Monitoring and Studies on Global Change in Mountain Biosphere Reserves

Dr. Thomas Schaaf
Director, Terra-Sana environmental consulting

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UNESCO-MAB Project "Global Change in Mountain Regions" (GLOCHAMORE) 2003-2005

Objectives:

- **To establish a world-wide network of mountain biosphere reserves to study global and climate change impacts**

- **To bring together global change researchers and biosphere reserve managers to develop a *Research Strategy***

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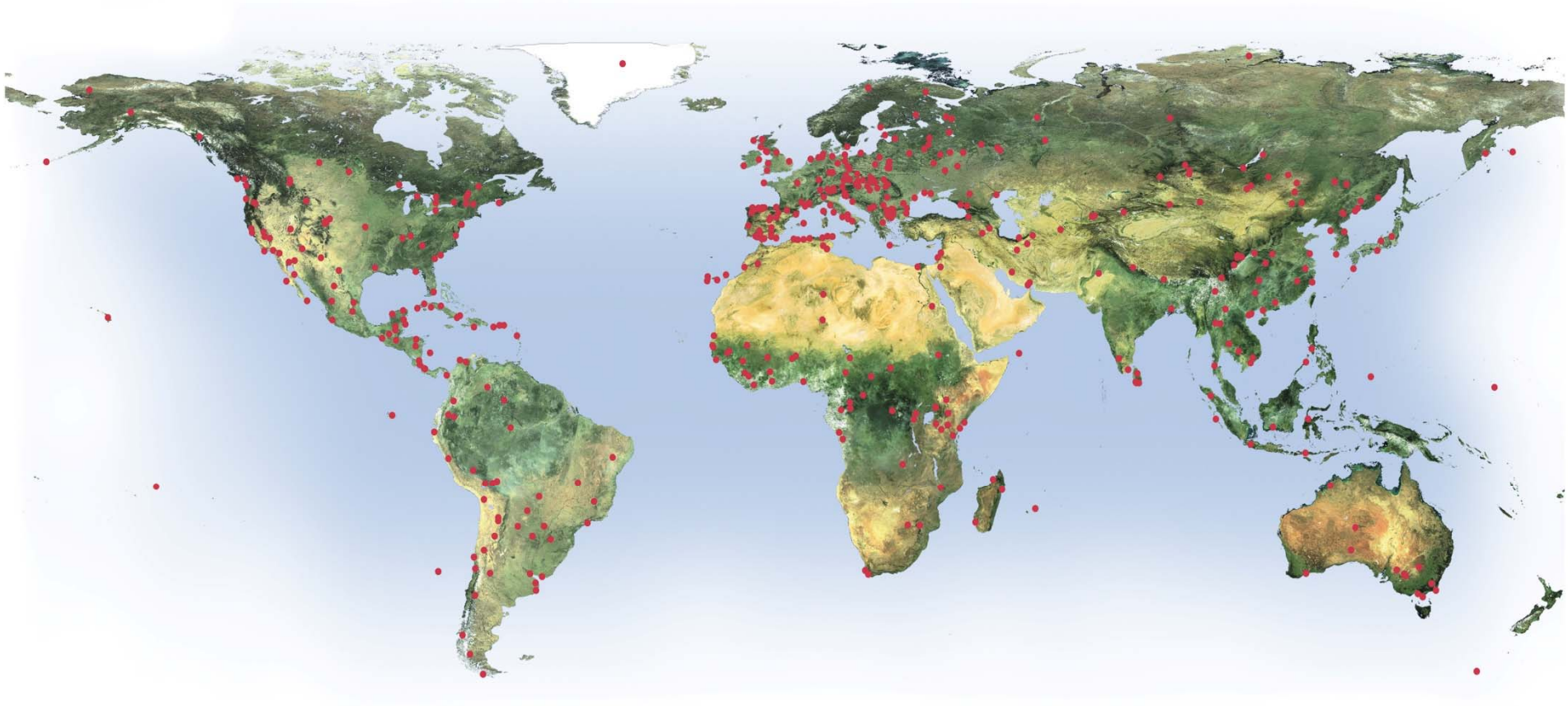
Why mountain biosphere reserves as study/monitoring sites for global change?

