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MINISTRY OF AGRICULTURE, FORESTRY AND RURAL DEVELOPMENT

Kosovo National Forest Inventory 2012

Pristina
2013

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Foreword

This report documents a major achievement in the history of forestry in Kosovo.
For the first time, all Kosovo have been surveyed.

The National Forest Inventory gives us the first confident information about wood harvesting in our country, based on field assessments. We now have a better understanding of forest conditions, development and level of harvesting.

It is of national strategic interest to any country to monitor increment and drain of wood.

This information will help investors, who are searching for business opportunities in wood-based industries. What kind of products can be manufactured from our wood? What kind of processing technology is required? As we become more integrated with Europe, our neighbours and international partners are interested in how we perform in the broader regional and European context.

The National Forest Inventory was prepared and carried out under the project "Forest Management Planning with GIS", which is implemented by Norwegian Forestry Group in cooperation with Kosovo Forest Agency. The Government of Norway sponsored the work. Kosovo Forest Agency has contributed the staff necessary to conduct the fieldwork. My appreciation goes to all the contributors to this work, including the 12 fieldworkers that for a six month period collected forest information throughout Kosovo, often in remote areas and steep terrain.

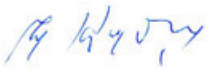

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Table of contents

English

List of tables

English

List of figures

Summary

Kosovo's second National Forest Inventory (NFI) was carried out in 2012/2013, ten years after the first. Using a method called systematic sample plot inventory and combining remote sensing technology and traditional field assessment, 12 foresters visited and assessed 1 860 sample plots throughout the territory during a six months period. For the first time the entire forest area has been assessed.

The purpose of NFI is to provide information for the government to helping develop the forest sector, to assess forest management sustainability and to fulfill potential international reporting obligations in the land use-, land use change- and forestry sectors.

This report is organized according to the 6 agreed upon quantitative criteria and associated reporting indicators for sustainable forest management in Europe. How results compare with those of other countries in South-East Europe is included.

Forest area in Kosovo is fairly stable at approximately 481 000 ha (44.7% of total area). Some cropland may have been converted to grasslands and settlements, but this is impossible to state with certainty since a large unclassified area, due to accessibility restrictions and lack of data in 2003, now has been classified. 38% of the forest area is privately owned, whereas 62% is public forest. Coppice forest dominates the forest area with 84%. Pure broadleaved forests cover almost 83% of the forest area.

Growing stock of trees with diameter at breast height >= 7 cm stands at 40.5 million m^3, about the same as ten years ago. Amongst the trees, *Fagus* species contribute 46% of the volume, whereas *Quercus* species represent 23%. Mean growing stock in Kosovo is 84 m^3/ha.

Annual increment over bark of trees with diameter (dbh) >= 7 cm is estimated at 1.55 million m^3 – 1.32 million of broadleaves and 0.23 million of coniferous trees. Maximum long-term annual felling strictly from a productivity point of view is at the order of 1.45 million m^3. This is a gross figure and should be reduced due to harvesting losses, natural losses and environmental considerations. Net maximum long-term harvesting level for Kosovo is at the level of 1.2 million m^3. This estimate should be further reduced due to areas unavailable for wood supply, including National Parks.

An analysis performed on 60% of the forest area documents that harvesting of an average 950 000 m^3 every year have taken place. Consequently, annual harvest may roughly be estimated at 1.6 million m^3. Only a small fraction of the harvesting (7%) is carried out according to forest legislation. At national level it seems that annual removals and natural losses of wood are balanced by gross annual increment. Based on the share of degraded high forest and results from recent forest management planning, in certain areas over-harvesting have taken place.

Since 2006, development of new cost-efficient forest management plans (FMPs) has been a priority for the Kosovo government. A total of 39 new management plans have been prepared.
Almost half the forest management units will have new plans by the end of 2013. The forest management planning method includes classification of forest stands according to management classes.
During the NFI this classification was also applied on the sample plots, providing overall statistics for Kosovo.

Kosovo forests are tree species rich. 132 000 ha (27.5%) of the forest area is stocked with four or more species. Almost the entire forest area (99%) shows some kind of human influence.

Sharri- and Bjeshket e Nemuna national parks have been designated as protected areas by the government. As much as 90% of growing stock in coniferous forest and mixed coniferous/broadleaved forest are located within the park. Forest management with the objective of wood production will still be possible within defined zones representing the major parts of the parks.

Kosovo's forest is neither a source nor a sink of the greenhouse gas carbon dioxide. This is because a quantity equivalent to the annual increment of woody biomass sequestering carbon, is being removed every year and most of it burnt as firewood. Through the combustion process, carbon is released into the atmosphere.

