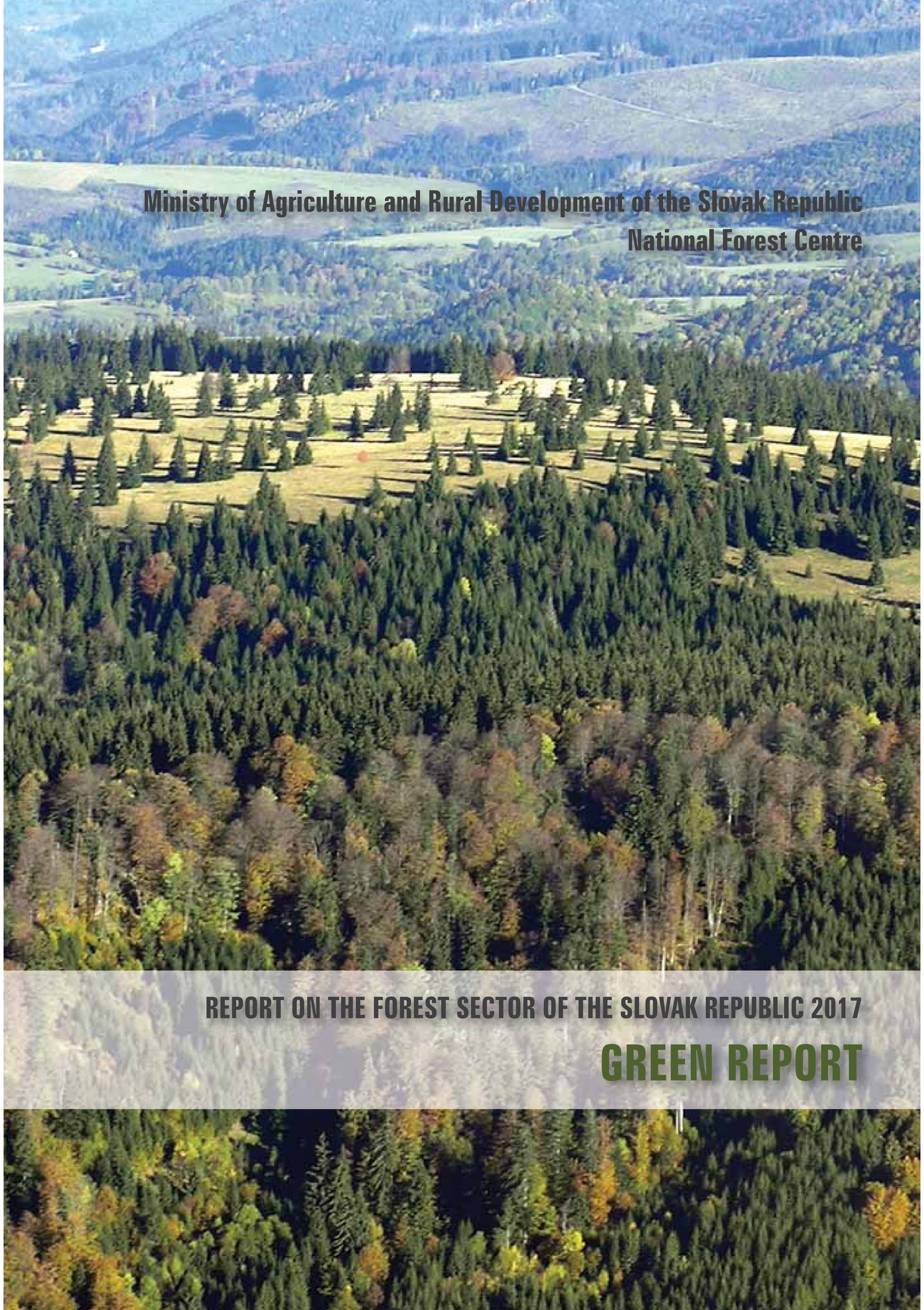

Ministry of Agriculture and Rural Development of the Slovak Republic

National Forest Centre

REPORT ON THE FOREST SECTOR OF THE SLOVAK REPUBLIC 2017

# GREEN REPORT

MINISTRY
OF AGRICULTURE
AND RURAL DEVELOPMENT
OF THE SLOVAK REPUBLIC

NÁRODNÉ LESNÍCKE CENTRUM
NLC
NATIONAL FOREST CENTRE

# REPORT ON THE FOREST SECTOR OF THE SLOVAK REPUBLIC 2017

# green report

Bratislava 2018

**Report on the Forest Sector of the Slovak Republic 2017 – GREEN REPORT**

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# CONTENTS

| | | |
|---|---|---|
| **2.** | **FOREST CONDITION AND ITS CHANGES** | 6 |
| 2.1 | FOREST AREA | 6 |
| 2.2 | FOREST STRUCTURE | 6 |
| 2.3 | GROWING STOCK AND CARBON SEQUESTRATION IN FOREST | 9 |
| **3.** | **HARMFUL AGENTS AND FOREST HEALTH** | 12 |
| 3.1 | ABIOTIC AGENTS AND IMPLEMENTED MEASURES | 12 |
| 3.2 | BIOTIC AGENTS AND IMPLEMENTED MEASURES | 13 |
| 3.3 | ANTHROPOGENIC FACTORS AND IMPLEMENTED MEASUR | 14 |
| 3.4 | FOREST HEALTH AND ASSESSMENT OF MEASURES IMPLEMENTED TO REDUCE FOREST DECLINE | 14 |
| 3.5 | FOREST FIRES | 15 |
| **4.** | **MANAGEMENT OF FOREST RESOURCES** | 18 |
| 4.1 | FOREST CATEGORIES AND SERVICES PROVIDED BY FOREST ECOSYSTEMS | 18 |
| 4.2 | GENE POOL AND REPRODUCTIVE MATERIAL | 19 |
| 4.3 | SILVICULTURE | 21 |
| 4.4 | FELLING OPERATION | 23 |
| 4.4.1 | Timber felling | 23 |
| 4.4.2 | Forest accessibility | 26 |
| 4.5 | FOREST CERTIFICATION | 26 |
| **5.** | **TIMBER TRADE** | 28 |
| 5.1 | TIMBER SUPPLY | 28 |
| 5.2 | TIMBER PRICES ON DOMESTIC AND FOREIGN MARKETS | 31 |
| **6.** | **FORESTRY ECONOMIC** | 32 |
| 6.1 | SECTORAL EARNINGS AND REVEN | 33 |
| 6.2 | OVERVIEW OF SECTORAL COSTS | 34 |
| 6.3 | ECONOMIC RESULT | 34 |
| 6.4 | ECONOMIC TOOLS | 35 |
| 6.5 | SOCIO-ECONOMIC STATISTICS AND SECTORAL EMPLOYMENT | 36 |
| **7.** | **ORGANISATIONAL AND INSTITUTIONAL STRUCTURE** | 38 |
| 7.1 | STATE ADMINISTRATION ON FORESTS | 38 |
| 7.2 | OWNERSHIP AND MANAGEMENT OF FORESTS | 38 |
| 7.3 | OTHER ORGANISATIONS OF THE SECTOR | 41 |
| 7.4 | PUBLIC RELATIONS | 42 |
| **8.** | **INTERNATIONAL COOPERATION** | 44 |
| **9.** | **TIMBER INDUSTRY** | 46 |
| 9.1 | BASIC FACTS | 46 |
| 9.2 | WOOD FOR ENERGY PRODUCTION | 48 |
| **10.** | **SECTORS ASSOCIATED WITH FORESTS AND THEIR FUNCTIONS** | 50 |
| 10.1 | NATURE PROTECTION | 50 |
| 10.2 | MANAGEMENT OF SMALL WATERCOURSES | 52 |
| **11.** | **CONCLUSIONS AND RECOMMENDATIONSA** | 54 |
| 11.1 | CONCLUSIONS | 54 |
| 11.2 | RECOMMENDATIONS | 57 |
| **12.** | **ACRONYMS AND ABBREVIATIONS** | 60 |

# 2. FOREST CONDITION AND ITS CHANGES

## 2.1 FOREST AREA

In 2017, the area of forest holdings reached 2.019 million ha, of which forest crop land (forest stands) accounted for 1.946 million ha (Compendium of Slovak Forestry Statistics). The long-term trend of increasing the area of forest holdings (FH) and forest crop land (FCL) continues (Figure 2.1- 1).

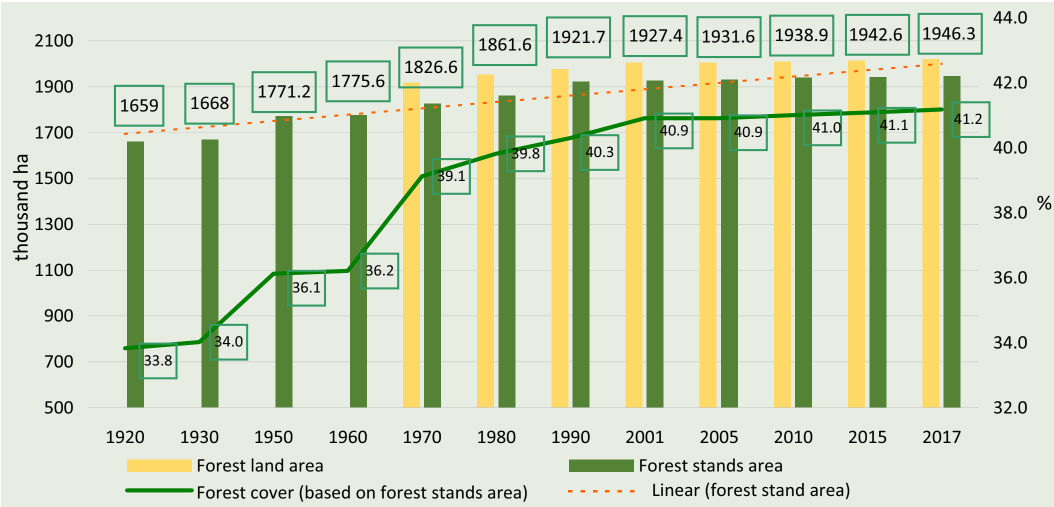



**Figure 2.1-1 Forest land, area of forest stands and forest cover, 1920-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1970-2018, Forestry Case Studies 55/1999*

Since 2001 the area of forest stands has increased by almost 19,000 ha. The annual growth is mainly due to a change in the category of land use. Forest cover, calculated as a percentage of forest holdings in the total area of Slovakia (4.903 million ha including water areas), reached 41.2% in 2017.

In addition to forests on forest land, in Slovakia there is also a certain percentage of farming and other land covered by forest vegetation (so-called „white plots“). Based on the results of the second cycle of the National Forest Inventory and Monitoring 2015-2016 (NFIM 2), the area of white plots is 288,000 ± 39,000 ha, or almost 15% of forest land. After adding the area of white plots to the area of forest stands (1,946,300 ha) and after deduction of the dwarf mountain pine area (20,400 ha) which, according to the International Food and Agriculture Organization (FAO) definition 2015, is not considered a forest (classed as „other land with tree cover“), the actual area of forests in Slovakia is 2.211 million ± 43,000 ha with corresponding forest cover standing at 45.1% ± 0.9%. The management of forests on non-forest land is not governed by sectoral laws. It adheres to the provisions of §47 of the Act No. 543/2002 Coll. on nature and landscape protection.

## 2.2 FOREST STRUCTURE

Due to a great diversity of natural conditions and habitats, Slovak forests have a very rich tree species composition, varied age structure and spatial arrangements.

### *Tree species composition*

Compared to the original mixture of tree species, the current composition is partially altered, but to a lesser extent than in other countries of Western and Central Europe. Changes have taken place over several centuries as forests have been used by mankind, firstly purely to satisfy its needs. Later, forests started to be purposely managed for timber production and certain tree species became more desirable than others. Some tree species were also unintentionally spread via management practices (e.g. hornbeam,Turkey oak, black locust).

The most abundant tree species are European beech (33.6%), Norway spruce (22.7%) and English/sessile oak (10.5%). Broadleaved species are at 62.8% more common than conifer species, which has a positive impact on the biological diversity of forest ecosystems and their stability. The area of coniferous species has been decreasing; since 2005 from its original 41% down to 37.2% in 2017. This is particularly true for Norway spruce, whose percentage declined during the period by 3.6% (from 26.3% down to 22.7%). Since 2005, the area of European beech has increased by 2.6% whilst the area of noble hardwoods (maples and ash) grew from 3.3% to 4.1%.

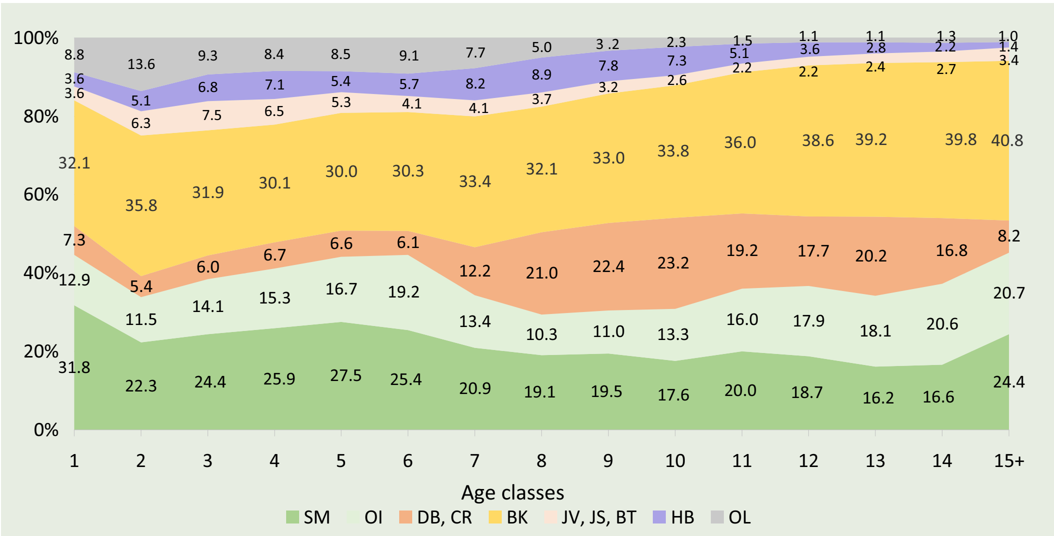



**Figure 2.2-1 Percentage of forest tree species by age classes**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2018; Prepared by: NFC-FRI Zvolen.*

*Note: 1. SM - Norway spruce, OI - Other conifers, DB - English /sessile oak, CR - Turkey oak, BK - European beech, JV-Maples, JS - European ash, BT - Elms, HB - Hornbeam, OL - Other broadleaves.*

European beech has a balanced presence in all age classes (ranging from 30 to 41%). From a production and environmental point of view, a decline in oak species is not a positive trend. Whilst they account for 20% of the forest area in the 8-14th age classes, in the forests of 1st-6th age class it is only around 6.5%. Oak area has shrunk mainly in favour of hornbeam and black locust. The most common coppice species is black locust (26,500 ha), whilst in the coppice with standards it is oak (39,500 ha). Of the introduced species, black locust is the most prevalent (34,500 ha) followed by Austrian pine (8,900 ha) and cultivated poplars.

## *Age structure*

Sustainable and balanced timber production, delivery of other forest related services and stable economic conditions for continual forest production cannot be maintained unless the age structure of forests is appropriate and particular age classes are approximately evenly represented. The actual age structure of a forest is compared with a so-called normal distribution of age classes with one class covering a period of 10 years. The actual age structure of forest differs from the normal (ideal/ optimal) structure (Figure 2.2-2). At present, the area of forests in age classes 1, 8, 9, 14 and 15+ is above normal while the area of forest in 2nd-7th age classes is subnormal (forests aged 11 to 70 years). Approximately normal is the area of forest in the 10-13th classes which are formed by mature stands of 91-130 years of age.

A large area of the 1st age class (young stands up to 10 years old) is a result of over-felling (particularly from 2004 onwards) caused by a high volume of incidental (unplanned) felling followed by forest regeneration. The Forest Act inter alia stipulates to remove with priority diseased and damaged trees that can encourage spreading of harmful biotic agents (except the areas under the 5th level of protection). The majority of forests in the 15th and 15+ classes are protection forests and forests protected for their conservation value. Figure 2.2-3 presents the changes in the area of age classes since 1970. It clearly shows an increase in the area of forest stands over 70 years of age and a decrease in the area of younger forest stands (except for the 1st age class).

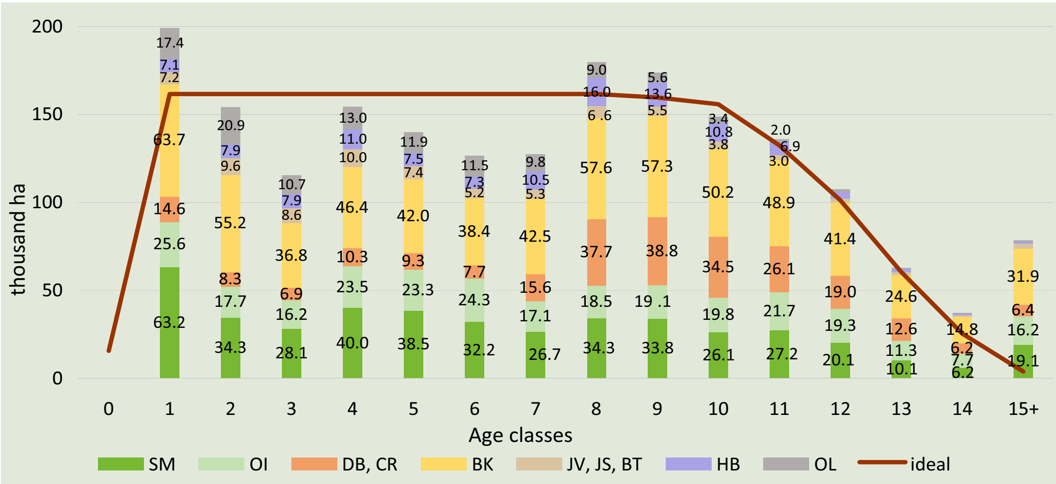



**Figure 2.2-2 Actual area of age classes by tree species and its comparison to normal/ ideal area of age classes**

*Note: 1. SM - Norway spruce, OI - Other conifers, DB - English /sessile oak, CR - Turkey oak, BK - European beech, JV-Maples, JS - European ash, BT - Elms, HB - Hornbeam, OL - Other broadleaves.*

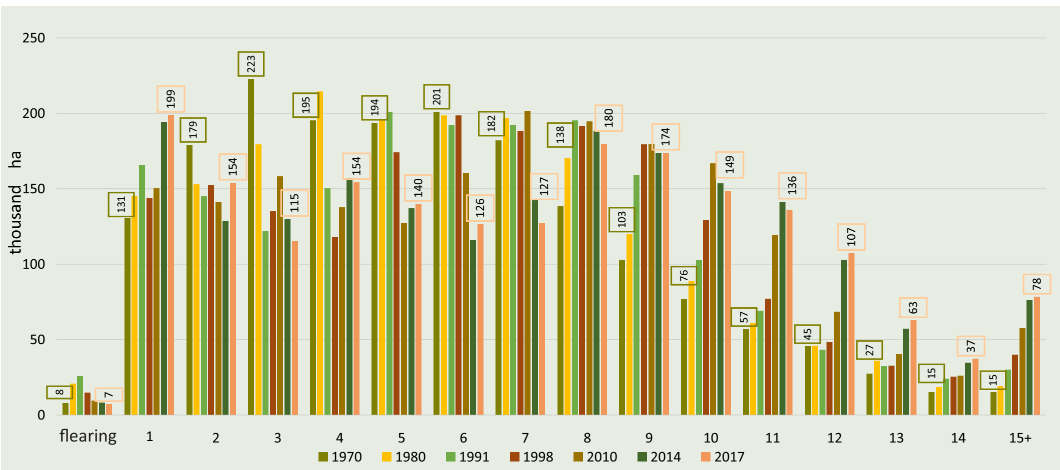



**Figure 2.2-3 Area of forests by age classes, 1970-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1970-2018; Prepared by: NFC-FRI Zvolen.*

The current trend of aging forests in Slovakia can also be demonstrated by the average age of individual tree species. The age of all major tree species, except for Norway spruce, is increasing. The decreasing average age of Norway spruce in Slovak forests (from 68.3 in 2010 to the current 65.2 years) is to a large extent due to the detrimental impact of harmful agents, particularly in older forests. Compared to 2000, the average age of oak increased by 14.2 years, ash by 13, pine by 11.8, larch by 9.7 and maple/sycamore by 5 years.

