Information on climate change impacts, vulnerability and adaptation in mountains in Europe

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(in collaboration with the Alpine and Carpathian Conventions)

See: www.eea.europa.eu
Relevant EEA assessment reports

- The European Environment Agency is the EU body dedicated to providing sound, independent information on the environment
- EEA has 32 member and 6 collaborating countries
Various pressures on mountains, example: intensifying utilisation (agriculture, forestry, urbanisation, transport - habitat loss, fragmentation)

- Up to 10% of mountain areas is affected by TEN-T corridors
- Approx. half of mountain populations live within 5 km from those corridors
Climate change in the Alps: temperature increase of 2°C compared to pre-industrial times (> twice rate of average global warming), further increase projected up to 3 °C in summer by 2050.

Seasonal absolute temperature changes [°C] 2031-2050 vs 1961-1990

- Aladin (Ensemble) A1B - Winter
- Aladin (Ensemble) A1B - Summer
- RegCM (Ensemble) A1B - Winter
- RegCM (Ensemble) A1B - Summer
Decrease in water availability is projected in summer, an increase in winter in the Alps

Change in water availability until 2071-2100

- **Spring**: ST: -5.5
- **Summer**: ST: -41.7
- **Autumn**: ST: -0.6
- **Winter**: ST: +135.1
Changes in temperature and precipitation will have a range of impacts

- Glacier melt
- Permafrost thawing
- Soil erosion
- Decreasing snow cover
- Changing river runoff patterns
- Water scarcity
- Groundwater renewal
- Water quality
- Biodiversity loss
- Heat
- Drought
- Natural hazards
- Flood risk

Source: CLISP- Climate Change Adaptation by Spatial Planning in the Alpine Space, Alpine Space project, http://www.clisp.eu/
Glacier mass balance of European regions, 1967–2008

In the European Alps more than half of the ice-covered area and probably two third of the ice volume disappeared since 1850

‘Dirty’ glaciers without snowcover are melting faster (Albedo effect)
Example: Missing Snow for Winter Tourism; the Alps end Nov 2011

Italy: Renon, 2260m a.s.l.

Austria: Hintertux, 2160m a.s.l.

France: La Croix, 2250m a.s.l.

Switzerland: Andermatt, 2250m a.s.l.
Example: projected changes in monthly seasonal river discharge
Mountains are rich in biodiversity

- 16% of Habitats Directive species live exclusively and 11% mainly in mountains
- 18% of habitat types are linked to mountains, other 39% occur in mountain areas

Mountains are also a significant resource of water and renewable energy
Climate change effects on biodiversity

Climate change has already caused treelines to shift upwards. For plants and other species with restricted mobility, upslope migration is a limited option. Growing seasons increase, phenology occurs earlier and of species distributions shift upwards. Such changes will be influenced by land use change. Many species may become extinct.
Some key EU actions

- **White Paper on Adaptation (2009):** strengthen knowledge base; mainstream in all key EU policies; develop policy instruments/financing; enhance international cooperation
- **EU research programmes** on climate change and natural hazards
- **EU Clearinghouse** on climate change impacts, vulnerability and adaptation (to share information incl e.g. case studies and national adaptation strategies, plans and measures)
- 12 EEA member countries incl several with mountains have adopted *national adaptation strategies*
Mountain conventions/transnational organisations in Europe

- Alpine Convention:  www.alpconv.org
- Carpathian Convention:  www.carpathianconvention.org
- Pyrenees Climate Change Observatory (OPCC/CTP):  www.ctp.org
Challenges

- Knowledge:
  - Climate change **monitoring and reanalysis**; high resolution **climate** scenarios at right scales. **Uncertainties** should be assessed and communicated.
  - Enhanced monitoring of **climate change impacts**
  - Climate change **vulnerability**, risks, opportunities to analyse
  - Assessments at **local/regional and sectoral level** (case studies, cost-effective adaptation measures)
  - **Sharing** through national platforms, EU Clearinghouse

- Implementing adaptation is a process, climate change to take into account in:
  - **Spatial planning**
  - **Water resource** management
  - **Risk** management (floods, droughts)
- Consider a **range of measures**: technological solutions, ecosystem-based options (green infrastructure) and behaviour change
- **Mainstreaming**: planned EU strategy 2013 and monitor progress in national adaptation strategies