Biosphere reserves include:

- **protected areas (natural or near-natural environments)**
- **areas inhabited by human beings and used for economic activities with different land-uses (transition areas)**
- **research infrastructure: e.g. long-term climatic data, species lists, scientists …**

UNESCO's
World Network of Biosphere Reserves



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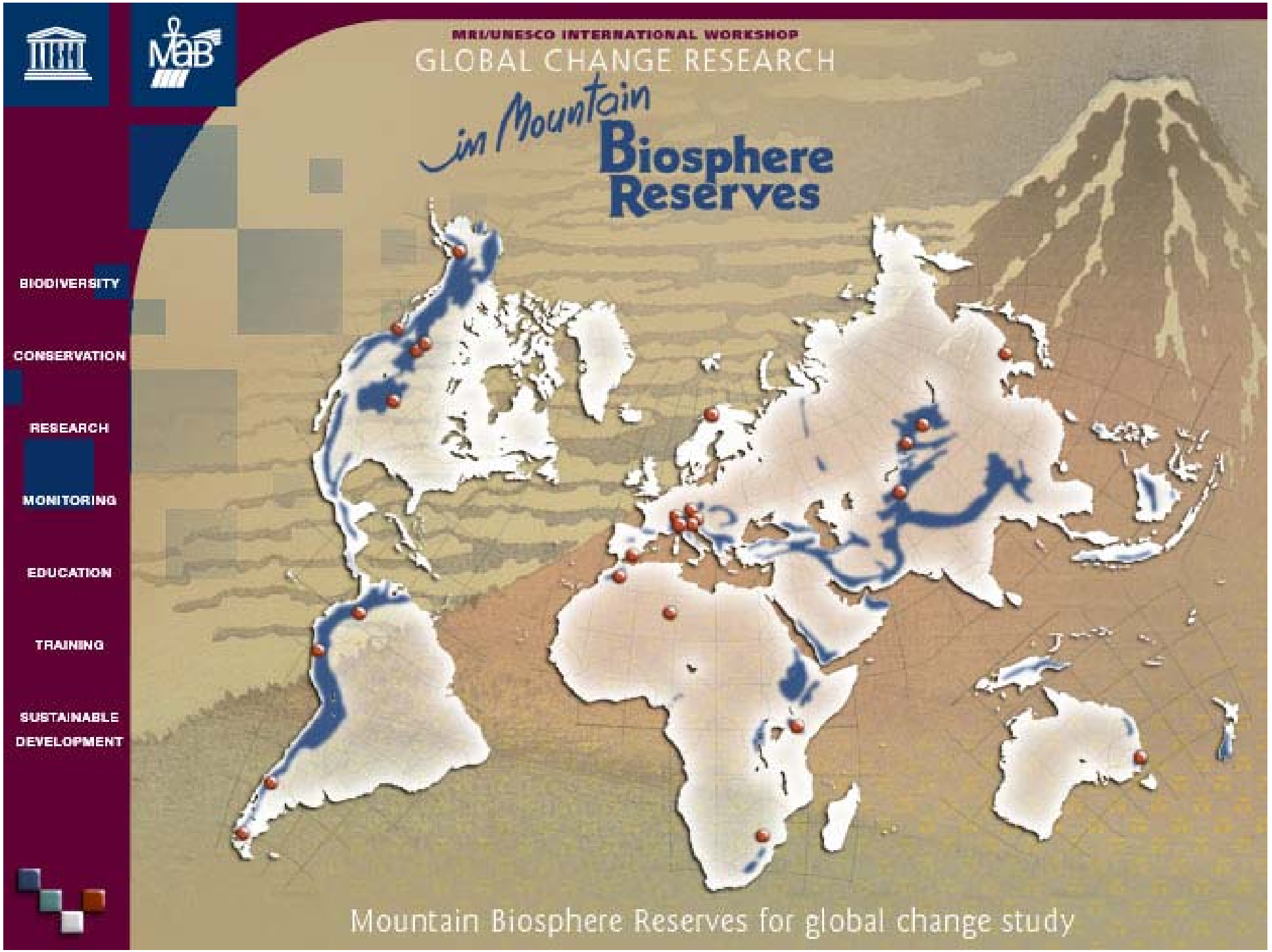
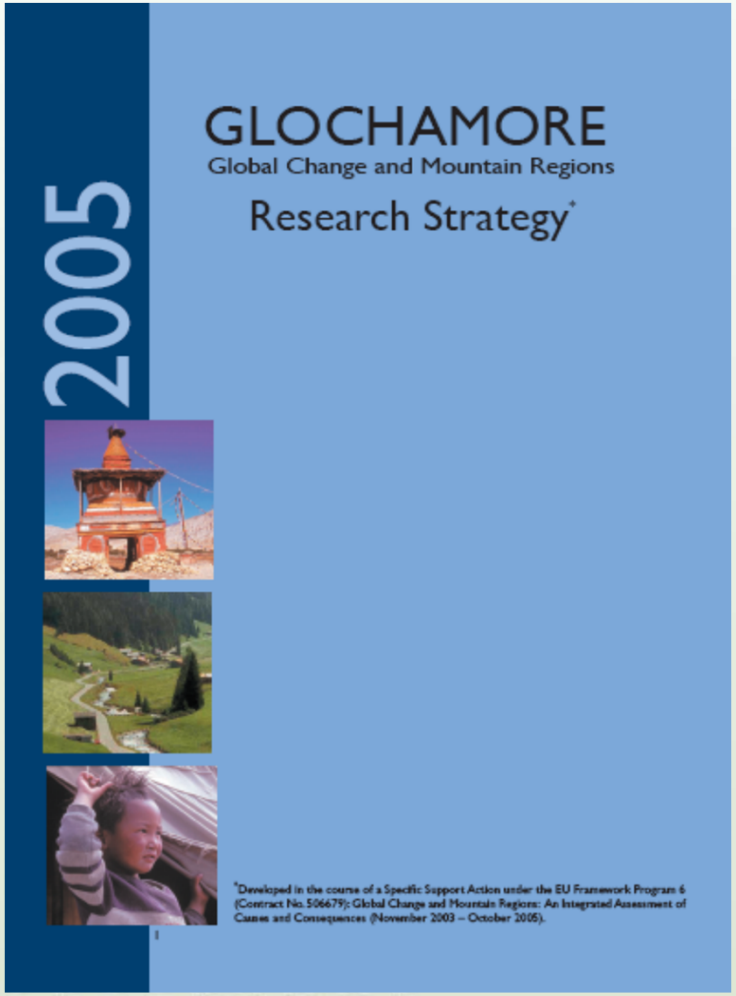