### *Spatial structure*

In terms of the vertical spatial structure, Slovak forests are divided into single-, two- and multi-storey stands. The majority of current forests (75.7%) are partially differentiated forests with a single storey resulting from the implementation of age class management system. The presence of more vertically diverse forests is limited. Two-storey stands, which are usually a transient phase of the shelterwood silvicultural system or arise from premature natural regeneration account for only 20.5% of all stands whilst multi-storey stands represent the remaining 3.8%. However, according to NFIM 2 results, the proportion of vertically differentiated forests is higher than officially stated.

The spatial structure is assessed using stocking as its main indicator. This indicator determines a relative level of forest density (cover of forest stand area and its production space by trees). The maintenance of optimum stocking is crucial for both forest production and delivery of multiple environmental services. The average stocking was 0.82, an increase of 0.02 compared to 2010.

## 2.3 GROWING STOCK AND CARBON SEQUESTRATION IN FORESTS

In 2017, the volume of growing stock totalled 480.25 million $m^3$ (underbark standing). The average volume of growing stock per hectare was 248 $m^3$ underbark. The volume of total current increment (TCI) in 2017 reached 12.023 million $m^3$, or 6.3 $m^3$ per hectare of forest crop land.

The growing stock of broadleaved species is increasing. In 2017, its volume reached 280.23 million $m^3$, an increase of 12.2% (30.4 million $m^3$) on 2010 figures. Conversely, the total volume of coniferous growing stock has been in decline since 2010 due to the presence of harmful agents, especially in spruce forests. Since 2010, the volume has decreased by 12.14 milion $m^3$, or 5.7%, which has already resulted in a reduction in the total growing stock in Slovak forests by around 0.4 million $m^3$, or 0.08 % when compared to 2016. The stock in mature stands currently amounts to 183.5 million $m^3$, which accounts for 38.2% of the total growing stock and compared to 2005 it is an increase of 56.4 million $m^3$, or 44.4%.

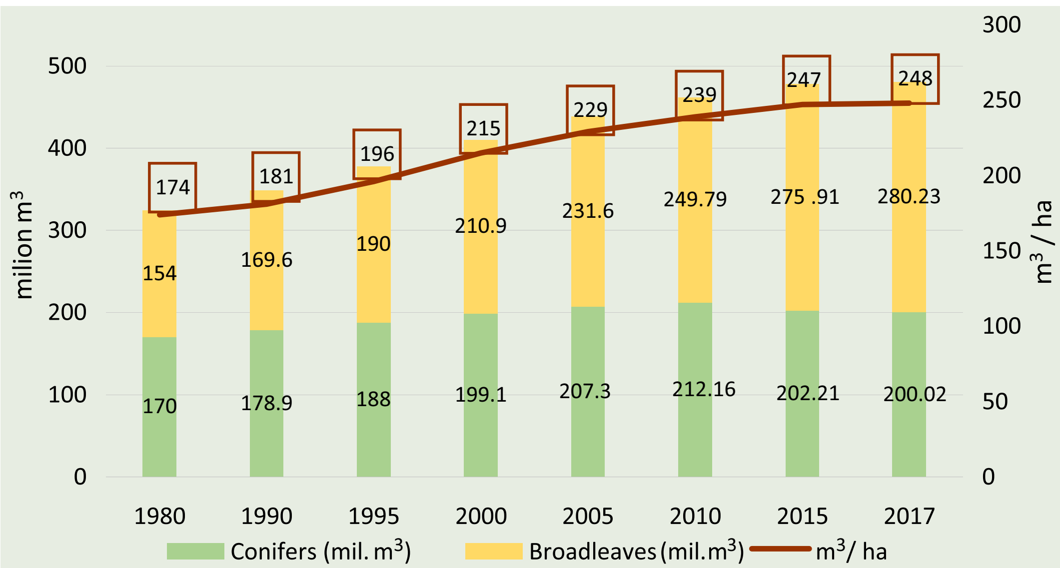



**Figure 2.3-1 Growing stock in total and per hectare by principal tree species groups (conifers, broadleaves)**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistic 1981 – 2018; Prepared by: NFC-FRI Zvolen.*

The present growing stock figures indicate the highest stock Slovak forests have reached in a century, if not longer. However, the volume of existing growing stock is at its peak and it is anticipated that in the coming decades the stock will decrease as a result of a gradual change in age structure. This trend has been confirmed by the forestry statistics which show that growing stock in Slovak forests amounted to 6.1 million m$^3$ in the period 1995-2000, but only 5.8 million m$^3$ in 2001-2005, 4.6 million m$^3$ in 2006-2010 and 3.2 million m$^3$ in 2011-2015. From 2015, however, it has averaged only 1.1 million m$^3$ per year. The results of NFIM 2 confirmed the increase of the total growing stock in forests compared to NFIM 1 - in ten years (2006-2016) it increased by 4.4%. In addition to the growing stock in forests, there are (based on NFIM 2 results) estimated 46 million ±7 million m$^3$ of growing stock in forests on non-forest land (white plots).

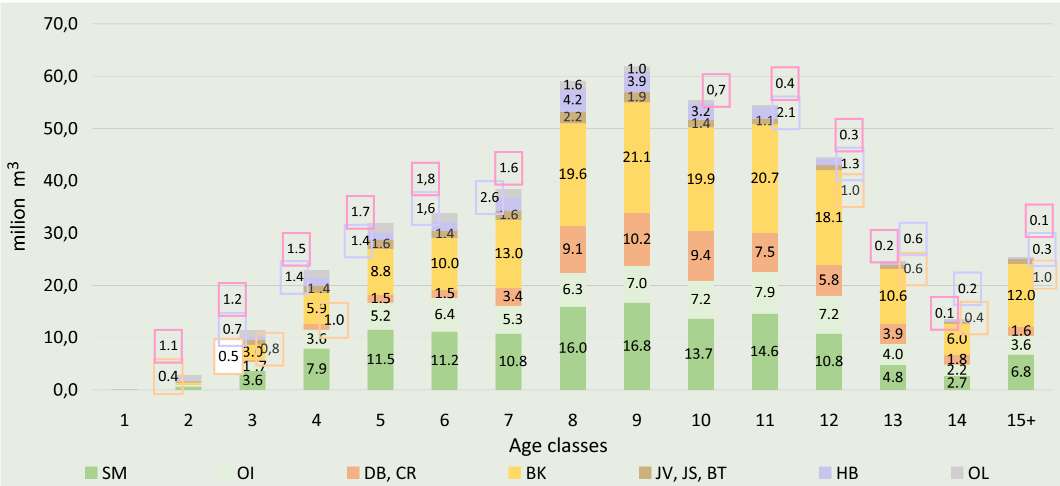



**Figure 2.3-2 Growing stock in Slovakia (million m$^3$) by age class and tree species**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics, 2018; Prepared by: NFC-FRI Zvolen.*
*Note: 1. SM - Norway spruce, OI - Other conifers, DB - English/sessile oak, CR - Turkey oak, BK - European beech, JV-Maples, JS - European ash, BT - Elms, HB - Hornbeam, OL - Other broadleaves.*

To support biodiversity, deadwood is also an important component of forest ecosystems. Deadwood should be kept in the forest to an extent appropriate to the type of forest, but with minimal risk of pest outbreaks. According to the NFIM 2 data, 87.0 million ± 5.7 million m$^3$ of deadwood (snags, stumps, lying thick and thin wood) is estimated to lie in Slovak forests, which is 45.2 m$^3$/ha ± 2.8 m$^3$/ha on average. Another 6.8 million ± 1.8 million m$^3$ of deadwood is on non-forest land. These figures are significantly higher than the European average. The current volume of deadwood is excessive in some regions of Slovakia and does not reflect natural growth dynamics, nor is it the result of deliberate retention. Rather, it is the result of declining forest health with a high degree of incidental felling and inadequate sanitary measures. At the same time, it creates favorable conditions for the outbreaks of biotic pests (insect and fungi).

The carbon stock in forest ecosystems both in above and underground biomass is increasing as it is directly related to growing stock increases.

# 3. HARMFUL AGENTS AND FOREST HEALTH

## 3.1 ABIOTIC AGENTS AND IMPLEMENTED MEASURES

In 2017, an estimated 1.07 million m³ of timber was damaged by various abiotic agents including wind, snow, rime and drought. Of this volume, 680,500 m³ (63.5%) came from coniferous forests with spruce being the most affected (529,800 m³). In broadleaved forests, European beech was the most affected (257,600 m³). The extent of damage caused by abiotic agents was below the long-term 55-year average, which stands at approximately 1.55 million m³. In addition, over 178,000 m³ of unprocessed timber damaged by abiotic agents was left behind in stands from the previous year. The long-term felling volumes of timber damaged by abiotic agents (Figure 3.1-1) indicate the increasing frequency of forest damage by wind, especially since 1996.

The measures taken to protect the forest mainly included incidental felling, which is the most effective measure following damage by abiotic agents (wind and snow in particular), especially in spruce forests. In 2017, 1.1 million m³ of timber damaged by abiotic agents was salvaged from forests. The volume of unsalvaged timber stood at more than 146,000 m³, of which 126,000 m³ was spruce and 2,500 m³ beech.

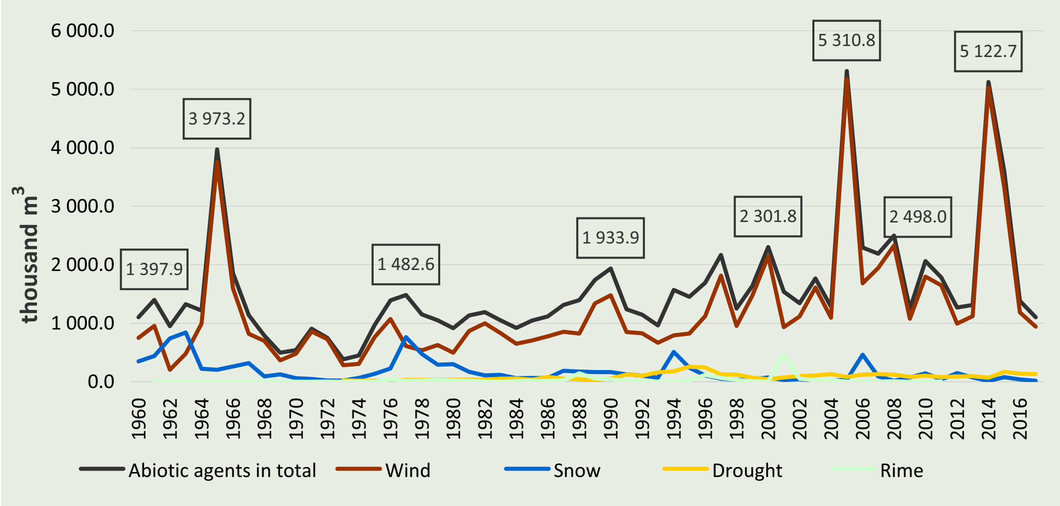



**Figure 3.1-1 Volume of felling operations in forests damaged by abiotic agents, 1960-2016**

*Source: NFC, Forest Protection Service 2018; Prepared by: NFC-FRI Zvolen.*

## 3.2 BIOTIC AGENTS AND IMPLEMENTED MEASURES

In 2017, an estimated 3.9 million m$^3$ of timber was damaged by biotic agents. Of this volume, bark beetle species alone were responsible for 3.7 million m$^3$ of damaged timber in primarily coniferous forests. The volume of timber damaged by European spruce bark beetle, the most notorious pest in Slovak coniferous forests, reached 3,4 million m$^3$. The volume of timber damaged by biotic agents increased 1.3 times compared to 2016. The volume has been the highest on record since at least 1960 (Figure 3.2-1).

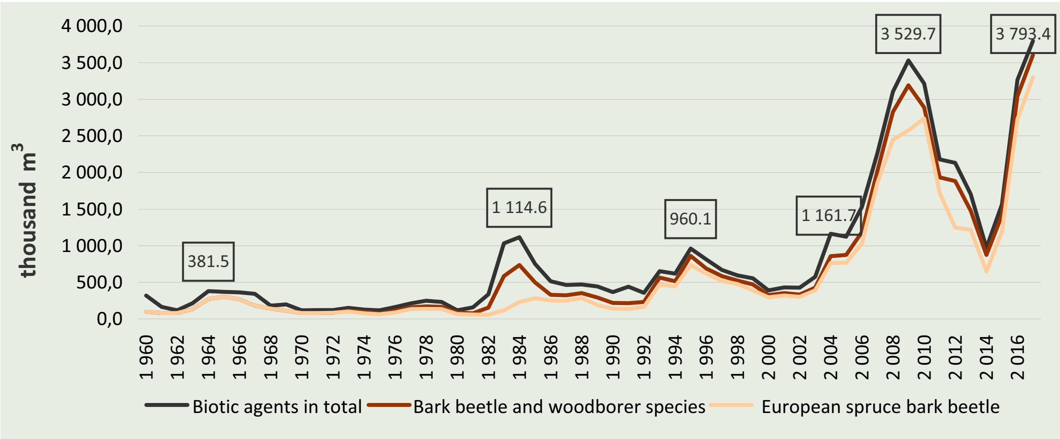



**Figure 3.2-1 Volume of felling operations in forests damaged by biotic agents, 1960-2016**

*Source: NFC, Forest Protection Service 2018; Prepared by: NFC-FRI Zvolen.*

In 2017, 3.6 million m$^3$ of timber was removed from forests damaged by bark beetle and wood borer species. Additionally, 506,000 m$^3$ of timber has yet to be removed.

Exceptionally high incidence of biotic agents in forests last year necessitated a broad range of implemented protection and monitoring measures. To prevent further escallation of bark beetle outbreaks, 30,600 trap trees were prepared and 58,000 pheromone traps installed in spruce forests, mostly in the Banská Bystrica and Žilina regions. 8,000 m$^3$ of damaged timber was debarked. The range of measures implemented was comparable to 2016.

In 2017, 180,000 m$^3$ of timber was infested by phytopathogens (13.5% less than in 2016). The most serious damage was caused by honey mushroom, which represented 69% of the total volume of timber damaged by phytopathogens. Coniferous forests (82%) were significantly more affected than broadleaved forests.

In many regions of Slovakia forests are being significantly impacted by game species. Forests are most vulnerable to damage in their early stages when young growth can be completely destroyed by ungulates. Spruce specimens are often damaged by stripping in small-pole and large-diameter growth stages. The effectiveness of individual protection of young trees by repellents is decreasing year-on-year. Game stock numbers are on the increase in the majority of existing hunting grounds.

## 3.3 ANTHROPOGENIC FACTORS AND IMPLEMENTED MEASURES

In 2017, these factors to a various degree affected 46,000 $m^3$ of timber. When combined with the unsalvaged 2,000 $m^3$ from the previous year, the figure stood at 48,000 $m^3$, of which 45,000 $m^3$ was removed from forests. The most significant human-induced factors included air pollution (63%) and timber theft (19%). Primarily affected by this type of damage were coniferous tree species (83%).

## 3.4 FOREST HEALTH AND ASSESSMENT OF MEASURES IMPLEMENTED TO REDUCE FOREST DECLINE

The measures taken to prevent further decline of forests and their extent in 2017 are described in greater detail in chapters 3.1 to 3.3. The main measures included the treatment of damaged timber and its timely removal from forest stands combined with the application of pesticides, pheromones and repellents. These measures were implemented to an extent comparable to previous years. In spite of these measures, the incidence of secondary harmful agents and the damage caused by them is further increasing.

The effectiveness of the implemented measures chiefly depends on the timing of their execution (i.e., prior to pest swarming - e.g., bark beetle species) and their consistency (i.e., timely removal of timber attractive to pests). These two principles are not always respected. The „timely" principle is often limited by the success of public procurement and approval by the nature conservation authorities. Compliance with the „consistency" principle is often limited by complicated contractual relationships between the contracting authority and the contractor and price-limited contracts. This is one of the reasons why Slovakia currently has a record high volume of timber damaged by bark beetle.

Other forest protection measures include pesticide applications, especially in forest nurseries (fungicides). Herbicides are used in young forest stands whilst insecticides are used to make timber unattractive to insects. In May 2017, over 1,000 ha of pine forests were damaged by outbreaks of Common pine sawfly in the Záhorie area. However, aerial spraying was not necessary as in July the outbreak was naturally resolved.

## 3.5 FOREST FIRES

In 2017, 162 forest fires were recorded in Slovakia with a total damaged area of 297.66 ha resulting in damage costing €410,330. The most common causes of forest fires included the unknown origin (33), careless manipulation with open fire (21), illegal burning of waste outside landfills (21), and uncontrolled burning of grass and dry matter (20). More detailed information is provided in Figures 3.6-1 and 3.6-2. Preventive measures against fire were implemented by forest owners and forest managing enterprises, particularly at the time of heightened risk of fire as requested by the §6b Sec. (1) c) of the Act No. 314/2001 Coll. on protection against fire.

In April 2017, the Automated Stationary System for Early Detection of Forest Fires (ASSEDFF) was launched in three areas with a high-and medium-level fire risk - Záhorie, Nízke Tatry (the Low Tatras) and Vysoké Tatry (the High Tatras). The ASSEDFF operates around the clock and data on all suspected fires is sent to the operational centers of relevant regional headquarters of the Fire and Rescue Service of the Slovak Republic (FaRS SR). Between April and December 2017, the system relayed to the FaRS SR in Bratislava and Trnava information on 49 suspected fires; the firefighters intervened in almost 30 cases. The FaRS SR Headquarters assessed the system as suitable for regular fire monitoring and it is approved to replace fire patrol watch at a time of increased risk of fire.

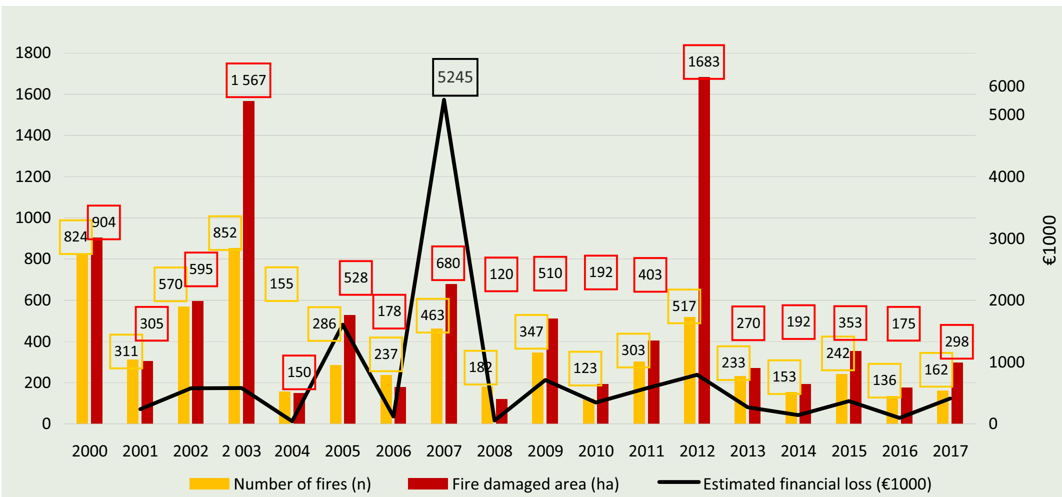



**Figure 3.5-1 Forest fires, fire damaged area and incurred financial loss, 2000-2017**

*Source: Fire Institute of MI SR; Prepared by: NFC-FRI Zvolen 2018.*

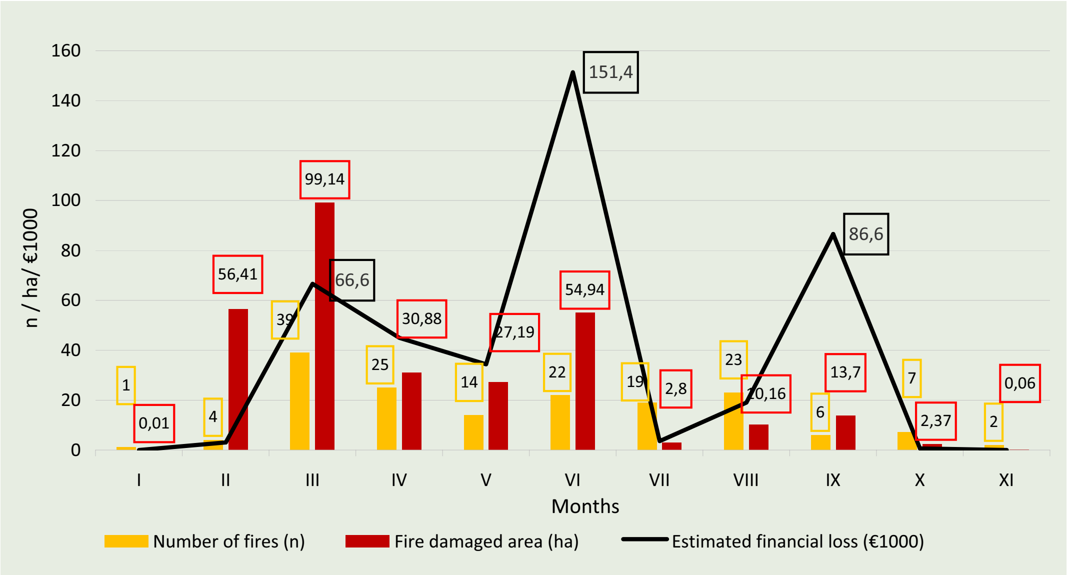



**Figure 3.5-2 Forest fires, fire damaged area and incurred financial loss by month, 2017**

*Source: Fire Institute of MI SR; Prepared by: NFC-FRI Zvolen 2018.*

# 4. MANAGEMENT OF FOREST RESOURCES

## 4.1 FOREST CATEGORIES AND SERVICES PROVIDED BY FOREST ECOSYSTEMS

Based on their principal functions, Slovak forests are divided into three main categories: production, protection and special-purpose forests.

