

Integrated Drought Management in Central and Eastern Europe / Global Water Partnership
Central and Eastern Europe

Project: Assessment of drought impact on forest ecosystems

Report on Topic 1 and 2

Slovenian forest sector

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1. General information

Slovenia belongs to the most forested countries in Europe. 1.184.369 ha of forests cover more than a half of its territory (58.4 %) [7]. It is the third most forested country in Europe, after Finland and Sweden. Forests are therefore an essential feature and constituent part of the environment, and the awareness of their protective and social importance is steadily increasing.

Slovenia is mainly a mountainous country. The occurrence and the structure of the forests are therefore, to a great extent, shaped by the climate, parent rocks, soils and relief. The macroclimatic types are influenced by the Mediterranean Sea, Alpine mountain chain and Pannonian plain. The warm sea-climate, penetrating from the coast, generally reaches the western Slovenian border where it is stopped by the first slopes of the hilly Sub-Mediterranean interior and modified into the cool littoral climate. Highlands, such as the Julian Alps, the Karavanke and the Kamnik-Savinja Alps are characterized by a temperate sub-polar climate. A transition from the Sub-Mediterranean climatic zone to the continental zone is interrupted by the Dinaric mountain massif, which is characterized by an interferential climate. A large part of central Slovenia has a humid continental climate. However, when approaching the Pannonian plains, the climate changes rapidly, and becomes semi-arid continental.

Based on studies of the phyto-geographic regions, and on different geographic features such as geology, soil, relief, precipitation, temperature, potential vegetation, climate, and phenology, the country was divided into the following eco-regions: Sub-Mediterranean, Dinaric, Pre-Dinaric, Alpine, Pre-Alpine, Pohorje and Pre-Pannonian eco-region [4].

Despite rather favourable conditions, the forest cover has not always been so high. It began to increase in the end of 19th Century when the forest cover started to grow from 737,000 ha (36.4

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%) in 1875 to 1.18 million ha (58.4 %) in 2011 [7]. The major reason for this was the abandonment of agricultural lands, which have been gradually overgrown by forest vegetation. Presently, efforts are being made to maintain the extension of forest cover constant.

In the Slovenian forests, there are a total of 71 different native tree species, 10 of which are coniferous and 61 deciduous. Deciduous species in the natural forests prevail. Most Slovenian forests are located within the area of beech, fir-beech and beech-oak sites (70 %), which have a relatively high production capacity [1].

Close-to-nature forestry, which has been used in Slovenia for over 50 years, promotes the conservation of nature and forests, as nature's most complex creation, while deriving benefits from a forest in such a way as to preserve it as a natural ecosystem of all the diverse life forms and relations formed therein. In Slovenia, the basic principles of forest management are sustainability, imitating the natural cycle in forests (close-to-nature management) and multi-purpose use of the forests (production of material assets, ecological and social functions). The management of forest habitat types should follow the general idea of keeping the forests as close to their natural state as possible, taking into account their economic and social functions. The idea of forest planning and management oriented towards natural species composition and a very limited share of non-indigenous tree species is widely applicable.

Slovenia has an established tradition of planned management of forests. The first forestry plans for this territory were made in the 18th century [2], while individual edicts for regulating forests were being made as early as the 15th century.

Ownership and the size of holdings

According to official statistics in the early 1990's, about 62.4 % of forests were privately owned and 37.6 % were publicly owned. In the past 10 years, the share of private forests has increased, due to the restitution of 7 % of the forest land to the former owners in the denationalisation process.

Currently, 71 % of forests in Slovenia are private property, 29 % of forests are public (owned by the state or communes) [1]. Larger and undivided forest estates of state-owned forests enable good professional management. In general, private forest estates are small, with an average area

of only 3 ha and even these are further fragmented into several separate parcels. Private forest property is becoming even more fragmented as the number of forest owners is increasing. According to the latest data there are already 314,000 (with co-owners even 489,000) forest owners in Slovenia [1]. The major fragmentation of forest property, the number of forest owners and co-owners, present a serious obstacle to professional work in private forests, to optimal timber production and utilisation of forest potential. Conversely, such circumstances are favourable to the diversity of species composition and forest structure. Larger forest holdings are found in mountainous regions, where forests represent an important source of income for the forest owners.

It is estimated that at the completion of the denationalisation process, about 80 % of forests will be privately-owned and about 15 % will be state owned. Other forest owners will most likely be municipal authorities, the Roman Catholic Church or co-operatives.

