



International Scientific Committee on Research in the Alps
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Research Agenda to the multi-annual Working Programme of the Alpine Con- ference (MAP 2005 – 2010)

International Scientific Committee on Research in the Alps (ISCAR)

Short version, June 2008

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Introduction

The proposed Research Agenda reflects main issues from the multi-annual working programme 2005-2010 of the Alpine Conference focussing on research topics of scientific interest and/or of societal relevance. The proposed main topics and actions have to be taken up by scientists and research institutions in future research programmes, research projects or joint activities. The results from such research activities should provide a substantial support to achieve goals of the multi-annual working programme until 2010. Therefore, most of the proposed research activities should start not later than in 2008.

The Research Agenda has been developed in 2 workshops (June 23, 2005 in CH-Berne, organised by ICAS, and November 15-16, 2005 in CH-Lugano, organised by ISCAR), a consultation among all participants of the Lugano-Workshop (February – March 2006) and a consultation with selected experts (May-June 2006). In both workshops, the Swiss Transdisciplinarity Net (td-net) gave methodological and the Swiss Academy of Sciences (SCNAT) financial support. Finally, results from the CIPRA-Project "Future in the Alps" have been integrated.

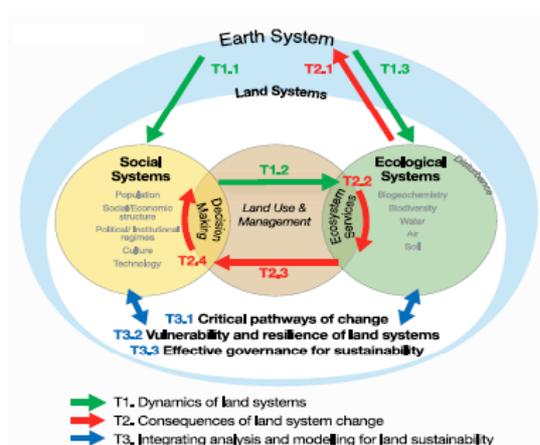
In order to analyse better the content of the MAP from a scientific point of view, all themes mentioned in the 4 key issues of the MAP have been summarized in 25 themes (see appendix 1). 20 selected research topics resulted from the expert's analysis of these themes. They are listed following the 4 MAP key issues:

1. Mobility, accessibility, transit traffic,
2. Society, culture, identity,
3. Tourism, leisure, sports
4. Nature, agriculture and forestry, cultural landscape
- 4A. Land use, spatial planning, protection
- 4B. Climate/global change, resource management

All proposed topics are described in this Research Agenda following partly the structure of the Research Strategy on Global Change Research in Mountain Regions (GLOCHAMORE). The proposed topics and actions are mainly of transalpine and interdisciplinary interest. Topics addressing disciplinary research or national/regional interest are mentioned, if main gaps have been identified.

This Research Agenda is not a research programme – the proposed topics and actions have their focus on key issues of the MAP 2005-2010. It is important to note that we are dealing with an interconnected ecological and economic system. While it is expedient in a programmatic sense to emphasize four key issues, they are nonetheless different aspects of the same underlying system. Thus it should come as no surprise that the connections between the four key issues are many. Mobility affects tourism. Society and culture affect agriculture and land use, and so on. Climate change affects both mobility and tourism directly, and via mobility, tourism indirectly. This Research Agenda aims towards a better understanding within each of the key issues.

It is evident, that a better understanding of the links between the key issues is of some importance. Research programmes along crosscutting topics (between key issues) have to be developed in other institutional contexts (FP7, COST, INTERREG, GLP, etc.) and in further steps. On a long term, the Research Agenda should help to focus science on the Alps to the development of an understanding of the Alps as a "land system" (see diagram from the Global Land Project (GLP) science plan).



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MAP-Key Issue 1: Mobility, accessibility, transit traffic

Rationale

The field of mobility and transport is a typically interdisciplinary subject, with closer relationships with other fields, like urbanization, economic development, planning, nature preservation, tourism or leisure in the mountain areas.

