part of park management (SERNAP & local people)
- Definition and implementation of **adaptation measures** (local people, municipalities, NGOs)
- Continuing documentation and establishment of a **Bolivian glacier archive** (BMI)
- Accompanying **scientific work**:

  - R. Tarquino, Instituto de Ecología: consequences of glacier retreat for park management

  - D. Weggenmann, Heidelberg University: GLOFs and risk management

Thank you for your attention!

Contact:

dirk.hoffmann@bolivian-mountains

Additional information

Bolivian Mountain Institute - BMI

Instituto Boliviano de la Montaña - BMI

The Bolivian Mountain Institute - BMI is a non-profit foundation based in La Paz, Bolivia. The BMI was founded by a small group of enthusiasts, inspired by the celebration of the International Mountain Year of the United Nations.

Contact:
Dirk Hoffmann, Director
Instituto Boliviano de la Montaña - BMI
Casilla 3 - 12417. La Paz, Bolivia
Phone/Fax: +591-2-271 24 32
Photographs: D. Hoffmann
bmi@bolivian-mountains.org

Klimablog „Cambio Climático Bolivia“

The Blog “Climate Change Bolivia”...

... is a blog dedicated to all relevant aspects around science and politics of climate change in Bolivia and can be followed under this direction:

www.cambioclimatico-bolivia.org

Due to funding restraints this Klimablog is presently only available in Spanish language.