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Austria

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AUSTRIAN NATIONAL REPORT

1. Integrated forest and water management of mountain watersheds in Austria – basics and facts

As one of the most richly forested areas in central Europe – after all 47% of its land area is wooded – Austria places a special value on this natural resource. Many species and habitats depend, either directly or indirectly, on the sustainable management of the country's forests. Thanks to a programme of near-natural sustainable forest management, which Austria has backed with its forestry act, all functional and ecological needs of forest ecosystems are taken into account, and the conservation of Austria's forests is assured.

Indeed, forests are also indispensable for the protection of living areas in Austria and their protective function is of enormous, ever increasing economic significance. About 67% of the total Austrian territory area is part of a torrent and/or avalanche catchment (about 12.000 torrent catchments and nearly 5.000 snow avalanche paths). Thousand of settlement areas and infrastructure facilities in Austria are protected against natural hazards (like debris flows, sediment disasters, snow avalanches, erosion and landslide events, rockfalls etc.) by forests what causes major strategic planning on a national and regional level in order to manage these forests effectively and to maintain their protective functionality. For many centuries, the Alpine region has been settled and managed in harmony with the elements, and using the protective function of forests is one of these traditional mitigation measures. Integral water and forest management is therefore an essential part of an overall strategy to guarantee the high standard of quality of life in Austria.

The most important problem related to the management of mountainous watersheds from a forest and water management point of view is – beside the notable impacts of Climate Change especially in the Alpine range - ageing protection forests and lacking regeneration. According to the results of the Austrian Forest Inventory (ÖWI 2000/2002), there is a very high need for regeneration in the productive protection forests: Regeneration is necessary in 2/3 of the area, but there is no regeneration present in 70% of the area. In the non-productive protection forest, on the other hand, only one quarter of the area requires regeneration. However, in 80% of the cases there is no regeneration present. Only 59% of the protection forests are classified as "stable", 33% as "stable to susceptible" and 8.3% as "critically susceptible to unstable" with a steady tendency. The inhibiting factors that obstruct an adequate regeneration include, for example, too dense ground vegetation, erosion, browsing or forest pasturing.

The following present policy / key drivers are shaping the landscape for policy development and implementation with regard to water and forest management in Austria:

- Development of a national Climate Change Adaptation Strategy
- Implementation of the EU Floods Directive (2007/60/EC)
- Implementation of the EU Water Framework Directive (2000/60/EC)
- Implementation of the Alpine Convention Mountain Forest Protocol
- EU - Green paper on Forest Protection and Information in the EU: Preparing forests for climate change
- Duties in the frame of FOREST EUROPE (previously known as MCPFE)
- Implementation of the UNFF8 outcomes

- Activities related to UNESCO - International Year of Biodiversity
- Shortage / limitations of financial resources

2. Legal and organisational framework related to forest and water management

The Forestry Act provides the legal framework for the management of all Austrian forests. To ensure sustainability, it provides for numerous management restrictions and stipulations, such as the requirement for certain measures to be authorised by the forest authority. Even more stringent regulations apply to the protection forest. Under the Forestry Act, forest enterprises are not required to draw up management plans. In practice, however, management plans, so-called operates, are used as a basis for management measures by all larger forest enterprises. These operations are usually updated or revised every 10 years in the course of a forest establishment.

Forest land use planning as set out in the Forestry Act provides for three planning instruments for the presentation and forecasting of forest conditions:

- Forest Development Plan
- Hazard Zone Maps, and
- Forestry Plan.

Whilst the former only have an indirect influence at the forest enterprise level, the Forestry Plan offers forest owners a possibility to present and plan certain technical fields within their own sphere of interest. To check sustainability at the regional and federal level, a number of monitoring instruments are available. The most comprehensive instrument is the Austrian Forest Inventory, but other surveys such as the annual timber harvest report or the test operation grid, which provides information about the earnings situation in forestry, also provide an important decision-making basis for forest policy in order to ensure sustainable management of the Austrian forest.

With regard to “protection forests” which play a vital role especially in mountainous regions, the Austrian Forestry Act place these forests under special protection, and the owners of protection forests must “manage them in such a manner under the local conditions that their preservation as a stable vegetation with a strong inner structure and timely regeneration is guaranteed”. Since the 2002 amendment, the Act makes a distinction between “site protection forests” and “object protection forests”. The category “site protection forests” includes forests whose site is threatened by the erosive forces of wind, water and gravity, and which require special treatment to protect the soil and growth, as well as to ensure reforestation. On the contrary, the category “object protection forests” newly introduced with the Forestry Act Amendment in 2002 includes forests that protect humans, human settlements, facilities or cultivated land in particular against natural hazards or damaging environmental impacts, and which require special treatment in order to achieve and safeguard their protective function or their welfare function

The Austrian Water Act regulates when the use of water (including spring water and groundwater) requires an authorisation. Authorisations can only be granted subject to the preservation of sustainable water use and third-party rights. The Water Act does not specify who may utilise the water, although the utilisation of groundwater and spring water by third parties always requires the permission of the land/forest owner. The provision of a public water supply as an essential service is seen primarily as a communal responsibility in Austria. The utilisation of (drinking) water as a commodity is a very sensitive socio-political issue in Austria; further steps towards marketing the water will therefore require a careful approach and must comply with the parameters of ecological sustainability. It is of high relevance to illustrate the connection between forest management and the supply with high-quality water and to increase people’s awareness of the value of water as an economic asset. At present, only a small part of Austria’s water resources is exploited, and there is a

vast potential for development. However, until now the forest owners have hardly succeeded in earning significant revenues from the exploitation of water.

3. The Austrian Forest Engineering Service for Torrent and Avalanche Control (WLV) – contributing to integral water and forest management

Mitigating natural hazards in Austria and more over in the Alps has a long tradition (e.g. the Austrian Forest-Engineering Service for Torrent and Avalanche Control celebrated its 125th anniversary in 2009), which build the basis of services of public interest in these regions. Emanating from conventional mitigation concepts (like the system of forest-technical torrent and avalanche control) – which aimed at decreasing both, the intensity and the frequency of events by implementing permanent measures in the upper parts of the catchments to retain solids from erosion and in the release areas of avalanches (and supplemented by silvi-cultural efforts to afforest high altitudes) – a more sophisticated approach has been implemented since the 1970s aiming at the deflection of natural hazard processes into areas not used for settlements. A fundamental change in the mitigation strategy applied in Austria has been recognised in the last few years, depending on the evidence that conventional technical measures against natural hazards are not only very cost-intensive in construction and maintenance, and that the feasibility of technical structures is restricted due to a scarceness of financial resources provided by responsible authorities. Moreover, and considering a increasing number of catastrophic events that were not prevented by any incentives and efforts to improve the protection strategy system, it has to become clear that conventional technical measures do neither guarantee reliability nor complete safety and a residual risk of damage to buildings, infrastructure and harm to people still remains. To cover these challenges an integral risk management strategy is subject to be implemented in Austria, with the overall focus on building natural hazard-related resilient communities. With this approach, Austria is following international ambitions to move away from “natural hazard defence” towards “risk management of natural perils”, with a focus on managing the consequences of these hazards and risks.

Considering these challenges and implementing protection and mitigation concepts especially in mountainous areas is a core task of the Austrian Forest Engineering Service for Torrent and Avalanche Control (WLV). As a matter of principle, WLV pursues the concept of a meaningful combination of protective forest biology, engineering and land-use planning measures within the scope of comprehensive natural hazard management. The tasks include the planning, implementation and maintenance of active protection measures, hazard zone planning, consulting and expert activities, as well as support for the catchment areas. Thereby, public funds from the Disaster Fund are available within the meaning of preventive protection. In the course of time, the protection measures in the catchment areas of torrents and avalanches have developed into integral management concepts that permanently include technical and forest biology measures, and most recently also temporary measures. The protection concepts not only comprise active measures, they are also aimed at controlling other spatial utilisations within the catchment area (catchment area management). With implementation of the EU Water Framework Directive as well as the EU Floods Directive, the perspective has to be raised to the level of larger hydrological units (river basin management).

WLV also develops surface management projects for the rehabilitation and safeguarding of mountain forests with a protection function together with the provincial forest inspection services and the provincial Chambers of Agriculture in consultation with expert engineering consultants and engineering offices. The measures are implemented mainly by the forest owners, many of whom belong to the mountain farming population. In 2006 measures were implemented in a total of 192 surface management projects with a total of EUR 15.3 million in funds.

4. "Protection through Forests Initiative" – example of a successful forest and natural hazard management instrument

The "Protection through Forests Initiative" (Initiative Schutz durch Wald – ISDW) that was called to life nationwide in 2007 serves to safeguard and improve the protection function of forests. This protection against natural hazards is achieved predominantly with predefined silvicultural measures that can be supplemented by accompanying technical measures where and to the extent necessary. It was developed in close cooperation between BMLFUW and experts from the provincial and district forest inspection services, the Forest Engineering Service in Torrent and Avalanche Control (WLV), and with scientific support from the Federal Research and Training Centre for Forest, Natural Hazards and Landscape (BFW). Within the scope of the national rural development programme (EU Regulation), implementation of the programme will be supported with about EUR 5.7 million per year. This initiative is in continuation of the Austrian Protection Forest Strategy and implementation of the Alpine Convention Mountain Forest Protocol.

In order to reach the set targets, the "Protection through Forests Initiative" is following a uniformly defined development and approval procedure that guarantees the necessary planning security and a transparent deployment of funds at all levels from framework and detailed planning through implementation of measures on the individual forest site to the final evaluation. Framework planning at the regional level is implemented in the so-called "district framework plan", which is developed jointly by the responsible forest authority and the Forest Engineering Service in Torrent and Avalanche Control. Once these framework plans have been approved by BMLFUW, the detailed projects are drafted and approved by the provinces. Building upon the individual district framework plans, the concrete proposals for action for the relevant forest surface/project area are then proposed by the project applicants in close coordination with the land owners and an implementation plan (taking in particular the costs to be calculated and the timeframe into account) is defined (= detailed projection). The planned implementation follows the project manual and is evaluated concomitantly. In order to ensure rapid approval and project progress as well as the most up-to-date information about the status of planning for all the authorities, forest owners and planners involved, a special user-friendly database with the appropriate background information has been established for the initiative. The provision of central background information for the interested public is forthcoming. The database links existing data from forest land-use planning with data from the federal surveying office. It is updated regularly, and in addition to the relevant planning and approval status it also includes an abundance of additional technical information.

More information available at http://www.isdw.at.

5. International co-operation and research activities related to integrated forest and water management in mountainous watersheds

Since mountain forests and watersheds are faced with similar problems and framework conditions worldwide, Austria is also committed to the development of joint strategies for a sustainable improvement of the condition of mountain and protection forests, as well as their protective function against natural disasters, at the international level. In addition to the protection forest efforts within the scope of FOREST EUROPE (previously known as MCPFE), the European Union or the Alpine Convention, Austria is/have been also participating in international research projects and information exchange activities. As examples may serve

- European Territorial Cooperation 2007-2013, Alpine Space programme, **MANFRED** - Management strategies to adapt Alpine Space forests to climate change risks
- European Territorial Cooperation 2007-2013, Alpine Space programme, **Alp-Water-Scarce** - Water Management Strategies against Water Scarcity in the Alps, http://www.alpwaterscarce.eu/
- INTERREG action Bavaria – Austria, **SicALP** (Site protection in limestone alps by means of forest regeneration measures)
- INTERREG-IIIC project "**Network Mountain Forest**", finalised in the end of 2009, http://www.network-mountain-forest.org/
- INTERREG-IIIB Alpine Space project "**:nab – Natural Potential of Alpine Regions**", finalised in 2006, http://www.nab-project.org
- COST Action **FP0601**: Forest Management and the Water Cycle (FORMAN), http://www.forestandwater.eu/
- COST Action **FP0603**: Forest Models for Research and Decision Support in Sustainable Forest Management

6. Recommendations related to forestry measures in water management and policy development perspectives

- In combination with technical defense works and preventive land-use/settlement regulations mountain forests can play a sustainable role for the protection from natural hazards, if they are managed consequently and constantly.
- Forests are not the best protection against mountain hazards, as often can be heard or read, because they have distinct functional limits, but there is no doubt, that forests are the best vegetation cover regarding runoff and soil-erosion reduction, landslide and avalanche prevention and as rockfall barrier.
- Especially in large catchments we have to accept the fact, that the triggering and damaging effects of flood and sediment disasters are dominated above all by the total amount and duration of precipitation and that the vegetation cover has very little to no influence on the resulting runoff.
- On the other hand, the smaller the catchment, the more effective is the positive runoff-reducing forest influence, because small catchments up to approx. 10 km² react in a disastrous way not on long-lasting, soil-saturating rainfall, but on short thunderstorm events.
- It is important to always keep in mind, that all components of modern hazard and risk management strategies have distinct limits. As a first step on the way to a better risk culture, we must try to embody in public opinion that absolute safety from natural hazards cannot be reached and will principally never be possible under the changing conditions of our dynamic world.
- Austria, and especially WLV, pursues the concept of a meaningful combination of protective forest biology, engineering and land-use planning measures – Forest - Technical –System.
- To achieve the goal of stable mountain forests with hazard-orientated structures long-term thinking and learning from nature is absolutely necessary.
- Social aspects in water management will become more and more important
- Transnational cooperation on the topic should be further intensified to exchange experiences, knowledge and methods between administration, technical authorities, and scientists. A continuous and long-term transnational and interdisciplinary cooperation for the development of common tools for water and forest management, risk prevention and management is indispensable. This cooperation should also interlink the experiences and results elaborated in different projects to be efficient and effective.
- Capacity building, awareness raising, interdisciplinary communication and cooperation were identified as key factors of integral water and forest management. Therefore transnational campaigns on capacity building and communication should be implemented

to support further actions on local, regional, national and transnational level. Policy-makers, administration, researchers, associations, enterprises as well as the public should be actively involved in those campaigns.

- The cooperation between science and practice should be improved. Interfaces between spatial planners, technicians, industry, the leading economic branches and service providers, the police, fire brigades, civil protection, politics, the army and other stakeholders should be institutionalised.
- An interdisciplinary, integrated approach of natural hazard and risk management and elaborated master plans (e.g. including local emergency trainings) should be continuously adjusted during and after extreme events. This approach represents the basis for a sophisticated early warning system. Although this kind of prevention requires adequate financial means and does not show immediate results, it is in the long run the cheapest and most sustainable way to save lives and goods.
- There is still the demand for monitoring concepts for especially small mountain watersheds (test basins), in order to derive appropriate mitigation and management strategies
- Development of an Alpine Protection Forest Strategy with attention of climate change and the resulting impact on mountain forests
- Adaptation of European Funding Principles and Strategies (LEADER, ELER etc.) in consideration of the economical future of alpine agriculture: Subsidies should focus on ecologic function of rural work rather than on specific agricultural products.
- Cross-linkage of basic functions of living in sensitive ecosystems (alpine valleys, highlands, mountain areas, sub arctic region) taking into account hazards and risks
- Fulfilment of goals due to the Kyoto-treaty: Counter-measures for the reasons of Climate Change in front of adaptation strategies.
- Flood Risk Management focused on the whole river basin following the principles of “more room for the rivers” and “balancing the risk”

Czech Republic

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Management of mountain watersheds in the Czech Republic: problems and perspectives

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Introduction

The territory of the Czech Republic (Central Europe, latitude: 48 – 51° N, longitude: 12 – 19° E, area of 79,000 km^2) consists of rolling plains, hills, and plateaus surrounded by low mountains (Sudeten). Elevation extremes are 115 m (Elbe River outlet) and 1,602 m (Giant Mts.).