Production forests are primarily managed for the production of high grade timber whilst still continuing to provide other important ecological and societal functions. Integrated forest management practices are implemented to support production objectives.

Timber production in these forests is limited by actual natural conditions. The highest percentage of these forests is on ferile forest soils (67.7%) suitable for all principal forest tree species (oak, beech, fir, spruce) as presented in Figure 4.1-2.

Production forests are the most common category of forest. They cover 1,402,900 ha, or 72.1% of the total area of forest crop land. Their area has increased by 5.8% since 2000, but is 5.2% lower when compared to the year 1980. The aforementioned changes in the area are mostly caused by changes in designation of special-purpose forests. The percentage of production forests is higher in non-state forests - 75.3% compared to 69.1% in state forests.

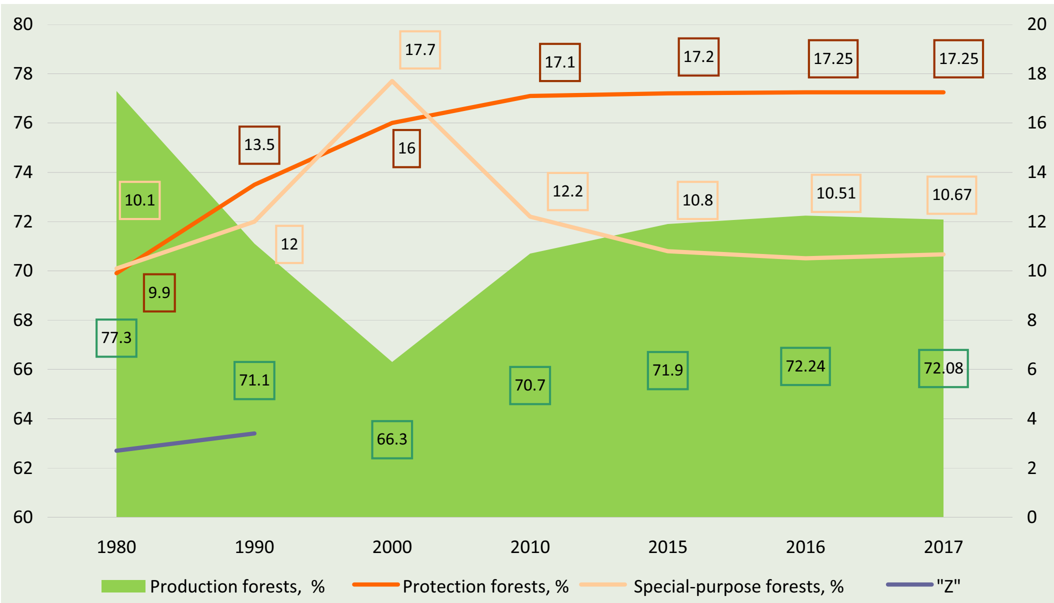



**Figure 4.1-1 Forest categories (%), 1980-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1981-2018; Prepared by: NFC-FRI Zvolen.*
*Note: 1. „Z“ - Areas for afforestation.*

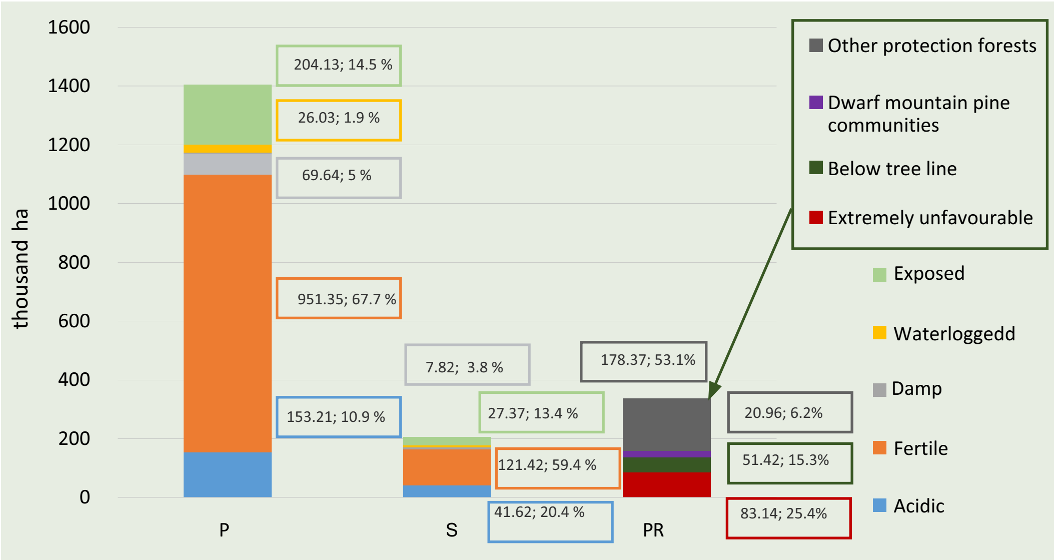



**Figure 4.1-2 Area of basic site types by forest category**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1981-2018, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen.*

*Note: 1. P – Production forests, PR – Protection forests, S – Special-purpose forests.*

Forests with primarily protection functions are designated as protection forests. These forests protect soils, water resources and infrastructure. They are found on sites with limited suitability for timber production. The majority of them protect soils on exposed/extreme sites (53%), or are situated beneath the tree line (15%). Due to extreme site conditions, 32% of these forests are not suitable for timber production. Their area has been slowly increasing and in 2017 they covered 335,900 ha, or 17.25% of the total area of forest crop land.

Social and cultural functions are of primary importance in forests which, due to their specific societal or group benefits, have been designated as special-purpose forests. These forests are under special (functionally differentiated) management with purposeful enhancement of one or more selected functions such as water purification, recreation, nature conservation, spa/wellness, education/research, game husbandry, etc. unless these functions can be supported by standard management practices.At present, these forests cover 207,500 ha, or 10.67% of the total forest crop land.

## 4.2 GENE POOL AND REPRODUCTIVE MATERIAL

### *Sources of forest reproductive material (FRM) and forest seed stock*

The most common designated source of FRM in Slovakia are approved forest stands. Their total area in 2017 was 74,734 ha which is 1,045 ha less than in 2016. To protect the gene pool of forest tree species, there are 116 designated gene reserves in Slovakia across a total area of 18,894 ha. In 2017, two new gene reserves were approved and under forest management plans review 24 new gene reserve management projects were prepared. There were 4,407 of registered seed trees in 2017. The number and area of seed orchards (58/122 ha) and seed stands (130/718 ha) remained unchanged from 2016.

The 2017 seed collection was poor, for many tree species no seed was collected at all. As a result, seed stock of all principal forest tree species (except for Scots pine) has decreased. Seeds of forest tree species are primarily treated and stored by the Forest Enterprise (FE) Semenoles Liptovský

Hrádok, a specialised seed unit of the Forests of the Slovak Republic, s.e. Seeds are also stored by other forest enterprises in their own facilities. The National Forest Seed Bank is managed by the National Forest Centre.

## *Forest nurseries, production facilities and transplant production*

Ther area of forest nurseries (529 ha) and their production plots (364 ha) remained unchanged. In 2017, 223.1 million transplants were produced. The average number of transplants grown per hectare of the production plot was almost 613,000 pieces.

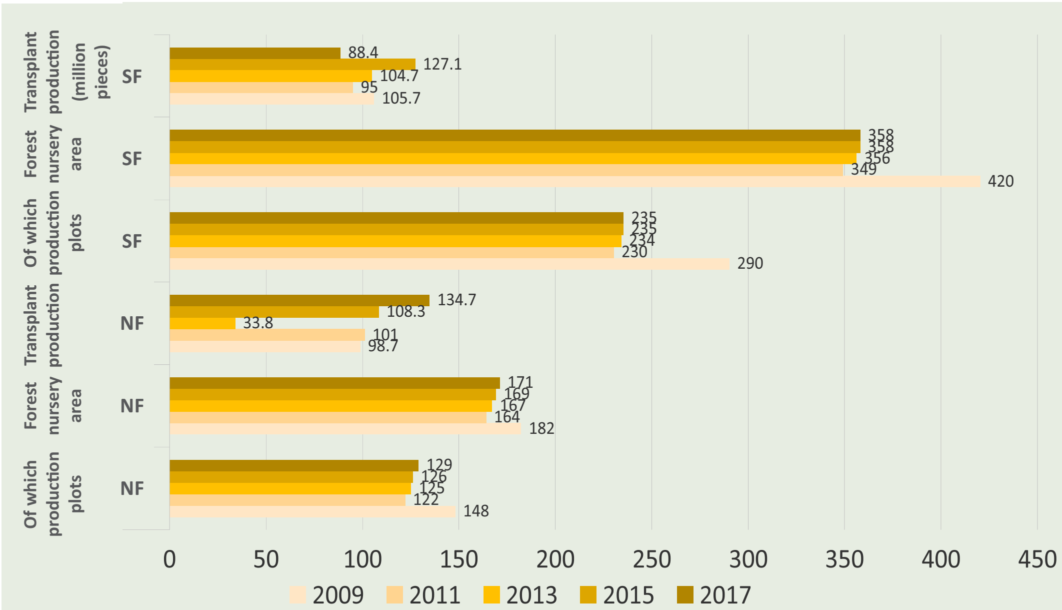



**Figure 4.2-1 Forest nurseries, their production plots and transplant production by use, 2009-2017**

*Source: NFC-FRI Zvolen 2009-2017; Note: 1. SF – State forests, NF – Non-state forests.*

**Table 4.2-1 Forest nurseries and production facilities at 31 December 2017**

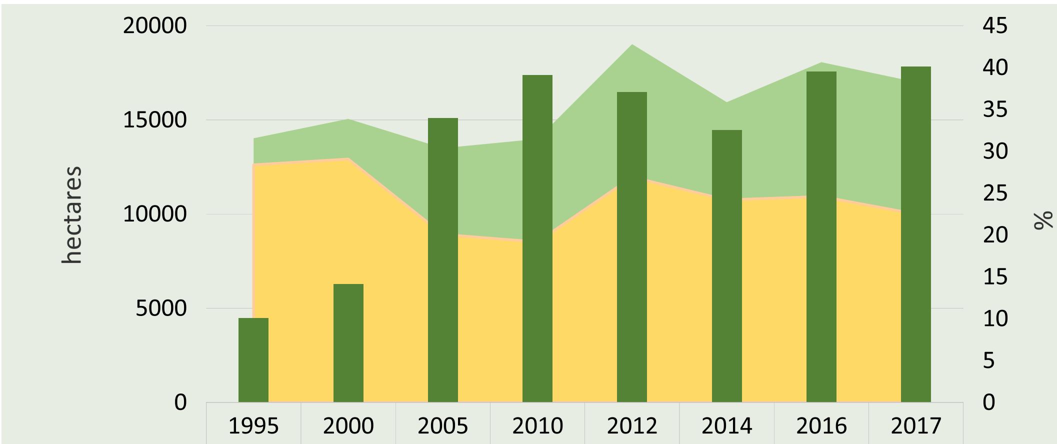
| Type | Central nursery | Nursery | Pollard nursery | Air-conditioned storage | Handling warehouse | Snow pit | Greenhouse | PEK | Chilling box |
|---|---|---|---|---|---|---|---|---|---|
| Number | 11 | 256 | 2 | 42 | 2 | 166 | 3 | 3 | 1 |

*Source: NFC-FRI Zvolen. Note: PEK – polythene-covered frames.*

# 4.3 SILVICULTURE

## *Forest regeneration*

In 2017, the total area of regenerated forest reached 16,699 ha. Artificial regeneration (planting) was carried out on 10,003 ha, or 59.9%. Natural regeneration was reported from 6,696 ha, which represented 40.1% of the total regenerated area of forest. At the end of 2017, a forest area in need of regeneration stood at 14,038 ha. This area included clearings after felling, failed regeneration areas and sites affected by natural disturbances. The rate of natural regeneration in Slovak forests is steadily increasing, but it needs to be managed to achieve desirable tree species composition of new forests. Tilling of the forest floor to encourage natural regeneration was implemented on 13,452 ha.




| | 1995 | 2000 | 2005 | 2010 | 2012 | 2014 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|
| Natural | 1410 | 2130 | 4580 | 5460 | 7047 | 5183 | 7133 | 6696 |
| Artificial | 12610 | 12920 | 8920 | 8520 | 11964 | 10751 | 10927 | 10003 |
| % of natural | 10,1 | 14,2 | 33,9 | 39,1 | 37,1 | 32,5 | 39,5 | 40,1 |

**Figure 4.3-1 Forest regeneration, 1995-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1996-2018.*

According to the results of NFIM 2, the area of naturally regenerated forest in Slovakia is larger than the area obtained from forestry statistics. The discrepancy in data is mainly caused by the fact that it is often present only following artificial regeneration and that the spontaneous (premature) natural regeneration is very common, even in forests yet to reach maturity. The NFIM 2 data shows that about 10% of Slovak forests regenerate well naturally with an area coverage of 75% or more.

The NFIM 2 data on tree species composition of regenerated sites shows that the most common species on these sites are beech, hornbeam and noble hardwoods. Compared to NFIM 1 conifer results, the percentage of spruce has increased, but the percentage of other coniferous species including fir and pine remains low. The aforementioned findings also correspond with the data available for forest regeneration in the 1st age class. This data shows lower percentages of fir and oaks and higher percentages of beech, spruce and less important species such as black locust, hornbeam and Turkey oak.

The high rate of incidental felling combined with ever increasing regeneration felling (due to higher growing stock) leads to a rapid increase in the area of youngest forests (≤ 10 years old) and the continuation of the unbalanced age structure of Slovak forests.

## *Treatment in young forests*

The most common negative factor affecting young, recently regenerated forests is (based on the NFIM 2 findings) browsing with the incidence of damage 30.7% ± 2.6% of individual trees. Browsing is followed by competition pressure from weeds, shrubs and other vegetation with a negative impact on 27.1% ± 2.5% trees. For the above mentioned reasons, weed control measures were implemented on an area of 41.8 thousand ha (of which 52% was in state forests) in 2017. Measures to limit ungulates damage in young forests were performed on an area of 37,300 ha (of which 57.6% was in non-state forests). Fencing measures were implemented on 407 ha of plantations (of which 58.7% was in state forests). The effectiveness of the implemented measures will manifest only as forests mature.

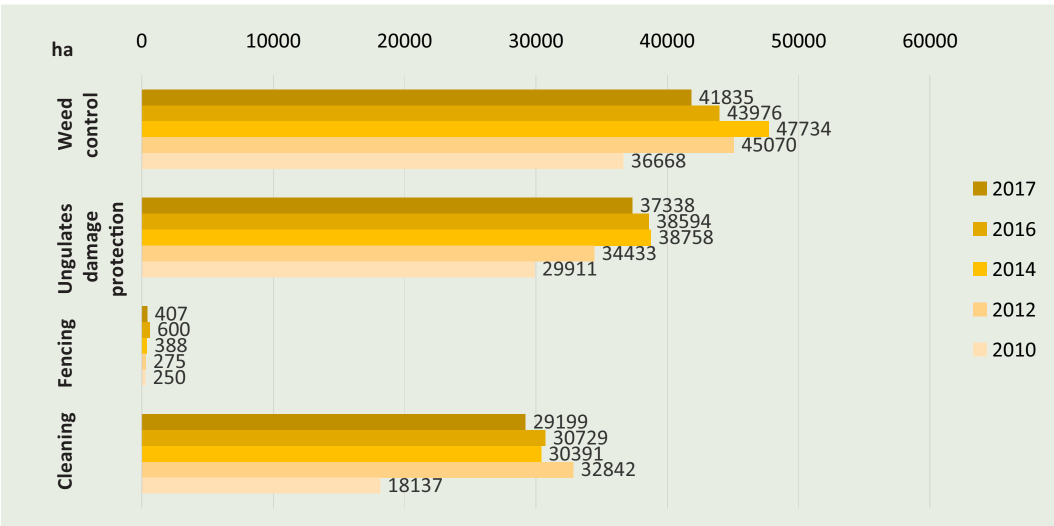



**Figure 4.3-2 Cleaning operations (ha), 2010-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2011-2018.*

*Note: 1. 1) Annual percentage of cleaning prescribed in valid forest management plans (FMP).*

## *Cleaning and thinning*

Cleaning and thinning operations ensure optimal development of species composition, spatial structure, health, vitality and resilience of treated forest stands. In 2017, cleaning operations were performed on an area of 29,200 ha, which was 102.8% of the planned volume. The higher than planned cleaning reflects the genuine needs of young forest stands as often their development cannot be sufficiently foreseen when updating forest management plans over a 10-year cycle. In 2017, the volume of cleaning operations was the lowest for the 6-year period, but was 61% higher than in 2010 (Figure 4.3-2).

Higher than planned volume of cleaning has been a long-term trend in state forests (20.1% higher than planned in 2017) and in municipal forests (10.3% higher than planned). In other categories of non-state forests, the actual volume of cleaning was below plan, in community forests by 13%, church by 67%, and in private by 78%.

In 2017, thinning (intermediate felling) was carried out on an area of 65,846 ha (64.2% of the planned volume). The volume of timber harvested was 1.187 million $m^3$ (68% of the plan). The difference in the volume of planned and actual thinning was mainly caused by the processing of incidental felling from intermediate forests damaged by natural disturbances and pests.

As in treatment of young forests, cleaning and thinning must be implemented timely and efficiently to achieve healthy and stable growth of treated forests in their later stages.

### *Silvicultural systems*

A long-term trend of decreasing the percentage of clearcutting continues. The clearcut accounted for 85% of the total regenerated area of forest in 1990, but at present it is only 25%. Conversely, the volume of shelterwood regeneration cuts has risen from 14% to 74% over the same period. This figure genuinely reflects the natural conditions of Slovak forests which support viable natural regeneration on about 70% of forest land. The shelterwood system prevails in production and special-purpose forests.

