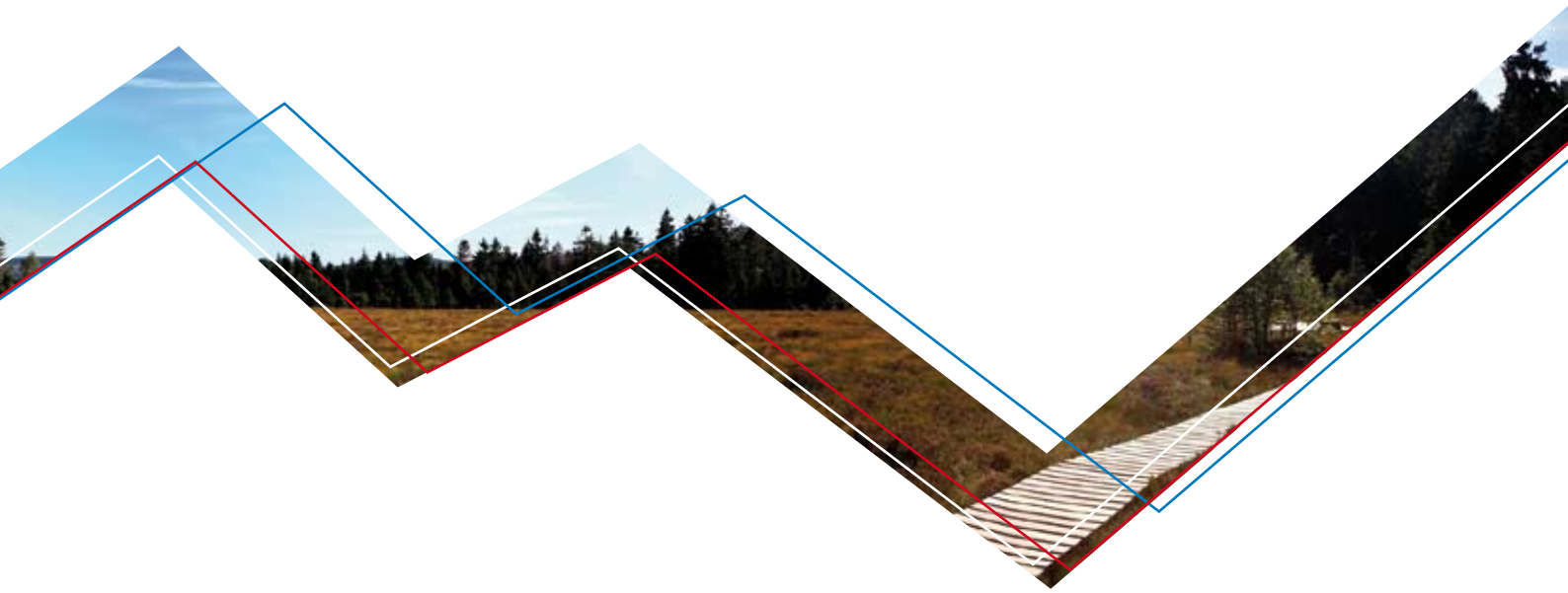
COMPACT NO 03/2009

NATURE PROTECTION IN CLIMATE CHANGE

A CIPRA BACKGROUND REPORT



CIPRA
www.cipra.org

CONTENTS

cc.alps in a nutshell

The Project “cc.alps – climate change: thinking one step further!” is organised by CIPRA, the International Commission for the Protection of the Alps, and financed by MAVA Foundation for Nature. Through the Project, CIPRA is helping to ensure that climate response measures in the Alpine region are in harmony with the principle of sustainable development.

Legal notice

Editor: CIPRA International,
Im Bretscha 22, FL-9494 Schaan
T +423 237 53 53, F +423 237 53 54

Authors: Mateja Pirc, CIPRA, Veronika Gaube, Institut für Soziale Ökologie, Wien, Wolfgang Pfefferkorn CIPRA,
Design: IDconnect AG
December 2009

CIPRA
cc.alps

1

FOREWORD

Through the project “cc.alps – Climate Change: Thinking one Step Further!“ CIPRA (Commission Internationale pour la Protection des Alpes) investigates climate measures in the Alps. CIPRA brings together climate protection and climate adaptation activities in the Alps (hereinafter these activities are defined as “climate measures“) and analyses what effects these climate measures have on the environment, economy and society. CIPRA’s aim is to make available to a wider audience those climate measures which are in line with the principles of sustainable development and to warn against those which have negative consequences not only on nature and the environment but also on the social structure and the economy.

The “CIPRA compact“ collection features various theme books that deal critically with climate measures in the Alps. The collection comprises the field of activity “nature protection“ besides others like: building and renovating, energy self-sufficient regions, spatial planning, traffic, tourism, natural hazards, energy, agriculture, forestry and water.

The CIPRA compact “Nature Protection“ provides an overview on actions for nature protection in the Alps to limit climate change and adapt to it. In the second chapter, CIPRA gives its central statement on this issue: nature protection means climate protection. Through the renaturation of bogs and fens, a near-natural cultivation of forests, the revitalisation of rivers and the creation of ecological networks, nature protection can provide an essential contribution to climate protection while also ecologically enhancing habitats in the Alps and protecting the population from natural hazards.

In the third chapter, the individual correlations are thoroughly analysed and described. First of all, the authors take a look at the various measures, their relevance and consequences, then another section deals with possible conflicts with the objectives of sustainable development. At the end of the chapter, the authors summarise their most significant insights and conclusions.

2

MORE NATURE FOR BETTER CLIMATE

CC.ALPS: CIPRA DEMANDS ON NATURE PROTECTION

When climate changes, nature feels it. Mountain areas are particularly sensitive, and the greatest losses in terms of plant and animal species may occur precisely there. According to scientific estimates, almost every second plant species in the Alps is threatened with extinction by 2100. For the flora with the highest number of varieties in Central Europe this would be an enormous loss. Because of global warming, also well-known animal species such as the Alpine ibex, the snow grouse and the mountain hare will experience far worse living conditions in the Alps.

Complete ecosystems are affected by climate change, for example watercourses. If their temperature, as some models forecast, increases in the next decades by two degrees Celsius, the living areas of fish species which rely on cold water will be reduced to as much as one fourth.

Nature protection and climate protection can go hand in hand. Intact living areas can withstand the consequences of climate change better than damaged ones. In addition, natural woods, living bogs and fens and extensively cultivated meadows improve our greenhouse gas balance, since they naturally bind carbons. Therefore, preventing the release of greenhouse gases which are still present in biomass must be a fundamental point in the connection between nature and climate protection.

Climate is now changing more quickly than in previous decades. However, ecosystems react with a marked lag in time, therefore vigorous but also wise action must be taken. Many projects currently under discussion for the management of climate consequences can damage the natural balance, and thus the most important climate system that we have available. CIPRA welcomes renewable energies which prove neutral towards climate, but only if the consequences have been carefully weighed. Conflicting objectives arise when valley biotopes are soaked in order to set up a lake for the production of electricity, when waters are jammed into a concrete canal to achieve protection against high waters, when snow cannons counterbalance the loss of natural precipitations or when extensively cultivated green areas are utilised for industrial biofuel cultivations.