Mountain catchments provide the society with benefits in the fields of:
- Water supply, retention and flood mitigation,
- Control of water quality,
- Timber production,
- Wildlife and biodiversity conservation,
- Tourism,
- Cultural heritage, source of aesthetic inspiration, local tradition and religion.

Traditionally, flooding is supposed the most important natural hazard in the Czech Republic. However, the deterioration of water quality became a serious challenge in the second half of the 20th century. Recently, the expected impacts of the global climate change; and political and socio-economic aspects, extended the traditional discussion on forest-water relationships and priorities in the management of mountain watersheds.

Mountain basins

In the Czech Republic, mountain regions are identified by gradients from 300 to 600 m. Mountain basins extend over the area of 31,000 km^2 (40 % of the country's territory). Forest management represents the main land use there. Some 60,000 km of relatively small headwater

streams are controlled by the administration of forestry units, national parks or protected landscape regions.

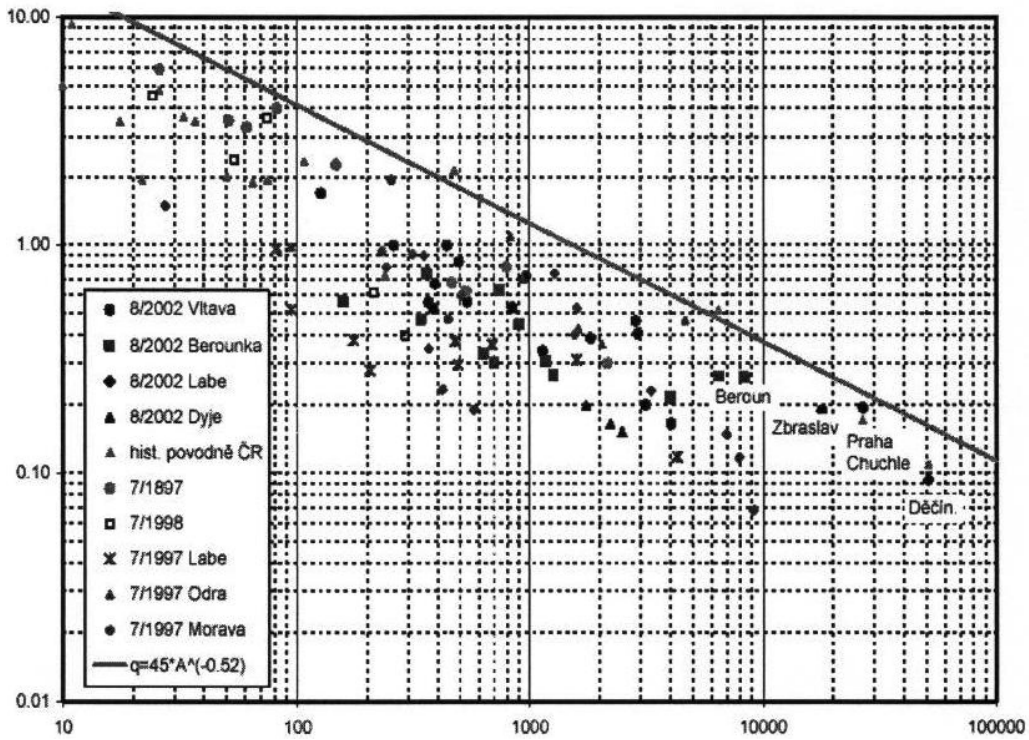
In mountains of the Czech Republic, the climate is temperate, represented by categories Dfb (humid continental) and Dfc (sub-arctic) of the Kőppen classification.

The long-term mean annual water budget of the country includes: 693 mm of precipitation, 499 mm evaporation, and 194 mm run-off. However, in the mountain basins, mean annual values of precipitation vary from to 650 to 1,600 mm, air temperature from 2.0 to 7.5 ^{o}C, and water yield from to 200 to 1,350 mm. The recent water supply system is oriented mainly on surface waters (80% of the total volume of drinking water) in mountain catchments. The water resources potential is exploited now by some 50 %.

Analysis of recent and historical floods

The catastrophic floods of 1997, 2002 and 2006 initiated several detailed analyses of those events in the historical context. These data resulted in plotting the probable maximum specific discharge in the Czech Republic, related to the catchment area (Figure 1).

Figure 1: Probable maximum specific discharge q_{max} ($m^3/s.km^2$) related to the catchment area.



Catchment area (km^2)

Critical flood phenomena represent namely heavy summer rainstorms of high intensities; floods from snow-melt events (or combinations snow-melt with spring rain falls) do not exceed the summer peak flows.

The recently applied scheme of flood control actually follows the principles adopted already in 1902 – 1919; responding to the catastrophic flood of 1897: supporting the retention in both reservoirs and watersheds, stabilising mountain streams by torrent control measures, and stabilising catchments by amelioration practices.

Forestry statistics

In the Czech Republic, forests percentage is 34 % (26,500 km^2). Mountain forests cover 18,550 km^2 (70 % of the total forested area). The climax of mountain forests is represented by six vegetation zones given in Table 1.

Table 1: Climax zones in the Czech Republic (Ta – mean annual temperature, Pa – mean annual precipitation).

Climax zone	Area (km^2)	Elevation (m)	T_a (^oC)	P_a (mm)	Veg. period (days)
Beech with oak	2,862	400-550	6.5-7.5	650-700	150-160
Beech	4,505	550-600	6.0-6.5	700-800	140-150
Beech with fir	6,360	600-700	5.5-6.0	800-900	130-140
Beech with spruce	3,445	700-900	4.5-5.5	900-1,050	115-130
Spruce with beech	1,060	900-1,050	4.0-4.5	1,050-1,200	100-115
Spruce	265	1,050-1,350	2.5-4.0	1,200-1,500	60-100
Dwarf pine	53	> 1,350	< 2.5	> 1,500	< 60

Since the end of the 13th century, the total area of forests did not change significantly. However, the native composition of mountain forests has been transformed from the mixture of Common beech (*Fagus sylvatica*), Common silver fir (*Abies alba*), and Norway spruce (*Picea abies*) to dominant spruce plantations (78 %), particularly in the 19th century. The relatively high percentage of even – age stands (84 %) with a simple structure result from the regulated clear – cut felling. The mean rotation period is 115 years.

The annual harvest of timber is 16 million m^3 (6 m^3/ha) with prevailing salvage felling (66 %), responding namely to wind breaks (69 %) and insect epidemics (21%). The natural regeneration (35 km^2/year), is only 18 % of the artificial one (200 km^2/year). Recently, the percentage of deciduous trees increased from 34 % (2001) to 38 % (2008).

The ownership of forests in the Czech Republic includes namely the state (61 %), private (23 %) and municipal forests (16 %). In mountain basins, state forests dominate with 76 %. Commercial forests represent 75 %, protective forests 3 %, and special forests 22 % of the total forested land.

Mountain wetlands

Traditionally, mountain wetlands are widely considered to serve extremely important ecological functions in supporting biodiversity, and preventing downstream flooding by absorbing precipitation. Recently, mountain bogs have been recognized for their role in regulating the global climate by storing large amounts of carbon in peat deposits. However, headwater wetlands are fragile components of a watershed. They need special control - including conservation, protection and integration in the process of watershed planning.

In the Czech Republic, two mountain wetlands (area of 66 km^2) have been included in the frame of the Ramsar Sites (Ramsar Convention on Wetlands, 1971). However, the complete database of mountain peat-lands is missing. Some 1,900 peat-land sites (cca 100 km^2) have been identified by inventories done in the 1950s and 1960s, but the total area of mountain wetlands is supposed still larger. Also not sufficient is the information on the historical loss or conversion of wetlands.

Air pollution and acid atmospheric deposition

Recently, mean annual contents of SO_2 and NO_x in the air do not exceed the limits for vegetation (20 and 30 $\mu g/m^3$) given by the Czech legislative (350/2002). Observed values of pH in precipitation, 4.6 – 5.8 in the open, and 4.5 – 5.6 in forest stands, show an increase of almost one pH unit during the last twenty years. In the open, the mean annual atmospheric deposition of sulphur is 11.8 kg/ha and nitrogen 15.2 kg/ha; while, under the forest canopy, corresponding loads vary from 6.4 to 29.7, and from 11.6 to 35.6 kg/ha, respectively. These loads are approximately one fifth of the atmospheric deposition observed in the late 1980s.

Consequently, in the last ten years, the evidence of defoliation at dominant spruce plantations shows relatively stable value of 30 %, but the damage of bark beetle has increased from 396 to 2,360 thousand m^3. Forest damages due high concentrations of ozone were not found significant.

Revitalization of mountain watersheds

In the 1980s, the extreme acid atmospheric deposition leaded to the decline and clear-cut of spruce plantations in mountain catchments of the Czech Republic: *Junco effusi-Calamagrostietum villosae* became a new dominant community there. In the 1990s, the open-field load of sulphur already dropped to cca 40 % of the mid-1980s level; and the revitalization of mountain ecosystems started.

The progress in revitalization has been evaluated by Ellenberg's environmental indicators: indices for light (L), moisture (F), nitrogen (N) and acidity (R). These values were tested to describe a progress in revitalization (changes in water yield, retention, stream-flow quality) of

mountain catchments in 1982 – 2008. Indicators F and L describe well the plant succession related to the microclimate and hydrology at clear-cut sites. Also the indices N and R follow trends in the atmospheric deposition and water quality, however, with lower sensitivity. Finally, Ellenberg's environmental indices reflect relatively long-term respond (cca 10 years) of the soil – vegetation status to the drop in air pollution and ameliorative measures.

Concerning mountain stream waters, also the species composition in algal mats shows a drop in anthropogenic acidity, but also the occurrence of natural acidity in mountain waters of the Czech Republic and their unstable chemistry. Comparing the period of 2008/2009 with the late 1990s, acidophilic algae like small diatoms (*Bacillariophyceae)* and filamentous green algae (*Chlorophyta*) have decreased, while colonial diatoms (*Diatoma mesodon* and *Fragilaria virescens*) and green algae *Microspora amoena*, *Tetraspora gelatinosa*, and *Draparnaldia plumosa* are dominating in 2008/2009.

The revitalization of mountain catchments and lakes includes also the revival of fish: acid tolerant brook char (*Salvelnus fontinalis*) and native brown trout (*Salmo trutta m. fario*) in the 1990s, following the positive changes in stream chemistry. In the 1990s, the population of brook char was surviving well with an effective self-reproduction, while brown trout evidently starved. However, in 2008-2009, the population of brook char is still dominant, but, biodiversity has increased by the population of brown trout and minnow (*Phoxinus phoxinus*, endangered species in the Czech Republic).

Environmental services in mountain basins: increasing ecological stability

Forest benefits on water quality, control of floods and soil erosion in mountain basins and their downstream effects are evident, and supported by the Forest Act (289/1995). Mountain forests of the Czech Republic belong to the most sensitive ecosystems in Europe: slow weathering bedrock and shallow podzolic soils with a very limited pool of basic cations have a small buffering capacity to the acid atmospheric load.

In the 1980s, mountain waters were stressed by an extreme acidification: they did not fit health standards particularly at parameters of pH, hardness and aluminium. Better stream water quality in semi-natural beach forests results particularly from the limited acid deposition in the dormant season and higher buffer capacity of beach stands. Therefore, the support of native mixed forests stands leads to higher stability of mountain catchments. Moreover, mountain spruce forests are endangered by the expected climate change. Additionally, the management of mountain watersheds should include traditional environmental friendly forestry practices: clear-cut limits, planting in advance, skidding of timber by horses or cables, seasonal skidding, and respecting the riparian buffer zones.

The state supports the stabilization of mountain watersheds by 96 million CZK per year; it is almost 25 % of the annual subsidies (390 million CZK) in forestry. That support includes: environmental friendly forestry technologies (36 million CZK), torrent control (5 million CZK), reforestation of damaged forests by the air pollution (11 million CZK), and aerial liming (44

million CZK). The European Union fund on Rural Development 2007 – 2013 (915 million CZK per year) has been used in mountain catchments by some 20 % (183 million CZK).

Practices on the protection of forests have been applied annually on the area of 1,200 km^2 (5 % of the total forest area) including particularly the control of insect (1,000 km^2), and acidity (liming on 40 km^2).

Prevention of climate change impacts

At the end of the 21st century, on the territory of the Czech Republic; scenarios of the global climate change consider increasing the mean annual air temperature by 0.9 – 3.0 ^oC. Consequently, changes in precipitation (particularly, the reduction of the snowpack by 30 %), and intensified evaporation might decrease the annual water yield by 10 – 40 %. Considering the timing of water yield, the seasonal runoff is supposed to increase by 30 – 50 % in the winter, and to decrease 20 – 90 % in the summer. Also, higher frequencies of extreme meteorological events (floods and draughts) are expected. In mountain watersheds, particularly, spruce forests will be endangered.

The mean annual temperature of surface waters might increase in 1.1 – 3.7 ^oC. Therefore, the winter stratification in lakes and reservoirs could be limited, the oxygen content reduced by 3 – 8 %, and species composition of phytoplankton and zooplankton modified.

According to the Kyoto protocol (1997), in the Czech Republic; the volume of emitted CO_2 decreased already by 9 % (2004 – 2008) in comparison with the level of the 1990s.

In 2004, in the Czech Republic; the National Agenda on Prevention of Climate Change Impacts was adopted. Joining the EU strategy, the reduction of greenhouse gases is expected to fit 30 % of the 1990-level in 2020, to decrease the combustion of fossil fuels by 20 %, as well as to increase the use of renewable energy sources by 20 % of the total energy produced.

Legislative

The control of mountain watershed in the Czech Republic includes the legislative framework based on:
- Forest Act (289/1995, protective forest stands, commercial forest production),
- Water Act (254/2001, protected headwater regions, streams and reservoirs of drinking water supply),
- Governmental Decrees on Protected Headwater Areas (9/1978 and 2/1979),
- Public Health Act (28/1975, hygienic buffer zones in drinking water catchments),
- Nature Conservation Act (114/1992, national parks, protected landscapes, nature reserves or monuments),
- Acts on the Environment (244/1992, EIA and SEA procedures, managing spots of ecological stability)
- Act on the Public Access to Environmental Information (123/1998).