In protection forests and certain types of special-purpose forests in order to support their specific functions and services, more gentle methods of selection system and continuous cover forestry are applied. These methods can be implemented only in selection forests with a height and diameter differentiated structure. These forests are rare in Slovakia. The selection system and continuous cover forestry were planned only for 0.8% of the total felling area on which the latter method was more common. The selection system is mostly implemented in well accessible stands of shade-loving coniferous species or their mixtures with shade-loving broadleaf species in medium and high altitude forests. It is possible to say that selection system methods can be implemented on approximately 10% of forest land in Slovakia.

Achieving the planned proportion of particular silvicultural systems and their regeneration cuts is largely impossible due to persistently high volumes of unplanned incidental felling which often resembles a clear-cut.

## 4.4 FELLING OPERATIONS

### 4.4.1 Timber felling

The total volume of timber felled in 2017 reached 9.39 million $m^3$. Compared to 2016, felling increased by 0.8%, but it was lower by 354,400 $m^3$, or 3.6%, than the planned felling calculated using actual felling possibilities and forest regeneration urgency. Of the total volume, 58.9% of timber came from coniferous forests, 41.1% from broadleaved forests. Of the total timber volume, 4.94 million $m^3$ (52.6%) was felled due to natural disturbances and pests, of which 89.9% came from coniferous forests. Additional 650 thousand $m^3$ of damaged timber remained unsalvaged in 2017. Of the total felling volume, state forest enterprises harvested 52.7%, non-state forest enterprises 47.3%. More detailed data on felling volume and its structure is given in Figure 4.4-1.

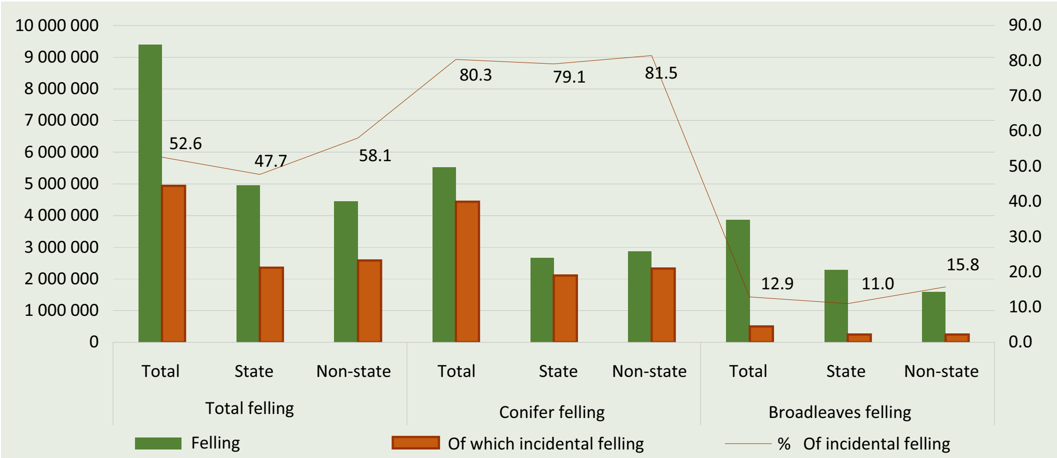



**Figure 4.4-1 Planned felling and incidental felling in total and by main tree species and ownership (state and non-state forests)**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2018.*

Both planned and actual timber felling are long-term increasing (Figure 4.4-2). The main factor behind the increase is the current age structure of Slovak forests with a normal to abnormally high area of 81 years old and older forests (Figure 2.2-2). Most forests of this age are mature. Figures 2.2-2 and 2.3-2 illustrate trends in the forest area and growing stock. They clearly show an increase in the area and accumulation of high growing stock in these forests. This is confirmed by the area of mature forest stands - forests intended for regeneration, which reached 448.1 thousand ha in 2017, which was 119,500 ha (36.4%) more than in 2005 (Table 4.4-1).

**Table 4.4-1 Growing stock and area of mature forest stands**

| Year | Area (ha) | Growing stock (1000 m³) | Conifer growing stock (1000 m³) | Broadleaves growing stock (1000 m³) |
|---|---|---|---|---|
| **2017** | 448,105.8 | 183,584.7 | 78,177.9 | 105,406.8 |
| **2015** | 449,603.9 | 183,477.9 | 80,698.3 | 102,779.6 |
| **2010** | 371,278.9 | 149,475.2 | 75,325.4 | 74,149.8 |
| **2005** | 328,536.4 | 127,162.2 | 64,823.2 | 62,339.0 |

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2006-2018.*

The natural consequence of these facts is the gradually increasing volume of planned timber felling, which in 2017 reached 9.74 million $m^3$. Over the last 20 years (compared to 1996), the planned felling increased by 97% (Figure 4.4-2). Despite this, the actual felling is still below the level of total current increment (the volume of timber that accrues in forests every year) and has been even lower than planned felling since 2012, except for the year 2014. (Figure 4.4-2) The natural consequence of these facts is the gradually increasing volume of planned timber felling, which in 2017 reached 9.74 million $m^3$. Over the last 20 years (compared to 1996), the planned felling increased by 97% (Figure 4.4-2). Despite this, the actual felling is still below the level of total current increment (the volume of timber that accrues in forests every year) and has been even lower than planned felling since 2012, except for the year 2014. (Figure 4.4-2)

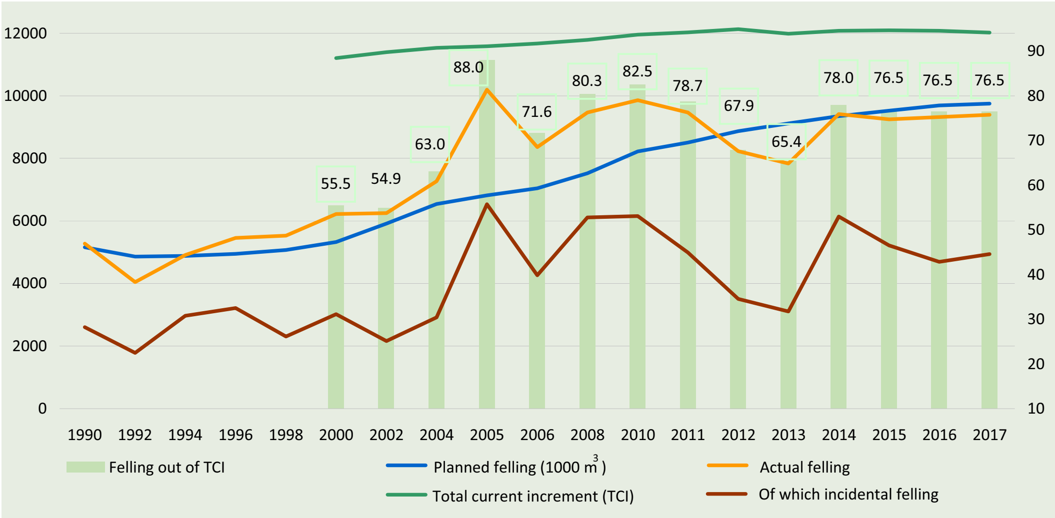



**Figure 4.4-2 Total current increment (TCI) and felling by planned, actual and incidental felling and comparison of felling volumes with total current increment (1000 m³), 1990-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 1991-2018; Prepared by: NFC-FRI Zvolen*

The current unbalanced age structure of Slovak forests contributes to cyclical changes in the volume of growing stock and felling possibilities. It is estimated that around the year 2030, possibly earlier, depending on the extent of incidental felling, we can expect a decrease in available felling volumes. The rational and effective use of the current higher than average felling possibilities, which are the result of the work of forest managers more than 70 years ago, should be a top national priority. Instead, we are witnessing a whole range of ongoing unresolved disputes, campaigns, various forest management and nature conservation scenarios in which arguments of foresters and timber processors about the important social, economic and environmental benefits of sustainable timber production (felling) are not rightfully considered.

Sustainably managed forests have a high potential for reducing the volume of $CO_2$ in the atmosphere. Trees harvested in sustainably managed forests are used before they naturally die and decay. Timber products with a long shelf-life (e.g. sawnwood, wood panels) prolong carbon storage for decades. Each felled and used tree creates space for the growth of new trees. While timber products bind $CO_2$, more carbon is sequestered in growing forests which actively remove it from the surrounding air. Sustainable forest management thus improves the $CO_2$ balance in the atmosphere. In addition, wood processing has low energy requirements and produces minimal emissions and non-degradable waste compared to other materials, the production of which emits into the atmosphere considerable amounts of $CO_2$ (such as steel, metals, plastics, concrete and fossil fuels production). Replacing wood with these materials would be an ecological disaster.

On the contrary, in unmanaged forests attacked by harmful agents, dead trees can become a primary source of $CO_2$, which further exacerbates climate change.

Figure 4.4-4 demonstrates the trend in incidental felling since 1960, broken down by groups of harmful agents. It clearly shows that over the last 15-20 years Slovak forests have been subjected to an extremely high frequency and intensity of harmful agents. The figure shows that if, after the damage caused by abiotic agents (wind in particular), the damaged timber is not timely removed from the forest, it will inevitably trigger outbreaks of forest pests, bark beetle in particular. As a consequence of this development, there is currently a large extent of dead forest and a high rate of unplanned, often large-scale incidental felling perceived negatively by the public.

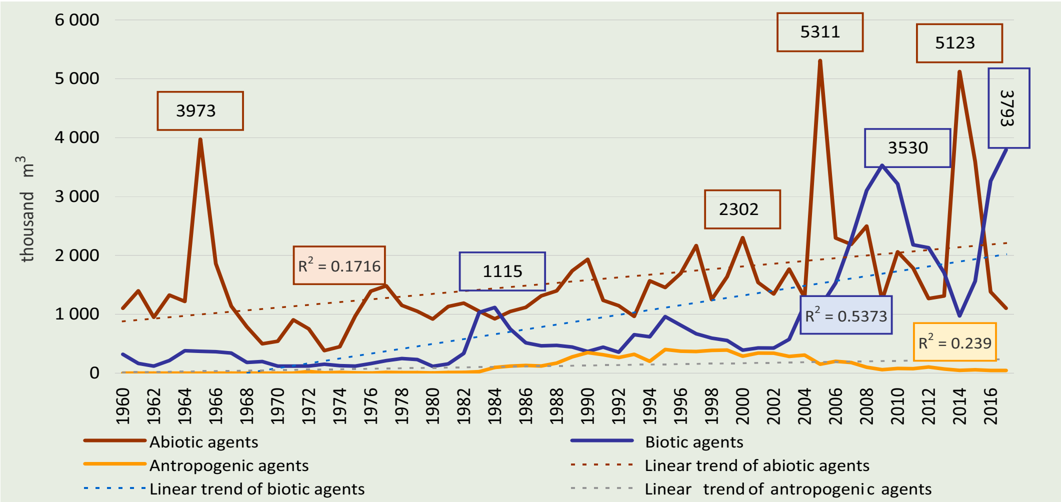



**Figure 4.4-3 Incidental felling by main harmful agents (1000 $m^3$)**

*Source: NFC, Forest Protection Service 2018.*

Besides the aforementioned conflicts of opinion, other factors have contributed to the current situation in Slovak forests. The most significant of these factors is the presence of a high proportion of mature and overmature forests. These forests are much more vulnerable to harmful agents than young forests. Instead of anticipating this development and ensuring the effective management of forests in cooperation with all stakeholders for the benefit of society as a whole, we are instead witnessing the most significant calamitious outbreak of forest pests in living memory.

## 4.4.2 Forest accessibility

The total length of forest roads in 2017 was over 37,856 km, of which 6,549 km were main paved roads (1L), 15,124 km main partially paved forest roads (2L) and 16,183 km were unpaved earth forest roads (3L) and permanent skidding roads. The density of these roads was 19.45 m/ha. Compared to 2016, the total length of forest roads increased by 108 km.

From the public EU sources (the Sectoral Operational Programme Agriculture and Rural Development SR 2004-2006, RDP SR 2007-2013 and RDP SR 2014-2020), funding was provided for the construction and reconstruction of forest roads in the sum of €133.57 million. For the period since 2003, public funding and investments from forest managing enterprises increased the length of all types of forest roads by 787 km whilst their density increased from 18.6 to 19.45, or 0.85 metre per hectare of forest land. The optimum density of forest roads varies from 20 to 25 m/ha depending on the terrain. Current available data suggests that the need for the construction of new forest roads, except for mountain forests, has considerably decreased.

# 4.5 FOREST CERTIFICATION

At 31 December 2017, 1.379 million ha of forests, or 70.9% of the total forest land, was certified in Slovakia of which the PEFC certified forests represented 1.232 million ha and the FSC certified forests 147,000 ha. To date, 273 certificates have been issued on participation in forest certification, of which 263 were PEFC and ten FSC certificates. Compared to 2016, the area of certified forests increased by 3,660 ha.

In 2017, fourteen primary timber processors and trading companies successfully completed the Chain of Custody (C-o-C) audit under the PEFC scheme. In total, the number of C-o-C certificate holders reached 80 last year. Under both schemes, 86 companies have so far been successfully audited against the C-o-C standards (multiple and group certification).

The PEFC Slovakia had a total of 20 members organised in three chambers: Forest Owner (Lessee) Chamber, Chamber of Timber Processors and the Chamber of Other Stakeholders.

# 5. TIMBER TRADE

## 5.1 TIMBER SUPPLY

In 2017, the total supply of raw timber reached a volume of 9.36 million m$^3$, an increase of 1% compared to 2016. The sale of timber is the most important source of earnings to preserve forest functions and maintain employment in the forest sector. It provides approximately 80% of the revenue and earnings for forest managing enterprises. In addition to the forest sector, timber is also a basic raw material for the timber processing industry (TPI), thus securing employment, earnings and revenue also in this sector of the national economy.

### *Domestic timber supply*

In 2017, domestic timber supply totalled 9.02 million m$^3$ (including timber used by forest enterprises themselves). Compared to 2016, the supply of timber to the domestic market was higher by 152,600 m$^3$. Supplies of softwood increased by 331,100 m$^3$. At the same time, supplies of hardwood decreased by 178,500 m$^3$.

**Table 5.1-2 Raw timber supply by state and non-state forest sector**

| Log grade | State (1000 m$^3$) | | | | Non-state (1000 m$^3$) | | | | (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Domestic | Export | Own use | Total | Domestic | Export | Own use | Total | State sector | Non-state sector |
| **Softwood** | | | | | | | | | | |
| **I-II grade logs** | 0.51 | 0.16 | 0.00 | **0.67** | 7.76 | 0.02 | 4.97 | **12.74** | 0.03 | 0.45 |
| **III grade logs** | 1,554.59 | 23.61 | 1.24 | **1,579.44** | 1,330.46 | 17.38 | 36.73 | **1,384.56** | 59.06 | 48.68 |
| **Pulpwood** | 775.20 | 1.42 | 0.34 | **776.96** | 779.44 | 33.41 | 4.00 | **816.85** | 29.05 | 28.72 |
| **Firewood and energy wood** | 91.03 | 0.01 | 7.98 | **99.03** | 212.26 | 0.26 | 6.26 | **218.79** | 3.70 | 7.69 |
| **Stumpage** | 194.92 | 0.00 | 0.00 | **194.92** | 187.18 | 10.46 | 0.44 | **198.08** | 7.29 | 6.96 |
| **Raw trunks** | 0.39 | 0.00 | 0.14 | **0.53** | 198.47 | 1.19 | 0.00 | **199.66** | 0.02 | 7.02 |
| **Other log grades** | 22.48 | 0.06 | 0.11 | **22.65** | 13.42 | 0.00 | 0.01 | **13.43** | 0.85 | 0.47 |
| **Total** | **2,639.13** | **25.26** | **9.80** | **2,674.19** | **2,728.99** | **62.71** | **52.41** | **2,844.11** | **100** | **100** |
| **(%)** | 98.7 | 0.9 | 0.4 | **100** | 96.0 | 2.2 | 1.8 | **100** | | |
| **Hardwood** | | | | | | | | | | |
| **I-II grade logs** | 7.24 | 4.16 | 0.00 | **11.40** | 10.90 | 6.54 | 0.00 | **17.45** | 0.48 | 1.20 |
| **III grade logs** | 988.71 | 48.88 | 1.33 | **1,038.92** | 336.55 | 33.77 | 0.25 | **370.57** | 43.49 | 25.48 |
| **Pulpwood** | 1,105.54 | 55.95 | 0.81 | **1,162.30** | 773.85 | 102.68 | 1.56 | **878.09** | 48.66 | 60.37 |
| **Firewood and energy wood** | 145.84 | 0.02 | 13.72 | **159.57** | 111.34 | 1.07 | 1.31 | **113.72** | 6.68 | 7.82 |
| **Stumpage** | 6.01 | 0.00 | 0.00 | **6.01** | 51.20 | 0.17 | 0.35 | **51.72** | 0.25 | 3.56 |
| **Raw trunks** | 0.00 | 0.00 | 0.19 | **0.19** | 22.95 | 0.00 | 0.00 | **22.95** | 0.01 | 1.58 |
| **Other log grades** | 10.00 | 0.17 | 0.14 | **10.30** | 0.00 | 0.00 | 0.00 | **0.00** | 0.43 | 0.00 |
| **Total** | **2,263.34** | **109.17** | **16.18** | **2,388.69** | **1,306.79** | **144.24** | **3.47** | **1,454.50** | **100** | **100** |
| **(%)** | 94.8 | 4.6 | 0.7 | **100** | 89.8 | 9.9 | 0.2 | **100** | | |
| **∑softwood + hardwood** | **4,902.47** | **134.43** | **25.98** | **5,062.88** | **4,035.78** | **206.95** | **55.88** | **4,298.61** | | |

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04; Prepared by: NFC Zvolen.*

*Note: 1. Export includes only timber directly exported by forest owners. The difference between the supply of raw timber and felling is caused by the increase of growing stock in the warehouses of owners and forest managing enterprises.*

In supplies of softwood log grades, 53.7% of the total volume were III grade logs and 28.9% was pulpwood. Hardwood supplies have long been dominated by pulpwood which accounted for 53.1% of the total volume in 2017. More detailed data on timber supply to the domestic market is given in Table 5.1-1 and Figures 5.1-1, 5.1-2.

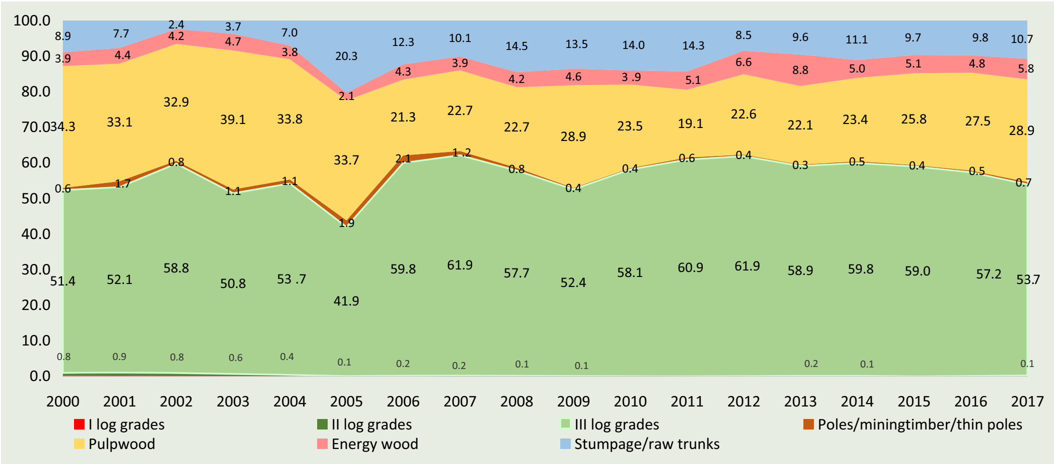



**Figure 5.1-1 Softwood supply by log grades (%), 2000-2017**

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen.*

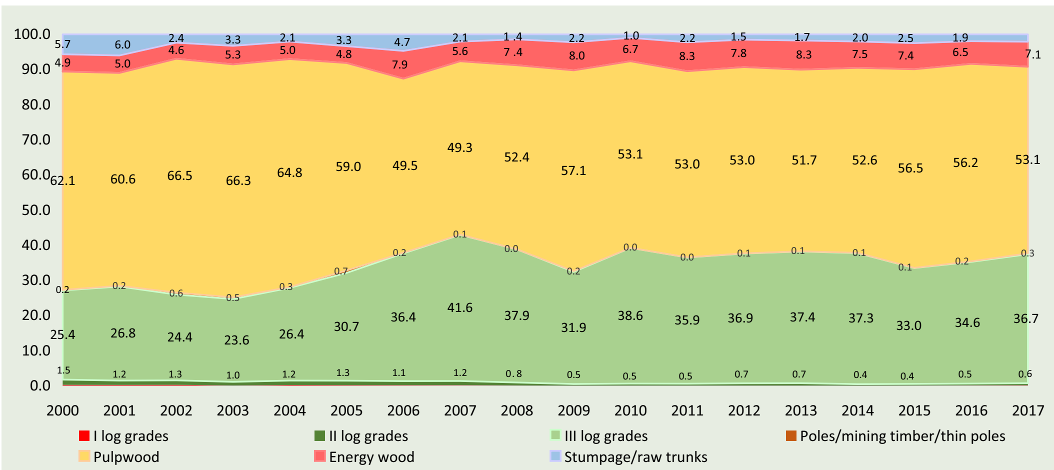



**Figure 5.1-2 Hardwood supply by log grades (%), 2000-2017**

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen.*

## *Foreign timber supply*

Preliminary data on foreign trade statistics shows that 2.02 million m$^3$ of raw timber was exported in 2017 (Figure 5.1-3). This figure represented the lowest export volume in the last 10 years. Forest enterprises exported 341,400 m$^3$, or 16.9% of the total export volume. The remaining 83.1% was exported by various non-forestry entities, commercial trading companies in particular. Timber was mainly supplied to EU countries. Of the exported softwood and hardwood log grades, I-III log grades were most represented.