Proposed topics

- 1a Development of mobility patterns over time**
- 1b Regional and urban development in the context of accessibility**
- 1c Impacts of traffic and related infrastructures: evaluation and monitoring**
- 1d Steering of transport: instruments and their impacts**

MAP 2005-2010: Mobility, accessibility, transit traffic (Chapter 2.1.) (original text; topics in bold = of scientific relevance)

This key issue combines the issues of Transport and Spatial Planning (1). Transport problems have been a key issue of the Alpine Convention from the very outset. The people who live in the Alps are directly affected by them. In particular the heavy burden caused by transit traffic on individual corridor routes has given rise to fierce discussions. Another issue that deserves greater attention is the extent and scope of traffic within the Alps. Relief can be provided not just by displacing traffic but also by preventing traffic in the first place (by separating the development of road traffic from economic growth). The type of housing development and the quality of the basic services provided locally have a considerable influence on the individual attitude towards traffic and on logistics.

Key issues

- Encouraging the relocation of traffic from roads to railways and strengthening **combined transport**
- Adopting action programmes that influence **mobility patterns** aiming at separating the development of road traffic from economic growth
- Infrastructures and logistics concepts for easing the **burden of transit traffic**
- Developing strategies aiming at reducing the burden caused by freight and passenger **traffic within the Alps**
- Strengthening **public passenger transport** (link-up of tourist centres, connections within the Alps, intelligent mobility concepts, etc.)
- Ensuring the accessibility of goods and services (local provision)
- Low-traffic housing development and land use ensuring a balanced **development in rural areas**, too
- Implementing the **true cost of transport**

Joint activities already in place

- Study to improve cross-alpine rail corridors and to transfer the method of the Brenner plan of action and the measures in the Gotthard area to other transit corridors
- Drawing up **indicators to assess the burden and measures** (Transport Working Group and Working Group on Environmental Objectives and Indicators)
- Study of the costs of alpine transport (Transport Working Group)

Priorities for the next six years

- Pursue the studies already under way
- Set up a **monitoring system** as part of SOIA in cooperation with the Transport Working Group and inform the general public about **transport trends in the Alps** and the **burden imposed by different types of transport** (transit/within the Alps, freight/passenger traffic, road/rail,

- etc.)
- Continue the discussion on the desired **accessibility of remote mountain areas** (provision with goods and services, personal mobility, public transport, etc.)
- Support the development of **transport-specific calculation systems that reflect the reality of costs**, and favour the use of the most **environment-friendly means of transport**
- Intensify co-operation with a view to improving **connections in public transport within the Alps** and beyond, and the public transport offers for tourists
- Exchange experience on **housing development and land use plans aiming at avoiding traffic**, and on improving provision and accessibility while guaranteeing a balanced development in rural areas

(1) The protocols addressed here are essentially "Transport" and "Spatial Planning and Sustainable Development" and to a lesser degree also "Tourism", "Energy", and "Conservation of Nature and Landscape".

1a. Development of mobility patterns over time

Research goals

- Better historical knowledge of the mobility patterns in the mountains regions (especially but not only in the Alps);
- Individual/social Preferences in the choice of mobility modes
- Comparisons of mobility patterns in different mountain spaces;
- Link between past and future patterns (see also demography patterns).
- Understand particularity of mobility in mountain areas. What does that mean in terms of behaviour, infrastructure, investments etc. (e.g. valleys, regions, vertical spaces, mountain-valley relations, transit routes, etc.) ?
- Interdisciplinary assessment of the relation between mobility patterns, settlement structures, and social and economic structures over time
- Closing the gaps in transport data relating to important segments of alpine transport. Especially data on tourism and leisure traffic are incomplete and there are methodological problems generating complete data.
- Understand the driving forces of mobility patterns and development in Alpine region, in particular in the light of policy measures (new infrastructures to solve traffic problems). These are not specific to mountain regions, but have a significant impact on mobility patterns in the Alps. Many driving forces are working outside the Mountain areas, but conditioning the mobility behaviour in these areas.
- Formulation of a "theory of mobility in mountain areas"

1b. Regional and urban development in the context of accessibility

Research goals

- Assessment of the socio-economic impacts of improvements of local accessibility within the Alps
- (i.e. by the analysis of the transformation of economic structure, socio-cultural practices and land use changes in mountain areas in the frame of Alpwide urbanisation processes, high capacity infrastructure and acceleration of transport systems. This means especially the declining of existing and the possible development of new services and functions in the mountains as well as the development to pure residential areas or "brain drain" processes).
- Analyzing the interactions between accessibility and the development of alpine-specific regional production systems
- Analyzing the interactions between enlarging metropolitan areas (metropolisation) and rural and tourist mountain areas.
- Better and more reliable forecasts of the future developments of the traffic and mobility in the Alps and their economic and social consequences (The problem is to understand the construction of "traffic forecast" by experts or consultancy, their role in policy shaping/conditioning and their impact on self-fulfillness)
- Develop besides forecasts also scenarios about alternative development paths, as a fundamen-

- tal instrument in the policy decision process.
- Understand traffic in a comprehensive system theoretical approach. Understand long term economic, demographic and technological evolution and its impact on mobility in the alpine area.
- Understand the long term impact of new infrastructure in particular in terms of barrier to innovations (problem of lock-in situation by very high infrastructure investments).