CIPRA requests:

A NETWORK FOR NATURE

Because of global warming, in the northern hemisphere of the earth vegetation areas shift horizontally as well as between valleys and mountains. In order for animals and plants to react to this change and be able to find new sites to survive, protected areas as well as non-protected shelters must maintain a variety of species, and ecological corridors must be set up between them, in order to facilitate migrations.

BRING ALPINE RIVERS BACK TO LIFE

Revitalisation of watercourses reduces natural hazards and thus significantly contributes to the management of climate impacts. If rivers have more space on both sides, they can retain more water and therefore reduce the danger of floods. At the same time, they become more varied and more valuable as living areas for plants and animals. In order to establish some supraregional coordination of such renaturation projects, Alpine countries and the EU must draft together a binding action plan, which includes a concrete time schedule for the various projects and makes available the necessary funds.

PRESERVE BOGS AND FENS

Bogs and fens provide an essential contribution to climate protection. They amount to just three percent of land, but store twice as much carbon than all woods. Therefore, they must be protected. Those areas which in the past were dried and partially destroyed must be brought back to their natural state. Bogs and fens which are soaked again can store more carbon dioxide, while at the same time their ecological value as living areas for numerous animal and plant species increases. In addition, they act as sponges: they provide natural water storage, and protect surrounding areas from flooding.

A QUALITY SEAL FOR CLIMATE FRIENDLY WOODS

Naturally cultivated woods bind particularly high quantities of carbon dioxide, a greenhouse gas. At the same time they have a high ecological value, since they offer diverse niches and living areas for animals and plants. Intact woods can better react to future climate change and therefore better carry out their various tasks — among which also protection from natural hazards such as landslides.

CIPRA requests that all woods in the Alps be certified based on a commonly recognised system such as the Forest Stewardship Council (FSC).

Such certificates include assessments on naturally and socially sustainable cultivations and help towards better marketing of timber from the Alps. If necessary, laws must be changed in order to make certification and sustainable economic management mandatory for the owners of private forests. In addition, the existing label jungle must be cleared: appropriate criteria are necessary, which apply to the whole Alpine region. The Alpine Convention is the place where they can be drafted.

CHECK SUSTAINABILITY

All the projects that slow down climate change or are supposed to counterbalance its impacts must be subject to a sustainability check. Unilateral decisions cannot be taken in case of conflicting objectives between climate protection and nature protection. The situation is particularly delicate when formerly natural areas become industrial land to grow raw materials for biofuels. Hydroelectric water plants and technical systems for high water protection can also entail great damage for the natural balance. Before anything is built, each project must be assessed in terms of its environmental, social and economic impacts. This to prevent that what is “well conceived“ becomes “badly made“.

FAIR COMPENSATION

Land and forest owners who give up part of their revenues to the benefit of nature protection must be compensated. Their land might be a significant element in an ecological network or in a renaturation project. Current promotion systems in the EU and in most Alpine countries do not offer sufficient compensation for such cases and must be urgently improved.

3

NATURE PROTECTION AND CLIMATE CHANGE

3.1 WHAT IS THE RELATIONSHIP BETWEEN CLIMATE CHANGE AND NATURE PROTECTION?

Since it is the committee of the Framework Convention on Climate Change, the Intergovernmental Panel on Climate Change (IPCC), set up in 1988 by the United Nations Environment Programme and the World Meteorological Organization, has the task to assess the risks of global warming on the basis of scientific principles. Various emission scenarios drafted by the IPCC show some possible developments of climate in the future. Based on each scenario (from complete cessation of greenhouse gas emissions to "business as usual") a global temperature increase ranging between 1.1 and 6.4°C is expected by the end of the century. From a global perspective, we must therefore count on an average increase of 3-4°C by 2100. The most recent studies even suspect a significantly higher warming. As to local developments, it turns out that climate warming will be particularly marked in the Alps. The increase is almost twice as much compared to the global trend (OcCC, 2008). In the history of the earth, climate has always changed, and nature in its wake. However, the speed and size of the current climate warming are extraordinarily high and are thus divergent from previous climate changes.

3.1.1 THE IMPACT OF CLIMATE CHANGE ON SPECIES AND ECOSYSTEMS

Changes in climate conditions are reflected on species and ecosystems. Due to climate change, distribution areas move along climate zones, height and moisture gradients. If there is an average global warming of 3°C in the next 100 years, a horizontal shift of around 600 km from the south to the north or a vertical shift of around 600 meters in height will be expected in the northern hemisphere. Experts assume that some species cannot manage such migrations with respect to the speed of the current climate change. Most woods expand at a speed of around 100 km in 100 years, many Alpine species grow 50 meters further up in 100 years and some grass species in the Alps reposition themselves

Figures 1 and 2:
Extreme high altitude species, *Ranunculus glacialis* (left) and *Androsace alpina*, according to the results of the research project Gloria are already displaying a retreat today.

by a mere 4 metres in 100 years (www.gloria.ac.at). In addition to this spatial shift, it is expected that species will change their genes, aspect or behaviour. Reactions of the species to climate change will be very different and are hard to foresee at the moment.

Climate change will produce winners and losers among plant and wildlife species. Mountain areas are particularly sensitive and will incur the highest losses in species. Species and ecosystems in mountain areas, especially in the higher areas of the Alps, are often durable and have special requirements and no chance of escaping (as per above). The way flora and fauna change as a consequence of climate change has been examined by international projects such as GLORIA (Global Observation Research Initiative in Alpine environments). GLORIA is a project for the establishment of a worldwide network in which long-term data on plants and temperature are gathered, in order to estimate future trends in species' variety and temperature. According to GLORIA, it has already been determined that some plant species have moved around 15 meters higher.

The "Flora Alpina" features 4491 plant species in the Alps, 501 of which are endemic. Therefore the Alps are the richest floral region in Central Europe. At the same time, they are most strongly impacted by climate change. According to current models, 45% of the Alpine species are threatened with extinction by 2100.

If, in the near future, there is no expansion and connection between currently existing protected areas, and if the variety of species outside these areas is not protected, a large number of species from certain regions will disappear or even be globally threatened with extinction.

Climate change also affects ecosystems: for the last 150 years, glaciers have been retreating in the Alps (according to Bundnaturschutz Bayern: 52% in surface area and 60% of the mass). This endangers, for example, the flow of Alpine rivers (see also compact Water). Low water levels and further hydrological changes lead to serious changes in the ecosystems of watercourses. Fish species in the head waters are increasingly endangered. OcCC/ProClim (2007) predicts that by 2050 watercourses in the Swiss Alps will have warmed by 2°C compared to 1990. This means that the habitats of cold water fish may shrink by 20-25%. Also the situation of meadows and wetlands and their ecosystems changes along with that of rivers.