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Finland

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FINLAND NATIONAL REPORT

1. Geography and climate

Finland is the most extensively forested country in Europe situated mainly in the boreal coniferous zone. Almost half of the volume of the timber stock consists of pine (*Pinus sylvestris*). The other most common species are spruce (*Picea abies,*) downy birch (*Betula pubescens*) and silver birch (*Betula pendula*). The landscape is mostly flat with few hills, and its highest point, the Halti at 1,324 m, is found in the extreme north of Lapland at the border between Finland and Norway. The area 300 metres a.s.l., mainly in northern Finland, is only 5 percent of the total area 338 000 km^2. The Finnish landscape is covered by forests, mires and thousands of lakes.

The climate is, in spite of the northern location, very favourable to living conditions due to the warming effect of the Gulf Stream. The climatic balance is evidently very sensitive and thus it is important to understand the environmental effects of the predicated changes in the climate. According to the estimates on the future climate change in Finland, by 2080 the average temperature could rise by 4 - 6°C and the average precipitation would grow by 15 - 25 %. About half of the present annual precipitation (500 - 600 mm) in the North fall as snow. Precipitation in the south amounts to about 600 - 700 mm annually.

Latitude is the principal influence on Finland's climate. Because of Finland's northern location, winter is the longest season. On the average, winter lasts from early December to mid March in the southwestern coast and from early October to early May in Lapland. Northern part of the country belongs to the Barents Euro-Arctic Region, which is intergovernmental and interregional cooperation area between Norway, Sweden, Finland and Russia.

2. Forests and water

Climate change will have many adverse impacts in forested catchments in Finland. The most important effect of climate change on hydrological regimes is the change in seasonal distribution of runoff. In winter, excess water from snowmelt and rainfall can cause more winter floods in the future. High flows and intense rainfall increase soil erosion, chemical leaching, urban and livestock wastes and nutrients into watercourses and coastal waters. The report “Climate change adaptation for hydrology and water resources” describes impacts and adaptation to these effects in relation to the hydrological cycle.

Finland´s high standards of water protection are based on the legislation in the Environmental Protection Act and the Water Act, as well as strict permit procedures according to which environmental and water permits are required even for small projects and production facilities. These permit procedures help to ensure that the objectives of the Water Framework Directive are achieved. Permits are granted only after the due consideration of factors related to the use of water and impacts on the status of waters covered by the relevant river basin management plan. Special attention is now paid to integrated forest and water management in the national and local forest programmes.

Lakes, rivers, groundwater reserves and the Baltic Sea have been carefully monitored in Finland for decades. River basin management plans have now been systematically drafted for all of Finland´s river basins. The objective of the river basin management plans is to achieve a good state of surface waters and groundwater by the end of 2015. River basin management planning systems are based on co-operation between the authorities, stakeholder groups and citizens, as defined in the new national legislation. Especially synergies between sustainable forestry and environmental objectives of the Water Framework and the Flood Directives (WFD, FD) should be increased. River basin management planning procedures have been designed to promote transparency, participation and dialogue. The Environmental Protection Act and the Water Act have both been amended as necessary.

The goal of the EU Water Framework Directive, which in Finland is implemented under the Act on the Organisation of Water Management (2004), is to achieve a good status of waters in the Member States by the year 2015. National aims and measures are defined in Regional Water Management Plans. The EU Soil Framework Directive currently under preparation will probably require that provisions on soil protection be included in national legislation.

In Finland has been new activity also in international level. Ministry for Foreign Affairs, Ministry of Agriculture and Forestry and Ministry of the Environment have carried out an International strategy for Finland's Water Sector. The aim of this strategy is to increase international cooperation and the impact of Finnish actors in the water sector by identifying broad themes under which the water sector in particular could operate. At the same time, the strategy aims to define clear objectives and means to increase international cooperation and partnerships. The focus of the strategy is on fresh water.

3. National Forest Programme

A great variety of representatives of the different stakeholder groups participated to prepare the Finland´s National Forest Programme 2015 (NFP). This was preceded by the drafting of regional forest programmes by the Forestry Centres together with the Regional Forest Councils. Altogether seven ministries and relevant agencies and institutions under these participate in the financing and implementation of the programme, and the role of the private sector is also significant. The private sector owns 65 percent of forestry land,

According to the NFP, Finland's official forestry recommendations will be duly revised to help forests thrive in changing circumstances. The purpose of the NFP is to increase welfare from diverse forests. The vision, or target state, of the programme is set for 2015, when Finland is a world pioneer in sustainable forest management, the competence of the sector has been refined into new competitive products and services, the use of domestic wood has increased significantly and forest biodiversity has improved.

Necessary measures to attain a sound ecological status of waters in forestry are in NFP as follows:

- Instructions and recommendations for water protection in forest management will be kept up to date using latest research and experiences
- Water protection in forest management will be implemented with cost-effective methods
- Small bodies of water in forests, such as brooks and springs, for which financing as nature management projects may be available in private forests will be reconditioned
- A national network for monitoring environmental loads to water caused by forestry will be established and maintained
- Research on the environmental loads on water and soil caused by forestry will be conducted, in particular, from the perspective of climate change
- A geographical information system (GIS) will be made available by 2010 which can be used to assess the risk of erosion caused by forest management and to illustrate the catchment properties that contribute to the emergence of the risk.

Climate change is estimated indirectly to increase environmental effects of forestry operations like soil preparation, stump harvesting for energy and ditch reconditioning on drained peatlands. Monitoring reports are produced on the implementation of both the National and the Regional Forest Programmes. They also present proposals for new measures and outline developments in the forest sector. Development of the programme is the responsibility of the Ministry of Agriculture and Forestry and the National Forest Council.

France

27ème session du groupe de travail
de la Commission Européenne des Forêts
sur l'aménagement des bassins versants de montagne - FAO

STRBSKE PLESO (Slovaquie)

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RAPPORT NATIONAL FRANCE

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En France, les actions d'aménagement des bassins versants de montagne visant à lutter contre l'érosion et les risques naturels sont menées depuis plus d'un siècle dans le cadre de la Restauration des Terrains en Montagne (RTM).

Les actions publiques de prévention des risques naturels en montagne dépassent cependant largement le cadre strict de la RTM, comme bien d'autres actions de gestion intégrée de l'eau et de la forêt

- *l'approche française d'aménagement des bassins versants est celle de la multifonctionnalité, dans une optique de gestion durable ; dont le contrôle de l'érosion et la prévention des risques constituent l'une des principales composantes,*

- *les vallées de haute montagne, en particulier dans les Alpes, connaissent une activité économique encore importante, relevant principalement du tourisme. L'aménagement de ces territoires et la gestion des bassins versants dépassent largement le cadre forestier,*

- *les actions RTM sont complétées par d'autres actions de prévention contre les risques naturels en montagne telles que l'information, le zonage et la gestion des crises.*

Le présent rapport est structuré conformément aux directives de la FAO, en se focalisant sur le thème de la gestion intégrée de la forêt et de l'eau dans les bassins versants, en s'appuyant largement sur la problématique liée aux risques naturels, sans oublier cependant celle de la ressource en eau.

L'Office National des Forêts est un acteur de plus en plus impliqué dans des projets associant de nombreux partenaires (collectivités territoriales / organismes de recherche ...) tant par ses services chargés des questions RTM, que par les services de gestion.

* Eau, forêts et sols : tendances et menaces ; indicateurs d'augmentation des risques

Depuis la précédente session du groupe de travail (axée sur le thème des conséquences des changements climatiques) la gestion de l'eau reste une question majeure en France, dans les petits ou les grands bassins versants de montagne.

En matière de risques naturels, quelques événements récents importants ont découlé de contextes météorologiques exceptionnels (pluie / neige) :
- crues torrentielles de mai et juin 2008, dans les Alpes (Queyras / Ubaye ...)
- crues avalancheuses exceptionnelles sur les Alpes du sud en décembre 2008, du Queyras au Mercantour.
Des études confirment une tendance à la baisse de l'activité avalancheuse en basse altitude, ainsi que l'évolution du type d'avalanches (plus d'avalanches de neige humide)[1] et donc une évolution aussi des distances d'arrêt. Mais les événements de 2008 montrent qu'il est difficile de parler de tendance d'évolution du risque, d'autant que ces risques sont souvent plus liées au développement

[1] "Impact of climate change on avalanche hazard." 2001 Eric Martin and al. *Annals of glaciology 32 163-167*

de l'urbanisation dans les vallées de montagne, plutôt qu'à l'évolution des phénomènes eux-mêmes.

En matière de gestion de la ressource, l'eau est toujours l'objet de conflits d'usage, liés au développement des vallées de montagne, étroitement lié à l'activité touristique :
- Tourisme estival autour des grands lacs artificiels et production hydroélectrique ...
- Retenues d'altitude pour alimenter les réseaux de neige de culture et approvisionnement en eau potable. Par ailleurs, se pose aussi la question de la sécurité vis à vis du risque de rupture accidentelle de ces retenues.

La préservation de la qualité des ressources en eau potable reste une préoccupation générale, toutefois non spécifique aux territoires de montagne.

La prise de conscience de la nécessité d'une gestion intégrée des territoires de montagne prenant en compte les problématiques de l'eau et le rôle de protection de la forêt se développe chez tous les acteurs de ces territoires
Elle permet de favoriser le travail en concertation et l'émergence de projets innovants, la mise en place de recherches et d'expérimentations, ainsi que l'établissement d'orientations stratégiques d'aménagement des territoires de montagne.

* Projets pour gérer et affronter ces menaces et tendances

Quelques projets nationaux et quelques projets internationaux auxquels la France est associée tentent d'apporter des solutions pour une meilleure gestion des hauts bassins de montagne.

Approche des aléas naturels et des enjeux éventuellement menacés, concernant les Forets Domaniales (appartenant à l'Etat) des départements de montagne :
Le Ministère de l'Agriculture a confié à l'ONF en 2007 la mission d'établir avant fin 2011 une cartographie aléas / enjeux de toutes les forêts domaniales situées dans les départements de haute montagne ou acquises au titre de sa politique de Restauration des Terrains en Montagne.
L'objectif visé est d'évaluer les risques encourus vis-à-vis des enjeux économiques situés à l'aval, en cas de disparition du rôle de protection du couvert forestier.
Les bases méthodologiques d'approche et de cotation des aléas et des enjeux ont été définies par l'ONF-RTM et le Cemagref[2]
La mise en oeuvre du programme est assurée par l'ONF. A la date de ce rapport, la moitié de la surface prévue a été traitée.

Cette première analyse qui concernera plus de 500 000 ha sur 25 départements permettra de déterminer les secteurs où le rôle de protection de la foret est prépondérant, et, selon l'évolution prévisible de la foret (naturelle ou sous l'action de l'homme), les secteurs prioritaires pour lesquels des interventions pour le renouvellement de ces forêts de protection sont les plus urgentes.
Une approche similaire est envisagée pour l'ensemble des forêts relevant du régime forestier où des aléas naturels menaçant des enjeux sont identifiés.

Projet Interreg IVa Franco-Suisse : "Forêts de protection" [3]
Ce projet pilote est mis en oeuvre sur 2009-2011. Il associe des services gestionnaires forestiers (ONF en France), le Cemagref, des collectivités territoriales et des structures responsables de la gestion d'axes routiers, en déclinant cette approche combinée entre aléas et enjeux.

Les objectifs du projet sont :
- d'offrir aux collectivités locales des outils leur permettant de définir une politique de développement local lié aux forêts à rôle de protection,
- d'encourager la formation et l'engagement de personnels qualifiés, ainsi que l'utilisation de techniques de récolte adaptées aux forêts de protection,

[2] Institut de recherche en sciences et technologies pour l'environnement
[3] Site internet en cours de développement

- d'augmenter la production et la valorisation locale du matériau bois, ressource naturelle renouvelable,
- d'améliorer les connaissances sur les effets des changements climatiques sur la forêt de montagne et d'assurer leur prise en compte par la gestion forestière

Révision des Documents nationaux de cadrage pour l'aménagement et la gestion des forêts

Ces documents - cadre ont été révisés (Directives nationales pour les forets domaniales - de l'Etat) ou sont en cours de révision (Orientations nationales pour les forêts des collectivités) pour :
- prendre en compte les conséquences envisagées du changement climatique annoncé,
- définir et afficher des principes directeurs permettant aux gestionnaires des forets de maintenir ou d'améliorer l'objectif de multi fonctionnalité des forêts, en particulier leur rôle de protection

Les documents cadres de niveau territorial (régional) reprennent ces préoccupations :
- "Directives régionales" et "schémas régionaux" d'aménagement forestier.
- Guides de sylviculture associés (publiés pour Alpes du Nord, en cours de rédaction pour Alpes du Sud) : ils mettent à disposition du gestionnaire tant des "fiches d'analyse", que des références techniques sur lesquelles s'appuyer pour conduire un peuplement selon sa composition et son contexte, pour atteindre les objectifs prioritaires retenus.

Consolider le rôle de la forêt pour la préservation de la qualité de l'eau - Projet Interreg IVa Franco Suisse "Alpeau" (2008-2011)

- comprendre comment fonctionne la purification de l'eau à travers les sols forestiers ...
- comment optimiser un peuplement forestier et son exploitation pour une protection idéale des eaux souterraines ?
- quelles coopérations instaurer entre collectivités en charge de l'approvisionnement en eau potable et les acteurs forestiers ?

Voici quelques unes des questions auxquelles ce projet, lancé fin 2008, entend apporter des réponses pour aider à définir les stratégies et les interventions sur les bassins versants[4].

* Travaux de recherche relatifs à la gestion des risques naturels en montagne

Analyses statistiques des données de l'Enquête Permanente sur les Avalanches (EPA)

Le Centre d'Etude de la Neige de METEO FRANCE et le Cemagref conduisent des travaux de recherche en statistique sur les données de l'EPA, afin d'identifier si des tendances d'évolution se dessinent tant en matière de fréquence que vis à vis des caractéristiques des avalanches décrites[5].

Sécurité des ouvrages hydrauliques : Mise en oeuvre des nouvelles réglementations 2007-2008

Un travail soutenu par le Ministère en charge de la forêt et le Ministère en charge de la prévention des risques naturels est conduit en commun entre Cemagref et ONF-RTM pour définir une procédure adaptée pour réaliser les "études de danger", imposées par les nouvelles réglementations, concernant les ouvrages de protection (digues) et dans le contexte spécifique des crues torrentielles en montagne.

Réflexions et expérimentations sur les transports solides des torrents et rivières torrentielles

Les réussites des grands reboisements "RTM" réalisés depuis le 19e siècle et les corrections actives des torrents ont limité l'apport de matériaux solides vers les rivières situées en fond de

[4] voir partenaires associés, objectifs détaillés et sites pilotes concernés sur internet : http://www.alpeau.org/

[5] voir publication : “Assessing the impact of climate change on snow avalanche activity in France over the last 60winters using hierarchical Bayesian spatio-temporal change point model” 2009 Nicolas Eckert *18th WorldIMACS/MODSIM Congress, Cairn Australia 13-17 july 2009*

vallées. Par ailleurs, ces rivières subissent encore parfois les effets des anciennes extractions de matériaux nécessaires aux activités humaines Le niveau de leur lit a tendance à s'abaisser provoquant la déstabilisation des berges.