1c. Impacts of traffic and related infrastructures: evaluation and monitoring

Research goals

- Better agreement between science and policy about the burden imposed by transport.
- Better understanding of the contribution of different sources to pollution in the Alps.
- Recommendations to mitigate the adverse effects of transport in mountain areas.

1d. Steering of transport: instruments and their impacts

Research goals

- Developing instruments and policies, in particular for the leisure and tourism mobility, sector by merging the actors in this field and by using the instruments of mobility management.
- Developing of professional adult advanced training offers which afford transfer learning
- Understand shaping of policy and policy measures (role of experts, NGOs, consultants, government bodies, citizen initiatives).
- Analyse the role of scientific knowledge, stereotypes and images (i.e. the avalanches of trucks), risk perception in the policy decision process.
- Investigate policy instruments and there impact on traffic (short, medium and long term) on different spatial scales (local, alpine space, global)

MAP-Key Issue 2: Societies, cultures, identities

Rationale

Social transformations within the Alps have been very important during the last 50 years. Economic growth, the renewal of the economic basis of the Alpine economy, migrations, tourism, tele- and mass-communication, etc. have changed many characters of the Alpine societies. To a certain extent these processes correspond with general patterns of late modernity, globalisation and enhanced mobility; but the Alps provide specific intensity of processes and combinations of factors which deserve a deep analysis of social reality.

On the one hand, we have several indicators about demographic and social change (census, employment, migrations, etc.) and they deserve to be worked at in a comparative way in an integrated monitoring of alpine societies.

On the other hand, we have very few reliable information at the alpine level about social dynamics and cultural transformations. Though, many case studies have been made at a very local scale by sociologists, anthropologists, geographers and historians, we lack some kind of general knowledge about these topics.

As a matter of fact, these topics are of great importance for regional politics and transnational policies. Besides they are very relevant for the understanding of local governance strategies through the Alps. Since some places are still loosing many inhabitants, since other places have huge rate of population growth, local societies are under stress in different ways. Public policies need to be adapted to this range of situations.

That is why this section of the ISCAR research agenda focuses on 4 questions, each of them being both a scientific topic and a political issue.

Proposed topics

2a Individual well-being

2b Social cohesion – social dynamics – cultural identities

2c Regulation in territorial transformation and management

2d Multi-level capacity in actor-networks

MAP 2005-2010: Society, culture, identity (Chapter 2.2.) (original text; topics bold = of scientific relevance)

This key issue refers to a particularly important field of action, which in the text of the Alpine Convention is given priority with the objective of effective implementation². This cross-sectional topic covers three fundamental discussion issues: **quality of life**, **cultural identity** and co-operation between the population living within and outside the Alps.

Key issues

- Intensifying **communications and the exchange of information within the Alps and beyond** (media, multilingualism, exchange programmes, alpine-wide organisations, social work with young people, etc.)
- Tradition and innovation – continued **development of alpine cultures of life** (architecture and art, fashion and design, food and drink, etc.)
- **Living conditions in the Alps** (provision for elementary requirements, basis of subsistence, population trend, new lifestyles, etc.)

Joint activities already in place

- Population and Culture Working Group: drawing up potential contents for a legal instrument on the subject of "Population and Culture"
- Initiatives by the Permanent Secretariat for co-operation ventures with interregional working groups and the EU INTERREG Programme "Alpine Space" on these Subjects

Priorities for the next six years

- Draw up a political declaration on "Population and Culture" by the time of the IXth Session of the Alpine Conference 2006, whose implementation is assessed by the Compliance Committee
- Encourage exhibitions, events, competitions and publications on issues **relating to the Alps as a whole**
- Stimulate a debate on the **future of settlement forms in the alpine space**
- Promote the **exchange of experience and the setting-up of theme-related networks** (e.g. architecture, local initiatives, provision for elementary requirements)
- Identify cultural issues likely to encourage a **sense of community in the Alps** (projects and workshops, social work with young people)
- Set up a dedicated internet-based information service for improving **communications throughout the Alps**

2a. Individual well-being

Research goals

- To know more about how local people define the quality of life and perceive the quality of their environment
- To identify objective indicators (i.g. migrations) and factors (public services, landscape, etc.) related to this subjective qualification of the Alps.