Climate change requires quick action since ecosystems are slow to react. Scientific bases are sufficient, there is no reason to wait any longer!

3.1.2 CLIMATE CHANGE: A CHALLENGE FOR NATURE PROTECTION

Not only does climate change have an impact on species and ecosystems, but also climate measures in the various fields of activity. The current debates on climate focus less on the containment of high energy consumption and more on the attempt to replace fossil energy sources

with renewable energies. If this road is taken, direct effects on nature and therefore also on nature protection must be assumed. For renewable raw materials to be made available as energy sources, agricultural land must be expanded or exploited more intensively. Extensively cultivated lands and protected natural areas would therefore be massively reduced. Even though more electricity can be produced from water power, this could have serious consequences for the ecosystems concerned if this means further reducing the quantities of residual waters or if watercourses which have so far had a natural character I are affected by new plants for the production of electricity. A series of technical solutions to adapt to climate change such as high water protection or snow cannons show a highly dangerous potential for nature. Even changes in land use as an indirect consequence of climate warming can exert a negative effect on biodiversity.

3.1.3 NATURE PROTECTION MEANS CLIMATE PROTECTION. THE EFFECTS OF NATURE PROTECTION ON CLIMATE CHANGE

Against the backdrop of climate change, the role of intact ecosystems is more significant than ever in the past, since they react more flexibly and dynamically to climate changes and, as reducers of organic carbon, they can improve the balance of greenhouse gases. As a consequence, nature protection can contribute at the same time to climate protection. Growing bogs and fens and forests can store carbon dioxide (CO_2), and an agriculture compatible with nature releases essentially less CO_2 than intensive agriculture. Renaturation and reactivation of rivers, meadows and wetlands as well as the improvement of the hydrologic balance of the landscape can soften the negative consequence of increased rainfall extremes also for people. The forest has always offered protection from natural hazards such as landslides, landslips and high waters. With climate change these dangers increase, so that well-functioning protection forests become increasingly significant (see also compact Forestry).

3.2 CLIMATE MEASURES IN NATURE PROTECTION

There are two essential strategies to approach the consequences of climate change: reduction and adaptation. Both strategies are necessary, they integrate with each other and their objective is to reduce the consequences of climate change on humans and ecosystems.

REDUCTION refers to the net reduction of greenhouse gas emissions and to protect and optimise CO_2 production by means of the management of habitats and areas. As an example, woods and wetlands can provide a fundamental contribution to the elimination and storage of CO_2.

ADAPTATION to climate change can occur naturally through the systems themselves, or can be supported by man, in order to avoid unwanted consequences. Adaptation measures can reduce the susceptibility of the system affected, strengthen affected systems or provide new chances. The relevant measures are often site- and sector-specific.

Table 1 shows the range of nature protection measures and whether the individual measures provided some contribution to reduction or adaptation.

Table 1:
Nature Protection Measures for the Reduction and Adaptation to Climate Change

REDUCTION	ADAPTATION
Extensive cultivation of old woods	Renaturation of watercourses
Renaturation of bogs and fens	
	Conservation and restoration of nature-near habitats
Sustainable land use	Ecological corridors
	Minimisation of landscape fragmentation
	Ensuring multiple gene pool
	Creation or expansion of protected areas
	Structure richness, wildlife areas

Source: Berry et al. 2008

In Nature protection there are three different types of measures that contribute to climate protection or to adaptation to climate change::

- Measures for preserving or creating natural CO_2 reducers and for reducing the emission of greenhouse gases
- Ecologic measures for protection from natural hazards
- Measures for adaptation to the shift of climate zones

3.2.1 PROMOTION OF NATURE PROTECTION MEASURES

One of the most prominent promotion instruments for nature protection is LIFE-Nature. With this programme the EU supports measures for the conservation or restoration of threatened habitats (among which pristine or strongly threatened landscapes such as alluvial forests, bogs or xeric grassland). LIFE-Nature helps implement the Habitat Directive and the Birds directive as well as creating the Natura 2000 European network of protected sites. The EU supports measures for the protection of nature by means of considerable funds also through the European Development Programme for Rural Areas (ELER).

At national and local level there are also promotion programmes that support the implementation of nature protection projects. In Bavaria for example, 12 million Euro have been earmarked for four years for the renaturation of bogs and fens.

Most climate relevant measures in nature protection were originally not conceived as a reaction to climate change, however they reduce stress factors for flora and fauna. Ecosystems can this way better react to climate change.

MEASURES TO MAINTAIN NATURAL CO_2 SINKS AND TO LIMIT GREENHOUSE GAS EMISSIONS

If ecosystems absorb more CO_2, than they release in the atmosphere, then they act as so-called biological carbon reducers against global warming. Alongside technological processes such as the “permanent disposal“ of CO_2 in the sea, the utilization of CO_2 sinks is the only opportunity to quickly lower CO_2 content in the air (Speich 2009). Incentives have been created through the climate convention and the Kyoto Protocol to maintain and strengthen such carbon reducers. According to the Kyoto Protocol, carbon reducers can be included in the national greenhouse gas balance. The most significant current carbon reducers are forests, whose biomass and humus production on the whole is increasing, as well as active bogs and fens (Margraf et al. 2008).

The focus of environmentally friendly nature protection measures lies above all in the reduction of the release of greenhouse gases which are bonded in the biomass.

FOREST CONSERVATION AND REFORESTATION

In the forest, living biomass, dead wood, the soil in the humus layer and – to a lesser extent – straw store large quantities of CO_2. The function of woods as CO_2 sinks can be increased by abandoning their use or making them extensive. An extensively utilized forest contains far more superficial biomass and dead wood than an intensively used one (Grigal 2000). In

particular the stage of turning forests used up to now, which are low in resources, into unutilised forest reserves which are rich in resources, is an especially effective CO_2sinks. On the whole, if half of woodlands in Switzerland (approx. 1.27 million hectares) were taken away from wood utilization and used as CO_2 reducer, no less than 1 million tons of CO_2 per year could be stored. However, the performance of the reducer gradually falls as time goes by, until in a few hundred years, in a durable situation similar to the original forests, a theoretically neutral balance is reached between absorption and release of CO_2 through the decomposition of biomass (Speich 2009).

Currently, forest conservation and reforestation are clearly amongst the most cost-effective means, with costs between € 2 and € 6/t CO_2, to avoid greenhouse gases on sites with the lowest cost creation or to bond CO_2 (Michaelowa et al. 2008). Speich (2009) has calculated that a forest which is no longer utilized for forestry reasons generates an economic profit one hundred times higher than with conventional use. So far, in the political debate on forestry and nature protection, the outstanding climate and nature protection performances of the woods have been considerably undervalued with respect to their other functions such as wood use. In particular, peripheral regions with very wild forest areas could also economically profit from the contribution of the forest to climate, if its performances were remunerated accordingly.