Cette problématique a été abordée pour le bassin de la Drôme dans le projet LIFE "Eau et Forêt" ("Forests for water") - aujourd'hui terminé : ce projet a formulé, par exemple, des recommandations d'expérimentation de recharge sédimentaire, par une diminution sélective du couvert végétal sur une partie du bassin versant.[6]
Il est nécessaire de poursuivre des recherches ou études dans le contexte hydrogéologique particulier d'autres bassins versants de montagne.
Le Cemagref de Grenoble mène des études de modélisation de ces transports solides.
Un projet de suivi des volumes de matériaux transportés sur des bassins versants expérimentaux, mis en place par l'ONF-RTM permettra de mieux cerner le domaine de validité de ces modèles.

* Considérations politiques et stratégies d'adaptation

Conforter les observatoires des risques naturels en montagne - Mettre à disposition des données
Le Ministère en charge de l'écologie et du développement durable a confirmé en 2007 la nécessité de maintenir et développer les observatoires des risques naturels en montagne (avalanches, crues et laves torrentielles, mouvements de terrain …) afin de disposer de données permettant de suivre les éventuelles évolutions de ces phénomènes dans les prochaines années.
Ces données doivent être mises à disposition du grand public et des acteurs des territoires.

Dans le cadre de cette politique, les données de la "BD-RTM événements", utilisées pour attirer l'attention des services de l'Etat et des experts en matière de risques naturels sur ce qui a pu se passer sur telle ou telle zone géographique, seront bientôt partagées, via un accès internet, accessible à tous.

Elaborer des schémas stratégiques forestiers de massif
Ces schémas sont mis en place à l'échelle des massifs montagneux, en concertation entre les collectivités régionales et les acteurs socio-économiques.
Leur objectif est de favoriser la valorisation des ressources forestières pour un développement dynamique des économies forestières locales, mais aussi dans le respect des engagements pris au niveau national dans le cadre des débats du "Grenelle de l'environnement 2007" (reconnaître et valoriser les services environnementaux de la foret).

Ces documents font référence au rôle de la forêt dans la gestion de l'eau et des risques naturels.
Des financements publics (Europe / Etat / Régions) peuvent être apportés à des projets entrant dans ce cadre.

Soutenir de nouveaux modes de développement économiques en montagne
Pour favoriser une nouvelle approche du développement économique en montagne, la convention interrégionale de massif des Alpes et le programme opérationnel interrégional du massif des Alpes (programme européen 2007-2013) soutiennent toute initiative prise à l'échelle d'un espace économique valléen proposant une approche intégrée des différentes problématiques, agricoles, forestières, touristiques ...

Faire évoluer les pratiques de gestion pour la mise en oeuvre de la Directive Cadre sur l'eau
Il convient de rappeler ici les recommandations finales de la composante française du projet LIFE "Eau et Forêt" [6]

[6] Recommandations finales de la composante française du projet LIFE "Eau et Forêt" – voir sur site internet ONF : http://www.onf.fr/projets-europeens/sommaire/projets_acheves/life_eau_foret/

* Conclusion

La gestion conjointe entre l'eau et la forêt dans les bassins versants de montagne recouvre deux grandes problématiques principales :
- la gestion de la ressource en eau
- la gestion des risques naturels liés aux phénomènes météorologiques

Nous ne pouvons que souligner ici l'intérêt de poursuivre et encourager les échanges et les travaux en commun tant au niveau local que transfrontalier ou européen sur ces deux thèmes, afin de donner aux décideurs et aux techniciens des références communes pour leur meilleure prise en compte dans le développement local.

Poland

Twenty-seventh Session of the FAO/European Forestry Commission's
Working Party on the Management of Mountain Watersheds,
Strbske Pleso, Slovakia Republic, 7-10 April 2010

MOUNTAIN FOREST WATERSHED MANAGEMENT IN POLAND

Lenart E.[1)], Niemtur S [2)], Pierzgalski E.[2)]

[1)]Ministry of Environment, [2)]Forest Research Institute

1. General characteristics of mountainous area

The overall national territory of Poland amounting to 312 700 km^2 includes 58,7 percent of agricultural land (76 percent of arable land and 22 percent of grasslands). Forests occupy about 29% of the national territory, with the acreage approaching 92 000 km^2. Mountainous areas (over 300 m above sea level) contribute 8.7% of the total land of Poland but mountains (over 500 m a.s.l.) occupy only 3% (10 000 km^2) of the total territory of Poland (fig.1). Mountain forests in Poland occupied the northern part of the Carpathians and Sudeten Mountains, extending about 700 km along the southern Polish border. Mountain forests have maximum elevation timber line about 1700 m. a.s.l. and have diversified climate, soil, vegetation and anthropogenic impacts.

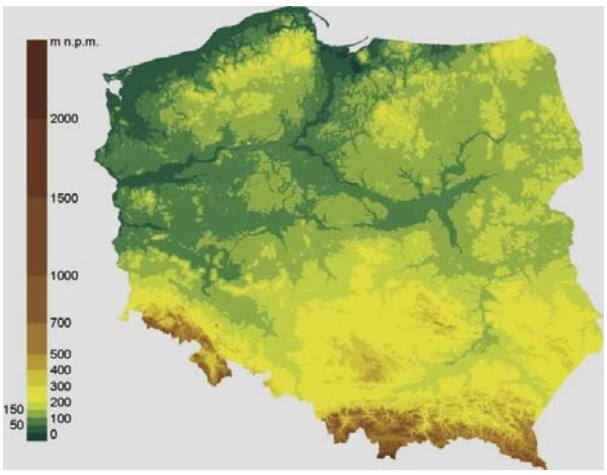


Fig.1. Location of mountainous areas in Poland

At present almost all mountain forests are under protection, from the passive protection in national parks and many nature reserves through the active protection to forests protecting soil, water and landscape. Nine of national parks have been established in Polish mountains. They cover about 102 0 km^2 and their forestage is estimated on 87%. In order to safeguard forest ecosystems under conditions of sustainable management five of so called the Forest Promotional Complexes have been established in mountains area. These forest areas have specific ecological, educational and social importance in Poland. Other activity is also Natura 2000. Special Areas of Conservation in mountain cover among others the following forest Natura 2000 habitats: mountain maple forests with high herbs (9140), mountain maple forests on slopes and screes (9180), mountain spruce forests (9410). In line with the Habitat Directive the forest management within these sites shall take into account the maintenance or restoration of the proper protection status of a given natural habitat. At the moment, only overall principles exist concerning the management of the forest natural habitats within

Natura 2000 sites but in general there is no essential contradiction between the multifunctional forestry model of management which prevails in the Polish forestry and the concept of protection provided for by the Natura 2000 network.

The species composition of the mountain forests significantly differs from the primeval (natural) because of past management (monoculture plantations, lack of natural tree regeneration, and the type of cutting system). In the Sudeten the coniferous sites occupy 46% of forest area and the current percentage of spruce stands area is about 72% but fir stands only 0.3% (fig. 2). In the Carpathians the coniferous sites occupy only about 3% and the average percentage of spruce and fir stands reaches almost 50% (23 and 27 respectively).

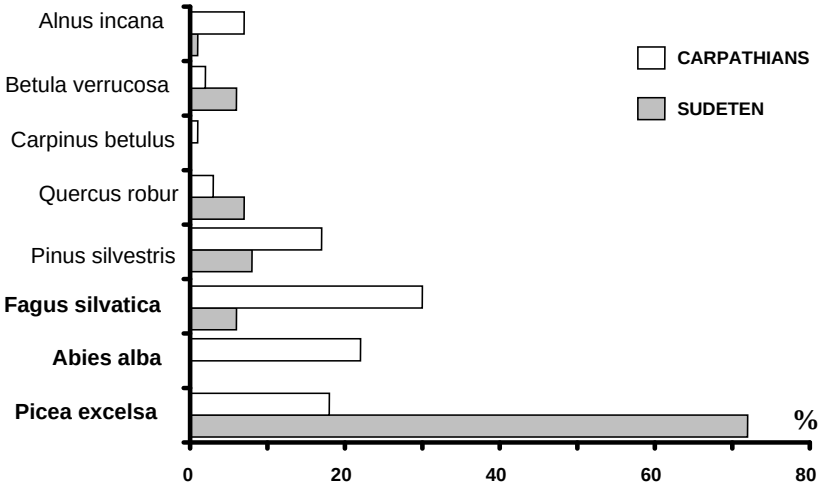


Fig. 2. The special forest composition in mountain forests

Polish part of Sudeten and Carpathians mountains belong to Odra and Vistula (Wisła) river basins (fig.3). However in Sudeten Mountain at state border with Czech Republic there is one peak (Three See Peak), from which water is rapids to Baltic See, Northern See and Black See.

Fig. 3. Main river basins in Poland

Despite of small area, mountains areas play an important role in water management: contribute to 30 % of the water resources, mainly rivers. Main concerns of water management in Poland are both the quantity and quality of water resources. Surface water resources (measured as an average river runoff in many years), being 28 % of the precipitation sum, are 1660 m^3/year *per capita*. This is three times less than the average European surface water resource, which places Poland in the group of ten European countries with the smallest water resources. Fortunately, 90 % Polish water resources are the resources that come from Poland's territory, which makes the great possibilities of the managing of the water runoff and protection of water's quality. Polish water resource depends on the precipitation, which is variable in time and space. The average precipitation sum slightly exceeds 600 mm a year- in central Poland it is only 500 mm, and in the high mountains situated in the southern part of the country 1500 mm. The average precipitation sum varies during the year and also in many years' periods and during wet years can be two times higher than in dry years. The precipitation variation in time and space causes different weather phenomena. One of them is the drought causing crop failure, an increase of forests fire risk and the drying up of wells. On the other hand, sudden thaws and downfalls occur causing periodical water excess and dangerous floods almost in the entire country. Floods in the Vistula basin occur on the average once on 5 years and in the Odra basin once on every 7 to 10 years. During the reported period (2008-2010) fortunately there weren't great floods in Poland.

2. Trends and threats

The mountain forests in Poland are under permanent threat of air pollution, climate changes with extremal weather conditions and the occurrence of pests. The air temperature rise and decline of snow cover duration are the reasons of water resources decrease. Direct effects of these processes are drying of streams, lowering of groundwater level as well as drying of soil. Droughts are an indirect reasons of deterioration of ecosystem's health what cause decline of forests due the pests and diseases. In mountains regions also snow and wind are reasons of forest's destruction.

The most harmful events in Polish Mountains in recent period took place in 1980's in Western Sudeten, where 160 km^2 was deforested by acid rains as a main reason. From beginning of 1980 we have observed significant air pollution decrease in Poland (fig.4) but heavy deposition during last decades and reinforced climatic anomalies contribute to serious forests damages observed recently in Polish part of the Carpathians.

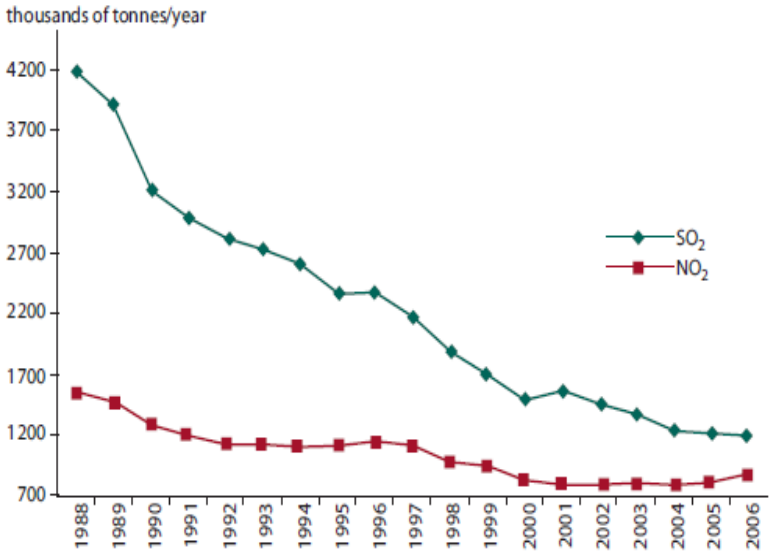


Fig.4 Decrease of atmosferic emissions of SO_2 and NO_2 from Polish territory (Central Statistic Office)

The situation in Carpathians is decisively more favourable than that in the Sudeten, especially because of the lower level of pollution and more fertile forest sites. Recently the process of forest decline is serious specially in the Silesian Beskid which belongs to the western Carpathians. On the fig. 4 it was showed, as an example, the dynamic of forestage decrease in the Bystra torrents catchment area which is located in the Silesian Beskid.

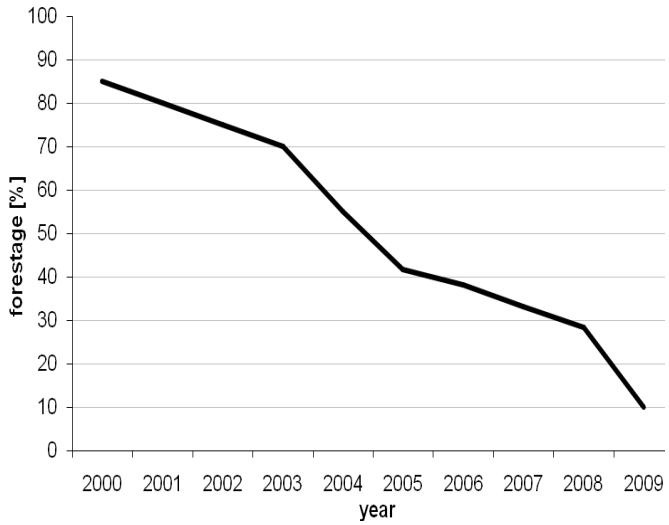


Fig. 5 Decrease of forestage in the Bystra torrents catchment area

3. Projects for mitigation trends and threats

To the main projects connected with protection of forest and water resources in mountainous area belongs:

- *National Program of Forest Cover Increase*

The country's forest cover increased from 20,8% in 1945 to 28,2 % in 1995 and 29 % in 2007. Ecological and economic consideration both justify in full the need to increase forest cover in Poland to about 33% by 2050. An important area for an increase in forest cover is constituted by the Sudeten and Carpathian Natural Regions which are characterised by relief and structure unwanted to agriculture as well as by vitally important function of forestry. Particularly intensive planting of the landscape is called for in areas with the greatest air pollution such as the voivodeships of Katowice, Kraków, Wrocław.