2b. To improve social cohesion with a better knowledge about collective dynamics and cultural identities

Research goals

- Better understanding of the related topics:
- Community building
- Social structures and processes
- Languages practices and symbolic meanings
- Gender issues
- Public Participation and Governance
- Heritage management policies and practices at local level
- The variety of lifestyles in the Alps and related expectations
- The role of elderly in local societies

2c. Regulation in territorial transformation and management

Research goals

- Better understanding of the related topics:
- Local and regional capacities in territorial and environmental management
- Change in Land use
- State of land and housing markets and social impacts
- Analysis of spatial practices of individuals (commuting, leisure mobility) and enterprises (choice of location, networks of customers, etc.)
- The meaning and quality of landscapes
- The role of regional and national legal contexts in these processes

2d. To foster multi-level capacity in actor-networks

Research goals

- Better understanding of the related topics:
- Competencies of local people in taking advantage of non-local opportunities
- Cross-regional initiatives
- Institutional co-operation
- Social capital and networks at various levels
- Education and training
- Uses of ICT

MAP-Key Issue 3: Tourism, leisure, sports

Rationale

The following topics have been outlined in the MAP (see next page; scientifically relevant = underlined): Competitiveness – New types of sport – Nature as a resource for tourism and the leisure industry – Culture as a resource for tourism and the leisure industry – Tourism and regional development – Close-to-nature / sustainable tourism.

Competitiveness should be considered in the context of globalisation (not only within the Alps) as well as in the context of regional development. Nature and culture are both important resources for tourism and interconnected in landscape. These resources should be considered related to tourist use, socio-economic development, protected areas or spatial planning and not for themselves. New types of sport and close-to-nature tourism are only of relevance in crosscutting topics. Aspects (event tourism, rural tourism, innovation, etc.) are integrated in proposed topics or have to be considered in crosscutting themes (see cross-cutting matrix).

Tourism is strongly related with topics of all other key issues, especially with social development, life styles (most live in different places, amenity migration), economy and landscape development. The main (overall) topic is "Future of tourism in the Alps and its role in regional development".

Proposed research topics

- 3a. Evaluation of competitiveness of existing and new touristic models in the context of globalization.**
- 3b. Relationships between culture and tourism in touristic areas**
- 3c. Interactions between urbanisation and alpine tourism**
- 3d. Sustainable management of winter stations**
- 3e. Governance and co-operation in alpine tourism: developing policy-based and agent-based approaches: How to organize tourism within and among touristic areas?**
- 3f. Potentials and strategies of sustainable nature-based tourism and sports in the Alps**

3g. Touristic transport infrastructures in high mountain areas

MAP 2005-2010: Tourism, leisure, sports (Chapter 2.3.) (original text; topics bold = of scientific relevance)

Tourism is not just a branch of industry; it also has cultural and social dimensions that are of great significance for the development opportunities of the Alps. It has shaped nature and society in the Alps as well as the perception of the Alps far beyond its direct contribution to the economic output; conversely it also depends on intact nature. Like no other sector tourism is interlinked with all the different development dimensions and with life in the Alps. Moreover, in the recreation and culture sector tourists and locals alike tend to use the same range of offers. In both cases sports play a very important role. New trends in sports have meant that planners, nature conservationists, investors and tour operators are now confronted with new questions. The Tourism, Leisure & Sports topic is therefore well suited to illustrate the many different forms of interaction involved in sustainable development¹.

