

Problem: climate change



Problem: man-made change



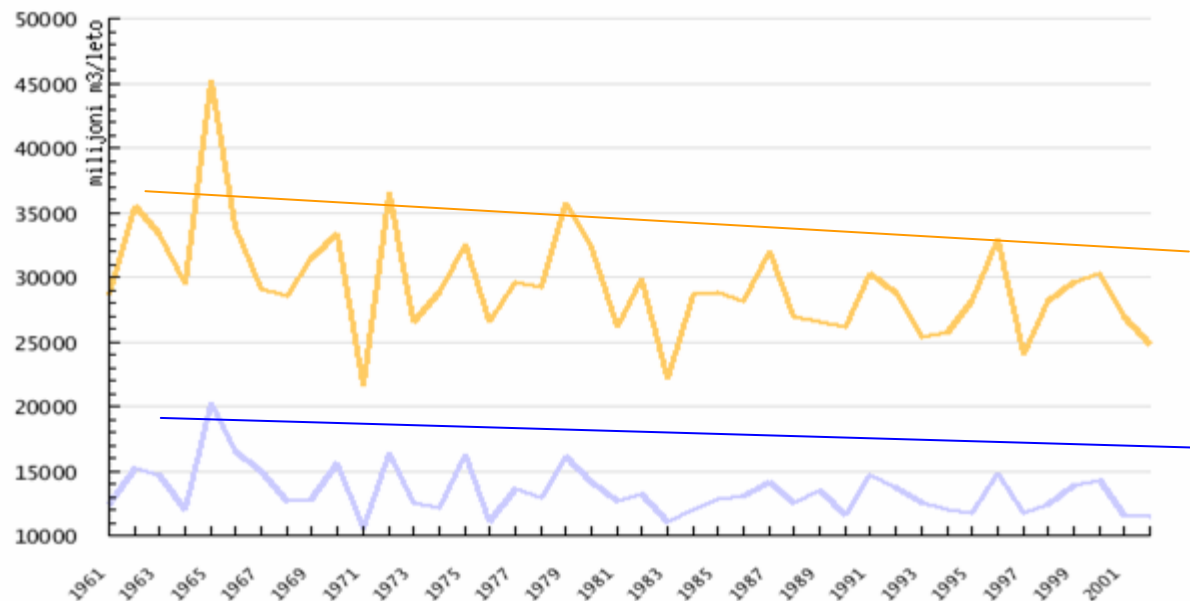
Alp-Water-Scarce

Content & objectives

- Initially, a [stakeholder interaction forum](#) will be created to define water problems. This forum will accompany the [entire project](#) and establish or extend an effective [communication network](#), closely linked to the press and media.
- The main [anthropogenically](#) and [naturally](#) defined [surface water](#) and [groundwater](#) systems will be characterized and their [vulnerability](#) towards water scarcity assessed. [Different water usages](#) such as drinking water, hydropower, agriculture (irrigation), tourism and artificial snow will be defined in zones with [potential future lack](#) of water.
- A [monitoring network](#) will be elaborated or intensified based on hydrometeorology, water quality and water abstraction. Integrated hydrological regional and subbasin [models](#) will be assembled and compared. Climate & anthropogenic [scenarios](#) are to be adapted and developed to enable prediction of future vulnerability to water scarcity.
- Special emphasis will be placed on the definition of [optimal ecological flow](#) of [surface](#) discharge and [groundwater](#) biotopes, supported by the selection and application of [aquatic indicators](#) & [biodiversity change](#).