From the viewpoint of nature protection, reforestation projects should be directed in such a way as to promote biodiversity including genetic diversity as well as variety in structures. So far however, with respect to climate change, in the northern Alps allochthonal species have been planted — for example the Douglas fir, since it can better stand drier sites compared to local conifer woods. In the future, this might represent a serious issue with respect to biodiversity. In the selection of species, indigenous solutions should therefore be chosen, and plant species such as beech, oak or silver fir. For further details: see compact Forestry.

Figure 3:
Measures towards a natural cultivation increase the storage function of the forest. More information in CIPRA compact Forestry.

Figure 4:
The wetting of degraded swamps provides a significant contribution to climate protection and generates synergies such as the protection of biodiversity.

CONSERVATION AND RENATURATION OF MARSHLAND

Active bogs and fens are the most important carbon reducer inland. Their loss dramatically enhances global warming. In order to contrast this, the functionality of these ecosystems must be preserved and the performances they deliver must be monetised.

Bogs and fens cover only three percent of the Earth's land but they store twice as much carbon as in the forests overall. Intact bogs and fens forming peat currently bonds with between 150 and 250 million tons of CO_2 per year worldwide (on average approx. 500 kg CO_2 per hectare/ year). Such enormous carbon storage potential is based on the fact that plants grow in an environment saturated with water and dead plant pieces are largely turned into peat. Carbon removed from the plant remains preserved in intact bogs and fens (Succow, 2008, SCNAT 2008).

The problem of our age is that, in many sites that we excavate very rapidly, we burn the carbon stored in the bogs and fens and therefore reintroduce it in the circle of the earth. In addition, by means of drainage we destroy those bogs that are still growing. In draining bogs and fens, oxygen penetrates into the peat body and, through peat mineralisation, large quantities of carbon dioxide are released. Every year, drained bogs and fens worldwide release around three billion tons CO_2 into the atmosphere. Therefore, these ecosystems have a dual significance for the CO_2 debate: while growing bogs and swamps bind carbon dioxide, they release the carbon dioxide compounds that have been created over very long periods. So far, once they are drained, current climate balances have given scant attention to these developments, but it is essential to ensure functional bogs and swamps and to return water to these ecosystems (Succow, 2008).

In order to bring water back, draining basins can be closed and dammed up, forms of use can be changed and care actions such as the removal of new shrubs and trees can be performed (Kohler and Heinrichs 2009). These measures also have a positive effect on biodiversity. After the rewatering, autochthonous flora and fauna settle anew, among them also the species such as the colias palaeno and the moor migrant hawker, which are particularly threatened by climate warming (Bund Naturschutz 2008).

It must be taken into consideration that, by increasing the water level and bringing back water, while CO_2 is bonded, at the same time methane is released – like CO_2 one of the most significant greenhouse gases. The quantity of methane released can differ considerably based on the performance of the action and on the site. With an amount of 16,000 sq km of bogs and fens in Germany, an assumed amount of 5% of intact or rewatered bogs and fens naturally releases around 24,000 tons of methane every year. In comparison: economic activities in Germany generate yearly emissions of 6.1 million tonnes of methane. Of these, 1.8 million tonnes can be attributed to agriculture.

EXTENSIVE LAND USE

Extensive land use compatible with climate and nature with adjusted fertilization and protection of the soil reduces CO_2 release. Ecologically compatible forms of land use (for example, environmentally friendly agriculture) release fewer climate-harmful gases. Organic plant cultivation requires less than half the energy of traditional cultivation methods (abandonment of energy-expensive mineral nitrogen fertilizers, lower additional feedstuff purchase, etc.). Multiple gene pools instead of monocultivations can, in addition, react more flexibly to climate change (Margraf et al. 2008). At the same time, extensively cultivated areas are significant elements in an ecological network. Details regarding extensive land use and its effects can be found in compact Agriculture.

3.2.2 ECOLOGICAL MEASURES FOR THE PROTECTION FROM NATURAL HAZARDS

With regard to future climate conditions, natural hazards will become a central issue. Intact ecosystems can give a significant contribution to reducing the consequences of extreme weather events for humans.

REVITALISATION OF RIVERS, STREAMS AND MEADOWS

Near-natural watercourses with large meadows are more dynamic and can therefore fulfil their different functions better than derelict rivers and streams. Sufficiently large high water areas can cushion high water peaks. For this reason, the revitalisation of watercourses is not only an ecologically reasonable measure, it also contributes to adaptation to climate change. There are many possibilities for revitalising watercourses: varied structuring of sections, enlargement of riparian strips and water meadows by moving back dams, networking with ground waters and side channels, etc. For further details see compact Water.

The EU Water Framework Directive (2000/60/EU; WFD) defines the environmental objectives for all European surface watercourses and for ground waters. It came into force in 2000 and is now implemented by the EU member states, aiming to ensure that, within no more than 15 years, the surface waters and ground waters will be in good condition.

Figure 5:
Renatured and reactivated rivers buffer increasingly extreme rainfalls, attributed to climate change. More information in CIPRA compact Water.

CONSERVATION AND RENATURATION OF BOGS AND FENS

Renatured or near-natural bogs and fens as well as other intact wetlands are high-value “rainwater retention storages“. By means of renaturation measures this increased water storage capacity has positive effects on the environment

Intact bogs and fens can store immense water quantities, since their pores are much coarser than those of degenerated wetlands. Discharge curves after heavy rains show that the discharge peaks from a cultivated, open moor are around four times higher than from a near-natural open moor (Zollner and Cronauer 2004).

EXTENSIVE CULTIVATION OF GRASSLAND, PASTURES AND FORESTS

In many places vegetation significantly contributes to stabilise the soil. Forests ensure a natural basis of life and protect from natural hazards. They offer protection from landslides, slow down rockfalls, landslips and erosion, and stabilise steep slopes (Rickli et al. 2004). Also varied communities of plants, which are present in natural pastures, meadows and forests, consolidate the soil with their roots and protect from erosion and shallow landslips. At the same time they improve water retention in case of heavy rain, thus reducing the discharge of waters on the surface of the soil (BFW 2005). If pastures, meadows and forests are extensively cultivated and natural development processes (succession) are taken into account, this stabilises the ecosystems concerned.

3.2.3 MEASURES TO ADAPT TO THE SHIFT OF CLIMATE ZONES

Climate change can have unpredictable and surprising effects on individual species and ecosystems because of the complex ecological interactions. Distribution areas move clearly along climate areas, as well as height or moisture gradients. Different strategies of networking of habitats from global to local level must make these shifts possible.

Against this background, the concepts of classic nature protection are no longer sufficient, since, up to now, it has focused on protected areas as “Islands“ for the conservation of biologic variety. Future-oriented nature protection must strive for a functional networking of large and small protected areas and complex habitats, while an ecological network is protected or even created.

Within the framework of the Pan-European Biological and Landscape Diversity Strategy, the Pan-European Ecological Network was established (PEEN), which at the moment consists of numerous initiatives for the setting up of national, regional and transregional ecologic networks.

In past years networking activities have emerged, which focus especially on the Alpine area, in particular the Ecological Continuum Initiative, the ECONNECT project, as well as the “Ecological Network” platform of the Alpine Convention.