Key issues

- The Alps as a destination within **global and inner-alpine competition** (changes in the global tourism market, concentration, repercussions of climate change, co-operation, etc.)
- **Tourism and sports** (new types of sport and their repercussions, transnational codes of conduct for sportsmen and women, etc.)
- **Tourism and culture** in the Alps (What is Alpine culture? Cities, rural tradition, intercultural encounters, etc.)
- **Nature as a resource** for tourism and the leisure industry, limits of its use
- Tourism, leisure industry and regional development
-

Joint activities already in place

- Co-operation between the Permanent Secretariat and the Via Alpina Project (network of hiking routes throughout the Alps, sustainable local development through sustainable tourism)
- Italy's initiative for agreements relating to the sports sector in the Alps
- Tourism activities organised by the Alpine Network of Protected Areas
- Trialling of "Ski resort auditing – Guiding principles for ecological revaluation"

Priorities for the next six years

- Study the repercussions of different **tourist concepts in international and inner-alpine competition** as it undergoes change; develop common rules and regulations to prevent negative ecological, social and economic consequences of stiffer inner-alpine competition
- Strengthen the **competitiveness** of close-to-nature tourism in the alpine region
- Strive towards an international agreement on staggering holiday periods
- Promote concepts aiming at co-operation between the tourist industry, agriculture, forestry and handicrafts
- Public relations work on the subject of **sustainable tourism** in co-operation with the different networks. Presentation of the Alps as an active, future-orientated region. Introduction of a development award.
- Trialling of "ski resort auditing" in other contracting states (D/I/F, etc.), further development of the methodology, formulation of a set of requirements for the environmentally compatible operation of ski resorts as part of an extended voluntary auditing
- Highlight the role of the alpine region as a historical and contemporary forum of **encounter between major European cultures**. Suggestions for relevant conferences, events and tourist offers.

3a. Evaluation of competitiveness of touristic models in the context of globalisation

Research goals

¹ This concerns in particular the "Tourism" protocol as well as the protocols on "Transport", "Mountain Farming", "Conservation of Nature and Landscape", and the issue of "Population and Culture" in Article 2, Para. (2) a) of the framework convention.

- Develop a transalpine research programme to the proposed topic
- competition and complementarity between "corporate and industrial" tourist model and "community and cultural" model
- Importance (international/big) sport events are for competitiveness

3b. Relationships between culture and tourism (including interactions between traditional and touristic cultures)

Research goals

- Better understanding of the interactions between traditional (domestic) and "touristic" (urban) cultures
- Better understanding of cultural transformation in touristic resorts, compared to rural settlement.
- Better understanding of the role of tourism for the survival of local cultures (by keeping the local population on place).
- Historical comparison with former anthropological (case) studies.

3c. Interactions between urbanisation processes and alpine tourism, leisure and residence

Research goals

- Analyzing the transformation of economic structure, socio-cultural practices and land use changes in mountain areas in the frame of alpwide urbanisation processes and changes in tourism. This means especially the development of new forms of services in the mountains under the conditions of different demands in tourism (e.g. residences instead of classical tourism), new forms of habitats and settlement structures (e.g. stronger regional cooperation, densified settlement structures) and coping decline as "brain drain" and losing significance (e.g. by developing urban heterogeneity).
- Analyzing the effects of changing alpine-specific regional production systems
- Analyzing the effects of growing metropolitan areas (metropolisation) on adjacent regions
- Documentation of changes, evaluation of the results, interpretation of the consequences under the perspective of the goals of sustainable spatial and economic development, socio-cultural regional cohesion, bio-physical diversity and energy saving.
- Elaborating advice for spatial policies and governance rules of best practices for the applied research.
- Scientific progress for researchers in regional and social sciences as spatial planning, urbanism, sociology, regional and economic geography

3d. Sustainable management of winter stations

Research goals

The goals of research are to identify and to evaluate classic or innovative ways, methods and governance answers of restoration and restructuring of winter stations in different kinds of alpine context, to help to prevent crisis and to facilitate sustainable development. Further, research on the property market in tourism places (not mere winter tourism) are required: How does this market work? Which are the goals of the different actors?

3e. Governance and co-operation in alpine tourism

Research goals

- Carry out of a certain number of case studies in the alpine countries in order to analyse the policy making process in the tourist destinations and the role of the different stakeholders in

this process. Analyse of the influence of each national context on the local/regional governance.

- Comparison of the decision making process in the alpine resorts with the ones of other parts of the World (e.g. North America, Scandinavian countries)
- Analyse of the relationship between certain features of local/regional governance and their influence in terms of sustainability (economy, ecology, society) for the tourist destinations.

3f. Potentials and strategies of sustainable nature-based tourism and sports in the Alps

Research goals

Better understanding of the recent and actual development, future potentials und success factors of nature-based tourism. Better understanding of conflict solving instruments between nature-based activities (nature sports) and natural heritages.