MRI/UNESCO INTERNATIONAL WORKSHOP
GLOBAL CHANGE RESEARCH
in Mountain
Biosphere
Reserves
BIODIVERSITY
CONSERVATION
RESEARCH
MONITORING
EDUCATION
TRAINING
SUSTAINABLE
DEVELOPMENT
Mountain Biosphere Reserves for global change study

GLOCHAMORE Results/Outputs:

- **5 international workshops and scientific conferences**
- ***GLOCHAMORE Research Strategy*** **(developed by > 300 scientists and biosphere reserve managers)**



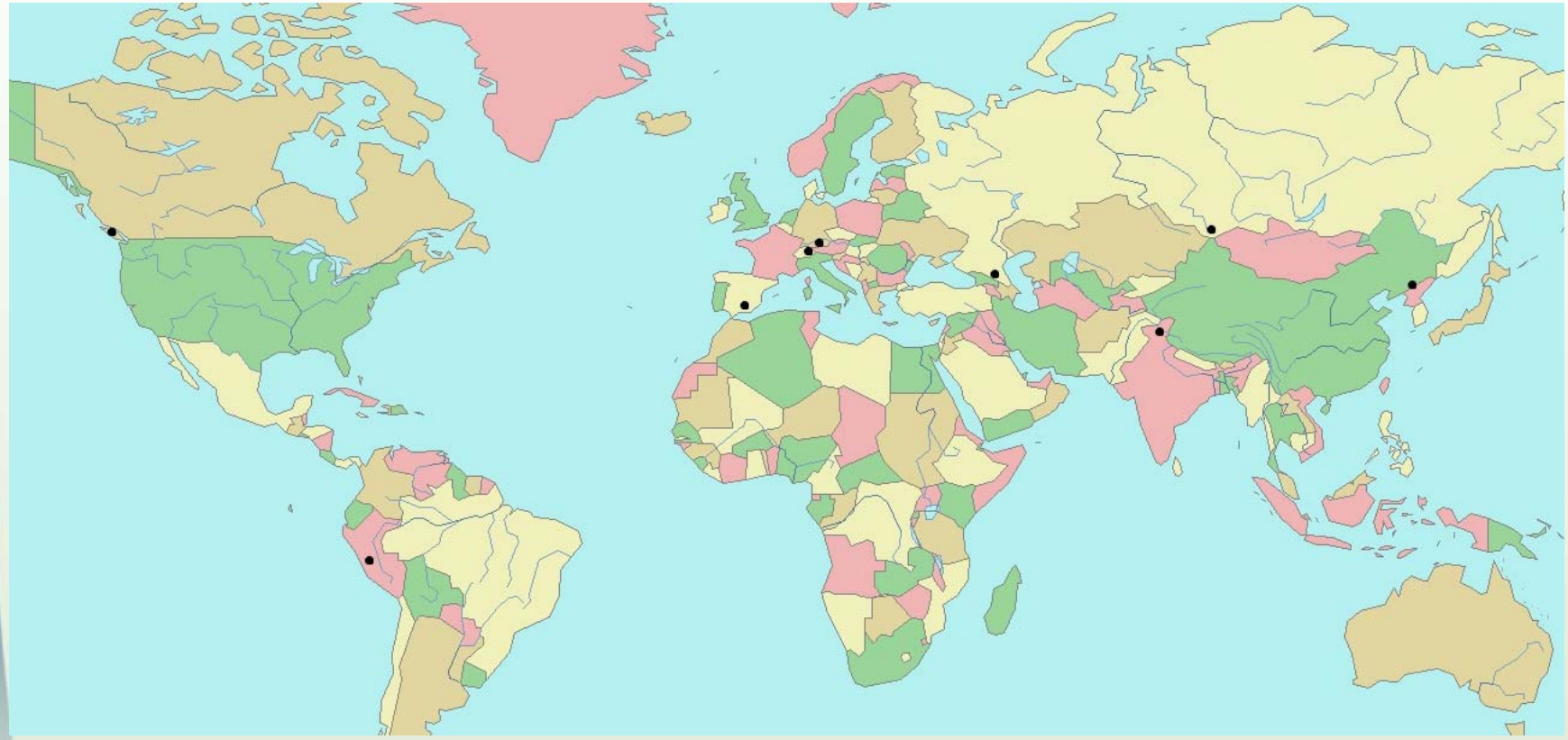
GLOCHAMORE
Research Strategy themes (as of 2007):

- Climate
- Land use change
- Cryosphere
- Water systems
- Ecosystem function & services
- Biodiversity
- Hazards
- Human and animal health
- Mountain economies
- Society and global change

GLOCHAMOST (2nd phase)
Implementation of *Research Strategy* themes (since 2007):

- **Climate**
- **Land use change**
- **Cryosphere**
- **Water systems**
- **Ecosystem function & services**
- **Biodiversity**
- **Hazards**
- **Human and animal health**
- **Mountain economies**
- **Society and global change**

GLOCHAMOST Network of Mountain Biosphere Reserves (2007-2012)



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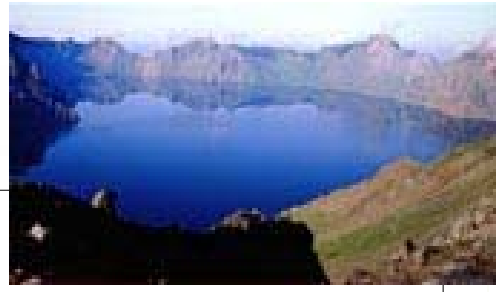
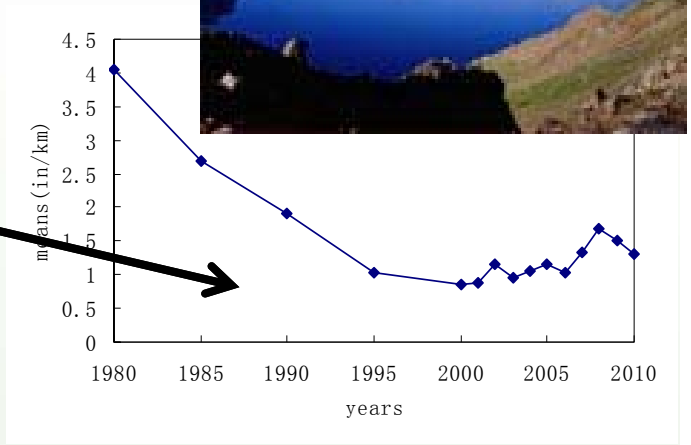
Changbaishan BR (China)