Anthropogenic changes

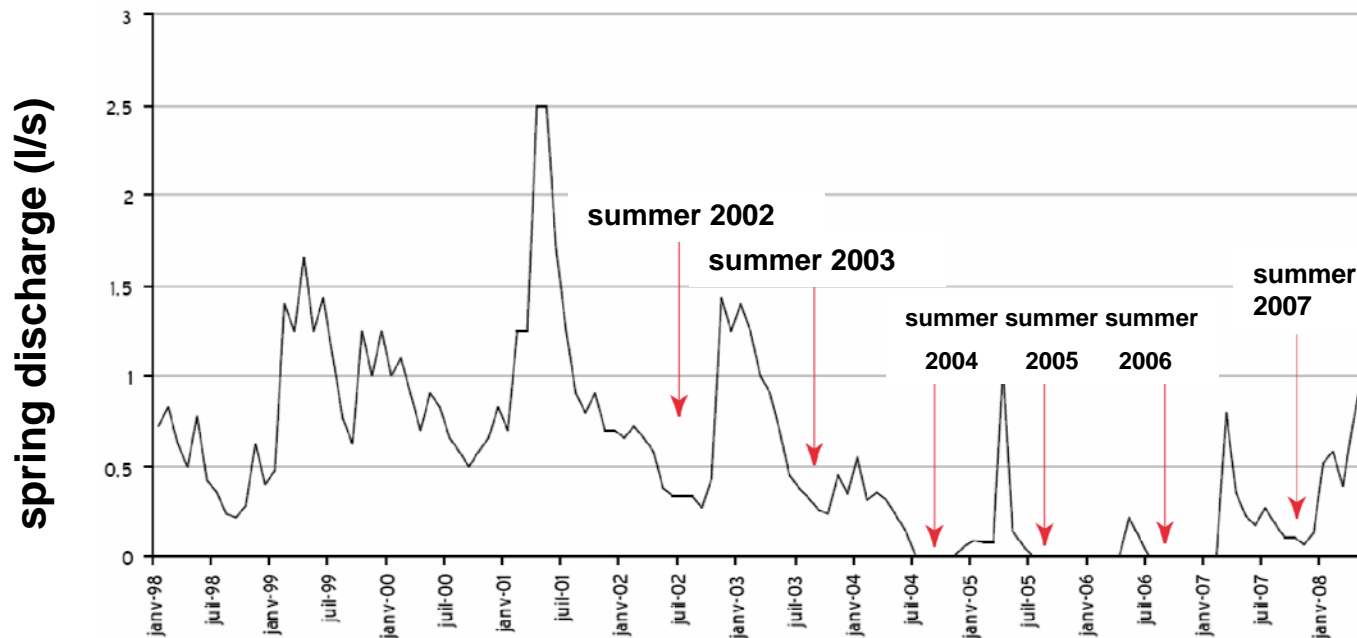
Water budget in Slovenia (1961 – 2001)



-  outflow from Slovenia
-  inflow to Slovenia (international rivers)