3g. Touristic transport infrastructures in high mountain areas

Research goals

Trends in the development of high mountain areas have to be analysed from an economic and from a social point of view, to understand processes of concentrations and extensions of touristic infrastructures. Understanding these processes, an alpwide spatial concept for touristic development in high mountain areas (remain undeveloped, status quo, extension) should be designed for political discussion.

MAP-Key issue 4: Nature, agriculture and forestry, cultural landscape

4A: Land use, spatial planning, protection

Rationale

Multifunctional agriculture and forestry on one hand and landscapes, habitats and species on the other hand are closely interrelated. Which management strategies in agriculture and forestry are appropriate to support a sustainable use of landscapes and to sustain natural biodiversity? What are the consequences of different management measures on cultivation and land use systems (forestry, agriculture) and landscapes? In this context the economic interests and benefits have to be considered, as well aspects of protection and the potentials and services of protected areas. Outcomes of such research have to be reflected in view of spatial planning and regional development: How can spatial planning be more effective ? What are the limits? How do people react to land use and landscape changes?

Overall goals

- New knowlegde about land use changes in the Alps and their consequences
- New knowledge about how to reach multifunctional landscapes with least costs involved.
- Networking of existing knowledge (Knowledge management!)
- New instruments for efficient implementation of scientific knowledge (eg. science – practice – platforms)
- Biodiversity strategy for the Alps, including ecological connectivity areas of alpwide importance

Proposed topics

- 4a. Influence of management strategies and cultivation methods on landscape functions and ecosystem services**
- 4b. Influence of land use changes on biodiversity (genetic, species, habitat, landscape)**
- 4c. Influence of social life-styles on land use change and landscape structure.**
- 4d. New approaches to identify, develop and monitor ecological connectivity areas**

MAP 2005-2010: Nature, agriculture and forestry, cultural landscape (Chapter 2.4.)
(original text; topics bold = of scientific relevance)

Nature and the cultural landscape are probably the most important resources of the alpine region. From time immemorial they have been shaped by human activities, particularly agriculture and forestry, and over the past few decades their current form and diversity have increasingly come under threat. Any impact on these resources threatens the quality of life and economic activities. Nature-related hazards

have also increased as a result of human influence (for instance structural change in agriculture or climate change). One of the core tasks of the Alpine Convention is to draw up

new prospects for the sustainable management of the cultural landscape, for the further development of rural existence and for the protection of sensitive areas from destructive influences (4).

Key issues

- Agriculture and forestry (cultural landscape, high-quality foods, protective forests, biomass energy, rural existence, diminishing appeal, new sources of income, **multifunctional role, agricultural policy**, etc.)
- **Maintaining landscapes, habitats and species** (keeping the landscape open, cultivation, biodiversity, protected areas, biotope networks, soil protection, etc.)
- Climate change and natural risks (forecast, prevention, consequences of housing development, agriculture and forestry)
- Water as a resource (drinking water and hydraulic power for the surrounding regions, climate change and water management, glacier protection, artificial snowfall, floods)
- Spatial planning and regional policy (changes in land use, natural/cultural landscape, public infrastructure, areasaving housing development, rural development)

Joint activities already in place

- Intensive co-operation and effective PR work within the Alpine Network of Protected Areas since 1995
- Study on cross-border protected areas (2004)
- Setting-up of the Natural Hazards Platform by the VIIIth Session of the Alpine Conference (2004)

Priorities for the next six years

- Formulate expectations vis-à-vis the **EU agricultural policy** from the point of view of the alpine region
- Exchange experience on **integrated sustainable rural development in the Alps**
- Activities of the Natural Hazards Platform
- Further steps towards the cross-border networking of protected areas and cross-linking with other ecologically significant facilities
- Develop alpine-wide concepts for the **management of drinking water resources and hy-**

draulic power

- Develop alpine-wide concepts on **glacier protection, flood protection and artificial snow-fall installations**
- Exchange experience on **concepts and measures to prevent land fragmentation** and to reduce land utilisation

(4) As a result this key issue quite obviously concerns topics from all protocols.