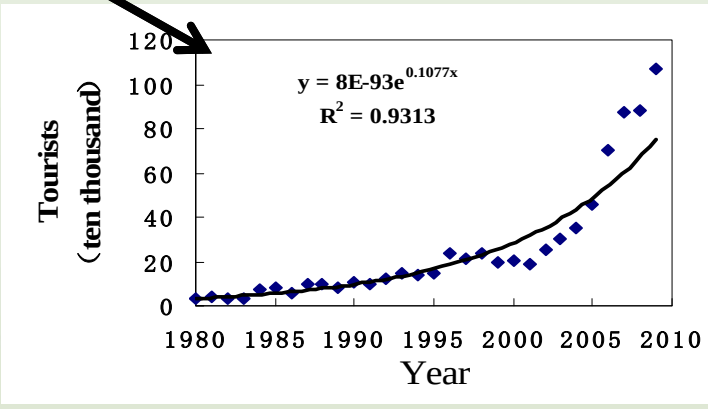
Biodiversity: decline of ungulates (e.g. red deers, musk deers)



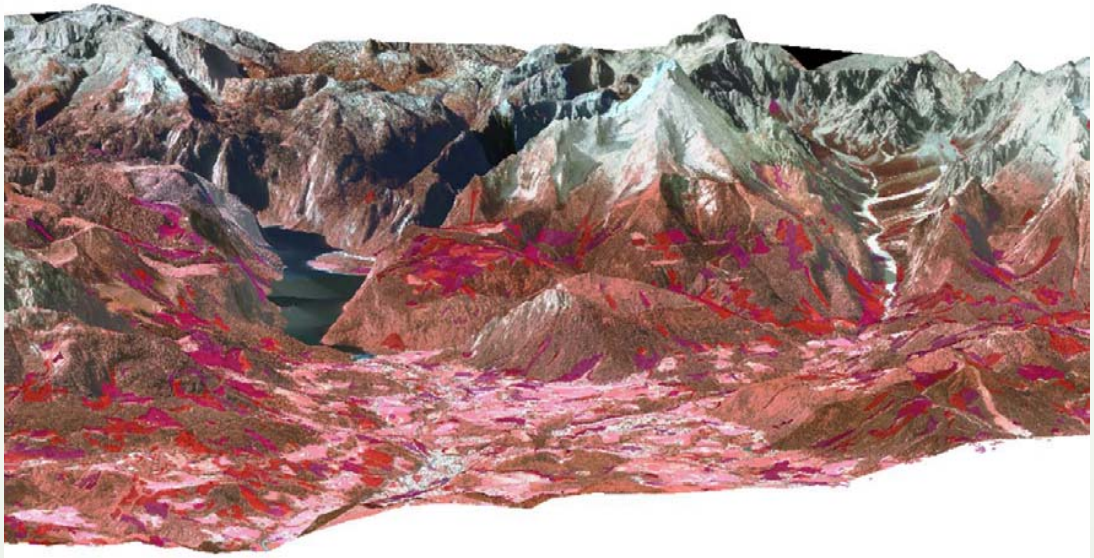
Water: water run-off decreasing

Land use change: Mainly forests (Korean pine), but increasing demand on space for tourist resorts and road construction

Economy: Accelerating increase of tourists (putting pressure on natural resources and wildlife)



Berchtesgaden Alps BR (Germany)



Biodiversity:
Noted upward shift of alpine grassland vegetation

Water: Water balance model with different gauges operational to study water run-off introduced

Land use change: Forest cover: (a) purple: 1980-90; (b) red: 1990-97 (subject to cutting/planting of trees, and disasters like storms, avalanches, insects)

Economy: Mainly tourism (2 million overnight stays/year, of which 75% in summer)

Huascaran BR (Peru)

Biodiversity: loss of rare species (e.g. increased frog mortality at altitudes > 3,500m due to combined effect of climate change and increased UV radiation)

Water: 27% of glaciated surface area loss in the Cordillera Blanca since 1970. Decrease of water run-off

Land use change: provoked by fires, mining, pastoral overexploitation and habitat fragmentation →

Economy: Agriculture suffering from higher temperatures (evapotranspiration), pastoralism due to larger water needs.