Forest contribution to the national economy

Despite a high share of forests, Slovenian forestry is not an important economic sector, although the trend is slightly increasing. In 2001, the share of forestry in the gross domestic product (GDP) was only 0,36 %, while in 2011 the GDP was 0,6 % [6]. Such a low economic contribution can be explained partly by the structure of forest ownership and partly by the GDP accounting methods. The fragmentation of private forests is one reason that causes forest estates to be of little economic interest for the owners. Moreover, with the increasing number of forest owners, private forest estates are becoming even smaller. Such a situation represents a serious obstacle to professional interventions in private forests, to the production of the high quality timber and to the potential forest utilization. The accounting system is the second reason for such a low share of forestry in the GDP. The official statistics evaluate only a part of the market products: timber and firewood. Non-wood forest products (NWFP), such as honey, mushrooms, game meat are assigned to other sectors, for example agriculture or food production, whereas non-market public goods and externalities are not accounted at all [4].

Functions of forests

Wood is traditionally important energy source in Slovenia, because more than 30% housings use wood for heating. Chopped wood still dominates as wood fuel, while wood chips and pellets have also been introduced in recent years. Slovenian market with all forms of wood fuel is

developing rapidly. The state contributed to this trend by introducing a system of co-funding of initial investment in modern boilers for central heating and by supporting promotional projects. Introduction of modern technologies also increased the demand for wood as energy source [8]. Wood biomass was and still is an important source of energy for households in Slovenia. Among all renewable sources of energy wood biomass prevails as the source for heat production. More than 75 % of wood biomass is used in households for apartment heating and cooking. Number of households using wood biomass has increased in the last 5 years. The share of renewable energy sources should reach 25 % by 2020. The government of Slovenia has prepared an Action plan for renewable sources of energy in summer 2010 in which ways to reach our targets are foreseen [3]. As the country is poor with regards to other natural resources, the production of high-quality wood is one of the main objectives of forest management. Considering a highly variable relief with steep slopes, intensive precipitation and large karstic terrain, protecting against climatic extremes, landslides, torrents, floods and the like, is one of the most important forest roles. Forests cover more than three quarters of the terrain with the inclination of more than 20 %, and as much as 90 % of the terrain with the inclination of more than 35 %. In Slovenia, erosion occurrences can be found in the area of 9,000 km, while stronger erosion occurrences are present in torrential areas which cover 4,900 km with more than 10,000 km of flood channels. Therefore forest has a great influence on water regulation (retention effect, mitigation of extreme outflows) and quality of water (uncontaminated areas, filtration,...). Therefore forests protect the supply of drinking water.

Forests are also home to indigenous plant and animal species. 14% of all endangered plant species and 50% of animal species live in forests, among them large carnivores, which have been extinguished in most European countries.

Additionally, forests provide a wide range of so-called social functions such as tourism, recreation, protection of cultural and natural heritage, education and research, and others. In cases where social and/or ecological functions are recognized as being important, forests with a special status can be declared. In these forests, the main objective is to ensure the protection and development of these functions.

Social aspects of forests

Forests in Slovenia are open to public. People often abuse this advantage and inappropriate activities and acts often take place in forests, which result in conflicts with forest owners. The most frequent negative occurrences are:

- disposal of waste in forests,
- unauthorised interventions into forest area (quarries, sand pits, removal of soil, construction of different objects),
- tourist and recreation activities not adjusted to forests and their functions,
- excessive collection of forest fruit and other forest products and inappropriate activities in peaceful zones in forests.

People are becoming increasingly aware of the importance of forests. Interaction of people and forests, which used to be intense because of wood and other material goods acquired from forests, has been increasing. Primarily because of the environmental role of forests and popularity of forest environment for relaxation and recreation. People are also aware of the importance of forests as a source of wood. Forests significantly contribute to the overall wellbeing of people. There are numerous natural goods in forests which enrich forest area and are a part of national heritage. Their preservation and maintenance is also a task for a wider community.