4a. Influence of management strategies and cultivation method-son landscape functions and ecosystem services

Research goals

- assessment of the impact of different management strategies and measures in forests and other landscapes on their function in order to create sustainable forest and landscape systems
- development of economically interesting and innovative forest products
- stakeholders: foresters, landowners, planners, other forest users, local authorities
- development and improvement of methodologies for assessment of policy impacts on landscape and natural resources
- obtaining scientific and empirical base for improvement of policy measures
- develop / optimize planning instruments for guiding landscape transformation

4b. Influence of land use changes on biodiversity (genetic, species, habitat, landscape)

Research goals

- Quantifying the impacts of land use changes (fragmentation, forest growing, etc.)
- Assessment of the effect of scale
- Prognosis for future development and proposal of economically interesting novel forms of land use (pasture, medical plants, etc.)
- Assessment of social acceptance of land use changes (-> key issues 2)

4c. Interactions between social life-styles, land use changes and landscape structures

Research goals

- assessment of the interrelations between social life styles and landscape structuring or land use changes (Bottom-up influence of life-style on landscape)
- development of new planning decision tools (regional planning, spatial planning)
- assessment of the relative importance of topdown measures (policy actions) and the effectiveness in influencing landscape change
- development and improvement of methodologies for assessment of policy impacts on landscape and natural resources
- providing tools to interrelate scientific knowledge (i.e. empirical findings about landscape change) and needs and values of society

4d. New approaches to identify, develop and monitor ecological connectivity areas

Research goals

- to develop a consistent methodology and terminology for connectivity approaches
- to verify priority areas for the conservation of biodiversity (including protected areas) and to define elements and sites of potential connectivity areas between these areas as well as between the Alps and surrounding regions and mountain ranges;
- to develop a catalogue of possible measures for the implementation of an ecological network

4B: Global change, natural hazards, resource management

Rationale

Notwithstanding the obvious and numerous implications of global change on many natural processes and social issues, we focused on natural hazards and water resources, because these are the effects of global change which are best recognized by the population (and tourists as well). Both topics were discussed with emphasis on water balance and catastrophic runoffs, while other aspects such as snow avalanches, mudslides and permafrost melting (rockfall etc.) were not considered as intensively.

In addition, we expected that other important characteristics and consequences, such as the up-shift of snowline etc., be treated in previous sections. Our intention was to concentrate on physical, chemical and biological aspects of global change and to consider social and cultural aspects less intensively, although we know that "risk" is a product of potential danger and the presence of humans or values. We anticipated that themes such as "livelihood", a central argument in the discussion of global change impacts, have been discussed more rigorously in other groups.

The following aspects have to be considered:

The increase of risks and extremes (such as floods and droughts) is widely recognized as effects of climate warming – so the perception of the public and science converges on this aspect.

This applies also to the cryosphere which is an important component of the system and where everybody can observe ongoing changes. While glaciers and permafrost change more slowly, snow is a crucial element that will become more relevant in future, not only for tourism, but also for the water balance and the dynamics of alpine rivers.

The Alps are extremely sensitive to small changes: large effects occur especially at borders of ecosystems (ecotones), which have small spatial scales, steep gradients and high patchiness.

One consequence of rapid climate change, high sensitivity and small-scale habitat structure is that we will recognize the effects of global change (temperature, radiation, precipitation, deposition of pollutants etc.) much earlier than in other regions; this implies a certain responsibility towards the rest of world.

Because we are dealing with complex interactions, we must consider various feedback mechanisms that include ecosystems as well as the social sphere.

We are beginning a dialogue, thus we cannot provide simple answers, but we want to indicate where to focus our interest in the near future. As a consequence, we must establish a way of communication/education.

"Global change" includes drivers that exist at a global level. Thus it includes climate change, but also population growth, urbanization, globalization of trade, faster transmission of invasives and diseases, etc. Aspects of global change other than climate change are clearly important for the Alps, especially, globalization of trade, increasing ease of transportation. "Global Change" contains natural and human induced changes. Our perception is that global change has a number of consequences on several of the subjects listed in the previous sections 1 through 4a. It begins to play an increasingly important role from the local to the regional and global level and has consequences on quite all the key issues of the MAP (1-4). Therefore section 4 B focus on climate change connected with natural hazards and water resources, of course without neglecting the human interventions and measures.

Moreover, we should also keep in mind, that climate change is not only "climate warming", but also precipitation, weather patterns and atmospheric circulation in connection with changes in snowfall, glacier retreats, avalanches, permafrost, water resources, natural hazards and deposition of long distance transported pollutants.