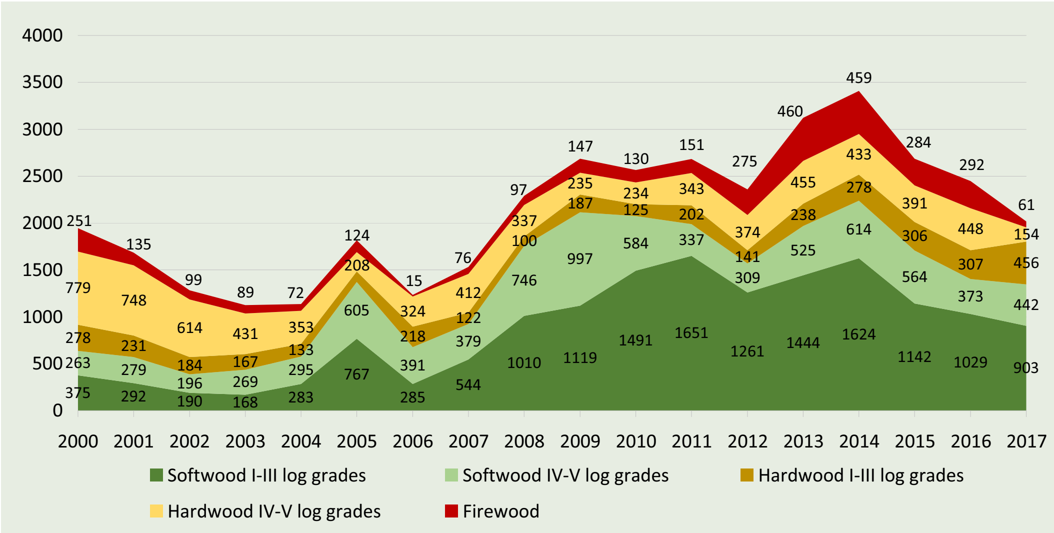



**Figure 5.1-3 Timber export by log grades (1000 m³), 2000-2017**

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen.*

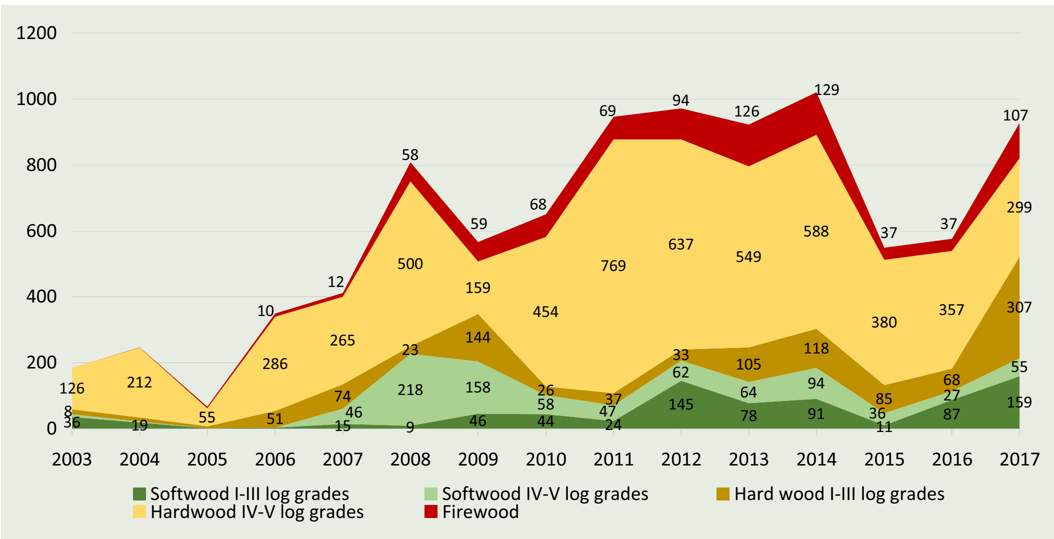



**Figure 5.1-4 Timber import by log grades (1000 m³), 2003-2017**

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen.*

In 2017, 927,000 m$^3$ of raw timber was imported to Slovakia, which was 351,000 m$^3$, or 60.9% more than in 2016 (Figure 5.1-4). It is considered positive that this increase was mainly attributed to an increased import of softwood and hardwood log grades of I-III grade quality.

In trading of raw timber log grades we can observe a positive trend of reducing the volume of exported timber whilst increasing the volume of imported higher quality log grades.

## 5.2 TIMBER PRICES ON DOMESTIC AND FOREIGN MARKETS

In 2017, earnings from timber trading in softwood log grades were down on 2016 by €1.66/m$^3$, or 3.3%. Conversely, hardwood log grades were on average selling for €2.69/m$^3$, or 6.1%, more than in 2016. Average earnings from traded raw timber grades has remained largely unchanged since 2011 (Figure 5.2-1), with a slight increase in the prices of hardwood log grades and a decrease in the prices of softwood log grades.

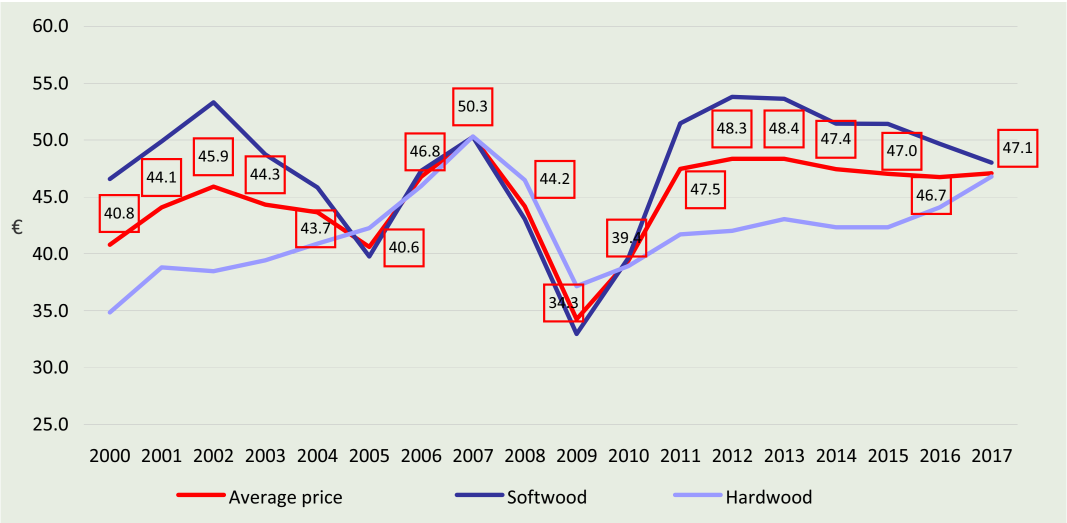



**Figure 5.2-1 Raw timber prices in the forest sector, 2000-2017**

*Source: Quaterly timber supply statistics Les (MARD SR) 2-04, Project APVV-14-0869; Prepared by: NFC-FRI Zvolen*

Export prices of softwood log grades have fallen sharply from €68.5/m$^3$ to €48.2/m$^3$ which is an almost 30% drop since 2013. Conversely, hardwood prices, after a sharp drop from €80.4/m$^3$ to €52.2/ m$^3$ in 2008, started to slowly recover to the current level of €57.6/m$^3$.

# 6. FORESTRY ECONOMICS

## 6.1 SECTORAL EARNINGS AND REVENUE

In 2017, forest sector earnings and revenue reached the sum of €532.71 million (Figure 6.1-1), an annual increase of 4.8%. This rise was partly contributed to improved timber trading with earnings up by 1.8% to €440.84 million due to an increased supply of raw timber and slightly higher trading prices.

Other earnings and revenue amounted to €91.87 million, an annual increase of 22.3%. In the non-state sector, the figure of €52.6 million was the highest since record taking began. In the state sector, the figure reached €39.31 million, an increase of €10.1 million on 2016, but still considerably less than average figures for the 1995-2014 period.

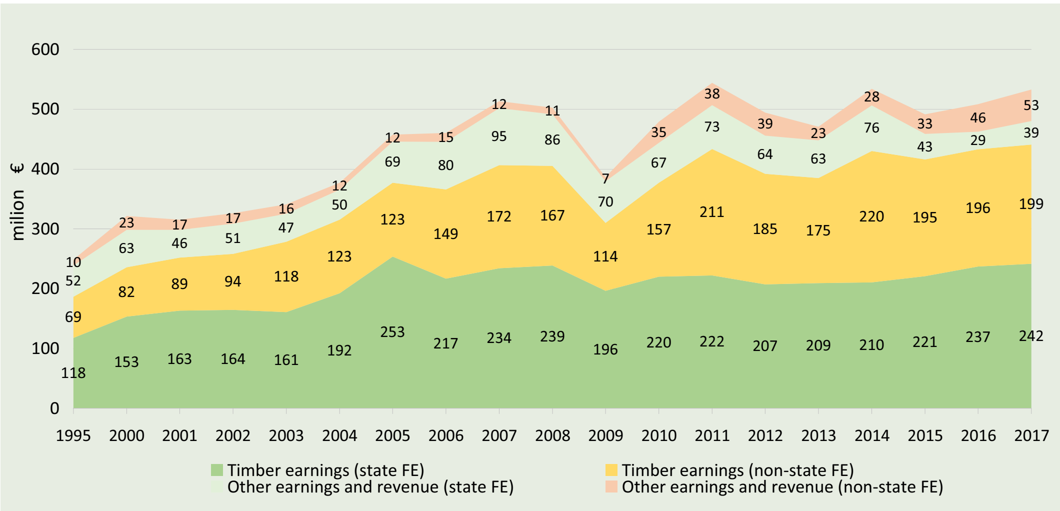


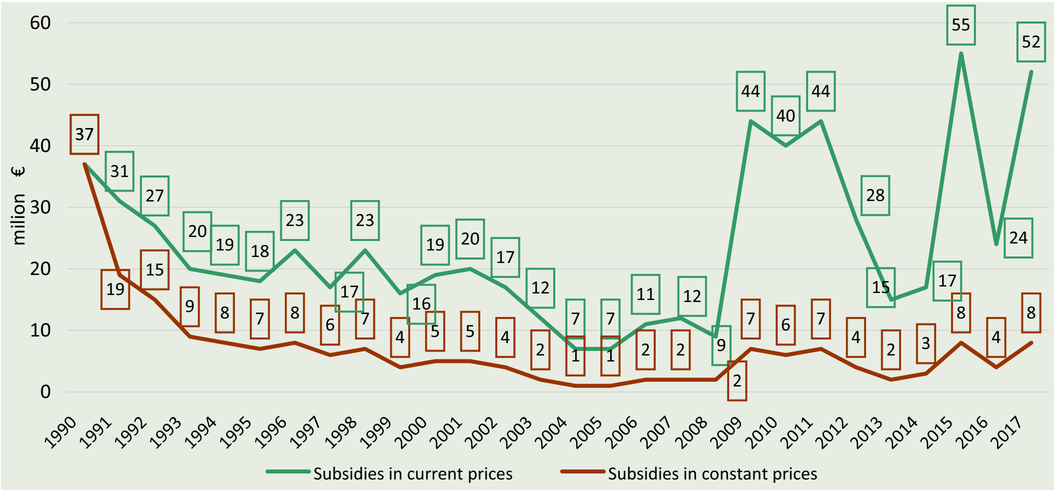

**Figure 6.1-1 Timber earnings and other earnings and revenue in the forest sector, 1995-2017**

*Source: Quaterly timber supply statistics Les 5-01; Prepared by: NFC.*

Other earnings and revenue represent income from the trading of forest products, transplants, by-products of forest production, hunting, tourism and forest services as well as income from leasing and the sale of forest properties and revenue from fiscal capital and bonds.

### *Public funding*

In 2017, the forest sector was awarded €55.55 million from various public sources (state budget, EU funds and other sources). In 2016, public funding provided only €27.26 million for the sector. The increase (by 103.8%) was primarily a result of the increased funding coming into the sector from the national Rural Development Programme of the Slovak Republic (RDP SR) 2014-2020. In 2017, the RDP SR provided €43.32 million representing 78% of total public funding. The trend in public funding available to the forest sector since 1990 is shown in Figure 6.1-2 in both current and constant prices.




**6.1-2 Public funding in the forest sector by current and constant prices, 1990-2017**

*Source: Department of Forestry and Wood Processing of MARD SR, APA MARD SR, state forestry statistics; Prepared by: NFC.*

State funding provided to forest enterprises was based on the Regulation of the Ministry of Agriculture and Rural Development of the Slovak Republic No. 226/2017 Coll. on forest sector funding for the provision of non-production benefits and services from forests. The total area of forest covered by this funding was 38,331 ha. The applicants received €2.07 million in total, or an average of €54 pre hectare of forest. Other organisations (National Forest Centre, Department of FaWP MARD SR, Museum Svätý Anton, Slovak Hunters Chamber, Slovak Forestry Chamber) were provided public funding to the amount of €4 million.

## 6.2 OVERVIEW OF SECTORAL COSTS

In 2017, the total sectoral costs reached the sum of €488.26 million (Table 6.2-1), a yearly increase of 5.3%. The largest proportion of costs was for materials including depreciation and services (66.8% of the total costs). These costs have been continually increasing every year. Compared to 2000 and 2010, they increased by 145% and 19%, respectively.

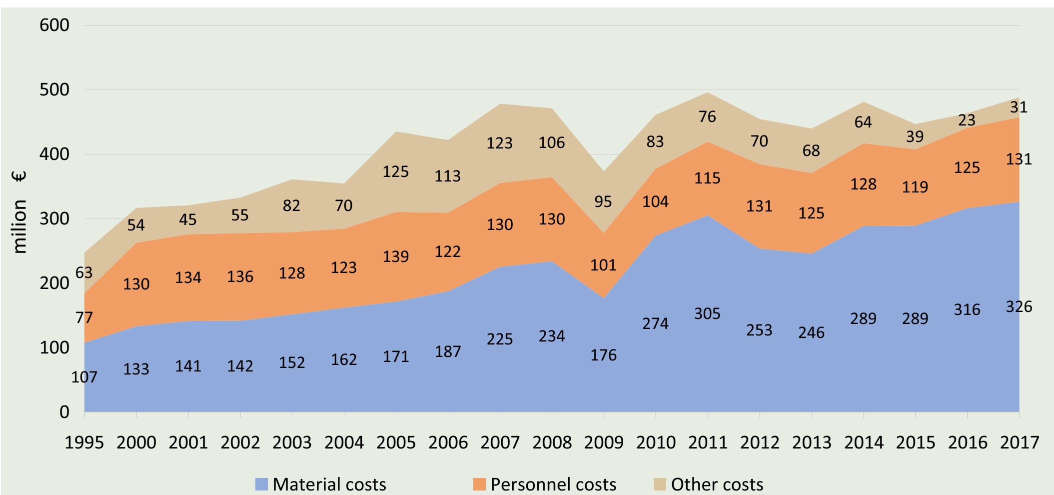



**Figure 6.2-1 Sectoral costs by type (€ million), 1995-2017**

*Source: Records L-144, Quaterly timber supply statistics Les 5-01; Prepared by: NFC*

The forest sector is traditionally a primarily labour intensive industry and this fact is reflected in high personnel costs, which remain largely unchanged over the years. In 2017, personnel costs reached €131 million, or 26.8 % of the total costs, of which labour accounted for €87.2 million. The volume of other costs has been long-term decreasing. In 2017, these costs amounted to €31.2 million, a reduction of 75.2% compared to 2005.

In the 2017 cost breakdown, forestry operations (silviculture and felling) comprised 52.2% of the total costs, followed by overhead costs (27.3%) and other costs (20.5%). In 2017, the growing trend in direct costs of silvicultural operations further continued; these costs increased by 23.8% compared to 2014. In the long-term, the increase of silvicultural operations is desirable as a higher return of forest benefits provided through improved management practices also benefits the finances of forest enterprises.

## 6.3 ECONOMIC RESULT

In 2017, the forest sector made a profit of €44.45 million. The economic result (ER) was comparable to 2015 and 2016 (Figures 6.3-1 and 6.3-2). The difference between the economic result achieved by state and non-state enterprises is still apparent. The comparatively worse economic result in state forest enterprises is chiefly associated with the costs incurred for the management of forests of unspecified ownership. These forests are commonly subjected to a felling ban, are often excluded from obtaining compensations for implied management restrictions and have very limited possibilities to receive public funding.

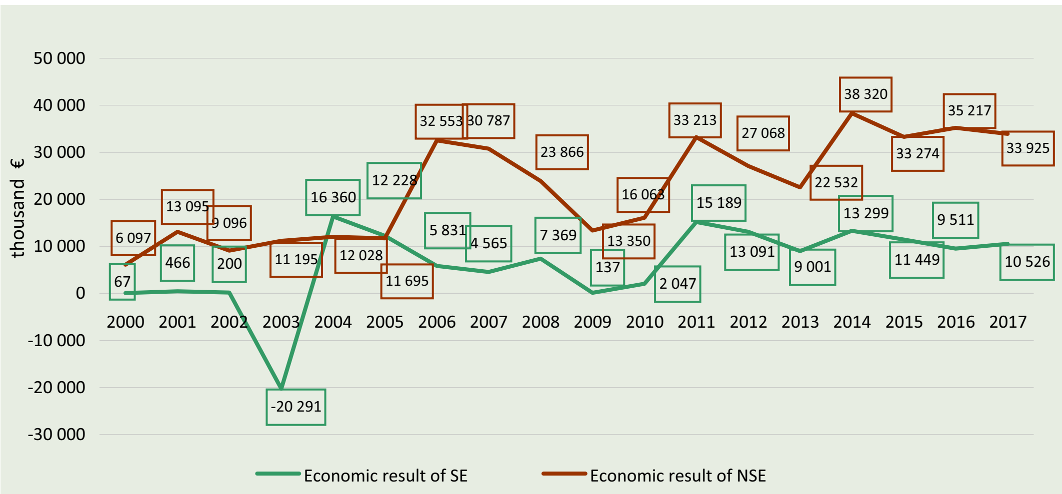



**Figure 6.3-1 Economic result by state (S) and non-state (NS) forest enterprises (€1000), 2000-2017**

*Source: Quaterly timber supply statistics Les 5-01, Profit and Losses Record POD 2-01; Prepared by: NFC.*

The positive economic result combined with depreciation provides internal sources for further investments of enterprises. In 2017, sectoral investments dropped by 35.5% on the previous year. The decrease was particularly large in state forest enterprises (48.2%). Conversely, non-state enterprises recorded an increase of 41.5%. The volume of investments is presently largely influenced by funding available from the RDP SR. State enterprises cannot apply for RDP SR funding for their further investment into the upgrade of forest machinery. The only elligible applicants for this type of funding are non-state enterprises and contractors offering services to forest enterprises.