The most significant measures for adaptation to the migrations of wildlife and plants are as follows:

LINKING PROTECTED AREAS AND COMPLEX HABITATS

Landscape elements such as corridors or stepping stones, which can support the networking of habitats, play a decisive role in the planning of nature protection (Dramstad and Gillilan, 1996). It is recommended that large connection areas be created instead of narrow corridors, since migration paths can change according to the various species. If conditions inside the protected areas are no longer appropriate, UNESCO in its “Man and Biosphere” Programme recommends the creation of buffer zones, which can accept migrating populations. For this strategy to work, the buffer area must be sufficiently large.

Based on local situations, measures in various sectors are necessary in order to improve the ecological networking of protected areas and complex habitats. Alongside nature protection, significant fields of action are for example agriculture, forestry, hunting, tourism, spatial planning, transport, water management and environmental education (see Kohler and Heinrichs, 2009: Catalogue of measures on www.alpine-ecological-network.org).

Figure 6:
In order to link living areas, it is necessary to overcome various barriers: alongside the ecological and legal obstacles, also the barriers between the various sectors and in the minds of people.

NATURE-SUSTAINABLE LAND USE OUTSIDE PROTECTED AREAS

In addition to measures in protected areas, land users outside protected areas should be offered incentives for judicious use. This increases the chance for species to find adequate conditions extensively and to move their habitats in response to climate change (Berry et al. 2008).

EXPANSION OF PROTECTED AREAS OR CREATION OF NEW PROTECTED AREAS

Protected areas can only contribute in the long term to the conservation of biodiversity if they are configured in such a way that the consequences of climate change as well as of “Global Change“ in the widest sense are sufficiently taken into consideration. In nature protection institutions there are accumulated needs, when strategies are sketched, nature protection plans are newly drafted or management tasks are defined for protected areas. Even though it is not yet possible to foresee all the consequences

of climate change, the data base is good enough to act now in a prescient manner.

Large buffer areas which surround large protected areas could be able to absorb future changes. However, in large parts of Europe, protected areas are on the one hand too small, and on the other hand their surroundings are too much utilized by man. New protected areas should also be established in low traffic and non-fragmented spaces. Static protection of individual species is, however, an obsolete concept.

3.3 CONFLICTING GOALS: HOW CAN NATURE PROTECTION REACT SUSTAINABLY TO CLIMATE CHANGE? WHAT CONFLICTS MAY EMERGE?

Possible conflicts between nature protection and climate protection derive, on the one hand, from the fact that nature protection measures in some cases may have a negative effect on individual aspects of sustainability; on the other hand, nature is very often negatively impacted by the consequences of climate measures from other sectors.

3.3.1 NEGATIVE CONSEQUENCES OF NATURE PROTECTION MEASURES ON THE ENVIRONMENT, ECONOMY AND SOCIETY

Since, in nature, interactions are extremely complex and nature protection measures are often directed towards a specific goal (for example, the conservation of a certain species), nature protection measures may also bring disadvantages for other species of a biotope.

Furthermore, nature protection measures can trigger economic and social conflicts. In a productive and well developed forest, conflicting targets between reducer performances and wood production are to be expected. It is possible to avoid them if the locally different economic relationships are taken into consideration. This way may also open new opportunities for biodiversity: in badly developed forests which cannot be used in a cost-effective way, the reducer function can come to the fore if it is financially more attractive. This should be the case for many remote areas, in particular in mountain regions (SCNAT 2008).

A significant conflict is the LOSS OF PROFITS FOR FARMERS AND FOREST MANAGERS. If farmers and forest managers give up part of their profits or of their areas to the benefit of nature protection, as for example in the case of ecological networks or in the event of bog and fen renaturation, they need corresponding compensation. The present financial promotion possibilities of the EU and of the various countries do not cur-

© CIPRA International

© Nationalparkverwaltung Berchtesgaden

Figures 7 and 8:
Exploitation or storage performance? More information in CIPRA compact forestry.

rently offer sufficient reimbursement and should urgently be improved.

If protected areas are established or expanded or ecological measures are carried out outside protected areas, there often emerge CONFLICTS WITH THE WAY OF LIFE AND ECONOMIC STRUCTURE of the people who live there. Nature protection regulations are often ignored or even opposed, since these are felt as measures imposed from the top, which do not take sufficient account of traditional ways of life and economic structures (see Pfefferkorn et al. 2006a).

In addition, the affected population is often not appropriately involved when protected areas are planned, established or expanded. Conflicts usually arise from this. In the project "Future in the Alps", CIPRA has shown how such conflicts can be reduced by means of new forms of decision-making process or at least can be dealt with in a constructive way (see Pfefferkorn et al 2006b).

3.3.2 THE CONSEQUENCES OF CLIMATE PROTECTION AND ADAPTATION MEASURES ON NATURE

Many well conceived climate measures from other fields of activity (for example energy production, transport, water management) can have negative consequences on biodiversity and can also endanger ecosystem functions.

Conflicts between climate protection and the conservation of biodiversity exist above all in the field of renewable energies. The boom of biogenous fuels and the connected increase in areas that are used for the cultivation of energy plants, must be assessed as particularly critical, first of all with respect to the hunger issue — in particular in southern countries (Umweltinstitut Munich 2007). The rocketing expansion of areas also has negative consequences on biodiversity: intensification of agricultural production, loss of green areas and the expansion of cultivated areas. Biogenous fuels deserve support only if they are not in competition with the production of food and when they can be produced in an ecologically sustainable way. Corresponding certification systems on the basis of life cycle assessments are currently being developed.

Also, a possible increase in electricity production from water power can have significant consequences for the ecosystems affected if, because of this, residual water quantities are further reduced or hitherto near-natural watercourses are dismantled (see with respect to this, compact Energy). Furthermore, the production of wind energy represents an ecological conflict, since pumped storage hydro power stations must be constructed in order to store the electricity from wind power stations which is not constantly available.

Since high water events become more frequent as a consequence of climate change, more extensive adaptation measures are necessary. If hydraulic engineering measures are taken, which considerably change the natural water flow (straightening, riparian control structures, channelling projects), there are conflicts with the protection of the ecosystems of the watercourses. For a sustainable high water protection – particularly as regards climate changes – restraint spaces must be preserved and the necessary space along rivers must be ensured. From an economic viewpoint it is more cost-effective to take such prevention measures than later to reimburse high water damage to buildings and infrastructures (SCNAT 2008).

Figures 9 and 10:
Renewable energies on the test bench: Measures are taken in the name of climate protection which can damage the natural balance.

4

CONCLUSIONS

NATURE PROTECTION IS CLIMATE PROTECTION

The main objective of nature protection is to ensure biological variety, intact ecosystems and their manifold functions. Intact ecosystems contribute to climate protection and can better adapt to climate change.