Protective purpose of forests

Forests regulate water flow by mitigating erosion power of raindrops and with great infiltration and containing capacity of forest soil. Hydro-meteorological role of forests is important in Slovenia because of terrain conditions and large quantities of precipitation in Slovenian mountains, which are one of the most precipitated areas in the entire Alpine arc. Ratios between the highest and lowest annual outflow of Slovenian waters indicate that the majority of Slovenian waters have torrential characteristics. Without forests, those characteristics would be strengthened considerably. Due to a high containing and filtration capacities of forest soil, forests are of an exceptional importance for the preservation of sources of clean potable water. Climate extremes in forests are mitigated compared to the climate outside of forests. Microclimate regularion of forest by shading and blocking wind close to ground, forests mitigate climate extremes also in their surroundings. Various particles from polluted air are disposed in forests, and forests act as a filter, which is particularly important in the proximity of the biggest pollution

sources (Zasavje, Velenje, Mežica) and larger urban areas. In the proximity of health and wellness resorts, forests contribute to the quality of air by oxygen enrichment.

Forests, which are exceptionally important for the protection of lands from landslides and breaking, forests on steep slopes or water banks, forests exposed to wind and which in torrent areas withhold excessive outflow of water, forests near the upper forestline, in highly steep slopes and in certain areas with emphasised biotope function and important remains of forests in farm landscapes are defined as protective forests (100,750 ha). Management in such forests is directed in the strengthening of their protective or biotope function.

In Slovenia, 9,630 ha of forests are declared forest reserves in which forests are subject to natural development. Forest reserves contribute to the increase in biodiversity in forests and enable studies of natural development of forests [5].

Degraded areas

In spite of rather stable forests, which are due to well-preserved forest structures, there are many natural and anthropogenic disturbances affecting their health. About 37.600 ha (3,2 %) of forests are damaged or degraded annually, mainly due to abiotic factors, among other reasons. Unfavourable weather conditions (such as drought, extreme winds and sleet) are the most frequent reasons for damage. Besides direct impacts, these factors can stimulate excessive development of insect's population or diseases.

Another factor having a detrimental effect on the forest's ecological stability is the impaired balance between vegetation and wildlife. Since an excessive population of herbivores seriously affects the forests' regeneration capacity, natural regeneration - being a prime condition of stable forests - may in some places become impossible.

Forest fires cause significant damage in the Karst and Sub-Mediterranean region [4]. The main reasons were human activities, while only 2% of all fires were caused by natural forces (mainly lightning). Air pollution also has a negative effect on forest condition and stand stability. Severe damage is, in most cases, confined to particular locations close to thermal power plants and other industrial zones. However, despite such situations, forest health inventories show that degrading has slowed down within the last five years and that the health status has stabilized. Although some problems on the local scale still remains - such as groundwater lowering, dieback of oak trees (*Quercus robur*) and narrow-leafed ash (*Fraxinus angustifolia*) in the eastern part of

Slovenia, influence of invasive plant species , deforestation and fragmentation of forests for agricultural purposes.

Wild game management

Hunting has always played an important role in social and cultural life. Wild game in Slovenia includes a group of wild mammals and birds which are hunted and are determined by a decree of the Government of the Republic of Slovenia. Wild game management provides ecological, social and economic functions of wild game and their habitats, and includes planning, preservation, sustainable management and monitoring of the condition of wild game. Particular attention is paid to large carnivores (bear, wolf and lynx), which were in the past exterminated in the majority of European countries. Today, Slovenia is one of the rare countries in Europe which preserve stable populations of large carnivores, also because of activities in the area of the promotion of coexistence between man and large carnivores. According to constant monitoring, the populations of wild game and large carnivores and some other protected animal species in Slovenia are stable and vital.

Wild game is property of the state and is managed by the Republic of Slovenia. The basis for the planning is monitoring of the condition of wild game and their life cycles. It is based on objective biological indicators (monitoring) - in populations of individual species as well as in their habitats.

Today, sustainable wild game management, which also includes hunting of wild game, is performed by local hunting clubs (families) established on the basis of voluntary decisions of their members. There are 420 hunting clubs in Slovenia, with the total of 20,000 hunters, which represent 1% of the total Slovenia's population. There are numerous activities related to wild game and hunting: maintaining balance between populations of wild animal species and their environment, preserving historical and ethnologic heritage, cherishing of music, literature and fine arts, transfer of tradition and knowledge to younger generations, care for preservation of ethical hunting code, participation in scientific research, etc. [5].

2. Forest governance

Forests and forestry are the responsibility of the Forest Department of the Ministry of Agriculture and the Environment. The Ministry is responsible for the forest policy (preparing the

national legislation), adopting forest management plans, financing the public forest service and paying subsidies. In addition, it is also in charge of international relations.

The Chamber of Forest Owners has been established in 1999 and is intended to represent forest owners and their interests. Membership is obligatory for almost all forest owners. The chamber will also take over some tasks that are presently under the responsibility of the Forest Service and are directly related to forest owners.