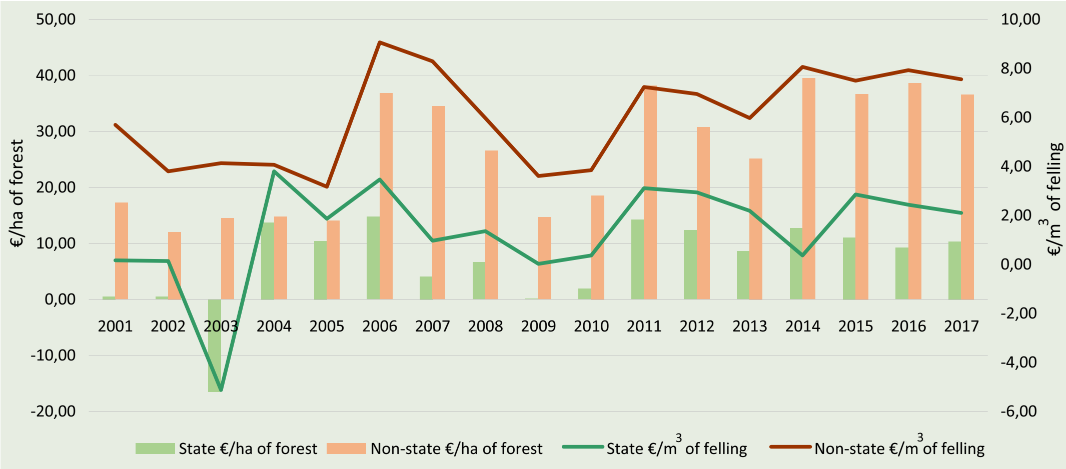



**Figure 6.3-2 Economic result by state and non-state forest enterprises by unit, 2001-2017**

*Source: Quaterly timber supply statistics Les 5-01; Prepared by: NFC.*

## 6.4 ECONOMIC TOOLS

In 2017, the sector contributed taxes to the state and municipal (council) budgets in the amount of €58.61 million. Compared to 2016, the contribution increased by €5.74 million, almost equally for both state and non-state forest enterprises. The taxes have grown by €9.54 million since 2010. The largest share of paid taxes came from value added tax (balance of tax on inputs and outputs). This tax brought in €36.24 million and represented 61.8% of the total tax. Income tax reached €12.62 million (has been decreasing over the last 3 years); property tax came to €9.15 million, the largest sum since 2010 (Table 6.4-1).

**Table 6.4-1 State and municipal taxes by type (€ million)**

| Tax | | Year | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **2010** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** |
| **VAT (collected minus refunded)** | **State** | 17.25 | 18.26 | 18.50 | 17.01 | 18.28 | 18.13 | 21.94 |
| | **Non-state** | 13.31 | 13.20 | 13.23 | 14.78 | 12.32 | 11.40 | 14.30 |
| | **Total** | **30.56** | **31.46** | **31.73** | **31.79** | **30.60** | **29.53** | 36.24 |
| **Property tax** | **State** | 5.38 | 5.94 | 7.14 | 6.57 | 6.35 | 6.73 | 6.88 |
| | **Non-state** | 1.50 | 1.60 | 1.93 | 1.90 | 2.00 | 2.10 | 2.27 |
| | **Total** | **6.88** | **7.54** | **9.07** | **8.47** | **8.35** | **8.83** | 9.15 |
| **Road tax** | **State** | 0.57 | 0.53 | 0.56 | 0.55 | 0.31 | 0.18 | 0.20 |
| | **Non-state** | 0.32 | 0.40 | 0.42 | 0.41 | 0.40 | 0.30 | 0.40 |
| | **Total** | **0.89** | **0.93** | **0.98** | **0.96** | **0.71** | **0.48** | 0.60 |
| **Total [1)]** | **State** | 5.67 | 8.14 | 4.87 | 6.82 | 8.68 | 7.79 | 7.43 |
| | **Non-state** | 5.06 | 6.30 | 5.55 | 5.73 | 6.19 | 6.24 | 5.19 |
| | **Total** | **10.74** | **14.44** | **10.42** | **12.55** | **14.87** | **14.03** | 12.62 |
| **Total** | **State** | 28.87 | 32.87 | 31.07 | 30.95 | 33.62 | 32.83 | 36.45 |
| | **Non-state** | 20.19 | 21.50 | 21.13 | 22.82 | 20.91 | 20.04 | 22.16 |
| | **Total** | **49.07** | **54.37** | **52.20** | **53.77** | **54.53** | **52.87** | 58.61 |

*Source: Quaterly timber supply statistics 5-01, MARD SR questionnaire; Prepared by: NFC.*

*Note: [1)] For non-state forest enterprises calculated from the disbursed salaries/wages and gross profit.*

In 2017, the respective authority of the state administration on forests (SAF) requested a levy for the exclusion of forest land from the forest land registry (compensation for the loss of non-production forest benefits and services) in the amount of €2.66 million, which was the highest amount since 2010. However, only 23% was actually paid. Financial penalties imposed for the breach of statutory obligations totalled €85,000, a sum largely corresponding with the previous year. Of this sum, €48,700, or 57%, was actually paid.

## 6.5 SOCIO-ECONOMIC STATISTICS AND SECTORAL EMPLOYMENT

### *Labour and job motivation*

Based on the data of the Statistical Office of the Slovak Republic (SO SR), the sector employed in 2017 (SK NACE 02 Forestry and logging) 11,200 employees, of which 9,200 were male. They were employed by state and non-state forest enterprises and suppliers of services. The largest share of the workforce (8,000) had high school education. The average monthly salary of employees of state and non-state forest enterprises was €1,004 in 2017.

At 31 December 2017, Job Centres across Slovakia (Offices for Employment, Social Affairs and Family) registered 1,295 unemployed people previously working in the forest sector.

### *Sickness and occupational injuries*

Data from the Social Insurance Agency shows that in 2017 there were over 15,500 persons insured in fields related to forestry and timber felling. Of this number, 11,200 were employees of various forest sector organisations; the rest were self-employed workers. Of this number, 3,700 were women.

The National Labour Inspectorate reported last year 82 job related injuries in the sector, of which four were fatalities.

Sectoral workforce is subjected to a number of work related risk factors including excess vibrations, noise, chemical substances and long-term physical burden. The number of employees in high-risk category jobs reached 691 last year, of which eleven were women.

In 2017, nineteen new cases of occupational diseases were reported.

# 7. ORGANISATIONAL AND INSTITUTIONAL STRUCTURE

## 7.1 STATE ADMINISTRATION ON FORESTS

The Ministry of Agriculture and Rural Development of the Slovak Republic (MARD SR) is the supreme national authority on forests. At the district level, there are eight Departments of Agriculture attached to district offices in particular regions and forty nine Land and Forestry Departments based at district offices. In military forests and forests important for national defence, the Ministry of Defence of the Slovak Republic (MOD SR) executes the state supervision through its Forestry and Hunting Office.

The State Administration on Forests (SAF) is governed by the following legislation:

- Act No. 326/2005 Coll. on forests in the wording of the pursuant regulations;
- Act No. 318/2010 Coll. on forest reproductive material in the wording of the pursuant regulations;
- Act No. 97/2013 Coll. on land associations in the wording of the Act No. 34/2014 Coll.;
- Act No. 274/2009 Coll. on hunting and on amendments of particular laws in the wording of the pursuant regulations;
- other legislation under which the authorities of state administration on forests act as concerned authorities of the state administration.

The authorities of SAF primarily deal with procedures based on the Act No. 71/1967 Coll. on administrative proceedings in the wording of the pursuant regulations (Administrative Code), especially procedures on the compilation and approval of forest management plans (FMP) including their amendments, and procedures related to game management and hunting.

Of equal importance are the advisory services on forests and game management and the release of forestry related information. In addition, SAF also conducts state supervision of forests and hunting activities including tasks such as issuing permits for interventions compromising the integrity of forest properties and their protection, issuing exemptions to banned activities in forests, dealing with legal offences and other infringements associated with forests, hunting and game management. Likewise, it oversees agenda related to forest reproductive material and land associations.

The state administration at the first and second level is organised through particular departments of district offices under the auspices of the Ministry of Defence of the Slovak Republic. Practical guidance and inspection of various authorities of SAF is provided by the Department of Forestry and Wood Processing of MARD SR.

In 2017, SAF authorities conducted 30,900 individual procedures, of which 3,600 were governed by the Administrative Code and 27,300 were procedures not subject to the Code.

## 7.2 OWNERSHIP AND MANAGEMENT OF FORESTS

The structure and trends in forest ownership and management are provided in Figures 7.2-1 and 7.2-2. In 2017, the state owned 769,023 ha of forest crop land, or 39.5% of its total area. At the same time, state forest enterprises managed 1,019,200 ha of forest crop land, or 52.4% of its total area. The remaining area of forest crop land was managed by non-state forest enterprises which own and manage private, municipal, community and church forests as well as forests of agricultural cooperatives.

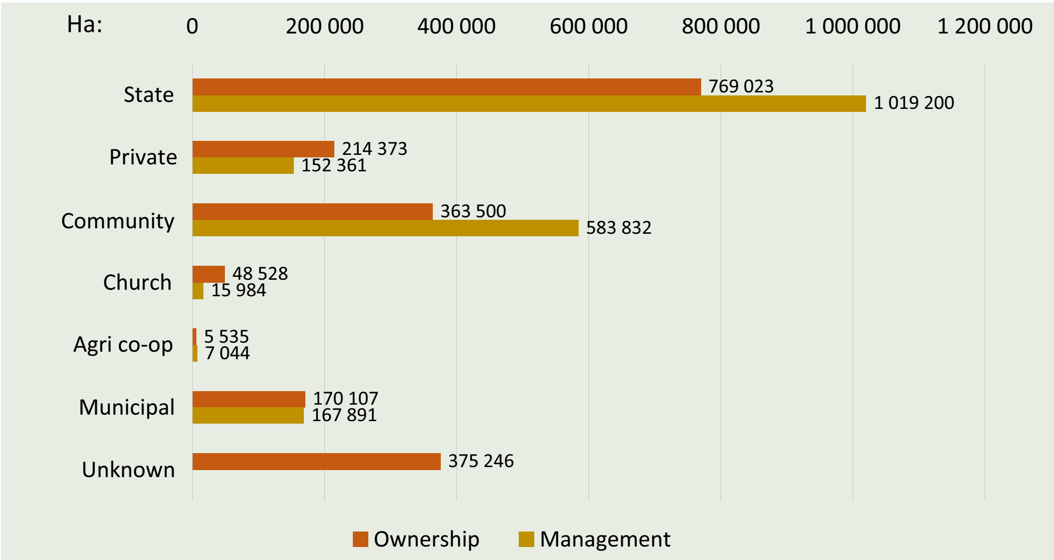



**Figure 7.2-1 Ownership and forest management (ha), 2017**

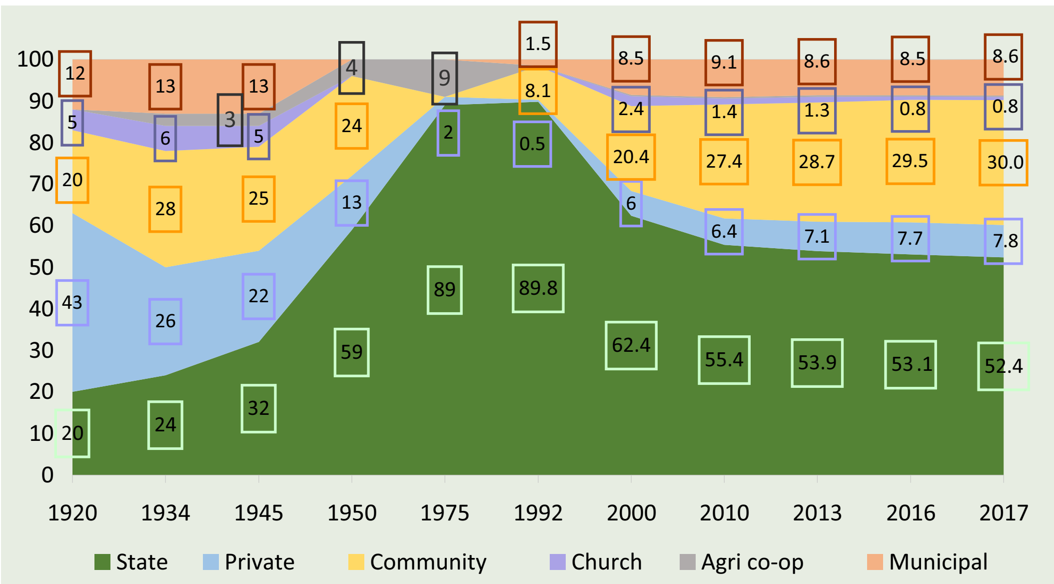



**Figure 7.2-2 Forest managing enterprises (%), 1920-2017**

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2018.*

## *State owned forests (core state forests)*

State forest enterprises manage 769,023 ha of forests owned by the state, of which most (86.1%) are managed by the Forests of the Slovak Republic, s.e. Banská Bystrica. In addition, they manage 250,100 ha of non-state forests, in particular forests of unknown owners, which are managed in line with statutory powers (§ 50 Sec. 6 of the Forest Act). Furthermore, they also manage forests of known owners leased under the §22 Sec. 2 of the Act No. 229/1991 Coll. and forests contractually leased to state enterprises by their owners. Last but not least, they manage forest land subject to the Civil Code provisions related to common ownership (§139 Sec. 2) - further referred to only as „other forests."

**Table 7.2-1 State managed forests by core state forests and other managed forests**

| Indicator | State forest enterprise | | | | | |
|---|---|---|---|---|---|---|
| | FORESTS SR | SF TANAP | MFE SR | FE Ulič | Schools | Total |
| **FL area (ha)** | 887,081 | 34,369 | 61,250 | 24,559 | 11,942 | **1,019,200** |
| *– core SF* | 662,020 | 32,391 | *46,617* | *20,577* | *7,418* | ***769,023*** |
| *– other forests* | *225,061* | *1,978* | *14,633* | *3,982* | *4,524* | ***250,178*** |
| **Growing stock (1000 m³)** | 222,471 | 4,501 | 13,449 | 6,122 | 3,492 | **250,035** |
| *– core SF* | 171,172 | *4,205* | *10,616* | *5,302* | *2,158* | ***193,453*** |
| *– other forests* | *51,299* | *296* | *2,833* | *820* | *1,334* | ***56,582*** |
| **MFS area (ha)** | 177,750 | 2,438 | 13,139 | 4,370 | 2,746 | **200,443** |
| *– core SF* | *131,356* | *2,284* | *10,906* | *3,698* | *1,722* | ***149,966*** |
| *– other forests* | *46,394* | *154* | *2,233* | *672* | *1,024* | ***50,477*** |
| **MFS growing stock (1000 m³)** | 74,530 | 889 | 4,212 | 1,805 | 1,437 | **82,873** |
| *– core SF* | *58,712* | *840* | *3,585* | *1,536* | *897* | ***65,570*** |
| *– other forests* | *15,818* | *49* | *627* | *269* | *540* | ***17,303*** |
| **Planned felling (1000 m³)** | 4,507 | 35 | 569 | 106 | 137 | **5,354** |
| *– core SF* | *3,501* | *32* | *285* | *91* | *84* | ***3,993*** |
| *– other forests* | *1,006* | *3* | *284* | *15* | *53* | ***1,361*** |
| **Actual felling (1000 m³)** | 4,259 | 185 | 334 | 97 | 72 | **4,947** |
| *– core SF* | *3,730* | *179* | *259* | *91* | *45* | ***4,304*** |
| *– other forests* | *529* | *6* | *75* | *6* | *27* | ***643*** |
| **Of which incidental felling (1000 m³)** | 1,996 | 180 | 171 | 4 | 7 | **2,358** |
| *– core SF* | *1,808* | *174* | *100* | *3* | *4* | ***2,089*** |
| *– other forests* | *188* | *6* | *71* | *1* | *3* | ***269*** |
| **TCI core SF (1000 m³)** | 4,233.9 | 90.5 | 296.1 | 153.9 | 54.1 | **6,402.97** |
| **TCI other forests (1000 m³)** | 1,397.7 | 9.7 | 105.4 | 27.1 | 34.4 | |

*Source: NFC-IFRI Zvolen, Compendium of Slovak Forestry Statistics 2017, state forest enterprise records; Prepared by: NFC-FRI Zvolen.*
*Note: 1. FL – Forest land, SF – State forests, MFS – Mature forest stands, TCI – Total current increment, F – Felling, TU – Technical University in Zvolen.*

From the 2017 data (Table 7.2-1), there is a noticeable overrun of the planned felling in core state forests and, on the other hand, underfelling by almost half of the planned volume in other forests managed by state enterprises. The reason for underfelling in other forests is legal barriers from forest owners who restrict felling operations on their land managed by state forest enterprises. As for other forestry operations, especially those incurring costs, the owners of these forests do not interfere with their implementation by state forest enterprises.

Except for the aforementioned felling operations, forest enterprises managing state and non-state forests implemented a,range of other silvicultural and protection measures. More detailed account of these measures is given in appropriate chapters of this report, albeit without breakdown into core state forests and other forests. Table 7.2-2 presents basic data on forests broken down by ownership type.

**Table 7.2-3 Non-state forests indicators**

| Indicator | Ownership type | | | | |
|---|---|---|---|---|---|
| | Private | Community | Church | Agri co-op | Municipal |
| Forest land (ha) | 152 361 | 583 832 | 15 984 | 7 044 | 167 891 |
| Growing stock (1000 m$^3$) | 39 439 | 142 888 | 3 879 | 1 786 | 41 590 |
| MFS area (ha) | 43 128 | 137 041 | 4 163 | 1 601 | 37 183 |
| MFS growing stock (1000 m$^3$) | 18 070 | 54 464 | 1 542 | 635 | 16 407 |
| TCI (1000 m$^3$) | 965,5 | 3 522,8 | 91 | 45,6 | 995,4 |
| TCI per ha/m$^3$ | 6.42 | 6.14 | 5.71 | 6.54 | 5.99 |

## 7.3 OTHER ORGANISATIONS OF THE SECTOR

- ***National Forest Centre***

  The Centre encompasses four specialised institutes:
  - NFC – Forest Research Institute Zvolen is responsible for forest research and innovation, especially in silviculture, forest protection, forest ecology and monitoring, forestry politics and economics. It is also responsible for specialised tasks of the MARD SR (strategic documents, Forest Protection Service, seed inspection, etc.).
  - NFC – Institute for Forest Consulting and Education Zvolen deals with tasks of out-of-school education, public relations, forestry training and specialised forestry courses.
  - NFC – Institute for Forest Resources and Information Zvolen is responsible for forest data management, data publishing and sharing including verification and update of numeric and geospatial data on all forests and forestry operations in Slovakia.
  - NFC – Forest Management Planning Institute Zvolen specialises in forest planning including framework planning, selection of planners and inspection and methodological support of the actual planning process. It includes an expert Surveyor Unit dealing with legal aspects of forest assessment and forest property evaluation.

- ***Research Station of the Forests of the High Tatras National Park (RS TANAP)***

  The RS TANAP conducts research and monitoring of forests and biodiversity in the forests of TANAP.

- ***Educational bodies***

  The provision of high school educated employees for the forest sector is ensured through a network of forestry apprenticeship schools and colleges (Banská Štiavnica, Bijacovce, Ivanka pri Dunaji, and Poltár) and specialised forestry colleges (Banská Štiavnica, Liptovský Hrádok, Prešov and Tvrdošín). The colleges and schools were attended by 1,207 students in 2016-17, which was 16% less than in 2015-16.

  The undergraduate and graduate courses are offered by the Faculty of Forestry of the Technical University in Zvolen which is also involved in forest-related research. The courses were attended by 801 students last year, a drop of 2.8% on 2016 numbers.

- ***Svätý Anton Museum***

  The Museum houses a unique exposition of historic and hunting artefacts of national importance. It is situated in the Svätý Anton Manor House, itself a national cultural monument.