A WIDE RANGE OF NATURE PROTECTION MEASURES WITH AN IMPACT ON CLIMATE

There are various nature protection measures, for the protection of species variety, for the maintenance or recovery of natural living environments and for the connection of individual living areas with ecological corridors:

Bog and fen protection, watercourse renaturation and intact forests are not only measures for nature protection, but at the same time they represent a significant contribution to climate protection and to adaptation to climate change.

Measures for the promotion of storage performances and also the prohibition of the release of carbon from rural ecosystems can provide an essential contribution to climate protection in future decades (Fischlin 2008). For this reason, nature protection measures such as forest preservation, forestation and the wetting of bogs and fens are particularly significant and must be sufficiently rewarded.

One of the most significant responses to changed climate conditions should be the setting up of a functional ecological network. Protected areas should be provided with buffer areas and networked. The impact of barriers such as roads, watercourse control structures and intensively utilized fields for agriculture and forestry purposes must be reduced. The consistency of rivers must be improved , quantities of residue waters must be increased and all their ecological potential must be reactivated.

Nature protection measures with an impact on climate must be carefully planned and implemented, otherwise well thought interventions may lead to conflicts. The population concerned must be involved.

CLIMATE MEASURES IN OTHER SECTORS CAN HAVE NEGATIVE CONSEQUENCES FOR NATURE

Particularly thorny from the viewpoint of nature protection are climate measures in the field of renewable energies, for example the intensive land use for the production of biofuels, the further expansion of hydroelectric power stations, etc. But also technical measures for the protection from natural hazards or forestry measures such as the inclusion of non local tree species can bring with them negative ecological consequences.

LEGAL FRAMEWORK AND PROMOTION MEANS MUST BE OPTIMISED

Nature protection and climate change are challenges which require measures at local, national and international level. Conventions such as the Convention on Biological Diversity, the UN Framework Convention on Climate Change, the Alpine Convention, the Kyoto Protocol and the EU water directive, networks of protected areas such as PEEN, Natura 2000 and the Emerald Network provide an appropriate framework for nature protection measures. However, legal framework conditions are not always sufficient to ensure the creation of ecological networks, especially with respect to cross-border activities.

For the financing of nature protection measures with an impact on climate, there are many promotion instruments available, which are however not sufficiently known.

WE KNOW ENOUGH TO ACT NOW

Climate change requires quick action, since ecosystems react with a considerable time delay. The database is sufficient to take immediate measures for climate protection and adaptation.

However, there is still great need for research and monitoring, particularly with respect to the aspects of nature protection measures which have an impact on climate.

5

GOOD PRACTICE-EXAMPLES

WOODCUTTING FOR BOGS

It is early summer, seven in the morning. A “clack, clack“ noise can be heard through the veil of mist in Ödmoos. Work is already fully underway. An early start is necessary, since later it will be very warm. Stefan lifts his axe and begins to remove shrubs.

Stefan is 23, he studies forestry and works on a voluntary basis at the renaturation of the bog. Bogs as particularly varied habitats have fascinated him since he was a young boy. Now he has become aware that these ecosystems can also provide a great contribution to climate protection. The Ödmoos near Traunstein is one of the many bogs in Bavaria which are already severely degraded. Only one percent of Bavarian bogs are in a natural state. It is necessary to take urgent action!

Stefan and his male and female friends have a common objective: they want to help so that the bog re-grows in areas which are again filled with water. Since only on a sufficient area can the bog provide a significant contribution to climate protection.

Figure 11:
Filling trenches in Ödmoos

Before the volunteers could go to work, the Ödmoos had to be mapped and it was necessary to draw up a plan for the renaturation measures, which envisages that in order to bring water back to place, drainage trenches be sealed and shrubs and trees removed. For the conservation of precious mountain pine bog in Traunstein, special cultivation works will be required also in the future. Stefan and his group of voluntary helpers will regularly remove the growing spruces, birches, Scotch pines and alder buckthorn, since they would subtract water from the bogs soil and disturb the sun exposure of the bog vegetation.

By means of targeted public relations, excursions and lectures, the knowledge, value and success of the measures in Ödmoos must be disseminated as much as possible. Stefan’s sister Lina, for example, has come to know many interesting things with a group of young people during an excursion about this special bog habitat, which today only a few others know. Lina is enthusiastic and, when she is older, she also wants to give a

hand to maintenance activities, just like her big brother Stefan. She has a lot of interest in bog plants – her favourite flower is the sundew – and she would like to help personally to ensure they remain.

PROJECT NAME: Bog renaturation in the Bavarian Alps
LEAD PARTNER: Bund Naturschutz in Bayern e.V. (BN) with its groups. Individual measures by other partners, for example clearing of scrub by forestry office, mountain forest project, landscape maintenance association.
DURATION: partially underway since 1978, further continuation time-wise unlimited
FOCUS: reduction of gases affecting climate, bog renaturation, water retention for high water protection

Further information: www.cipra.org/en/cc.alps (de/en/fr/it/sl)

The bog renaturation project in the Bavarian Alps won one of the three main prizes at the cc.alps Competition for an amount of 20,000 Euro.

Figure 12:
An artist of survival: sundew, a typical carnivorous plant of the bogs, looks like a tender reddish rose and grows on moss cushions or also directly on naked peat.

• ROAD MAPS FOR THE GREAT CRESTED NEWT AND CO.

There are maps for nearly everything: roads, railways, building areas, contour lines, and so on. They help people to move around the land. In Grésivaudan valley in the French department of Isère, road maps have recently been produced regarding wandering animals. Not that they would now read such maps. But they are used by humans in order to respect the roads trodden by animals.

This valley on the border between French pre-Alps and the actual Alps used to be a large wildlife passage, which gave animals the opportunity to cross the Isère river and to reach the Vercors, Chartreuse or Belledonne massifs. Now things have totally changed. Because of increasing urban sprawl, intensive agriculture and numerous transport infrastructures, wild animals, along this 70 km long Alpine valley, have just six ecological corridors available on both sides of Grenoble. Not only big animals find it hard. Crested newts from the Grand Lemps nature reserve survive the roads only when they are very lucky. And roads are certainly not the only obstacle. The Grenoble area comprises 500,000 inhabitants, and every year more than 10,000 building authorizations are granted.

Still, in the Isère department the issue has been acknowledged and an attempt has been made to do something. The stronger arguments for urgent action are the inventory of the land development plan and the local inventory of amphibious animals run over, which have been carried out every year since 1996. Politicians, nature researchers, hunters and fishermen, but also spatial planning and infrastructure experts agree: ecological corridors must be conserved and recreated!

The first projects are already underway. More than 400 problem areas have been identified and a cartographic document has been drafted, which defines corridors on an area of more than 7,000 square kilometres. This is a well known size for administrations, local bodies and planning departments. Based on this inventory, ten priorities were defined for the re-creation of connection corridors for wildlife. In the meantime, the whole Rhône-Alpes region, in which the Isère department lies, has supported the promotion of ecological corridors. However, activities in Isère are groundbreaking not only for France but also with respect to the whole Alpine region. Regarding climate change, ecological corridors play a particularly significant role, since they allow species to move when living conditions change. So, for example, crested newts can reach the Grand Lemps nature reserve unharmed.