- *Forest policy*

Forest policy is based on the 1993 Forest Act and it regulates forest protection, silviculture, exploitation and its use. In turn, the Act considers forests as natural resources in order to ensure their close-to-nature and multipurpose management in accordance with the principles of protection of the environment and natural values, long-term and optimal development, so they can fulfil their functions. The Act also regulates the conditions of forestland and individual forest trees and groups of forest trees outside settlements in order to preserve and enhance their role in the environment.

Besides the Forest Act, in 2007 the Slovenian Parliament also adopted the National Forest Development Programme, which was prepared by the Ministry of Agriculture, Forestry and Food. Taking into account the natural principles of forest ecosystems, public interest, available state budget, as well as the needs and interests of forest owners, the Programme provides the basis for the conservation and development of all forests and their functions. It sets out strategies for the development of individual spheres of forest management and provides professional guidelines for co-operation with fields that interact with forestry in the landscape.

- *Public forestry service*

Public forestry service is performed in all forests, regardless of ownership, by the Slovenia Forest Service, while certain tasks of the public forestry service are also performed by the Slovenian Forestry Institute. Management of private forests is often ineffective because forest holdings are fragmented. Association of owners, for which timber removal and other works in larger complexes are organised, can significantly contribute to better efficiency of management of private forests. The Chamber of Agriculture and Forestry should also be involved in the training of forest owners for reaching commercial efficiency of forest management. Large area

covered by forests and the necessity of comprehensive direction of their development require highly competent and well-organised public forestry service. Tasks of the public forestry service are determined in the Forest Act.

The Slovenia Forest Service is a public forestry service. It is organized at the state level (central unit), regional level (14 units) and local level (94 local units and 430 forest districts). It employs about 700 forestry experts. According to the 1993 Forest Act, the Forest Service is responsible for forest protection (preparing forest fire protection plans), monitoring of forest conditions, their development, for providing guidelines for forest management, for preparing forest management plans (at 3 levels), for constructing and maintaining forest roads, for advising forest owners and for providing them with knowledge and training (courses).

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Supervision in forestry

Supervision in forests from the aspect of observance of the Act on Forests, the Forest Reproductive Material Act and the Nature Conservation Act, and related regulations, is performed by the forestry inspection service, and also by the inspection responsible for nature conservation in protected areas. In 2006, the Slovenia Forest Service started implementing, in accordance with the Nature Conservation Act, direct supervision in nature, which presents supervision in forest area from the aspect of observance of the regulations on nature protection. Supervisors already carry out nature protection supervision in protected areas.

Education of forestry personnel

Forestry personnel of the professional and medium level are educated in the Forestry and Wood Processing Secondary School in Postojna, while the Biotechnical Faculty (University of Ljubljana), Department of Forestry and Renewable Forest Resources offers higher education professional study of forestry and university study of forestry and renewable forest resources. A higher education programme (forestry and hunting engineer), is taking place in Postojna, at the Higher Vocational College.

Research and development activity

The majority of research activities in the area of forestry take place at the Slovenian Forestry Institute and the Department of Forestry and Renewable Forest Resources at the Biotechnical Faculty. They are co-funded by the Ministry of Education, Science and Sport and the Ministry of Agriculture and the Environment. Individual research projects and project tasks are also funded by the Farmland and Forest Fund of the Republic of Slovenia, and forest management and other companies. The Slovenia Forest Service also participates in research field.

Education and training of forest owners

Education of forest owners is one of the most important forms of active participation of forest owners in the provision of efficient forest management, both in economic sense and in the sense of strengthening of all non-material functions of forests. Institutions which independently or through mutual cooperation act in the area of education of forest owners are: Slovenia Forest Service, Forestry and Wood Processing Secondary School in Postojna, Chamber of Agriculture and Forestry, Slovenian Forestry Institute, Slovenian Adult Education Centre, Biotechnical Faculty, Union of Forestry Associations of Slovenia, Association of Forest Owners with their local branches and associations related to forestry.

The most frequent topics of education are: cultivation and protection of forests, technology of work and forest roads, wood processing, acquisition and use of wood for energy, financial support in forestry, direction of development of wild animal populations, planning of development of forests and forest area, functions of forests and cultivation of forest landscape, legal regulations on forests and forestry and the area of the EU forestry policy.