- ***Slovak Forestry Chamber (SFCH)***

  The Chamber is a non-state, non-political, independent entity which enforces and protects legal, professional, social amd economic interests of its members. These include 413 individuals and 20 legal entities employing approximately 6,500 people.

- ***Council of the Non-state Forest Owner Associations (CNFOA)***
  The Council is an official umbrella body of non-state forest owners including owners of private, municipal and church forests in Slovakia.
- ***Association of Forest Sector Employers (AFSE)***
  At 31 December 2017, the Association included 24 legal entities representing 4,588 forest sector employees.

## 7.4 PUBLIC RELATIONS

A key public forestry event of 2017 was the 11th **Forestry Days**. The main motto of this popular annual event was „Forests without Barriers - Forests for All." An important part of events oganised for the public were the events hosted by the Forestry Museum in Vydrovská dolina (Vydrovská Valley) in which around 62,500 people from Slovakia and 25 different foreign countries took part in 2017. The Forest and Timber Museum in Zvolen was last year visited by more than 37,500 visitors. The State Forests TANAP Museum organised 16 events for both forestry professionals and the general public which were attended by almost 3,000 participants. The Svätý Anton Museum organised 56 different events for the public in 2017 attended by more than 15,700 visitors.

In addition, other traditional events and activities were held in 2017 including the 16th **Tree Day** (15,000 visitors), **Green Lens** (557 participants), **Travelling Owl of the State Forests TANAP** (100 participants), Best Forest Warden (300 participants) and 53rd year of the Venerovský Skiing Competition (200 participants). During the 7th year of the **"Forest Hidden in the Book"** project, primary school pupils took part in the "Best Forest Postcard" contest. The events organised as part of the 7th year of **Children's Forest University** were attended by 46 pupils and their teachers from six primary schools.

In 2017, two accredited courses of forest pedagogy were organised together with follow-up courses for already qualified forest teachers. In total, the State Forests TANAP and NFC held 175 public events last year (guided forest walks, various excursions, educational events, etc.) attended by 27,250 members of the public. In addition, a substantial number of press releases were issued together with media outputs and contributions to the Halali TV programme. Brief shots for commercial TV channels and articles for regional newspapers were also prepared.

# 8. INTERNATIONAL COOPERATION

The most important activities and events in the field of international forestry and forest related policies with a,direct impact on global, and hence also European forests included:

- The United Nations Forum on Forests (UNFF) Working Group and Special Session, 16-20 January 2017, UN Headquarters, New York.
- Joint Session of the ECE Committee of Forests (UN ECE) and the Forest Industry (COFFI) and the FAO European Forestry Commission (EFC FAO), 09-13 October 2017, Warsaw held in conjunction with the 4th European Forest Week "LASY 2017."
- 23rd Session of the Conference of the Parties (COP) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC), November 2017, Bonn (Germany).

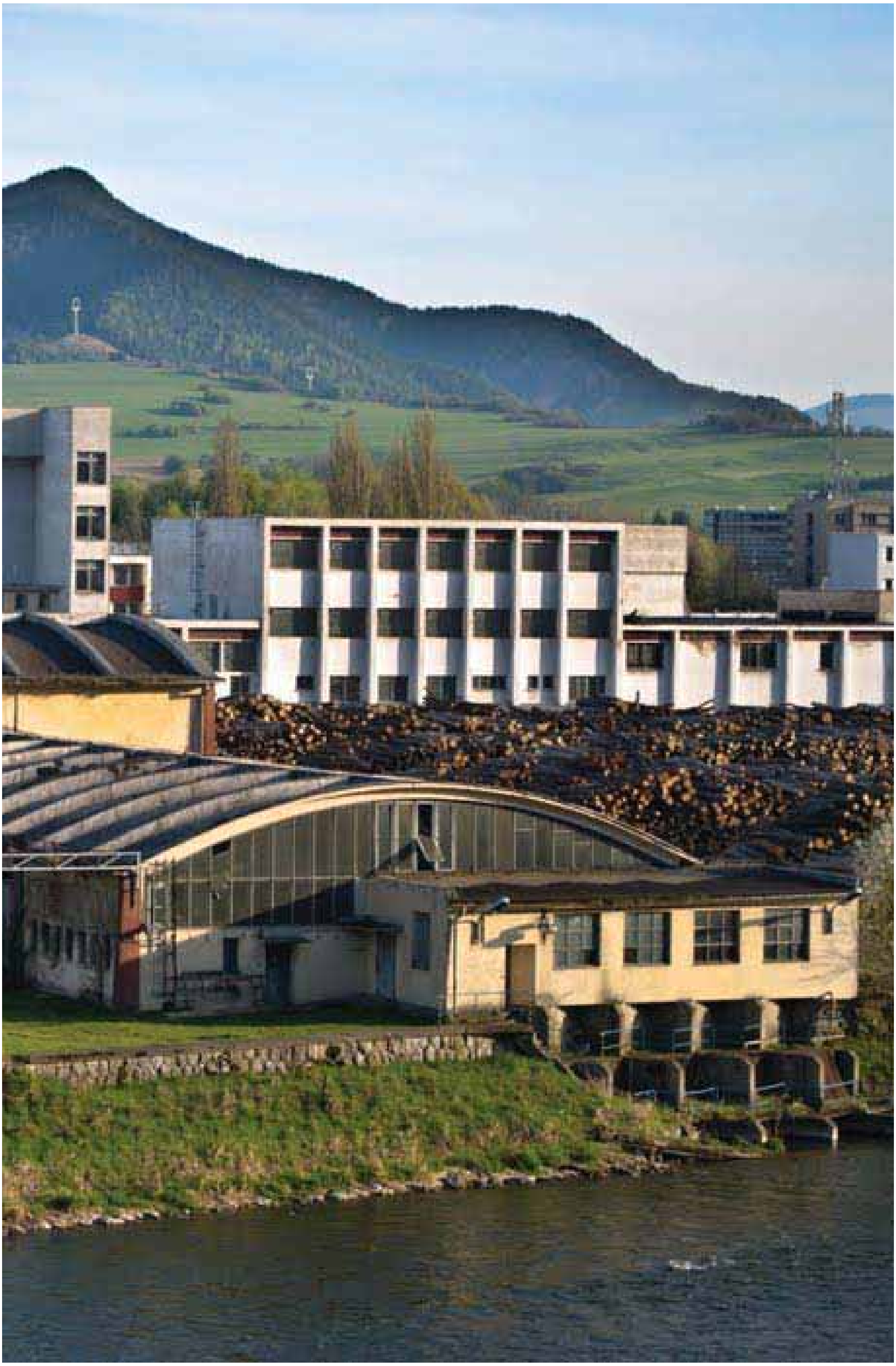
## *FOREST EUROPE*

From 1 January 2016, the Slovak Republic assumed the chairmanship of FOREST EUROPE (FE), the most important pan-European political process on forest policies. The agenda and tasks of the Secretariat are conducted by a separate unit called Liaison Unit Bratislava (LUB) based at the NFC.

The most significant task of the Secretariat in 2017 was a review of the FOREST EUROPE process, in which its structures, procedures and working practices were all reviewed. The review also focused on cooperation with other parties involved in forestry policy in Europe to increase its relevance. In the review, the signatories expressed their support for the continuation of the FOREST EUROPE process as the most prominent political platform for dialogue and cooperation on forest policy in Europe.

In 2017, the FOREST EUROPE Secretariat continued to implement the Work Programme in all six activities approved by the signatories in May 2016. The results of all activities and meetings of expert groups were continuously published on the official website of FOREST EUROPE (www. foresteurope.org).

In the upcoming period, the main challenge for the Slovak Presidency in the FOREST EUROPE process will be to prepare a round table conference on a „Legally Binding Agreement on Forests" in Europe. The Agreement process is based on the decision signed at the Extraordinary Ministerial Conference held in Madrid in 2015.



# 9. TIMBER INDUSTRY

## 9.1 BASIC FACTS

The total volume of timber processed in Slovakia grew from 7,394,000 m$^3$ to 8,272,000 m$^3$, or 11.8%. Year-on-year consumption of softwood and hardwood logs of I-III grades, softwood logs of IV-V grades and fuelwood all increased. Conversely, consumption of hardwood logs of IV-V grades continued to stagnate. The growth in domestic timber processing was reflected in maintaining the industry's economic results at the 2016 level and the creation of 961 jobs which represented a growth of 4.3% (Table 9.2-1).

**Table 9.1-1 Timber industry: Selected economic indicators**

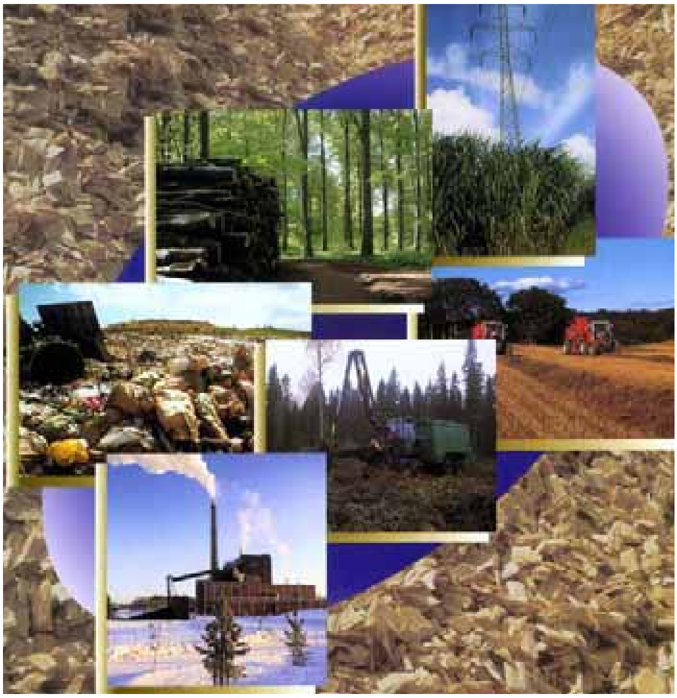
| Indicator | Industry | € million | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2010 | 2012 | 2014 | 2015 | 2016 | 2017*) |
| Revenue | TI | 456 | 494 | 613 | 590 | 687 | 673 |
| | FI | 621 | 661 | 771 | 817 | 964 | 923 |
| | PPI | 1,458 | 1,407 | 1,317 | 1,379 | 1,372 | 1,388 |
| | TPI | 2,535 | 2,562 | 2,701 | 2,786 | 3,023 | 2,984 |
| Costs | TI | 469 | 513 | 597 | 573 | 660 | 655 |
| | FI | 607 | 665 | 805 | 835 | 950 | 894 |
| | PPI | 1,328 | 1,315 | 1,222 | 1,242 | 1,220 | 1,253 |
| | TPI | 2,404 | 2,493 | 2,624 | 2,650 | 2,830 | 2,802 |
| Gross economic result | TI | –13 | –19 | 16 | 17 | 27 | 18 |
| | FI | 14 | –4 | –34 | –18 | 14 | 29 |
| | PPI | 130 | 92 | 95 | 137 | 152 | 135 |
| | TPI | 131 | 69 | 77 | 136 | 193 | 182 |
| Employment | TI | 5,667 | 5,031 | 5,005 | 4,875 | 4,954 | 5,400 |
| | FI | 10,236 | 9,806 | 10,583 | 11,102 | 11,287 | 11,426 |
| | PPI | 6,591 | 6,202 | 5,986 | 6,110 | 6,205 | 6,581 |
| | TPI | 22,494 | 21,039 | 21,573 | 22,087 | 22,446 | 23,407 |

*Source: ME SR 2010, SO SR 2012 -2017 (Record Prod 3-04); *) 2017 data is preliminary.*

*Note: 1. TI – Timber industry, PPI – Pulp and papermaking industry, FI – Furniture-making industry, TPI – Timber processing industry.*

Despite the positive development of economic indicators and growth in the volume of domestic timber processing, there has been no significant increase in the competitiveness of most enterprises of mechanical wood processing and the growth of added value. Production mostly consists of sub-deliveries of unfinished products with a lower level of finalisation for foreign companies. Only a small part of top quality roundwood is being processed, with domestic production at around 300,000 m$^3$. Except for few multinational companies operating in Slovakia, no significant investments in the modernisation of processing technologies have been made.

Conversely, the pulp and papermaking industry belong to the best performing industries of the national economy and 11 companies associated in the Pulp and Paper Industry Federation of the Slovak Republic cover most of the production in the entire industry. The industry is forced to respond to changes in supply and demand on the European market, in particular through innovation and changes in the structure of production.



An important environmental aspect of timber production and its use is the fact that timber used for products, particularly durable ones, has protected the atmosphere from $CO_2$ emissions for decades. Therefore, it is important and desirable to use timber as much as possible for a wide range of different products with the longest possible shelf-life. Carbon bound in timber is released back into the atmosphere only when the products turn to waste or fuel. In 2016, 3.11 million tonnes of $CO_2$ was estimated to be stored in timber products in Slovakia. At the same time, 2,051,000 tonnes of $CO_2$ was released into the atmosphere from timber products consumed in 2016. The overall balance is thus highly positive since the volume of $CO_2$ bound in timber products increased by 1,059,000 tonnes. Figure 9.1-1 shows the final balance of $CO_2$ capture and emissions for all basic categories of timber products (conifer and broadleaved sawnwood, wood panels, paper and cardboard) since 1990.

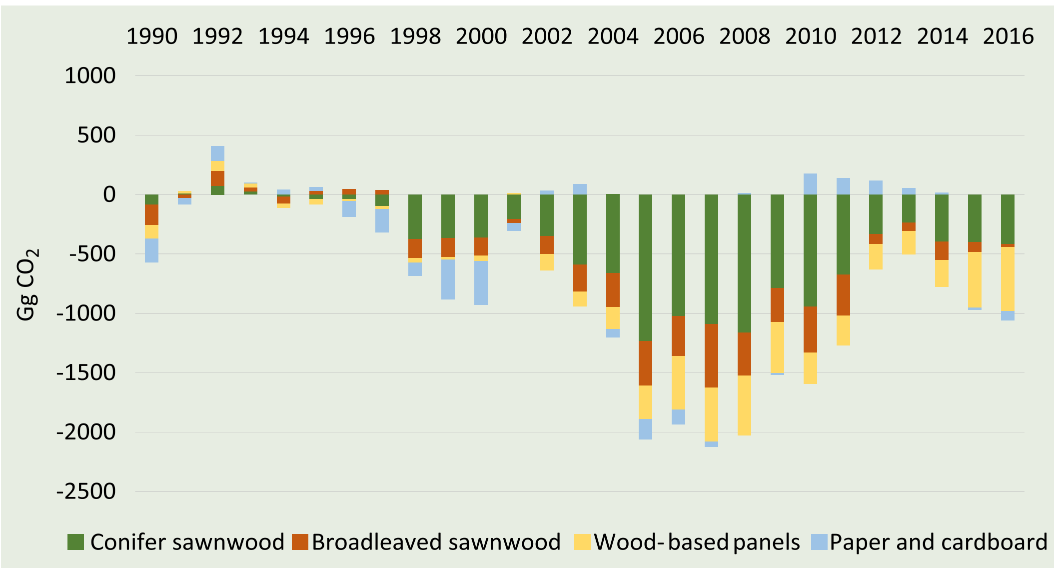



**Figure 9.1-1 Total weight balance of „capture“ and „emissions“ of $CO_2$ (Gg $CO_2$eq.) by basic wood product category**

*Source: Project APVV-14-0869: Exploring the Use of Wood as a Renewable Raw Material in the Transition to a Green Economy.*

*Note: 1. „Capture“ represents $CO_2$ stored in wood products and released into the atmosphere with a delay and have negative values in the balance; “emissions” represent the volume of $CO_2$ released into the atmosphere from used wood products and have positive values in the balance.*

## 9.2 WOOD FOR ENERGY PRODUCTION

In 2017, the total consumption of solid fuelwood biomass (fuelwood, wood chips, woody residue, briquettes and pellets) reached 3.05 million tonnes. The key consumers of woody fuels, the dominant renewable source of energy in Slovakia, are the timber processing, pulp and papermaking industry, private households, municipal heat units and the energy sector.

The share of combined generation of electricity and heat in the overall energy production from woody fuels slightly increased. Compared to 2016, the total production increased by 100,000 tonnes. There was a change in the overall consumption structure in favour of the timber processing industry due to the increase in the volume of industrial timber processing by domestic processing companies (export decrease, import increase). The share of woody fuels in the total consumption of primary energy sources in the Slovak Republic was 1.9%.

Due to the change in the structure of woody fuel consumption in favour of the timber processing industry which uses its own woody residue as well as the decline in the felling of broadleaved species, the supply of fuelwood biomass from forest enterprises fell by 15,000 tonnes to 1.42 million tonnes when compared to 2016. Annual fuelwood consumption increased by 15,000 tonnes and reached 845,000 tonnes. This growth was attributed to an increase in the number of family houses partially or exclusively heated by fuelwood. Consumption of wood chips decreased by 30,000 tonnes to 580,000 tonnes. This decrease was chiefly associated with a stagnation in consumption in municipal heat units and the energy sector, abundant supply of wood chips from non-forest sources, and higher costs for the production and transportation of wood chips from forests. Fuelwood biomass accounted for 46.7% of the total annual consumption of woody fuels..

# 10. SECTORS ASSOCIATED WITH FORESTS AND THEIR FUNCTIONS

## 10.1 NATURE PROTECTION

### *NATURA 2000*

The European network of protected areas NATURA 2000 (Table 10.1-1) includes two partially overlapping networks of the Special Protection Areas (SPAs) and Sites of Community Importance (SCIs), the designation and management of which is monitored and guided by the European Commission.

Borders of SPAs remained unchanged in 2017. The area of forests in SPAs also remained largely stable, although there is a trend of its slow gradual increase caused by growing forest cover in these areas. At present, the SPAs include 836,000 ha of forest stands. Approximately 51.6% of the SPAs area overlaps with other protected areas. On the remaining area of SPAs (48.4%), the first level of protection is applied.

In 2017, the Slovak Government approved management plans for the first six of the total of 41 SPAs. These plans specify protection objectives, protection measures and land use conditions including restrictions based on a higher level of protection.

The national list of SCIs was last year extended to include 169 new sites covering a total area of 31,656 ha, of which forests cover 18,136 ha.

### *National network of protected areas*

The national network of protected areas (Table 10.1-2) includes large-scale protected areas (LSPAs) such as national parks (NPs) and protected landscape areas (PLAs). In addition, it includes several categories of small-scale protected areas (SSPAs) such as nature reserves (NRs), national nature reserves (NNRs), nature monuments (NMs), and protected sites (PSs). Both types of protected areas can be zoned (divided into sections with a different level of protection).

In 2017, five small-scale protected areas (caves) were added to the network. Since these sites are underground, there is no land area attached to them and thus the total area of the network remained unchanged. The total area of forest land in the nationally protected areas was approximatelly 784,000 ha.

### *Overlap between the national and NATURA 2000 networks*

The total area of NATURA 2000 in Slovakia is approximately 1,463,000 ha. An area of mutually overlapping SPAs and SCIs is included only once. Of the total area, 951,000 ha are forest land. The overlap between NATURA 2000 network and a national network of PAs is around 776,000 ha. NATURA 2000 thus increases the area of forests under protection by approximatelly 578,000 ha.

The existing system is very confusing for the practical management of forests in these areas. Overlapping areas are typical for an overlap of requirements and restrictions imposed by the Act on Nature and Landscape Protection within the requirements of EU directives. These requirements are often conflicting, particularly with respect to varying multiple procedures for granting approvals for and exemptions from the systematic management of forests. Additionally, it is important to realise that both NATURA 2000 and the national network of PAs also overlap in places with sites protected under other international agreements on nature conservation, e.g. UNESCO biosphere reserves (MaB), Ramsar sites and natural UNESCO World Heritage Sites. Boundaries of sites protected by international agreements are often unmarked in the field.