Anthropogenic changes

Temporary drying up of a spring in Savoy



Alp-Water-Scarce

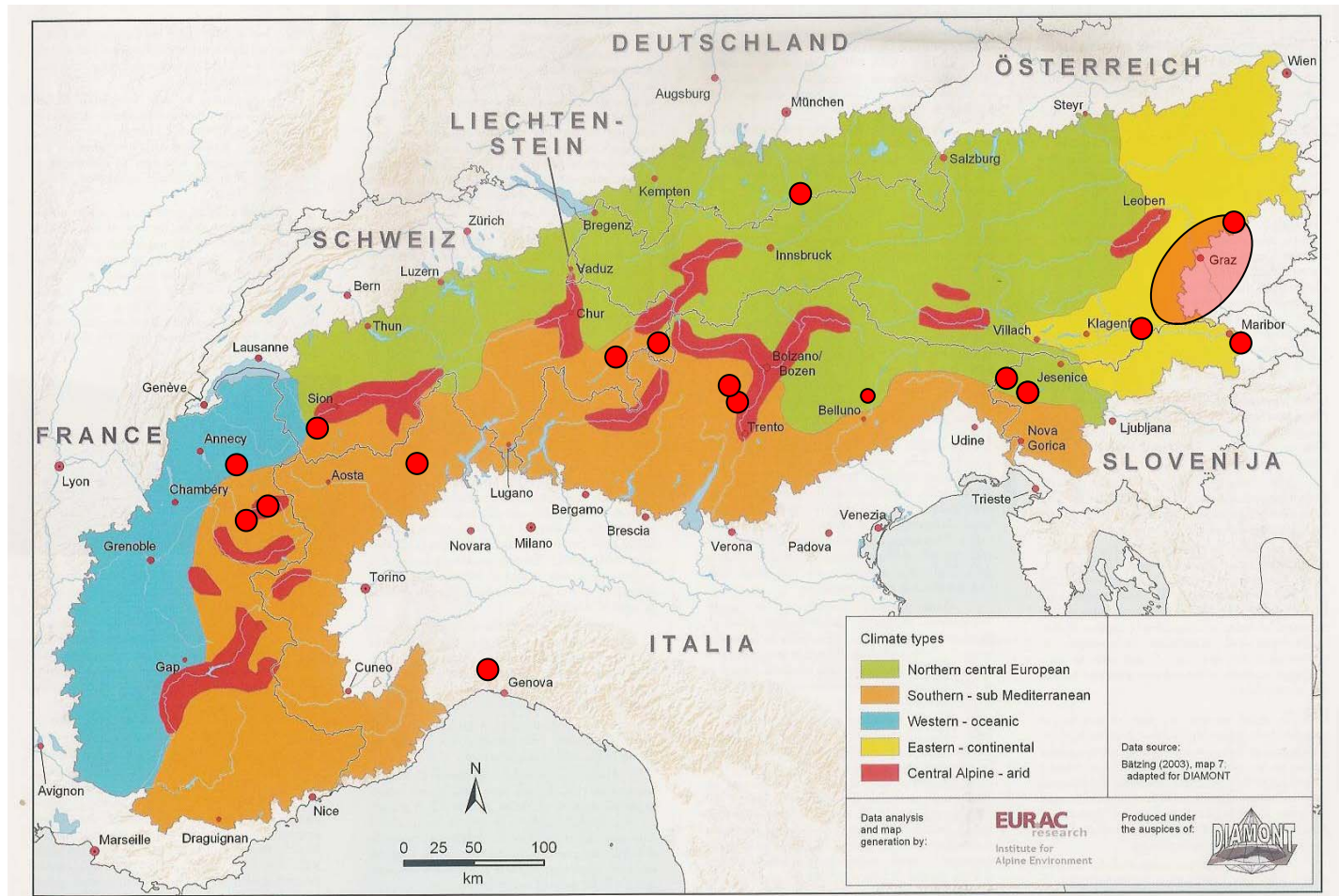
Content & objectives

- Finally, an **early warning system against water shortage** will be **developed** and **tested** in pilot regions, strongly supported by the **stakeholder interaction forum**. This will form the operational basis for **suggestions for water management strategies**.

➡ The **long term** aim is to **reinforce** authorities & stakeholders to develop **integrated & sustainable water management** and to suggest socio-economic **adaptation & mitigation strategies** against water scarcity.

➡ On the **short term**, an **early warning system** against water shortage in the Alps will be based on an **operational** methodology with strong **stakeholder participation** taking into account **present** and **future zones** as well as time **periods** of water scarcity.

Pilot sites with relation to climate



● study site

Alp-Water-Scarce

Pilot Sites

- Maurienne, Tarantaise, Bourget - **France**
- Arve river basin, Upper Savoy - **France**
- entire Land Kärnten, Sattnitz area, Jauntal and Lower Gurktal & Gailtaler Alps - **Austria**
- Styrian Border Mountains & Styrian Basin - **Austria**
- Koralpe - **Austria**
- Karavanke transboundary mountain belt – **Austria / Slovenia**
- Julian Alps - **Slovenia**
- Pohorje with Dravsko and Ptujsko polje, northeast Slovenia - **Slovenia**
- Scrivia River Basin - **Italy**
- Piave River, Veneto - **Italy**
- Fersina, Noce and Adige river basins - **Italy**
- Entella river basin and Scrivia river basin (part of Po) - **Italy**
- Sesia river basin (including Monte Rosa glacier), in Valsesia, Piemonte - **Italy**
- Cantons of Grison, Valais at the South-East of Switzerland, southern part of the Alps – **Switzerland**
- Spöl River, Swiss Italian border, Central parts of Alps - **Switzerland**