- + Climate change and natural risks
- + Utilisation of water as a resource

Proposed topics

4B.a. Regional Climate change in the Alps: prediction, impacts, prevention

4B.b. Impact of Global Change on vulnerability and natural hazards in the Alpine region

4B.c. Management of water resources in changing water cycles

MAP 2005-2010: Global change, natural hazards, resource management (Chapter 2.4.) (original text; topics in bold = of scientific relevance / interest)

Nature and the cultural landscape are probably the most important resources of the alpine region. From time immemorial they have been shaped by human activities, particularly agriculture and forestry, and over the past few decades their current form and diversity have increasingly come under threat. Any impact on these resources threatens the quality of life and economic activities. Nature-related hazards have also increased as a result of human influence (for instance structural change in agriculture or climate change). One of the core tasks of the Alpine Convention is to draw up new prospects for the sustainable management of the cultural landscape, for the further development of rural existence and for the protection of sensitive areas from destructive influences (4).

Key issues

- Agriculture and forestry (cultural landscape, high-quality foods, protective forests, biomass energy, rural existence, diminishing appeal, new sources of income, multifunctional role, agricultural policy, etc.)
- Maintaining landscapes, habitats and species (keeping the landscape open, cultivation, biodiversity, protected areas, biotope networks, soil protection, etc.)
- **Climate change and natural risks** (forecast, prevention, consequences of housing development, agriculture and forestry)
- **Water as a resource (drinking water and hydraulic power for the surrounding regions, climate change and water management, glacier protection, artificial snowfall, floods)**
- Spatial planning and regional policy (changes in land use, natural/cultural landscape, public infrastructure, area-saving housing development, rural development)

Joint activities already in place

- Intensive co-operation and effective PR work within the Alpine Network of Protected Areas since 1995
- Study on cross-border protected areas (2004)
- Setting-up of the Natural Hazards Platform by the VIIIth Session of the Alpine Conference (2004)

Priorities for the next six years

- Formulate expectations vis-à-vis the EU agricultural policy from the point of view of the alpine region
- Exchange experience on integrated sustainable rural development in the Alps
- Activities of the Natural Hazards Platform
- Further steps towards the cross-border networking of protected areas and cross-linking with other ecologically significant facilities
- Develop **alpine-wide concepts for the management of drinking water resources and hydraulic power**
- Develop alpine-wide concepts on **glacier protection, flood protection and artificial snowfall installations**
- Exchange experience on concepts and measures to prevent land fragmentation and to reduce land utilisation

(4) As a result this key issue quite obviously concerns topics from all protocols.

4B.a. Regional Climate change in the Alps: prediction, impacts, prevention

Research goals

Answers for following main questions:

- How (much) climate has changed in the Alps during the last decade/century?
- How will it change in future, at what time scales?
- How large are the uncertainties of the predicted changes?
- How will the climate change in particular regions, in different seasons?
- How does it affect temperature, precipitation, discharge, water resources, and ecosystems?
- How can we adapt to these changes?
- Which spatial resolutions and which ecological and economical consequences?
- How can mitigate them?
- What were the impacts of climate change in the Alps in the past? How did mankind adapt?
- Will the rates of change increase?

4B.b. Impact of Global Change on vulnerability and natural hazards in Alpine region

Research goals

- To understand the responses of natural hazards in mountainous areas to Global Change and to quantify ecological, economic and social impacts
- To develop mitigation and adaptation strategies in cooperation with decision makers from different institutional levels, interest groups, and local stakeholders.
- Forecast and prevention
- Put a focus on "Global change and landscape geoconservation"

4B.c. Management of water resources in changing water cycles

Research goals

- Contamination of ice and snow monitoring of the cryosphere contamination
- Impact of extreme events and of climate change on the water balance and the dynamics of alpine rivers (is more important than its impact on tourism!) (And vice versa! The responsibility derives from an economy's contribution to climate change, i.e. on the GHG emissions, and not from its vulnerability!)
- Alternative concepts to decrease the vulnerability in Alpine regions
- The impact of climate change on the hydrological cycle in general, and on the surface run off in particular should be emphasized.
- Adaptation to the increasing rate of change should be a key topic within the defined key issues.
- Utilisation of water as a resource: Drinking water and hydraulic power for the surrounding regions -> alpine-wide concepts for the management of drinking water resources and hydraulic power
- Climate change and water management, glacier protection, artificial snowfall, floods -> alpine-wide concepts on glacier protection, flood protection and artificial snowfall installations