PROJECT NAME: “Living Corridors“

LEAD PARTNER: Conseil Général du Departement Isère, Environmental Office

DURATION: 02/2009 – 2015

BUDGET: 9 million Euro, co-funded by the EU

FOCUS: Identification of problem areas, creation of ecological corridors, clarification of legal issues, raising the awareness of stakeholders and the population

Further information: “Szene Alpen 90: “Schengen für Fauna und Flora“ (de/en/fr/it/sl)

GRAVEL IN RIVERS, CEMENT IN HEADS

The water flows impetuously through the rocks. It has eroded the rocks for centuries and carries gravel from the Carnic and Julian Alps down to the Mediterranean Sea. As a wild river, the Tagliamento begins its journey from the Mauria Pass, 1200 metres above sea level in the northern part of the Italian region of Friuli Venezia Giulia; at first to the East, then to the south. As a canal, after 170 kilometres, it ends in the Gulf of Venice. On its way, it overcomes many obstacles, changes its bed various times and makes eternal friendships. For example, with Nicoletta Toniutti, environmental scientist from Milan.

The Tagliamento in Friuli Venezia Giulia is a unique river landscape, with many side branches, gravel banks, bushes and islands. Untamed nature, which as such reacts more flexibly and dynamically to climate changes and offers effective protection from high waters. Since the Tagliamento has a lot of space on both sides, it can retain more water and therefore reduce the danger of floods. This represents a significant contribution to mastering consequences of climate change.

However, the last great untamed Alpine river is heading towards an uncertain future. In the middle of its course, three retention basins of 30 million cubic metres must be built. In addition, a new highway is planned, which would dramatically impact the landscape and the river ecology of the upper section. A unique landscape in Europe would be destroyed – and with it part of a 150 square kilometres corridor for flora and fauna, which joins the Mediterranean sea with the Alps. The current efforts to achieve the status as a UNESCO biosphere reserve in Tagliamento are at the moment only theoretical.

Nicoletta Toniutti has been fighting for years against the planned river constructions on the Tagliamento. Successfully, so far. In 1996 she exchanged her well paid job in the private economy with unrewarded voluntary work with WWF Italy, began to research, made contacts with scientist, aroused the expert world, in short: she set up a rescue network for the Tagliamento. Since 2003 Nicoletta Toniutti's job is as the person in charge of Tagliamento for WWF. In the meantime, the "King of Alpine rivers" is a model river landscape in the Alpine area. However, the regional government continues to be in favour of the project for high water protection which has proved useless, and even damaging. Why? Nicoletta Toniutti has some suspicions: gravel is money. And there is much of that in the bed of Tagliamento. Thanks to the river facilities, the densely populated Latisana plain will be officially considered as safe – and land will be sold for more money.

The friend of Tagliamento is not giving up. She continues to coordinate research activities, organizes excursions, submits complaints, drafts

resolutions and petitions. She knows: just left to itself, the Tagliamento will provide a great contribution to adaptation to climate change also in the future. So far, nothing has been actually built, though everything was ready: planning documents, building firms, part of the money. Time was on Tagliamento's side. "Luckily we have an economic crisis – at least for the river."

MAINTENANCE OF THE TAGLIAMENTO, KING OF ALPINE RIVERS

CIPRA published for the first time in 1994 an overview on the hydro-geomorphological status of the Alpine rivers. This gave environmental experts and natural scientists the opportunity to choose Tagliamento as model river landscape and open air laboratory. The river is today one of the most famous in Europe, from a scientific viewpoint as well as with the general public. Through the successful collaboration of science and committed organisations such as CIPRA and WWF the destruction of this unique river landscape is increasingly unlikely.

www.cipra.org/de/alpmedia/publikationen/2314/ (de)
www.wwf.it/client/render.aspx?root=986&content=0 (it)

Figure 13:
Can this unique living area continue to withstand dangers?

A HOME FOR THE CORN CRAKE

When, in the spring, the farmer starts up the mower and cuts the meadows, birds and amphibious animals flee. Only eggs remain, together with meadow breeders such as the lapwing or the corn crake. This is not the case in the cloister meadow in Benediktbeuern. Here grass is cut at the earliest in mid-July or even in the first half of August, when the young animals have already flown.

Such an extensively used green area is of great significance for the habitat compound system because of its richness in species. On the intact meadows and pastures of the cloister land, plants and animals can better adapt to future changes deriving from climate change. In the teaching projects that the cloister organises, youngsters and adults learn the value of intact ecosystems for nature and climate protection.

The cloister land was intensively cultivated for almost a century. Since 1988 there is a new cultivation concept, which is oriented to the principles of sustainability. Extensive cultivation of meadows and pastures means, for example, a later first cut on those areas which are far from the town. Following this new approach to pastures, drainage trenches were dammed in order to bring water back. Canalised streams were re-opened; meadows producing grass for litter were cared for again. Populations of rare species have been rapidly established through such extensive cultivation. Rare birds such as the corn crake, titlark and lapwing use the open, poor and increasingly wet meadows as breeding areas. Endangered grasshopper and admiral species have found their home again. For example, the endangered sooty copper has found a suitable habitat in the meadow cut only once; the population in the cloister land has meanwhile become the largest in Bavaria.

Measures towards extensive cultivation and renaturation on the cloister area are exemplary in the whole nation and can be taken as models also by other regions.

PROJECT NAME: Nature protection and landscape maintenance on cloister land
LEAD PARTNER: Zentrum für Umwelt und Kultur (Centre for the Environment and Culture) Benediktbeuern, Bavaria, Germany. Teaching facility started by the Don Bosco Salesians with innovative offers for the conservation of natural living principles and cultural heritage
DURATION: since 1988 – unlimited
FOCUS: Extensive cultivation of cloister land Benediktbeuern with improvement of hydrologic balance, renaturation of 200 hectares of bogs, creation of the protected area for meadow breeders and of the landscape maintenance project for the integration of straw in contemporary stable-keeping practices.

Further information: www.cipra.org/competition-cc.alps/elisabethwoelfl (de)

• TREES WITH BACKGROUND

The silver fir stands out from the surrounding pines by some forked branches. It has been here for almost five hundred years in the Chartreuse mountains on mossy soil, and it is the only tree at this height which overlooks the Isère valley between Chambéry and Grenoble in the French Alps. Soon however it will make room for tender young shoots, which wait patiently in the underwood for a ray of light, to be able to grow.

The workers of the forestry firm will come and will fell the old silver fir according to all the rules of sustainable forestry management, without damaging the young sprouts and the surrounding pines. They will take the trunk to a nearby sawmill, the next station of the regional wood chain. As is envisaged by century old tradition in Chartreuse.