Results & products foreseen



Alp-Water-Scarce

Results & products foreseen

- Develop a [user forum](#) (transalpine, national and regional) and a website
- Develop [Early Warning System](#) against Water Scarcity in selected pilot regions
- Predict [water quality change](#) as an effect of decreasing groundwater recharge
- Apply tools to [support decision making](#)
- Develop [transnational concepts of water management](#) that ensures water supply for human uses and preservation of aquatic biodiversity
- [Best practice demonstration](#) in target areas, exchange of knowledge and experience
- [Handbook](#) for water resources management focused on water scarcity problems for policy makers.
- [Communication](#) and [dissemination](#) of results
- [Recommendations](#) and suggestions for resource conflict management and for mitigation measures for stakeholders & end users
- [Increase public participation](#) in sustainable water management process
- [Recommendations](#) for mountain water regulations

Communication and Dissemination

profile

Missing mountains

In Europe alone, mountains cover as much as 37% of the surface and significantly influence our societies, economy and wellbeing through the benefits of natural, cultural and socio-economic resources. The Alps, in particular, are best known for their role in hydropower generation. Nonetheless, mountains remained the sleeping beauty of European policies and research for a long time.

Now, the European Union fully recognises the role of Europe's mountains and provides a powerful motor for structured, sustainable, territorial development, management and promotion of research. Because mountains were perceived as ubiquitous and eternal suppliers of natural resources, very few coherently organised management schemes existed, even where signs of conflict were arising. As a result, sustainable development has now become a top priority in European mountains, supported by the UN resolution (2007) with its global mountain perspectives.

The impact of territorial cohesion policies and their consequences are important for the development of the various European mountain regions, long perceived as barriers or peripheral zones. One example of a powerful unit is the Alps-Mediterranean Euroregion, which unites three Italian and two French regions. In Italy, the Piedmont region is exemplary with particularly efficiently-coordinated efforts between scientists as well as politicians and decision-makers to tackle problems of the future development of mountain regions faced with the challenge of climate change and depopulation. Amongst others, European organisations involved with public policy oriented



Hiking for mountain recognition, Prof. de Jong (Germany), Prof. Williams (Sweden) and Prof. Mohr (France)

mountain issues include: AEM (Association of Elected Representatives of Mountain Regions); Mountain Partnership (FAO); UNESCO; EMF (European Mountain Forum); COPRA (International Commission for the Protection of the Alps); Alpine Convention/Carpathian Convention; Forum Alpinum; ALPARC (Alpine Network of Protected Areas); EUROMONTANA (European multi-sectoral association for co-operation and development of mountain territories); EEA (European Environmental Agency); and GMBA (Global Mountain Biodiversity Assessment network).

Whilst schemes on mountain policy-making are catching up rapidly, mountain science and mountain research still remains dispersed. Several dozen research working groups and institutes exist that are partially focused on mountains. In contrast, there are few entirely mountain or alpine-focused research institutes and networks. These are

Protecting the natural resource...

actively involved in promoting mountain research, networking and organising mountain sessions, workshops or conferences. Nevertheless, few are specifically designed to help breach the communication gap between scientists and stakeholders. Mountain specific research institutes and networks include:

- Institute of Mountain Research, Innsbruck
- Institute of Alpine Geography, Grenoble
- Mountain Institute, Chambéry
- Italian Mountain Institute, Rome
- Alpine Institute of Applied Ecological and Economic Research, Milan
- Institute of Pyrenean Ecology, Saragossa
- Centre of Alpine Ecology, Valtellina del Monte Bondone
- Centre for Mountain Studies, Perth
- Mountain Research Initiative, Bern
- Swiss Federal Institute of Snow and Avalanches, Davos
- International Scientific Commission on Research in the Alps, Bern
- Swiss Interacademic Commission for Alpine Studies, Bern

Introducing mountain themes in the framework of larger interdisciplinary conferences promotes awareness-raising on mountain issues. One such platform is the European Geosciences Union (EGU). In the last two years, the President of Cryospheric Sciences Section, Carmen de Jong, has created a mountain section to promote mountain-related sessions and successfully attract scientists and policy-makers as well as journalists. Topics include artificial snow and climate change.

Hilfe

Glacial Lake Outburst Floods; climatology; glaciology and hydrology in mountains; biogeochemistry of alpine soils; education and outreach as well as Union Symposia and Great Debates on the destiny of the natural and anthropogenic cryosphere.