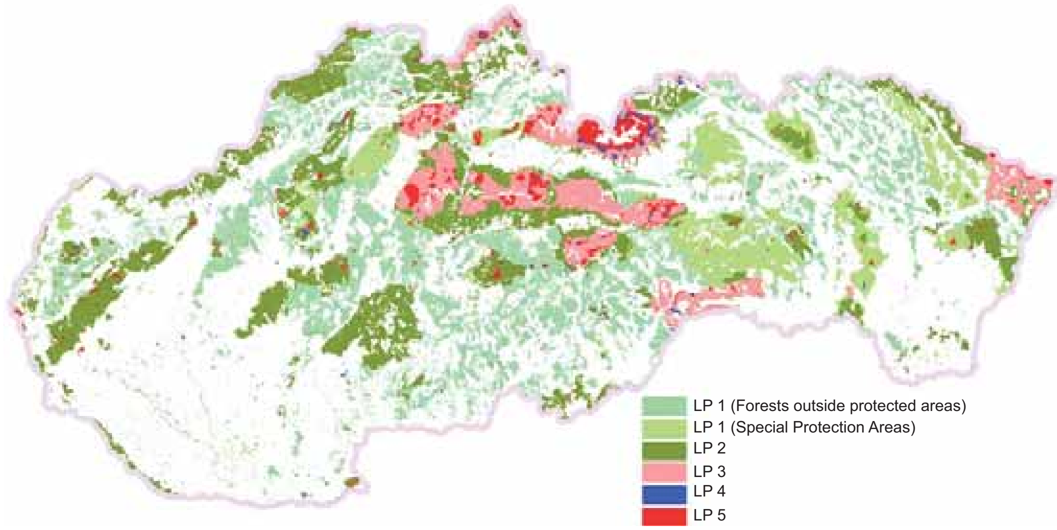



**Figure 10.1-1 Forest land by level of protection**

*Source: ME SR 2018, NFC-IFRI Zvolen; Prepared by: NFC-FRI Zvolen, 2018.*

**Table 10.1-2 Protected forest area by category and level of protection**

| Protected area | | Level of protection (ha) 1 | 2 | 3 | 4 | 5 | Total |
|---|---|---|---|---|---|---|---|
| Protected Landscape Area (PLA) [1)] | | 0 | 344.7 | 0 | 0 | 0 | **344.7** |
| National Park (NP) [1)] | | 0 | 0 | 195.8 | 0 | 0 | **195.8** |
| NP buffer zones | | 0 | 151.7 | 0 | 0 | 0 | **151.7** |
| Zones of PLA[2)] and NP[3)] | LP 5 | 0 | 0 | 0 | 0 | 6.0 | **6.0** |
| | LP 4 | 0 | 0 | 0 | 3.0 | 0 | **3.0** |
| | LP 3 | 0 | 0 | 25.6 | 0 | 0 | **25.6** |
| | LP 2 | 0 | 21.1 | 0 | 0 | 0 | **21.1** |
| Small-scale Protected Areas (SSPA) | ((National) Nature Reserves ((N)NR)/[3] | 0 | 0 | 0 | 11.9 | 61.7 | **73.6** |
| | (National) Nature Monuments ((N)NM) | 0 | 0 | 0 | 0.7 | 0.5 | **1.1** |
| | Protected Landscape Elements (PLE) | 0 | 0 | 0 | 0 | 0 | **0** |
| | Protected Sites (PS) | 0 | 1.6 | 2.5 | 1.2 | 0 | **5.3** |
| | SSPA buffer zones | 0 | 0 | 1.0 | 3.0 | 0 | **4.1** |
| Sites of Community Importance (SCI) – outside the national network of PA | | 0 | 65.4 | 2.3 | 1.3 | 0.4 | **69.4** |
| Special Protection Areas (SPA) – outside SCI and the national network of PA | | 321.8 | 0 | 0 | 0 | 0 | **321.8** |
| **Total** | | **321.8** | **584.5** | **227.2** | **21.1** | **68.6** | **1223.2** |

*Source: ME SR 2015 at 1 January 2018; Prepared by: NFC-FRI Zvolen, 2018.*

*Notes:[1)]Area without SSPA and zoned PLAs and NPs; [2)]Zoned PLA: Horná Orava; [3)]Zoned NP: PIENAP and Slovenský raj NP.*

*1. Areas derived from actual GIS layers with difficult overlap interpretation so data is just estimated.*

### *Compensations for restrictions in the management of forests on forest land and implemented forest protection measures based on §28, Sec. 3 of the Act No. 326/2005 Coll. on forests in the wording of the pursuant regulations*

According to the Ministry of Defence of the Slovak Republic, compensations totalling €3.21 million were granted in 2017 for the management restrictions imposed in forests on forest land. The sum was €1.38 million lower than in 2016, but the volume of compensations requested was also lower at €3.46 million.

In addition, the State Nature Conservancy of the Slovak Republic (SNC SR) was obliged by law to implement measures in buffer zones of 44 SSPAs managed by the State Forests TANAP, NAPANT (Low Tatras National Park), PLA Kysuce, PLA Horná Orava, NP Veľká Fatra, NP Malá Fatra, NP Muránska planina and PLA Poľana. The SNC SR prepared statements on proposed measures (at 31 January 2017) which were drafted by certified forest managers in charge of particular forests and submitted to the the Forest Protection Service in Banská Štiavnica.The proposed measures focused on the protection of vulnerabe forest stands weakened by bark beetle outbreaks, European spruce bark beetle in particular (Ips typographus), with the objective of reducing the risk of further outbreaks.

## 10.2 MANAGEMENT OF SMALL WATERCOURSES

The total length of watercourses in Slovakia is 61,100 km of which state forest enterprises manage over 19,400 km of small watercourses (SW). State forest enterprises spent €794,500 last year on investments and maintenance of these watercourses, the majority of which was allocated for post flood cleanup. Costs of forest amelioration, mountain torrent regulation and protection of water regime reached €16,000. Investments in maintenance and flood prevention are very limited due to the budget constraints of forest enterprises.

# 11. CONCLUSIONS AND RECOMMENDATIONS

## 11.1 CONCLUSIONS

### *Forests, their condition and development*

- The area of forest land and forests have been increasing long-term. The forest data available from the second cycle of the National Forest Inventory and Monitoring 2015-2016 (NFIM 2) gives the actual forest area inclusive of forests on non-forest land (white plots) at 2,211,000 ± 43,000 ha; computed forest cover is 45.1% ± 0.9%.
- Forests on forest land are dominated by broadleaved tree species, European beech and oak in particular. The share of coniferous species has been declining, chiefly due to the detrimental impact of harmful agents which is most prevalent in spruce forests.
- Slovak forests are aging. The average age of all principal tree species except for Norway spruce is increasing. The decreasing average age of Norway spruce is a direct result of a catastrophic decline of older spruce forests devastated by natural disturbances (windstorms, pest outbreaks).
- The actual age structure of Slovak forests is uneven. Higher than optimal is the percentage of forests above 70 years of age (mostly mature forests) whilst the percentage of younger forests is below optimal except for the youngest forests (1st age class). This fact alone has increased the regeneration felling to the highest level on records.
- Growing stock is increasing as forests are aging. This upward trend has been confirmed by the results of the second cycle of the National Forest Inventory and Monitoring 2015-2016 which indicated the growing stock increase by 4.4% compared to the results from the first inventory cycle in 2005-2006.
- Growing stock in forests on non-forest land (white plots) is estimated at 46 million ± 7 million $m^3$ of timber (NFIM 2 data).
- The actual uneven age structure of Slovak forests with a high percentage of older, mature forests has resulted in the highest growing stock for at least a century. A high percentage of growing stock in mature forests entering regeneration combined with a high volume of incidental felling will cause growing stock to fall in the coming years.
- The NFIM 2 data puts the volume of deadwood (including small diameter timber and stumps) in Slovak forests at 87 million ± 5.7 million $m^3$, which is on average 45.2 ± 2.8 $m^3$ pre hectare; on non-forest land it is additional 6.8 million ± 1.8 milion $m^3$.
- The current volume of deadwood is abnormal and considerably higher than the European average (https://foresteurope.org/state-europes-forests-2015-report/). This volume does not reflect natural forest dynamics, nor does it result from the intentional retention of deadwood in forests - it is a consequence of the declining health of Slovak forests with a high volume of timber damaged by harmful agents.
- Slovak forests are suffering from an unprecedented frequency and intensity of harmful agents. Various restrictions often severely hamper timely and systematic conduct of incidental felling and subsequent removal of matter from forests damaged by biotic agents (bark beetle in particular). At present, we are talking about an unprecedented scale of forest decline in Slovakia. The volume of timber damaged by biotic agents reached 3.9 million $m^3$ in 2017.

### *Forest management*

- The majority of Slovak forests are production forests (72.1%). The second most common are protection forests (17.2%) in which ecological functions are of prime importance. Lastly, there are special-purpose forests (10.7%) in which social and cultural functions prevail.

- More than 16,700 ha of forest were regenerated in 2017. Whenever possible, natural regeneration took priority and accounted for 40.1% of the regenerated area. Natural regeneration needs to be directed towards future targeted tree species composition. Attention needs to be paid to achieve site suitable tree species composition of young forests and reduce the negative impact of ungulates.
- The volume of treatment of young forest stands (weed/game control, fencing and cleaning) has been decreasing since 2012-2014. However, the current treatment volume is still higher than in 2010.
- Cleaning operations in state and municipal forests reflects the true needs of young stands and the actual volume exceeds the plan. In other categories of non-state forests the cleaning volume is generally lower than planned. The volume of thinning operations carried out in 2017 was the lowest for the last 6 years and compared to 2012 it fell by 11%; however, it grew by 61% compared to 2010.
- Thinning was performed on a lower than planned area (only 64.2%) due to a high volume of incidental felling.
- Felling is increasing, mainly due to aging forests (more mature forests entering regeneration) and a high volume of incidental felling is attributed to biotic agents in particular. In 2017, the total felling reached 9.39 million $m^3$ of which 58.9% were softwoods and 41.1% hardwoods.
- The volume of incidental felling is high; in 2017, it represented 52.6% of the total felling. This high volume is mainly caused by the harmful impact of biotic agents (massive outbreaks of European spruce bark beetle) and windstorms.
- A high volume of incidental felling combined with ever increasing regeneration felling leads to an increase in the area of youngest forest stands up to 10 years of age (1st age class) and further exacerbates the trend in the uneven age structure of Slovak forests.
- The uneven age structure of Slovak forests contributes to cyclical changes in felling volumes. It is estimated that around the year 2030 (depending on the actual incidental felling), the total felling volume is to decrease.

## *Timber supply and economics of the forest sector*

- The volume and value of raw timber supply are increasing. In 2017, forest enterprises supplied domestic market with 9.02 million $m^3$ of timber including timber used by enterprises themselves. Compared to 2016, the domestic supply was higher by 152,600 $m^3$, especially due to higher supplies of softwood (331,100 $m^3$ up on 2016). Conversely, supplies of hardwood decreased by 178,500 $m^3$.
- Export of raw timber is decreasing, but import of raw timber including high quality grades has been on the increase which is viewed positively. Annual raw timber export fell by 17.7% (2.02 million $m^3$). Import figures for raw timber grew by 60.9% compared to 2016 and reached 927,000 $m^3$.

- Raw timber was exported mainly by non-forest timber trading companies and other enterprises which together exported 83% of the total volume. Forest managing enterprises exported less than 341,000 $m^3$, or 17%.
- The trend in average log grade prices remains largely stable; a marginal increase of €0.4 was reported compared to 2016. Average softwood prices decreased by €1.66/$m^3$ compared to 2016. Conversely, average hardwood prices increased by €2.69/$m^3$.
- Sectoral earnings and revenue reached in 2017 the sum of €532.71 million (up by 4.8% on 2016), chiefly due to increased other earnings and revenue (22.3% up), increased domestic supply of raw timber (152,600 $m^3$ up) and a slight increase in average prices of supplied timber (€0.4 up).
- Profit of the sector reached €44.45 million in 2017 which was comparable with the years 2015 and 2016. The profit of state forest enterprises continued to be lower than that of non-state enterprises.
- Forest enterprises paid taxes to the national and municipal (council) budgets in the amount of €58.61 million. Compared to 2016, taxes grew by €5.74 million, an approximately equal rate in both state and non-state enterprises.
- Sectoral costs reached in 2017 the sum of €488.26 million, an increase of 5.3% compared to 2016. This increase was chiefly attributed to a higher volume of silvicultural and felling operations.

## *Other conclusions*

- In 2016, the Slovak Republic assumed the chairmanship of FOREST EUROPE, the most important pan-European political process on forest policies. Its Secretariat „Liaison Unit Bratislava“ is based at the NFC in Zvolen. It continues to follow the Work Programme as planned till 2020.
- There is a disproportionately high percentage of forests in protected areas (both within a national and European network). The area of NATURA 2000 sites represents 29.7% of the total country area, which is substantially more than the EU average of 18.15%. Overlap of the national network of protected areas with the NATURA 2000 network (SPA/SCI), their mutual incompatibility, insufficient identification of their boundaries and their marking in the field, combined with an unpredictable escalation of nature conservation requirements related to the approval of forest management plans for particular protected areas, create an excessive bureaucratic burden for forest managers. Equally, it generates confusion related to nature conservation imposed management restrictions in particular forests.
- The majority of protected areas still do not have approved plans for their management which would specify protection objectives and measures for their achievement including those that would combine sustainabe management of natural resources with sustainable management of species and habitats.
- Despite economic indicators trending positive recently, no major growth in the competitiveness of the majority of timber processing companies has been observed and that includes a lack of growth in the production of added value products. Production mostly consists of intermediate products supplied to foreign companies.
- Contrary to timber processing, the pulp and papermaking industry belongs to one of the most profitable and competitive industries of the national economy.
- There is a lack of facilities for the processing of the highest quality softwood/hardwood roundwood.
- Timber production and its use has significant environmental benefits for climate change mitigation since wood based products store sequestered CO2 long-term. The volume of CO2 in wood products (sawnwood, wood panels, paper, cardboard, etc.) increased in 2017 by 1.059 million tonnes.

## 11.2 RECOMMENDATIONS

- Implement the following forest policy documents: the Action Plan of the National Forest Programme 2014-2020, the Action Plan of the National Programme on the Utilisation of Available Timber Resource and other strategic documents related to climate change mitigation and adaptation measures in forests, which also include measures on current forest-related issues and provide opportunities for the further development of both forest and timber processing sectors.
- Continue in the implementation of supporting measures for forest managing enterprises regulated by the Regulation of the Ministry of Agriculture and Rural Development of the Slovak Republic No. 226/2017 Coll. on forest sector funding for the provision of non-production benefits and services from forests.
- Ensure adequate funding for forest research and science from domestic sources and through the involvement in international scientific and research cooperation, including the transfer of latest know-how into the forestry practice.
- Ensure that the new Forest Act amendment includes provisions for continuous funding of forest management plans from the state budget.
- Increase the effectiveness of inspection of felling operations and their legality.
- Evaluate possibilities and introduce systematic felling regulation to effectively manage growing felling potential and high rates of incidental felling. For this purpose, use methods of mathematic modelling to gradually improve the current uneven age structure of Slovak forests.
- Implement effective, timely and consistent protection measures aimed at supressing recod high infestation of Slovak forests by the European spruce bark beetle.
- Promote mechanical and biological methods of forest protection in place of chemical methods, making use of the funding available through the RDP SR 2014-2020.
- Ensure regular monitoring of harmful agents including those which are less important or introduced; make better use of the Forest Protection Service expertise and share data through the electronic forest protection information system.
- Draft measures to reduce current high spring stocks of ungulates to a manageable level.
- Intensify cooperation with the State Nature Conservancy of the Slovak Republic to achieve nature conservation goals through active management of protected areas and forests.
- Create conditions and improve possibilities for the implementation of innovative approaches in the area of non-timber products and services to encourage income diversification.
- Improve public awareness on the importance of sustainable management of forests and the practical advantages of using wood compared to other materials.
- Continue in organising public activities/events with an emphasis on forest education and assess possibilities for future regular funding.
- Implement measures to support competitiveness of the timber processing industry as outlined in strategic sectoral documents and their action plans, with a special focus on the industries with higher added value and those with a negative trade balance such as veneeer production (hardwood in particular), production of wood fibre and particle boards, production of components for wooden eco-houses, production of secondary paper products and processing of waste paper.
- Contribute to effective climate change mitigation by increasing the volume of $CO_2$ bound in wood products, resolving conflicting opinions on the utilisation of wood for energy production, leaving wood in forests to naturally decompose and by adapting forest ecosystems to climate change.

# 12. ACRONYMS AND ABBREVIATIONS

- AFSE – Association of Forest Sector Employers
- APA – Agricultural Paying Agency
- CFM – Certified forest manager
- CNFOA – Council of the Non-state Forest Owners' Associations
- C-o-C – Chain of custody
- COFFI – Committee of Forests and the Forest Industry
- COFO – Committee on Forestry (FAO)
- COP – Conference of Parties
- CSFS – Compendium of Slovak Forestry Statistics (forest stand inventory)
- EC – European Commission
- ECOSOC – Economic and Social Council (UN)
- EFC – European Forestry Commission (FAO)
- EFI – European Forest Institute
- EFI CEEC – European Forest Institute Central-East European Regional Office
- EU – European Union
- FAO – Food and Agriculture Organization (UN)
- FE – FOREST EUROPE
- FF TU – Faculty of Forestry of the Technical University in Zvolen
- FM – Forest management
- FMP – Forest management programme (plan)
- FRM – Forest reproductive material (planting and seeding stock)
- FLA – Forest land area
- FSA – Forest stand area (forest stands without other forest land)
- FSC – Forest Stewardship Council
- GDP – Gross domestic product
- HLPF – High-level Political Forum on Sustainable Development (UN)
- IF – Incidental felling
- IFM – Integrated forest management
- IP – Inventory plot
- LPM – Forest and Estates Ulič, state enterprise
- LUB – Liaison Unit Bratislava (FE)
- LULUCF – Land Use, Land-Use Change and Forestry
- MARD SR – Ministry of Agriculture and Rural Development of the SR
- MCPFE – Ministerial Conference on the Protection of Forests in Europe
- ME SR – Ministry of the Environment of the SR
- MFE SR – Military Forests and Estates of the SR, state enterprise
- NATURA 2000 – European Union network of protected areas Natura 2000
- NFC – National Forest Centre
- NFC-FRI – National Forest Centre – Forestry Research Institute
- NFC-IFRI – National Forest Centre – Institute for Forest Resources and Information
- NFIM 1 – National Forest Inventory and Monitoring (1st cycle)
- NFIM 2 – National Forest Inventory and Monitoring (2nd cycle)
- NM – Nature Monument
- NNM – National nature monument
- NNR – National nature reserve
- NP – National park
- NPUATR SR – National Programme on the Utilization of Available Timber Resource of the SR
- NR – Nature reserve
- OECD – Organisation for Economic Co-operation and Development
- OESAF – Offices for Employment, Social Affairs and Family
- PA – Protected area
- PEFC – Programme for the Endorsement of Forest Certification
- PLA – Protected landscape area

- PMP – Permanent monitoring plot
- PPI – Pulp and papermaking industry
- PS – Protected site
- RDP SR – Rural Development Programme of the SR
- RES – Renewable energy sources
- RS TANAP – Research Station of TANAP
- SAF – State administration on forests
- SAFH – State administration of forests and hunting
- SCI – Site of Community Importance (Natura 2000)
- SDG – Sustainable Development Goals (the 2030 Agenda for Sustainable Development, UN)
- SF TANAP – State Forests of Tatra National Park
- SFCH – Slovak Forestry Chamber
- SFE – State forest enterprise
- SFM – Sustainable forest management
- SHA – Slovak Hunting Association
- SHCH – Slovak Hunting Chamber
- SLF – Slovak Land Fund
- SO SR – Statistical office of the SR
- SPA – Special Protection Area (Natura 200)
- SS – Spring stock
- SSPA – Small scale protected area
- STS – Slovak Technical Standard
- TCI – Total current increment
- TU – Technical University in Zvolen
- UN – United Nations (Organisation)
- UNECE – UN Economic Commission for Europe
- UNESCO – United Nations Educational, Scientific and Cultural Organization
- UNFCCC – United Nations Framework Convention on Climate Change
- UNFF – United Nations Forum on Forests
- VZ – (Altitudinal) vegetation zone
- WPI – Wood processing industry

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GREEN REPORT

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