The silver fir – just like pines, spruces, beechs, oaks and maple trees from the Chartreuse nature park – will bear the AOC label in its second life as timber, as a turned crafts item or as a sitting room table. The controlled term of origin “Appellation d’Origine Contrôlée“, acronym AOC, is a government protection seal for certain agricultural products from France and Switzerland. It ensures that cultivation and production take place consistently in the traditional way and in the region. It ensures jobs and value creation along the whole production chain. And it helps protect the environment through sustainable production processes. Consumers

Figure 14:
Young silver fir

know that with their money they not only buy a product with a specific function, but one with an identity. AOC is a guarantee for tradition, origin and quality.

So far the protected term of origin AOC has been especially known for food and consumption goods such as wine, champagne, calvados, butter, cheese and olive oil. That the managers of the Chartreuse Nature Park, set up in 1995, have claimed the protection seal since 2005 for non agricultural products but for their wood crop is a novelty.

The wood in Chartreuse nature park is a characterizing landscape element. Two thirds of the park area is covered with forests of various species. The AOC quality seal means that the forest can better fulfil its climate and nature protection functions. It is sustainably managed and stores with its large percentage of surface biomass and dead wood significantly more CO_2 than an intensively managed forest. However, it is not only a significant carbon valley, a stronghold of biological variety and a deliverer of quality excellent wood, but it offers the inhabitants of nearby cities Grenoble and Chambéry also a recreation area and jobs.

Forest management and wood processing have a long tradition in Chartreuse. Already in the Middle Ages the wood represented the basis of life for the inhabitants of the Chartreuse. They picked fruits in the forest, hunted wild animals, collected acorns for their pigs, felled wood to build houses, manufacture tools and of course to heat. The AOC protection label represents for the current inhabitants a good basis for the basic idea of the regional nature park: use the forest carefully and further develop the region sustainably.

The AOC protection seal has brought the Chartreuse nature park and its surrounding areas many positive economic and social stimuli; it has contributed to the creation of many new jobs. The demand for wood from the Chartreuse is significant. From sawmills to turners, from wood sculptors to biomass power stations – 120 firms in the region live on the management of the forest and on the processing and marketing of wood. The regional network functions outstandingly, the value creation remains in the region. The old silver fir has also remained. It decorates as a new wood panelling the walls of a guesthouse at the foot of the Chartreuse mountains and offers visitors from close and far away a welcoming hospitality.

AOC protection seal for the wood in Chartreuse nature park, France

Further information: www.parc-chartreuse.net/economie/index.asp (fr)

6

BACKGROUND INFORMATION

- **A current list of links, additional examples and compacts to further themes www.cipra.org/cc.alps (de/en/fr/it/sl)**
- Berry,P., Paterson, J., Cabeza, M., et al. 2008: Minimisation of and Adaptation to Climate change Impacts on biodiversity. Bezug PDF: www.macis-project.net/MACIS-Deliverable-2.2-2.3-Oct.2008.pdf
- BFW 2005: Zusammenspiel von Vegetation & Abfluss. Bundesamt für Wald. http://bfw.ac.at/rz/bfwcms.web?dok=5360 (20.5.2009)
- CIPRA Internationale Alpenschutzkommission 2009: Relevante Instrumente zum Thema ökologische Netzwerke im Alpenraum. Schaan. Bezug PDF: www.cipra.org/en/alpmedia/dossiers/13
- Dramstad, W. E., Gillilan, D. M. 1996. Landscape ecology principles in landscape architecture and land-use planning, Island, Washington, DC.
- Fischlin 2008: Klimaschutz, das Kyoto-Protokoll und der Schweizer Wald. In Perspektiven: Schweiz Z Forstwes 159 (2008) 9: 258–266 Bezug PDF: www.sysecol.ethz.ch/pdfs/Fi131.pdf
- GLORIA (EU, Uni Wien): Global Observation Research Initiative in Alpine Environments, www.gloria.ac.at
- Grigal, D.F. 2000: Effects of extensive forest management on soil productivity. Forest Ecology and Management 138. S.167-185.
- Kohler, Y. und Heinrichs, A. K., 2009: Katalog möglicher Massnahmen zur Verbesserung der ökologischer Vernetzung im Alpenraum. Bezug PDF: www.alpine-ecological-network.org/images/stories/090330dMassnahmenkatalogKontinuum.pdf
- Margraf. C., Frobel, K., BN Landesarbeitskreis Artenschutz 2008: Naturschutz in Zeiten des Klimawandels. InfoDienst Nr. 155, Bund Naturschutz in Bayern e.V.
- Michaelowa, A., Greiner, S., Dutschke, M. 2008: Flexibilität als Grundlage effizienter Klimapolitik. In: Betriebliches Umweltmanagement: Handel mit Emissionsrechten. http://www.betrieblicheumweltmanagement.de/ bum030403.htm (24.5.2009)
- OcCC–ProClim 2007. Klimaänderung und die Schweiz 2050. Bezug PDF: www.occc.ch/products/ch2050/CH2050-bericht_d.html
- OcCC, 2008: Das Klima ändert – was nun? Der neue UN-Klimabericht (IPCC 2007) und die wichtigsten Ergebnisse aus Sicht der Schweiz. OcCC - Organe consultatif sur les changements climatiques, Bern, 47 pp. ISBN: 978-3-907630-33-4
- Pfefferkorn, W., Leitgeb, M., Heckl, F., Gottsberger, T. (2006) a: Partizipation und biologische Vielfalt. Ein Leitfaden für Beteiligungsprozesse bei der Umsetzung der Biodiversitätskonvention. Wien, 2006.
- Pfefferkorn, W., Golobič, M. Zaugg Stern, M., Buchecker, M. (2006) b: What new forms of decision-making are the most promising with regard to sustainable development when it comes to negotiating regional planning demands? Schaan, 2006.
- Rickli C. et al. (2004). Der Wald und seine Bedeutung bei Naturgefahren geologischen Ursprungs. Forum für Wissen WSL 2004, S. 27–34. Bezug PDF: www.wsl.ch/publikationen/pdf/6205.pdf Empfehlungen
- SCNAT– Akademie der Naturwissenschaften Schweiz (Hg.) 2008: Biodiversität und Klima – Konflikte und Synergien im Massnahmenbereich, Bern
- Speich 2009: Bedeutung von Waldreservaten für die Bindung von CO_2 als Beitrag für den Klimaschutz — für ein nachhaltiges Atmosphärenmanagement. Arbeitspapier.
- Succow, 2008: Klimafaktor Moor. Beitrag an der Potsdamer Klimakonferenz 2008. Bezug: www.potsdamer-klimakonferenz.de/potsdamer-klimakonferenz-2006/succow/succow
- Umweltinstitut München e.V, 2007: Münchner Stadtgespräche Nr. 47: StaAgro-Sprit. Bezug PDF: www.umweltinstitut.org/stadtgespraeche/download/m-stadtgespraeche47.pdf
- Zollner A., H. Cronauer, 2004: Der Wasserhaushalt von Hochmooreinzugsgebieten in Abhängigkeit von ihrer Nutzung. LWF-Bericht Nr. 40 Hochwasserschutz im Wald