Research platforms such as the EGU identify the differences between well established and well nurtured polar research and the more dispersed mountain research. Although sharing similar physical characteristics to polar regions, mountains experience much more anthropogenic pressure, requiring the interdisciplinary components in this research field to be expanded. Mountains are the hinterland of large agglomerations, offering advantages in terms of tourism, climate and natural resources but also absorbing the effects of pollution, traffic congestion, urbanisation etc. On top of this, mountains are affected more by climate change than the lowlands, acting as amplifiers on a large diversity of phenomena concentrated like sky scrapers over limited space. Under these conditions, the effects of climate change on temperature and water supply may be subject to as yet little-understood sensitive thresholds and knock-on effects.

Research funding for large, interdisciplinary projects in mountain regions can be provided by the FP7 programme, but this is limited to occasional, very specialised calls, often outside Europe. Other programmes such as COST, ERC and ESF do not provide full funding but are limited to the creation of networks and the exchange of scientists. Basic mountain research focused on classical subjects such as climate, glaciers, permafrost and biodiversity can be occasionally funded by national research grants or foundations. Applied mountain research responding to rapidly evolving problems can ideally be financed via the globally unique Alpine Space Interreg Programme. However, all these programmes have low funding success rates.

One example of an Alpine Space Interreg programme is Alp-Water-Scarcity co-ordinated by the Mountain Institute, France and focusing on Water Management Strategies against Water Scarcity in the Alps. It involves 17 partners from five alpine countries including local governments, public organisations, agricultural societies as well as national institutes. Scientific research, specialised tasks and field work are carried out on the basis of subcontracting. A stakeholder forum exchanges knowledge and information amongst stakeholders and scientists. The Mountain Institute is also involved in Climate Change and Impacts on Tourism in the Alpine Space (ClimAlpTour), another Alpine Space Interreg, ICT for sustainable development of natural resources (ICT-BNSURE), a FP7 project and an EEA study on the impacts of climate change on water resources and possible adaptation strategies in the Alps financed by the German Environmental Agency.

In future, it is essential for research themes to focus more strongly on interdisciplinary topics such as water management, sustainable tourism, air pollution, the social dimension of natural hazards and renewable energy (especially wind and solar power). European funding should integrate a certain flexibility to respond to emerging problems and priorities in mountains, such as winter Olympic Games, artificial snow making, hydroelectricity and minimal flow, all strongly related to climate change. Mitigating climate change in harmony with sustainable development should be a key consideration. Co-funding for synthesising and disseminating scientific information and creating strong permanent networks with local mountain populations should be provided in co-operation with the local stakeholders.

The role of mountains, in particular the Alps, as an important economic lever for Europe should be recognised and reinforced. Mountain

ranges are now widely utilised as communication passageways, linking maritime trade with the deeper hinterland. Their development should not be geared towards copying a few monopolistic models but on the identification of unique and diverse niches. Alpine valleys have now developed to modern silicon valleys, attracting 'soft' industry based on scientific and skilled knowledge. Their economic status is often higher than that in lowlands. Protecting natural resources including snow, water, glaciers, biodiversity hotspots, slopes and soils and climate should remain a key priority in the future since this will guarantee this long-term economic asset.

To avoid missing mountains, it is essential to judge interdisciplinary research in response to modern problems and develop corresponding solutions from mountain peak to peak.



Professor Carmen de Jong
President, Cryospheric Sciences
Division of the EGU (www.egu.org)
Coordinator of Alp-Water-Scarcity
(www.alpwaterscarcity.eu)
Workpackage Leader ClimAlpTour
(www.climalptour.eu)
Scientific Director
The Mountain Institute
carmen.dejong@institut-montagne.org
The Mountain Institute
University of Savoie
Fata Morgana
73376 La Bourgnon-de-Lac-Cadot
France
www.institut-montagne.org

Alp-Water-Scarce

Upcoming events on Climate change

1st General Meeting, 27 April 2009, Vienna, Austria

2nd General Meeting, 25 - 26 September 2009, Ljubliana, Slovenia

3rd General Meeting, February 2010, Italy

Summer School 25 June – 4 July 2010, Salzburg, Austria

Mid Term Event 5 July – 7 July 2010, Steiermark, Austria

4th General Meeting, October 2010, Switzerland

5th General Meeting, March 2011, Italy

Final Meeting, September 2011, France

Thank you for your attention!