- *Programme of Small Scale Retention*

The programme of retention increase is being implemented in Poland on the basis of agreements made in 1995 and again in 2003 between the Minister of Environmental Protection, Natural Resources and Forestry on the one hand and the Minister of Agriculture and Rural Development on the other hand. Commonly, the term "small-scale retention" means different activities aimed increased water resources, but the major role of the small-scale retention measures is to positive influence on the moisture content of habitats by raising the groundwater level, increasing the water content in soils, as well as influence on the microclimate. Small-scale water retention is understood as the ability of plants, forest litter, soil and morphology of a terrain to retain water. The retention measures include small natural reservoirs (water bodies, old riverbeds, lakes), artificial reservoirs (ponds, excavation pits, impounding reservoirs, dammed lakes), rivers and network of water collecting ditches which delay the water runoff from the catchments area. According to the Programme of Small Scale Retention capacity of reservoirs which can be include to small-scale retention measures should be less than 5 millions m^3 on agricultural area and 1 millions m^3 in forests. The implementation of signed by two Ministers document was planned up to 2015. Total volume of water increase planned up to 2015 is 965 million m^3. The

State Forest General Directorate is participating very active in the *Programme of Small Scale Retention* and many of the small-scale retention measures were built in mountainous areas.

- *Operational Programme "Infrastructure and Environment"*

The State Forest General Directorate in 2006 start to prepare project „Mitigation of water erosion in mountainous areas and maintenance of torrents and connected infrastructure in good state" in the frame of *Operational Programme "Infrastructure and Environment"* which was approved by the European Commission for the period 2007–2013. The objectives of the project is increase of water resources, soil conservation, protection against gully and torrents erosion and decrease flood threats in mountain forests watersheds. It is planning to built 129 ponds, protection of slopes areas against surface water erosion (53 km of skidding paths) and conservation of 173 km of torrents against bank and bed erosion. Total cost of this project is about 35 mln Euro. Project which is still in the phase of documentation's preparation.

- There are also a few others programmes which influenced on moumtain watersheds like *Odra 2020 Programme, Vistula 2020 Programme* etc.

4. Research and case studies

The evidence of the need for research concerning mutual relationships between forest and water are numerous conferences organized in recent years. One of these was conference tittled "Forest and water" in Mrągowo (Poland, 14-17 September, 2008). It aims to exchange the investigation results and views presented by scientist, practitioners and others involved in forest and water relations. That would include the potential in the improvement of the water management through the sustainable forest management. The scope of the conference refers to the Resolution "Forests and Water", signed on the 6th November 2007 in Warsaw, worked out within the framework of the Ministerial Conference on the Protection of Forests in Europe. The conference in Mrągowo aims at bringing closer Resolution "Forests and Water" to the scientific, administrative and social decision makers as well as to consider options and ways of implementation of the commitments of the Resolution. During the conference the participants discussed on sustainable management of forests in relation to quality and quantity of water resources, influence climate on forest and water management, cooperation between water and forest management as well as on and on economical aspects of forest-water relationships. Participants presented a lot of interesting papers with results on:

- response of pine to environmental conditions on organic and mineral ground,
- dissolved organic carbon concentrations in throughfall and soil waters at ICP Forests level II monitoring plots in Norway: short-term and long-term variations,
- influence of precipitation and stand species composition on quality of drinking waters in mountains streams,
- long-term dynamics of climate elements as a factor modulating water storage of forest wetland areas,
- drought in mountain and forested areas,
- forestry and water budget of north-eastern German lowlands – consequences for choice of tree species and for forest management,
- the role of forest in protection of floodplain lakes,
- the use of hydrogel for afforestation of postindustrial areas,
- the value of water-protecting function of forests,
- pricing of forest retention properties.

Main conclusions formulated by participants of the conference were:

- The preservation of the natural environment in line with the principles of sustainable development requires simultaneous solving of the tasks resulting from a need to ensure water availability to forest vegetation as a major factor determining the life of forests and from the important role that forests play in conserving of water resources.

- The growing significance of forests in environmental protection shows foresters the main directions for them to follow aimed at proper shaping and protection of soil and water resources, as well as actions related to nature-and-forest education. Their implementation requires substantial outlays. Therefore there is an urgent need to develop tools to estimate the value of the non-productive services that forests provide and to launch the mechanisms of appropriate financial compensation for these services.
- The continuous provisioning of information about the quantitative and qualitative changes in water resources in forests is the basic tool used to detect the status, threats and the need for actions that would reduce unfavorable trends in this respect. It is therefore necessary to develop and implement a system of monitoring hydrological phenomena ongoing in forests in order to ensure the continuity of long-term collection and storage of data according to a uniform method linked with the nationwide monitoring of surface and ground waters.
- The focus should be on the improvement of water management in forests through elimination of the obstacles hindering forest administration's initiatives concerning management of water resources, renaturalization of valuable natural habitats and other actions aimed at a beforehand adjustment of forests to climate change. For this reason, the competences and rules of cooperation between water and forest management administrations should be clearly laid down.
- The noticeable climate changes and the associated disturbances in water cycling in nature manifested by, *inter alia,* a disastrous shrinking of the available water resources, combined with the concurrently increasing threat from floods and droughts confirm the need for raising public awareness of the prominent role forests play in mitigating these unfavorable phenomena. Also there is the need to extend the range of interdisciplinary education for specialists in hydrology and water management pursued in the departments of environmental engineering and protection, forestry and agriculture.
- Attempts should be made at quick implementation of the provisions of the Resolution *Forest and Water* developed in the framework of the 5th Ministerial Conference on the Protection of Forests in Europe (Warsaw 2007). The most urgent goals in this respect include cooperation between forest and water management administrations, enhancement of the retention capacity of forests, undertakings related to the adaptation of forests to climate change, as well as development of efficient economic tools to valuate ecosystem services.
- Implementation of the tasks specified in the Resolution *Forest and Water*, requires taking into consideration climatic, morphological and habitat conditions specific to individual European countries, as well as research and organizational cooperation at local and regional level. It is necessary to intensify research and implementation of tasks with a view to deepening the knowledge of forest-water interactions changing under the impact of natural transformation of stands at successive stages of their development and also under the impact of abiotic factors and economic activity.

5. Policy attention and adaptation strategies

According to the National Policy on Forests the safeguarding of the permanence of forests along with their multifunctionality, will be achieved by improving the state of forest resources and providing them with comprehensive protection as well as by reorienting forest management away from the previous domination of the raw-material model towards a pro-ecological and economically balanced model of multifunctional forest management. The role of the forests in Poland grows systematically in importance. It is connected with the population increase, with the development of urbanization and industrialization of the country and the development of agriculture as well as with an increasing demand for non-production values of forests. The forest law respects strategy of sustainable development and articulates importance of ecological, economic and social functions of forests. The main idea behind the new forest policy is that the

subjects of the policy are forests under all forms of ownership and their functions. Other subjects of this policy are the aims and the principles of forest management and the links between forestry and society and other divisions of the national economy. About 70% of the forest area in lowlands takes clear-cut managed forests. In mountain watersheds clear cutting is forbidden by law and are applied group, shelterwod and selective felling. There is a need to review all legal documents pertaining to forest-water interrelationships (*inter alia*, Water Law, Forest Act, etc.) in order to harmonize the provisions, unify the terminology and update the contents to recent research findings and experiences of practice. Long-term tasks of policy attention and adaptation strategies are connected with implementation of *Water Frame Directive of European Union*, *National Program of Forest Cover Increase,* network *Natura 2000, Programme of Small Scale Retention*, *National Program of Municipal Sewage Treatment Odra 2020 Programme, Vistula 2020 Programme* and others.

Romania

NATIONAL REPORT

OF

ROMANIA

Taking into consideration the floods evolution and trends and the conseqences of floods in Romania in the last years, it was compulsory to find a new approach of the problem. The effects of climate changes show an evidence of incresing hazards, by severe droughts, followed by heavy rains which sometimes are accompanied by torrential rain or snow melting. As follows, there have been accelerated the erosion, sliding or collapsing processes.

For exemple in the hydrographical basin of Tisa, which was hardly affected by floods, in 26th-27th of July, 2008, floods caused damages to the environment and it affects the forestry railway (only in the Wasser Valley, railway has a lengh of 42.4 km out of which 30% has been affected.), forestry roads, forestry and agricultural areas. Also, in some villages, floods caused fatalities and displacement of people.

The water volume value registered on the 26th of July 2008

River	Distance from spring (km)	Basin altitude (m)	Basin surface (sq km)	Maximum discharge (m3/s)
Novăţ	16.0	987	88	202
Ruscova	18.2	1177	185	174
Vaser	47.0	1097	410	497 *

*Regular discharge is 13-17 m3/s
Discharge (guarantee 1%) is 421 m3/s

The works proposed to be performed within Wasser hydrographical basin consist of carrying out the security of existing works (stream channels, dams, dam stones) which there have been distress and establishment of new works such as:

- dams, dam stones and traverses – 6385 cubic meters
- wall for support on a lenght of 244 m
- stream channels - 215 cubic meters
- afforestation – 3 ha

On the other way, there could be seen that the „defensive works" such as dams, dam stones, stream channels, fulfil their role, but in the same time, they had a negative impact both downstream, as well as upstream the hydrographical works: water courses have been fragmented, it could be seen an increase in nutrients and organic substances within rivers and the habitats number is decreasing.

Nowadays, the concept of durable development is very well-known, and it leads to durable protection against floods which means to comprise the flood risk management plan for each river basin district in order to achieve good ecological and chemical status and to contribute to mitigating effects of floods.

The National Strategy on the assesment and management flood risk was elaborated in 2005. This year, the Strategy is in process to be reviewed and updated, taking into account the impacts of climate change. A new approach has been taken into consideration in elaboration of the strategy: flood risk management which means the policies, procedures and practices with risk identification, analyse and evaluation; reevaluation and risk monitoring so human communities with all their citizens may live, work and fulfill their needs and aspirations in a sustainable environment. The mains activities of flood management are prevention, protection and prepardaness (before flood), emergency situations management (during the flood) and assistance, reconstruction, flood management activitie review (after the flood).

The principles of the new strategy consist of sustainable environment (economical, social and ecological acceptability), strategic approach, transparency and simplicity, basin – type approach, interdisciplinary approach, solidarity principle, balance between preventive measures and actions and response and reconstruction measures and activities, use of UE and UN Economical Commission best practices, integrated actions for entire hydrographyc basin (7 basins were tendering for hazard mapping and integrated management solutions).

The objectives of the National Strategy on the assesment and management flood risk are economic, social and environment.

Economic objectives lead to economical loss prevention or minimizing through flood risk measures in urban area, economical loss prevention or minimizing through flood risk measures in existing infrastructures and economic loss prevention or minimization through flood risk measures in protecting agricultural areas.

Social objectives take into consideration flood risk prevention and limitation for human communities, flod risk prevention and decreasing in case of public goods (hospitals, schools) and recreational areas, epidemic prevention and population health improvement after flood related pollutin and accesibility to important infrastructures (bridges, airports) during flooding.

The environment objectives focus on less anthropic interferences within the geomorfological structure of hydrological basins, land quality improvement and protection through appropriate agricultural practices, ecosystems, protected areas and monument protection and conservation, environment protection and esthetic improvement, climate change prevention and minimization in order to prevent floods.

The implementation will be done by Ministry of Environment and Forests, Ministry of Agriculture and Rural Development, Ministry of Transport and Infrastructure, Ministry of Administration and Internat Affairs, Ministry of Economy and Trade, Ministry of Finance, Ministry of Educationa and Research, County Councils, Local Coucils, Local Comunities, Householders.

The action plan will follow the steps, which are included in EU Flood Directive, such as, preliminary flood risk assessment (by 22.12.2011), flood hazard maps and flood risk maps (by 22.12.2013) and flood risk management plans (by 22.12.2015).

Implementation costs of National Strategy on the assesment and management flood risk, this is estmiate at around 25.5 billions euro.
As regarding the funds for Watershed Management within forest area these are divided in National Budget funds, refundable funds and non-refundable funds.

As regarding the National Budget funds, there have been allocated 21 millions euro for 108 objectives of watershed management works for the period 2008-2010. There are 31 objectives of watershed management works finished by December 2008.

Concerning refundable funds, The Government of Romania contracted 10 mil euros from Council of Europe Development Bank for the period 2008-2010.

A component of the measure 125 – *Improving and developing the infrastructure related to development and adaptation of agriculture and forestry* within Rural Development Programe of Romania 2007-2013, focusing to watershed management works within forest area. The specific objectives of this measure are developing the forestry infrastructure in order to ensure the forestry sector competitiveness and decreasing the risks of harmful natural phenomena over the forest. The operational objeactiv lead to buiding and modernising the forestry infrastructure (forestry roads, forestry railways and funiculars) and supporting the torrential correction works within the forest. Public expenditure for this measure is around 476 mil euros, out of which 80 % are from FEADR and 20% from National Budget.

Mihai Olaru
Nicolae Oprisa

Ministry of Environment and Forest

Slovakia

Working Party on the Management of Mountain Watersheds
27th Session, 7-10 April 2010, Štrbské Pleso, Slovakia

SLOVAK NATIONAL REPORT (M. Schwarz)

Geography and hydrology

Slovakia is a landlocked country in of Central Europe with a population of over five million (5, 424, 925 to 31 December 2009; population density 111/km^2) and an area of 49, 036 square kilometres. It is located in the Western Carpathians and their peripheral lowlands.

Majority of its territory belongs to the Danube catchment basin (96% of total area); the remaining 4% are drained to the Baltic Sea through the Vistula River tributaries. Perhaps surprisingly, the *main European divide* does not follow the highest ridges of the Carpathians, but it rather follows lower ridges and flat landscape of the foothills of the the High Tatras Mts., the Slovak highest mountain range.

The long-term average water balance can be best illustrated by the equation: precipitation (753 mm) = evapotranspiration (492 mm including other minor losses) + runoff (261 mm). The equation entries can considerably vary between the years.

Table 1 Water balance 2008

Water balance	
Precipitation	40 049 mil. m^3
Annual inflow (the Danube, Morava, Uh, Tisa, etc.)	69 005 mil. m^3
Annual outflow	73 387 mil. m^3
Slovak contribution to outflow	10 146 mil. m^3

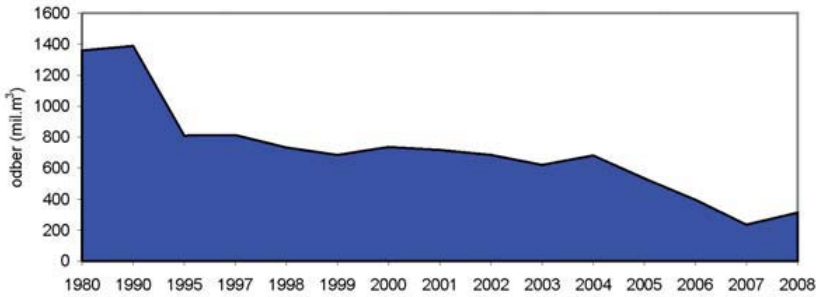
Source: Slovak Hydro Meteorological Institute

The majority of inflow is generated by the Danube River bringing water from the Alps. The second most important inflow resource is the River Tisa, albeit a very short border watercourse, bringing water from Romania and Ukraine.