Katunskiy BR (Russian Fed.)

1985 2011

Biodiversity: 8 endangered plant species with habitats limited to high-altitude zones will face extinction due to global warming

Water: glacial melt observed over last 100 years.

Land use change: so far, no significant land use change noted.

Economy: agriculture, pastoralism (marals), with growing tourism sector

Gebler glacier: July 1897 & 2011

Sierra Nevada BR (Spain)

Biodiversity:
mountain shrublands and pine plantations. Natural forests (oaks, maples, etc.) are regenerating after decades of overexploitation.

Water: Spring/summer snowmelt contributes greatly to water flow, but decline of snow cover over last 10 years…

Land use change: increase of tree cover expected due to abandonment of rural areas/agriculture

Economy: increasing tourism until ca. 2006/07, but then a drop (number in overnight stays)

Nanda Devi BR (India)

Biodiversity: Known for its "Valley of Flowers" with >600 vascular plants and many endangered species (snow leopard)

Water: Water stress based on farmers' observations:

a) **increase in frequency of abnormally high precipitation events in elevations > 1500m**
b) **abnormally low precipitation events in 500-1500m zone**

Land use change: increase of forestry cover thanks to "chipko movement" (*tree huggers*) in 1970s

Economy: agriculture, forestry, sharp increase of tourism since 1980s.

BR Val Mustair Parc Naziunal (Switzerland)

Biodiversity: upward migration of plants and butterflies

Water: no significant trends on floods. Conflict resolution: Use of rivers for (a) energy production, or (b) for natural flow

Land use change: study on-going using remote sensing techniques

Economy: mostly tourism and farming. Increase of organic farms until 2004, then slight drop

Global and Climate Change in Mountain Sites (GLOCHAMOST)

© Berchtesgaden Alps Biosphere Reserve
Berchtesgaden Alps Biosphere Reserve

GLOCHAMOST (Global and Climate Change in Mountain Sites - Coping Strategies for Mountain Biosphere Reserves)

GLOCHAMOST is the follow-up initiative of UNESCO-MAB to the GLOCHAMORE Project. Its aim is to implement selected key research areas of the GLOCHAMORE Research Strategy to develop adaptation strategies for mountain biosphere reserves in the context of global and climate change.

The following 5 key research areas provide a framework for research and knowledge sharing on the impacts of global/climate change on mountain biosphere reserves:

- **Climate**: Climate change including the frequency of extreme events (item 3.1 of the GLOCHAMORE Research Strategy)
- **Biodiversity**: Key fauna and flora (item 6e of the Research Strategy)
- **Water**: Water quantity (item 4a of the Research Strategy)
- **Land Use Change**: Understanding the origins and impacts of land use (item 2b of Research Strategy)
- **Mountain Economies**: Employment and income (item 9a of the Research Strategy)

See the 2011 reports:

- Canada: Mount Arrowsmith Biosphere Reserve
- China: Changbaishan Biosphere Reserve
- Germany: Berchtesgadener Land Biosphere Reserve
- India: Nanda Devi Biosphere Reserve
- Peru: Huascaran Biosphere Reserve
- Russian Federation: Katunskiy Biosphere Reserve
- Russian Federation: Teberdinskiy Biosphere Reserve
- Spain: Sierra Nevada Biosphere Reserve
- Switzerland: Reservat da Biosfera Val Mustair-Parc Naziunal

See also earlier reports finalized in 2009:

What is needed?

→ **SDG 13 on climate action: use BRs as long-term observatories on climate change**

a) Establish a baseline of biophysical and socio-economic parameters
b) Monitor trends evoked by global and climate change
c) Define adaptive management measures
d) Implement adaption schemes, in consultation with local people and local/national authorities
e) Share information among mountain biosphere reserves world-wide

Thank you

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