Carmen de Jong (Project Leader)

E-mail: carmen.dejong@institut-montagne.org

Daniela Hohenwallner (Project Manager)

E-mail: alpwaterscarce@gmail.com

Institut de la Montagne

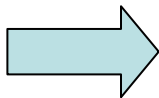
Campus scientifique de l'Université de Savoie

Pôle Montagne

3376 Le Bourget-du-Lac Cedex

Phone: 00.33.(0)4.79.75.81.52

Fax: 00.33.(0)4.79.75.81.71



www.alpwaterscarce.eu



Meeting Report

Mountain Hydrology under Increasing Climate Variability and Anthropogenic Pressure

Special session on Water in Mountains, organized by the Mountain Institute, University of Savoy, France
1 September 2008,
in the frame of the 13th IWRA (International Water Resources Association)
World Water Congress in Montpellier

Carmen de Jong, Scientific Director of the Mountain Institute, University of Savoy, Chambéry, France
Expertise: mountain hydrology, micro-meteorology, fluvial geomorphology, integrated water resources management, tourism
<http://www.institut-montagne.org/Carmen/carmen-de-jong.htm>

Prof. Carmen de Jong chaired the session on Water in Mountains with invited speakers from Canada, Austria, France, Switzerland, Spain and Israel, who presented water management issues both in semi-arid and humid mountain regions. Carmen de Jong introduced the session by underlining the importance of comparing hydrology and water management issues across different mountain regions in the world (de Jong et al 2009). She also described the new Interreg project „Alp-Water-Scarce“ on Water Management Strategies against Water Scarcity in the Alps lead by the Mountain Institute with 17 partners in five countries. De Jong stressed the importance of a stakeholder interaction forum within the project, bridging the gaps between scientists, government bodies and stakeholders in dealing with current water problems induced by climate and anthropogenic change in the Alps (de Jong et al 2005).

Hans Schreier, Professor Emeritus of the Institute of Resources, Environment and Sustainability of the University of British Columbia, Vancouver, Canada
Expertise: geomorphology, watershed analysis, GIS, land-water interactions, water soil quality and pollutants
<http://research.irm.sbc.ca/schreier/>

Hans Schreier focused on the need for green water management (water that leaves the ground and vegetation into the atmosphere in the form of vapor, interception, transpiration or evaporation) and the necessity of adapting to increased climate variability in mountain communities starting with an assessment of the water footprint (Schreier et al 2006).

He described the case studies of Kimberly and Elkford in the Columbia river basin in the Rockies, strongly supported by the local mountain communities. The aim of this project is to support the communities in developing a strategy for climate change adaptation. Hans Schreier showed that there is no consensus yet on the future projections of precipi-

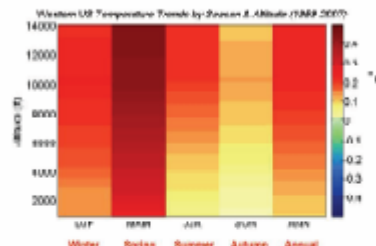


Fig. 1 Increase in temperatures over the last 50 years in the western US Mountains. Notice the strong increase in spring time. (Redmond and Abatzoglou 2007).

tation in mountains. It is clear however, that the springtime temperatures have increased considerably in the higher altitudes over the last 50 years (Redmond and Abatzoglou 2007) (Fig. 1) and that there are large increases in discharge particularly in the month of June over this period. Snowmelt and glacier melt discharge generally peaks higher and earlier in the season and therefore leads to prolonged drier summer flow. In response to these changes Hans Schreier demonstrated concrete methods to lessen a community's water footprint by stricter regulation of existing and new housing developments. The approach used to reduce surface runoff is threefold: firstly, initiate Basin Management Plans (BMP) at individual property scale, secondly in neighborhoods and thirdly, at the watershed scale. For example, by decreasing impermeable surfaces and augmenting surfaces with high infiltration capacities, such as lawns and driveways, by applying rules to replenish organic topsoil around new houses, and by collecting rainwater on roofs, the communities are aiming to decrease surface flow to 0% (see Schreier 2009 and website).