The year 2008 was considered water balance positive. Compared to 2007, all major water parameters (precipitation, inflow and outflow) increased. Water volume stored in reservoirs and dams went up from 798 million cubic metres (69% of total capacity) to 809.4 million cubic metres (70% of total capacity).

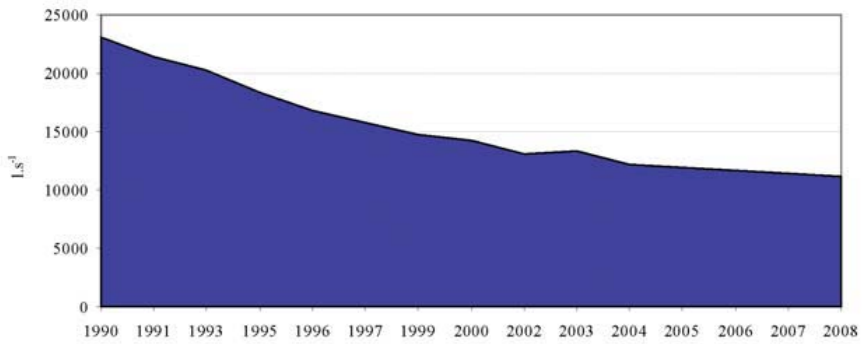
The withdrawal of surface and ground water has been long-term decreasing. The main driving forces behind a slump in withdrawal have been identified as declining industrial and agricultural production (irrigation in particular) and, from 1989 onwards, also downward household water consumption contributed to increased water bills. Despite this fact, temporary problems with water supply to major urban agglomerations occasionally occur.

Figure 1 Volume of wirhdrawn surface water 1980 - 2008



Source: Slovak Hydro Meteorological Institute

Figure 2 Volume of withdrawn underground water 1990 - 2008



Source: Slovak Hydro Meteorological Institute

Table 2 Surface water withdrawals (million m^3)

	Human supply	Industry	Irrigation	Other agricultural uses	Total
1998	68.370	621.858	42.447	0.0400	732.707
2008	52.057	251.797	9.133	0.0040	312.991

Source: Slovak Hydro Meteorological Institute

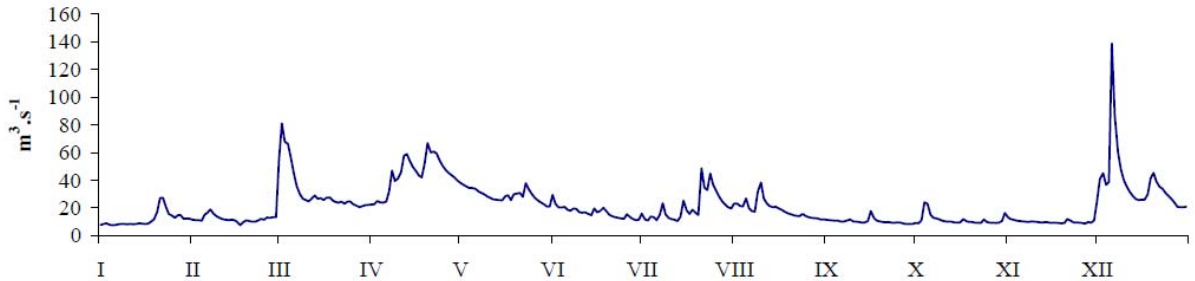
Table 3 Groundwater withdrawals (L.s^{-1})

	Human supply	Industry	Agriculture (including irrigation)	Other
2008	8468.82	1108.00	320.81	1224.46

Source: Slovak Hydro Meteorological Institute

Owing to a limited national territory, climatic variability is mostly a result of altitude – the higher altitude, the higher precipitation and lower evaporation. Lowland soils are water saturated only during winter and spring months. In the vegetation period, available water is fully used up by the vegetation. On the contrary, in mountain locations precipitation permanently surmounts evaporation; part of precipitation is thus available for aquifers recharge and runoff. As a result, majority of watercourse discharges is sourced in mountain watersheds. In an average year, precipitation exceeds evaporation in altitudes over 500 m. Nonetheless, watercourse discharges are most dependent on mountains with ridges exceeding 1000 m altitude. The border between mountain and other watersheds is not abrupt since it is determined by the location of particular mountain ranges, prevailing direction of their ridges and other attributes. Owing to this fact, only watersheds in central and northern Slovakia can be considered a truly mountain type. Majority of Slovak watercourses has a combined snowmelt and rain dominated hydrologic regime (with primary spring and secondary autumn peak flows) except for lowland watercourses which are rain dominated. In spite of flowing through southern Slovakia lowlands, the Danube River is the only Slovak watercourse with snowmelt dominated hydrological regime typical for summer peak flows resulting from the Alps snowmelt.

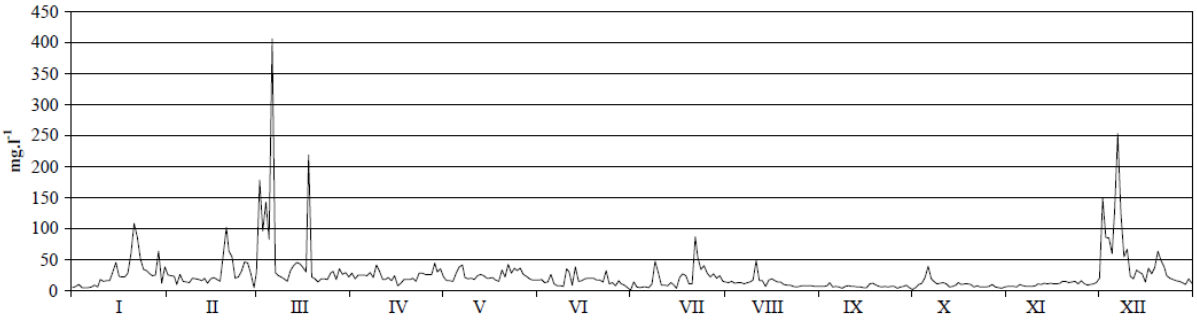
Figure 3 Average daily streamflow of Hron River at Banská Bystrica gauge 2008



Source: Slovak Hydro Meteorological Institute

The year 2008 was noted as rather discharge atypical. The Hron River statistics did not show a traditionally distinct spring peak flow - instead a substantial increase of stream flow was observed in late autumn months. This peak flow surprisingly resulted from moderate rainfall (some 35 mm) which followed the period of relatively light rains. Peak flows on other watercourses were synchronised though level different; in some instances, maximum levels were reached in summer months owing to intense storms. Majority of mountain watersheds is rather densely forested, i.e. the watershed of the Hron River, the second longest Slovak territory sourced river, has in its upper part 75% forest cover. On the other hand, it is important to note that Slovak mountains are relatively densely settled and majority of Slovak watercourses are settled almost to their heads. The only unsettled short 5 – 15 km sections of watercourses are found in deep valleys of particular ranges. Despite considerably high forest cover, intensive anthropogenic activities (agriculture, transportation, urban infrastructure, etc.) strongly influence long stretches of Slovak watercourses.

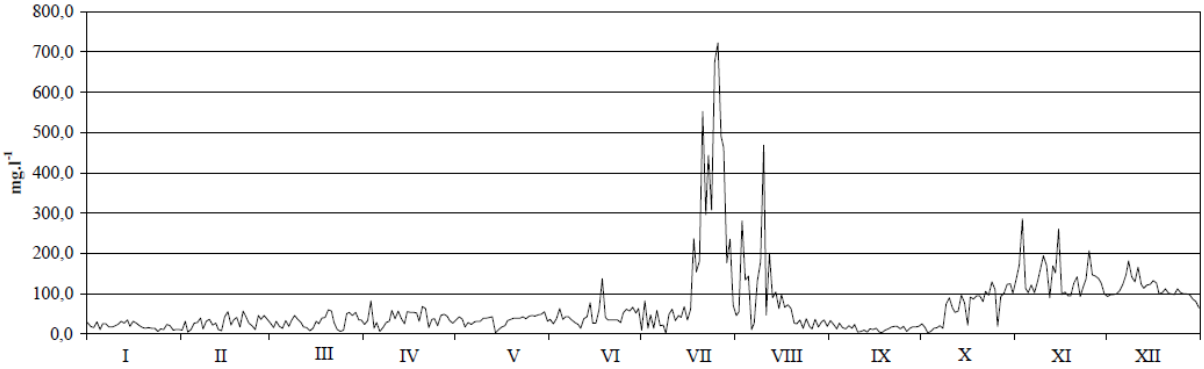
Figure 4 Average daily sediment load of Hron River at Kamenín gauge 2008



Source: Slovak Hydro Meteorological Institute

The graphics shows increased sediment loads during spring and autumn peak flows when vegetation cover of arable land is at its lowest. It suggests forest land contribution to sediment yields be less important than contribution of arable land, high forest cover of the watershed notwithstanding. Nevertheless, particular sediment loads often more depend on soil properties and slope gradient than actual vegetation cover. Figure 5 shows that watersheds on flysch rocks with heavier soils display generally higher sediment load than other watersheds including summer periods with high intensity storms.

Figure 5 Average daily sediment load of Ondava River at Horovce gauge 2008



Source: Slovak Hydro Meteorological Institute

Land use

Table 4 Land use recent changes

Land use (Cadastre records)	1 January 2008	1 January 2009	Annual change	Change factor		
				State border changes	Map improvement	Land use conversion
Agricultural land	2 428 899	2 423 478	-5 421	32	-294	-5 156
Forest land	2 007 142	2 008 257	1 115	-1	231	883
Water bodies	93 656	94 575	919	-2	21	902
Built up areas	227 931	229 059	1 128	0	-36	1 166
Other areas	145 945	148 335	2 390	0	208	2 180
∑ Slovak Republic	**4 903 573**	**4 903 704**	**131**	**29**	**127**	**-20**

Source: National Yearbook on Land Resources

2009 cadastre records indicate an annual decrease in agricultural land area and increase in all other land use categories. The change readily confirms long-term trends (see also text below). The continually increasing area of water bodies is a direct result of the establishment of new water reservoirs whilst the increase in build up area is related to development activities. In the process, both agricultural and forest land are being lost; nonetheless, the forest land loss is more than generously compensated for by forest expansion to non-forest land. Current deforestation is mostly associated with the development of ski resorts and highway infrastructure.

Forest cover

The pressure on the agricultural use of available land accelerated in early decades of the 20th century. From the 1920s onwards, lower demand for agricultural land resulted in a gradual increase of forest area. The increase has been to a certain degree associated with the afforestation of non-forest land. In the past, such efforts were partially or fully supported by the Government (e.g. Government Decree No 550 from 7 June 1994 on afforestation of abandoned agricultural land between 1994 and 1996 with view to 2000). Despite the Government supported scheme, majority of new forest has originated from natural forest expansion to abandoned land. The rise has been so rapid that cadastre records are not able to reflect actual forest cover. The results of first national forest inventory (2005-2006) based on a statistical survey confirmed considerably higher forest cover than previously reported. The inventory surveyed only the actual forest crop land rather than cadastre reported forest land which also includes forest nurseries, certain forest roads, cleared tracts, firebreaks and other small open areas within the forest. These plots currently account for more than 3.5 % of forest land. In view of the abovementioned facts, staggering 270 000 ha of forest is currently situated on officially non-forest land.

Table 5 Forest cover of the territory of Slovakia since 1920

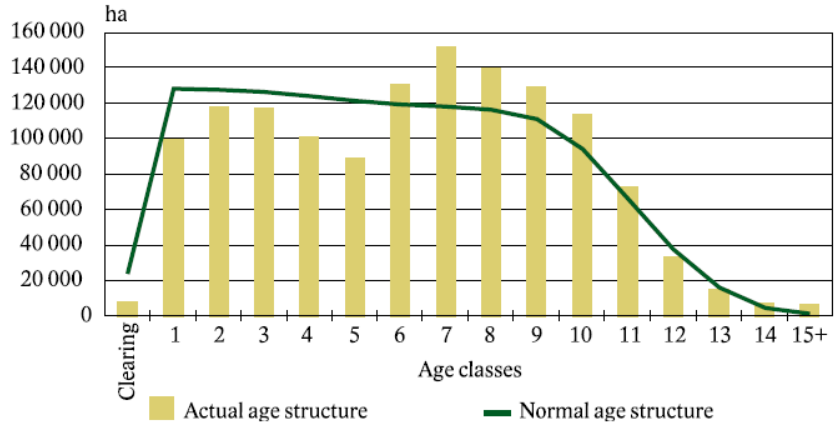
Source	1920	1950	2000	2006	2009
National Cadastre	1 637 837 ha	1 771 166 ha	1 997 961 ha	2 007 006 ha	2 008 257 ha
	33.4 %	36.1 %	40.7 %	40.9 %	41.0 %
National Forest Inventory (statistical survey)	-	-	-	2 172 341 ha (±19 615)	-
	-	-	-	44.3 ±0.4%	-

Source: National Forest Centre

Main trends in forest cover development

Slovak forests represent *genuine* forests with a relatively high average age, growing stock and stocking density. The average age of particular tree species varies between 49 and 78 years. The average stocking density gradually decreases with age from 0.9 in 10-20-year-old stands to around 0.7 in most mature stands. The age structure of Slovak forests is not entirely optimal since the area of clearings, majority of which are of calamity origin, represents only a tiny proportion of forest land.

Figure 6 Age structure of commercial forests (actual and normal).



Source: National Forest Centre

As the Figure clearly indicates, felling is presently being concentrated in *strong age classes* with high growing stock. Large felling volumes have a profound impact on many ecological aspects of forest including water quality. Public often considers clear-cuts for major culprits of flooding regardless of the fact that both their use and maximum area are severely limited. On top of that, many shelterwood cuts are often misinterpreted for clear-cuts. In few years time and *strong age classes* gone we will start to experience timber shortages. Lack of available timber might increase pressure on forest management practices and fuel intensive introduction of forest plantations.

Declining forest health and ever increasing incidence of windthrow represent two of *most* challenging issues facing the current generation of forestry professionals. They result in felling volumes regularly exceeding annual allowable cut and compromised tending of young stands (insufficient capacities for concurrent incidental felling and tending). The situation is further worsened by frequent bark beetle outbreaks thanks to which the volume of incidental felling is doubled compared to other years. Nonetheless, current total volumes of felling do not exceed annual increment – the fact which can soon be changed unless insect outbreaks are brought under control.