3. Plan for national strategy for development of the forest sector in Slovenia

Forestry in Slovenia can be considered as very progressive and ecologically oriented. For many decades, the concepts of sustainability and multi-functionality have been implemented in management practice and forest policy. The Resolution on national forest programme, released in 2007, is the basic document, which determines the strategic framework of state policy for achievement of long-term and sustainable management of productive multifunctional forests in Slovenia.

For the assessment of developmental potential, several goals were formulated in the frame of:
Forests and economic activities:

- increase utilization of production potential of forest sites;
- increase the openness of forests with forest roads;
- adequately maintained forest roads;
- develop Slovenian market of forest wood assortments.

Forest seed production and arboriculture:

- provide adequate quality and quantity of forest reproductive material.

Management of state forests:

- increase the share of state forests;
- improve cadastre and plot structure of state forests;
- preserve farm holdings and rural areas in mountains with restricted management possibilities;
- rational forest production.

Management of private forests:

- improve organization of forest owners;
- intensify education of forest owners and counselling;
- stop further fragmentation of forest holdings;
- provide implementation of necessary cultivation and protective works in forests;
- provide implementation of works in technologically modern and safe way;
- incentives for forests in which ecological or social functions determine the manner of management;
- better participation of owners in the planning of the development of their forests;
- improve marketing of forest wood products, other forest products and functions of forests.

Wood and paper industry:

- increase export of wood products with increased added values in domestic wood industry;
- increase the use of wood and wood products in construction and residential environment;
- wood and wood products should become the leading material by 2015.

Other activities related to wood:

- higher share of use of wood in Slovenia's primary energy balance;
- increase the scope of activities using wood, in particular in rural areas, where those activities considerably contribute to their development.

Hunting:

- ensure sustainable commercial use of all huntable species.

Beekeeping:

- use bee pasturing potential of forests.

Collection of non-wooded forest products:

- use the potential of forests in terms of the acquisition of non-wooded forest products in a manner friendly to forest

Tourism and recreation in forest areas:

- use of forest for tourism adjusted to functions of forests.

Livestock pasturing in forests:

- regulate livestock pasturing in forests and direct it to adequate areas.

4. Main problems in the forest sector in Slovenia

Environmental impact of forests and their economic incidence is reduced by all factors which pose a threat or disturb their functioning and stability or cause direct damage. The most important factors which specifically influence on the reduction of environmental impact of forests are:

Shortage of forest roads

Although Slovenian forests in the period until 1990 were on average well open with roads (19.8 m/ha), there are still numerous areas, primarily in private forests, which require the construction of forest roads. Construction of forest roads in closed forests is among the most important forest management measures.

Shortage of forest towing paths

Particularly on rocky terrain without forest towing paths it is not possible to transport wood to roads; wire transport is considerably more expensive. The problem of shortage of forest towing paths in private forests is similar in its scope to the problem of shortage of forest roads.

Lack of realized forest growing work

Many forest owners, primarily those with small forest holdings which dominate in Slovenia, do not pay enough attention to forest management, and the majority is not trained for work in forest, therefore such owners are not ready to carry out forest growing works despite co-funding of by the state and the EU. With the abolition of the renewal of forests by planting where this is necessary and of cultivation works, forests deteriorate in the long run from the economic aspect.

Fragmentation of forest holdings

Forest holdings in Slovenia are very fragmented, whereas co-owners were not taken into account; joint ownership is frequently a hindering factor in forest management; forest holdings are usually divided into separated parcels, which additionally hamper forest management and their development.

Absence of links among forest owners in the implementation of works in forests and sale of wood

Various works in forests could be carried out more rationally if they would be implemented simultaneously in larger areas - connecting fragmented holdings. Single forest owners are very ineffective with their small quantities of wood on the wood market, and they find especially hard to sell wood of lower quality.

Insufficient skills of forest owners for the work in forests

Due to small scope of works in forests as a consequence of small size of forest holdings, forest owners are insufficiently skilled for the work in forests, which also reflects in low efficiency and high frequency of accidents at forest work.

Other problems

- low level of innovation in the marketing of other functions of forests, related to non-wood forest products and services provided by forests,
- insufficiently directed research work in the area of innovation and entrepreneurship related to economic incidence of forests,
- insufficient level of interaction among industries, which are based on wood in the sense of industry organisation, production chains and logistics channels,
- insufficient social awareness of the importance of wood and consequently insufficiently exploited wood potential,
- low level of value added to wood in Slovenia,
- lack of competitive edge of the primary wood production and reduction of its capacities.

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