Table 6 Comparison of planned and actual felling with increment 2008

<table>
<tr><th colspan="2">Total current increment</th><th colspan="2">Annual allowable cut</th><th colspan="4">Actual felling</th></tr>
<tr><td rowspan="6">11.786 mil m^3</td><td rowspan="5">80.3%</td><td rowspan="4">7.522 mil m^3</td><td rowspan="3">100.0 %</td><td rowspan="5">9.467 mil m^3</td><td rowspan="4">64.6 %</td><td colspan="2">Of which incidental felling</td><td></td></tr>
<tr><td>Removed</td><td>Pending</td><td></td></tr>
<tr><td>2.498 mil m^3</td><td>0.333 mil m^3</td><td>Abiotic</td></tr>
<tr><td>2.827 mil m^3</td><td>0.817 mil m^3</td><td>Bark beetle</td></tr>
<tr><td></td><td>25.9 %</td><td>35.4 %</td><td>0.374 mil m^3</td><td>0.048 mil m^3</td><td>Others</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="2">6.115 mil m^3</td><td>Total</td></tr>
<tr><td></td><td>19.7 %</td><td colspan="5"></td></tr>
</table>

Source: National Forest Centre

Forest cover in Slovakia is sufficiently stable and projected to rise; the area of cuts and annual felling are reasonable given current forest production potential. Despite opinions of some NGOs there is no reason to consider forestry a *main culprit* of flooding events occasionally occurring in mountain regions, especially on heavier soils with poor infiltration capacity.

Forest management and water quality

Over the years, a number of practical measures have been introduced to protect soils against erosion. These measures, the most important of which is the designation of **forest areas for protective purposes** (protective forests), also indirectly improved water quality. These forests, which are typical for low intensity management, are designated on the basis of site survey results independently of forest owners' interests. Their primary function is to protect soils against erosion. Decreased levels of sediment load in our watercourses are only an indirect result of sensitive management of these forests since particular forest stands are designated protective independently of the sediment control objective at a landscape level. Owing to this fact, Slovak forestry practice does not recognise the concept of riparian buffer zones around watercourses.

The 2008 statistics put the area of these forests at 330 349 ha, equivalent to 17.1 % of total forest land in Slovakia. The extent of these forests has been moderately increasing as a result of improved soil survey. The growing incidence and volumes of incidental felling, however, often require the implementation of more invasive and complex management methods (calamity removal) originally unconsidered and for which majority of forest owners are not technologically equipped.

On top of that, there is a possibility to designate a special type of *water-protective forests* mostly concentrated around reservoirs of drinking water. The area of these forests greatly varies - from a narrow belt surrounding reservoir's shores to more substantial areas of entire watersheds. These forests are designated for a 10-year period and thus their area around particular reservoirs often changes. Generally, the total area of these forests (23 621 ha; 1.21 % of total forest land) remains largely unchanged.

As for pesticide use, their application in Slovakia is rather limited compared to other EU Member States (below EU average) with no single major water pollution incident reported in

2008. In forestry sector, their use is only marginal compared to agricultural production, although in recent years we have recorded an increase in the application of pesticides associated with control of bark beetle outbreaks (products containing alpha-cypermethrin).

Technical amelioration and torrent control

Technical amelioration and torrent control in forests are the legal responsibility of respective forestry bodies. Their obligations are defined by the Act No 364/2004 Coll on waters and the Act No 666/2004 Coll on flood prevention. Recent funding constraints have almost frozen investments into this area. As a result, new projects are quite rare and some of old structures are gradually falling into disrepair.
The state subjects under the MA SR (predominantly the Forests of the Slovak Republic, s.e. and State Forests of the Tatra National Park) in 2008 managed 17 855 km of minor watercourses. Forestry subjects under the SR Ministry of Defence and forestry colleges managed additional 651 km.

Table 7 Investments of Forests SR into managed watercourses

Investments 2008 (€)				
Category	**Internal resources**	**External funding**	**Total**	**Note**
Debris basins and flood control	240 119	33 177	273 296	Rural Development Programme for 2007–2013, Operational Programme - Environment
Fire control reservoirs	0	656 053	656 053	Rural Development Programme for 2007–2013
Dam improvement	0	111 579	111 579	Rural Development Programme for 2007–2013
Total	**269 873**	**689 231**	**959 103**	
Investments 2009 (€)				
Category	**Internal resources**	**External funding**	**Total**	**Note**
Fire control reservoirs		517 113	517 113	Rural Development Programme for 2007–2013
Debris basins and flood control		352 872	352 872	Operational Programme - Environment
Total	**0**	**613 452**	**613 452**	

Source: Forests of the Slovak Republic, s.e. Banská Bystrica

Table 8 Other expenses of Forests of SR, s.e. related to managed watercourses

2008	
Maintenance and repairs of watercourses	733 917
Repairs of flood damaged water channels and related constructions	315 873
Total	**1 049 790**
2009	
Maintenance of watercourses	42 759
Repairs of flood damaged water channels and related constructions	96 653
Total	**139 412**

Source: Forests of the Slovak Republic, s.e. Banská Bystrica

Investments of the State Forests of the Tatra National Park into the area were 103 070 € (in 2008), which included maintenance of minor watercourses, removal of woody debris from watercourses

(originating from avalanche and windthrow events), flood control measures and repairs of flood damaged water channels and related constructions.

Lack of coordination between forestry and water management sectors

One of the major challenges associated with the management of mountain watersheds is the improvement of existing cooperation with the Slovak Water Company, which administers major as well as many minor watercourses, and forest land administrators. The gap between both sectors is such wide that research focused on water quality issues is conducted separately and often without the presentation of achieved results to the counterpart (see *Chapter Water Plan* for more details). The previously mentioned direct responsibility of particular state forestry agencies for the management of minor watercourses is, in case of forests, combined with the fact that they cover the majority of mountain watersheds and significantly contribute to water quality in watercourses and their water balance. The Act No 364/2004 on waters compels forest owners to only very few broadly defined responsibilities: "*Forest land owners are obliged to manage their forests in a way to ensure appropriate conditions for water accumulation and water regime improvement; they are in particular obliged to eliminate detrimental changes to runoff regime and soil flushing processes maintain soil water content and enhance retention capacity of particular landscapes.*" None of the abovementioned obligations has, however, been incorporated into regulatory guidelines or, indeed, documents of strategic importance.

At a theoretical level, **water management authorities** can direct forest owners to implement measures to meet the abovementioned obligations. Despite this fact, such approach is rarely used and, if used, is often associated with the management of particular watercourses. No cases of forest owners being directly ordered to impose erosion control measures have been reported so far. Crucially, the Act does not pay any attention to funding of imposed obligations.

The Act recognises 12 protected water management areas, majority of which are situated in mountain regions of Slovakia. Their primary objective is to protect strategic national sources of drinking water. Designation of these areas has practically no impact on forest management in a particular area. The Act explicitly prohibits only *drainage of forest land at a scale significantly disturbing water regime in the affected area,* the measure almost unknown to Slovak forestry practice.

Forestry practice is slightly more impacted by the designation of buffer zones around sources of drinking water (see also above). Some of buffer zone forests are included in the category of special purpose forests as *water protective forests*. A specific management regime applies in these forests owners of which are exempt from tax levy. Budget constraints make the competent water authorities largely hesitant to designate these forests since forest owners are entitled to compensations for management restrictions imposed on their land. Thus the whole process of sustainable stewardship of water sources largely stagnates.

National Water Plan

A recent approval of the National Water Plan (Government Decree No 109 from 10 February 2010) should improve the situation in the management of water resources. The plan directly implements the Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (the EU Water Framework Directive - WFD). The regulation’s main objective is to counter deterioration of surface waters and achieve their acceptable quality by 22 December 2015.

The document itself provides a comprehensive analysis of surface and groundwater resources and includes both the proposal for their effective monitoring and identification of key challenges. Forests and forestry are nevertheless in the document mentioned only marginally. The only reference made to forestry is the one identifying it together with agriculture and industries as one of 3 major *contributors to water pollution*. There is neither reference to the role of forestry in

the maintenance of forest itself nor its contribution to rural development. The Directive represents a reference base for the *Complex Programmes of Erosion Control and Measures on Enhancement of Retention Capacity of Slovak Territory* compiled for particular catchments. On contrary to the previously mentioned, these programmes contain a direct, and fairly authoritative, reference to forestry and agriculture since they impose restrictions and/or bans on timber felling, forest road construction, crop selection, etc. Rather unilateral in their essence of focusing on the achievement of WFD objectives (enhancement of water quality and water habitats) they substantially lack consideration for challenges facing other sectors including forestry and agriculture. At the same time, they ignore a need for effective incentive schemes to promote defined objectives among landowners and other stakeholders. From a fiscal point of view, only payments for water management services are directly addressed – no reference is spared on payments for forest related services.

The deadline for the elaboration of these programmes including a public consultation procedure was set for the end of 2009. Their submission to the European Commission should be completed by the end of March 2010. Despite the fact that the documentation on WFD implementation contains a list of comments from numerous public bodies, the comments from forestry and agriculture sectors are missing. We can only speculate about the obscure reasons behind a total absence of consultations with landowners and land use specialists in the development of programmes for particular catchments.

Despite the aforementioned shortfalls the implementation of WFD will significantly influence the management of mountain watersheds and thus we hope for substantial communication and cooperation improvements.

GREEN PAPER on Forest Protection and Information in the EU: Preparing forests for climate change (Brussels, 1 March 2010)

The cross-compliance mechanism can as well have an effect on forest management, especially after the Health Check modification that introduced water management in the Good Agricultural and Environmental Condition (GAEC) framework with **the new standard** "Establishment of buffer strips along water courses" **that will be made compulsory from 2012 the latest**.

The implementation of the mentioned standard can bring positive changes to Slovak forestry practice where the absence of wooded buffers along water courses is considered one of its future challenges.

Turkey

EFC Working Party on the Management of Mountain Watersheds

27th Session
Štrbské Pleso, Slovak Republic, 7-10 April 2010

NATIONAL REPORT OF TURKEY

National Report of TURKEY

1. Introduction

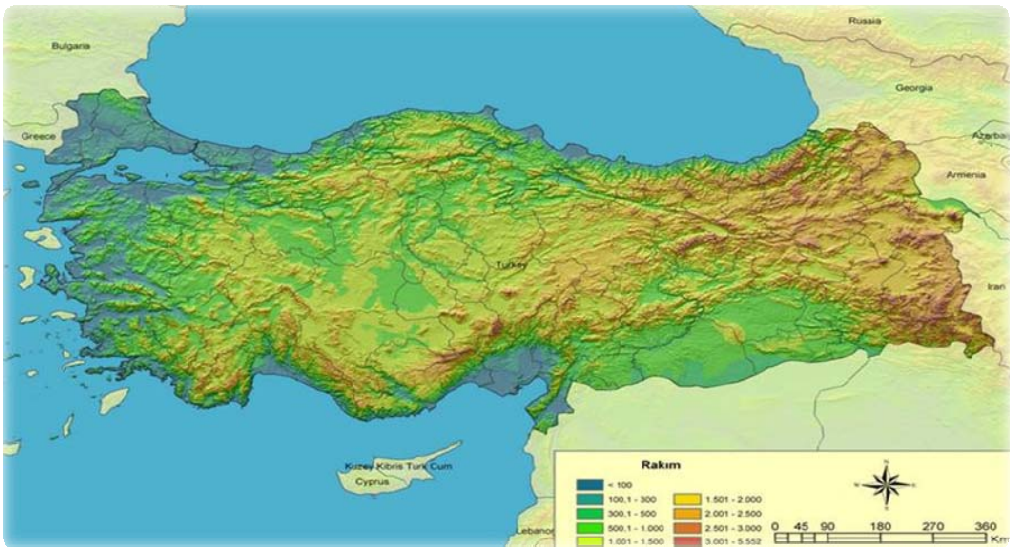
Turkey attended for the first time to the sessions of the Working Party in Oulu, in 2008. Also we have expressed our interest to host the "28th session of the Working Party" in the same session.

This year, The Ministry of Environment and Forestry of Turkey assigned General Directorate of Forestry to follow-up the sessions of the Working Party. Within this presentation you will find the current situtation and the ongoing projects related to integrated forest and water management of mountain watersheds in Turkey.

2. General Information

Turkey has 779,452 km2 land and 72 million population. The country is located where Europe and Asia meet. She has diversity and prosperity of topography, climate and vegetation cover.

According to land use; %34 of the country lands are farmlands, %27 are rangelands and pasturing lands, % 27 are forest lands and %12 are settlements areas and other lands.



Geographical Map of Turkey

Turkey has 21,2 Million Ha. Forest areas which is the %27,2 of the total country area. In Turkey, all forests are under the control and supervision of the State regardless of their type of ownership. Forests are generally located on mountainous areas and they are usually natural and semi-natural with high biodiversity value. The country has 9000 plant species of which 3000 is endemic and over 80.000 fauna species.

Turkey is located in a place where the semi-arid and dry sub-humid Mediterranean climatic conditions are dominant and the climate is Continental in the inner parts, Subtropical in the Mediterrenean Region. Average altitude is 1,132 m. High mountains are concentrated in Northern, South and Eeastern Anatolia. Due to the climatic characteristic and some other specific hydrological, topographic and vegetative identities, Turkey is likely to be affected by desertification driven process such as irregular distribution of rainfall and high temperature and other events. Mountainous topography and sudden changes in altitudes create variety of local micro-climatic conditions over the country.

Turkey has divided into 25 hydrological watersheds. Mean annual water flow of these watersheds is about 186 billion cubic meters. The renewable water potential of Turkey is estimated to be 234 billion m3/year and almost half of it has potential for development. The average precipitation is 643 mm. Total rain-fed based water quantity is about 501 billion cubic meters. However, only less than half portion of this amount can be consumed in irrigation, hydro powers and drinking-cleaning purposes. In terms of technical and economical criteria, total usable quantity of water resources is about 110 billion cubic meters.

Erosion is a serious problem in Turkey causing social, economical and environmental problems. According to the inventory studies % 86 of the country has been exposed to water and wind erosion different level and times. In addition to bed load, approximately 500 million tons of suspended sediment is transported by stream and rivers. 600 tons soil is lost to lake, river, sea in 1 km2 each year by erosion.

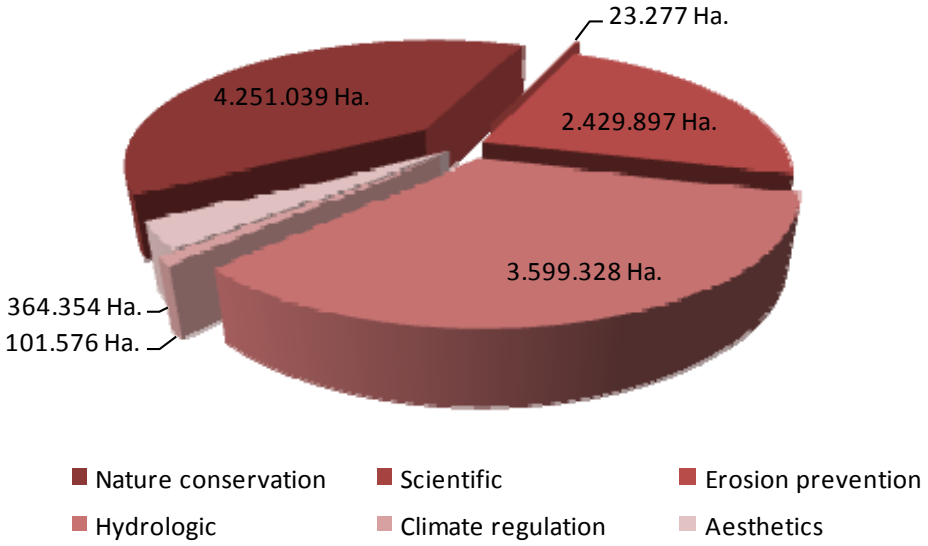
3. Forest and Watershed Management

The Ministry of Environment and Forestry of Turkey is the key responsible institution for the coordination of the implementation of the forest and watershed management activities at national level. General Directorates of Ministry of Environment and Forestry that works in the forest and watershed management are;

- General Directorate of Forestry,
- General Directorate of State Hydraulic Works,
- General Directorate of Afforestation and Erosion Control,
- General Directorate of Nature Conservation and National Park,
- General Directorate for Forest Village Relations.

In Turkey, all forests have to be managed according to the forest management plans. All the forest management plans - when renewed or made for the first time - are made in compatible with the functional planning process and GIS.

The major problem of introducing water production objective into forest management plans is the very limited amount of data and information on water producing functions of forests in Turkey. After a series of preparations, preparation of functional forest management plans has been initiated since 2006. A total of 27 percent of forests in Turkey are assigned for erosion control and water production.



The country has 25 main catchment areas with 9 major river basins covering about half of the entire land area. In the watersheds, there is both natural erosion and accelerated erosion as a consequence of human activities. Establishing forests through taking erosion precautions, in the water-collecting catchments of the stream and rivers, where precipitation-flow regime is destructed, in the hillsides, where vegetation is destructed; transforming degraded forest lands to fertile forest lands or improving vegetation; regulating water flow in the upper parts of the streams and establishing natural balance through this would prevent floods and overflows.

The root cause of this situation is a lack of integrated management, which affects the sustainability of forest management, as well as contributing to water pollution, the erosion of productive soils and instability of fragile ecosystems. The relationships among different elements of the environment, climate, soil, water, vegetation, wildlife and human activities determine the ways in which a region can be developed sustainably to meet the needs of its population. So far lots of projects throughout the region have been planned and implemented according to the integrated management approach. Some of these have been very successful in terms of new technologies, coordination of public and private organizations and wider stakeholder participation.

In order to realize objectives, integrated watershed rehabilitation projects have been prepared by the Ministry of Environment and Forestry of Turkey**.** Watershed rehabilitation is the work in order to take technical, cultural and administrative precautions to sustain natural balance between soil, water, and vegetation in the watershed, and to increase social, cultural and economic development of the community, living in the watershed.

It is considered that water management starts from upper watersheds; that functional forestry works in these catchments constituting the water bodies have a key role; that degradations in the upper catchments directly affect the water management in the lower catchments and the ones that use the water bodies in these catchments; and that it is obligatory to approach watershed management in an integrated way.

With the activities towards conservation of upper watersheds, and afforestation and plantation activities; protection from direct rain contact and so prevention of surface flows, erosion, floods and overflows as well as feeding underground waters are aimed at. All these preventions are to provide a healthy and natural water cycle in a sustainable way.

Rural poverty is an important element for pressure on the natural resources of upper watersheds and it constitutes an important problem leading to the disorder of the natural balance in these watersheds. Therefore, attempts are made for integration of preventions for watershed rehabilitation and conservation with preventions for increasing rural poverty. It is considered that a part of the incomes collected directly or indirectly as a result of using water bodies should be spared for financing the preventive activities to be realised at the upper watersheds.

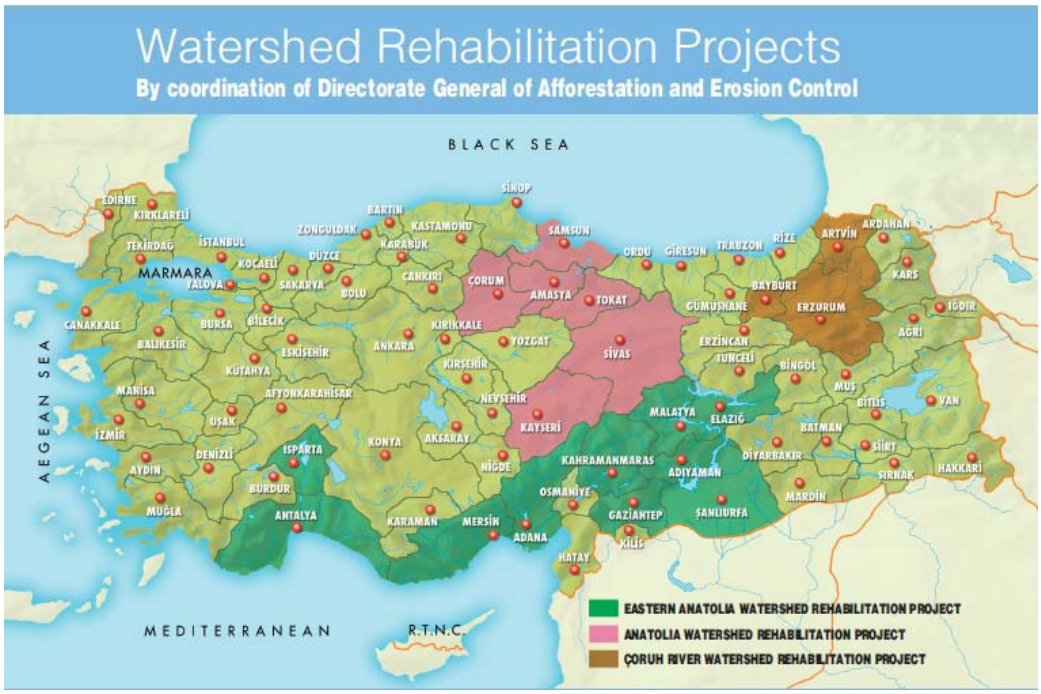
In the watersheds of Turkey; apart from the natural erosion deriving from climate, topography and geological structure; an accelerated type of erosion is present due to incorrect land practices and excessive use of land. The most important reason for destruction of natural resources in the watersheds is rural poverty. People have to use natural resources in order to continue their living. Hence, this situation leads to further destruction and greater poverty; and this vicious cycle continues on and on.

Watershed rehabilitation works in 1950s were introduced with the aim of decreasing the damages of floods and overflows and thereby providing safety for current dams. First implementations in the upper watersheds were reduction of soil erosion, facilities and afforestation works regulating water flow regime.

4. Watershed Projects

General Directorate of Afforestation and Erosion Control, which is structured under the Ministry of Environment and Forestry, is carrying on some projects related to Integrated Watershed Management. These are;

- Eastern Anatolia Watershed Rehabilitation Project
- Anatolia Watershed Rehabilitation Project
- Çoruh River Watershed Rehabilitation Project



Primary objective of these projects is to stop natural resource erosion. Also rural districts are supported in order to reduce the pressure on natural resources. Participation of local community and nongovernmental organisations is essential as well as related state agencies. Participation is sought in decision-making, implementation and project finance. These objectives were to be pursued through efforts to improve productivity of range and forestland, promote production of fuel wood, fodder, and more sustainable use of marginal lands, facilitate the adoption of treatments for range and forestland to yield quick benefits, and to ensure increased involvement of local communities. A key underlying objective was environmental rehabilitation of degraded land. There is also a component for genetic resources conservation of indigenous species.

- **Eastern Anatolia Watershed Rehabilitation Project**

The Project was signed by World Bank and Government of Turkey on 25th March, 1993 and implementation was initiated within the same year. This project aimed at rehabilitation of natural resources at the upper watersheds.

The project was implemented in 88 micro-catchments at 11 provinces and was completed as of 30 September 2001. At the end of nine year project implementation, all agencies spent US $ 78,333,000 in total.

The project handled with rural poverty and natural resource degradation problems in upper Euphrates and Tigris River catchments, aimed at sustainable and improved rangeland, forestry and agricultural activities at the micro catchments by decreasing soil erosion and increasing soil fertility.

In Eastern Anatolia Watershed Rehabilitation Project, integrated participatory approach was embraced and a project approach was implemented in which all related government agencies cooperated with the local people. All the activities within the project were aimed at upper parts of the catchment.

Natural resource conservation and rehabilitation was targeted and in order to reach this target, income raising activities to increase the living standard of local community as well as training the local people for natural resource preservation and sustainable management activities were realised. Local people were trained while the capacity building activities for the agencies were also continued.

Realised Works

- 73.156 Ha. Soil Conservation Afforestation,
- 19,882 Ha. Rangeland Rehabilitation,
- 2240 Ha. Oak and 1687 Ha. Cedar Rehabilitation,
- 1,069,498 m irrigation channel,
- 1.260 irrigation ponds,
- 2,643 Ha. agricultural terrace construction was realised and
- 12,368 ha area was opened to irrigation.

- **Anatolia Watershed Rehabilitation Project**

The Project was put into force following the agreement signed by Turkish Republic and World Bank on October 4th, 2004 and the coordinator unit of the project is Directorate General of Afforestation and Erosion Control.

Anatolia Watershed Rehabilitation Project covers natural resource rehabilitation and decreasing rural poverty activities in 28 upper micro-catchments in watersheds of Kızılırmak and Yeşilirmak rivers; and decreasing and monitoring agricultural, animal and water pollution activities in lower micro- catchments.

The global objective is to introduce farming practices which will reduce the discharge of agricultural nutrients into surface and ground water in watersheds draining into Black Sea.

All communities and related groups that are responsible for natural resource management and affected by this management are involved in each phase of management including decision making, planning and implementation, monitoring, evaluation and assessment. This project aims at participation of all related Government agencies as well as local community for a sustainable natural resource management.

Difference of the project; it includes reducing agricultural, livestock and water pollution on the lower parts of the watershed beside natural resource rehabilitation and reducing rural poverty.

Activities

I- Rehabilitation of Degraded Natural Resources

- Rehabilitation of forestlands, rangelands and farmlands,
- Environment friendly agricultural practices,

- Measuring and monitoring water pollution.

II – Income Raising Activities

- Small scaled irrigation,
- Agricultural terrace and production in these terraces,
- Increasing and developing product variety in agricultural products,
- Developing animal husbandry, greenhouse, fishery and beekeeping.

III- Strengthening Policy and Regulatory Capacity towards Meeting EU Standards

- Supporting implementation of EU Nitrate Directive,
- Setting and introducing agricultural practice rules,
- Corporate support for organic farming.

IV– Training and Awareness Raising Works

- Conservation of natural resources,
- Increasing productivity in farming,
- Training the farmers about inorganic manure and pesticide use, and organic farming techniques as well as introduction of new techniques to the farmers and awareness raising works will be continued during the project period.

- **Çoruh Watershed Rehabilitation Project**

Çoruh Watershed is located at northeast of Turkey, at the south of Black Sea and adjacent to neighbouring country Georgia border and covers nearly 2 million hectares land. The project is an integrated project and Artvin, Bayburt and Erzurum provinces are included within the project. There are 18 Micro-catchments within the project, 12 of them are of high priority and covers 604,301 hectares land, 242 villages and 55,000 people. The Project will be implemented between 2010-2016.

Çoruh River Rehabilitation Project is similar to the previous projects in a different part of the country with different characteristics; apart from the above mentioned activities, extending and supporting the solar energy system, which is a renewable energy source, was targeted in order to reduce consumption of fossil fuel. Furthermore; functional planning for forestlands, national park and hunting-wildlife improvements, eco-tourism planning and development are also included.

- **Yıldız Mountains Project**

The proposed Biosphere Reserve that is the focus of this Project lies in northwestern Turkey an area commonly referred to as European Turkey. The Project area comprises the Turkish part of the Yildiz Mountains, which encompasses a total area of about 130,000 Ha. A total of 25 villages are located within the proposed Biosphere Reserve. In addition, some cultivated

areas are owned by inhabitants from six villages, located outside the periphery of the Biosphere Reserve.

Project Aim:

- Achieving conservation of biodiversity and natural resources through the establishment of a Biosphere Reserve Sustainable development,
- Participatory process in project planning,
- Increasing awareness of local communities and providing environmental training,
- Increased collaboration between Turkey and Bulgaria.

This project is based on Biosphere Reserve concept which is new approach in our country. As the project is based on Biosphere Reserve principles, participatory planning process is aimed. As a result, the village communities live in Yıldız Mountains, the people live in catchment area, non governmental organizations, state institutions, and all Turkish population because of the national heritage, European Union because of its support and whole people live in the world because of uniqueness of Yildiz Mountains are accepted as stakeholders.

- **Yunt Mountain Project**

The full title of the Project is "Development of Public Participation and Improvement of Socio-Economic Prosperity in Mountain Communities: Yuntdagi Model" (TCP/TUR/3102), which is financed by FAO (TCP) and stretching years 2008 and 2009.

Development objective of the Project is to support the Turkish Government on implementation sustainable mountain development and improving the livelihoods of rural people in mountain areas. Objectives at national level are to introduce multi-disciplinary and participatory approaches for sustainable mountain development and building up the framework for mountain management planning. Objective at field level is to test modern approaches for sustainable management of mountain ecosystems and for livelihood improvement.

In the framework of participatory and integrated approaches for mountain management, the following core strategies were considered at all phases of the Project implementation;

- Participation,
- Multi-sectoral and multi-disciplinary approaches,
- Coordination among the institutions,
- Priorities and demands of the local people,
- Benefitting from the FAO and other worldwide experiences,
- Providing the supports from national/international expertise,
- Awareness rising of the public and institutions related mountain management.

During the Project; workshops, baseline surveys and training seminars were held. Also some pilot activities such as; vine cultivation, private afforestation, feed crop production in private lands, establishing solar energy system, constructing drip irrigation systems, improving sheep breeding in the region and establishing a sheep herd disinfection facility were executed.

5. Conclusion

As it was mentioned before; the main problems affecting the forest and watershed management activities in Turkey are erosion and rural poverty. Agricultural resources are insufficient due to rapid population growth in the upper watersheds and therefore migration to the cities increased as a result of rural poverty. Due to excessive and uncontrolled migration from upper watersheds to the cities, there is only elderly population in many watersheds. Due to the fact that small water bodies, which were once used for agricultural irrigation, are now allocated for drinking and domestic purposes and agricultural water bodies are now insufficient; the water is now economically used and demand for modern irrigation techniques has risen.

Also there is a need for “Integrated Mountain Management Strategy” in Turkey. Although the activities are being held under the same ministry; coordination and collaboration problems are occuring now and then. So, a responsible body concerning forest and watershed management activities is required.

The importance of the participation of all stakeholders emerged as an impotant issue during the implementations of these Projects. The Integrated Watershed Management concept is centered on participation; but watershed stakeholders’ participation is still limited, as are their links with decision makers. In order to make the works more common and successful, integrated watershed rehabilitation projects should be implemented with a participatory understanding from all the institutions, working in the watershed, civil society organizations and people living in the area.