Fire is the most significant disturbance to forest stands. An area of 12 200 ha, or 2.5% of total forest area was found to be seriously affected by fire. For the forest owners, this is an economic loss. 14.5% of growing stock has some kind of damage. However, in many cases these damages will not reduce vitality in the long run. Biotic and abiotic disturbances are part of a healthy forest ecosystem.

Introduction

The main objective of Kosovo's National Forest Inventory (NFI) is to promote a sustainable forest management by assessing the total forest resources and the annual sustainable harvest level. The first country-wide forest inventory was carried out in 2002-2003 through UN Food and Agriculture Organisation (FAO), and implemented by Norwegian Forestry Group (NFG). In 2010 the Ministry of Agriculture, Forestry and Rural Development (MAFRD) requested an update of Kosovo's national forest inventory – ten years after the first. In the *Policy and Strategy Paper on Forestry Sector Development in Kosovo 2010 – 2020, it is stated*:

"Accurate information about the status of the forest resources shall always be available. In particular the policy of the Government is to establish and maintain permanent resources for national forest inventories. This information will provide data for monitoring of the forest resource base, policy making and strategic planning by central forest authorities, to safeguard the use of wood products in harmony with the development of the forest resource base."

The objectives of the second National Forest Inventory for Kosovo are:

- Providing valid forest statistics on land use and land use change
- Producing valid forest statistics on the status and change in growing stock, wood increment, and carbon stocks for national planning and international reporting
- Maintaining and strengthening forest assessment know-how

Why a National Forest Inventory?

National Forest Inventories are useful for several purposes:

- Helping policy makers in developing the forest sector
- Assessing the balance between forest drain and increment
- Assessing availability of wood raw materials
- Establishing appropriate processing capacity and technology to best meet market demands for products.

NFI data are important to Kosovo's potential future international reporting obligations. Both the FAO Global Forest Resources Assessment and the regional Ministerial Conference on the Protection of Forests in Europe (FOREST EUROPE) require country level forest information.

Kosovo's future international reporting needs can be grouped into three categories:

1. Assessments carried out by FAO, such as the Global Forest Resources Assessment.
2. Climate changes. Kosovo is not yet a signatory to the UN Framework Convention on Climate Change (1993), and the Kyoto Protocol (2004). However, as a potential so-called non-Annex 1 country, Kosovo would be required to provide some information on its carbon emissions and sinks from various sectors, including land use, land use change and forestry.
3. Regional processes on criteria and indicators for sustainable forest management (FOREST EUROPE). The process identified six criteria, each with a set of quantitative indicators for monitoring, evaluating and reporting on progress towards sustainable forest management at the national level.

Figure 1: *Overview map of Kosovo*

This report is organized according to the agreed upon six criteria for sustainable forest management in Europe. The fulfillment of the criteria can be evaluated through a set of 35 quantitative indicators.

English

Table 1: *Criteria and indicators for sustainable forest management i Europe*

Criterion	Indicator	Explanation	Addressed by NFI
C1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles	**1.1 Forest area**	Area of forest and other wooded land, classified by forest type and by availability for wood supply, and share of forest and other wooded land in total land area	X
	1.2 Growing Stock	Growing stock on forest and other wooded land, classified by forest type and by availability for wood supply	X
	1.3 Age structure and/or diameter distribution	Age structure and/or diameter distribution of forest and other wooded land, classified by forest type and by availability for wood supply	X
	1.4 Carbon Stock	Carbon stock of woody biomass and of soils on forest and other wooded land	X
C2: Forests Ecosystems Health and Vitality	**2.1 Deposition of air pollutants**	Deposition of air pollutants on forest and other wooded land, classified by N, S and base cations	
	2.2 Soil condition	Chemical soil properties (pH, CEC, C/N, organic C, base saturation) on forest and other wooded land related to soil acidity and eutrophication, classified by main soil types	
	2.3 Defoliation	Defoliation of one or more main tree species on forest and other wooded land in each of the defoliation classes “moderate”, “severe” and “dead”	
	2.4 Forest damage	Forest and other wooded land with damage, classified by primary damaging agent (abiotic, biotic and human induced) and by forest type	X
C3: Maintenance and Encouragement of Productive Functions of Forests	**3.1 Increment and fellings**	Balance between net annual increment and annual fellings of wood on forest available for wood supply	X
	3.2 Roundwood	Value and quantity of marketed roundwood	
	3.3 Non-wood goods	Value and quantity of marketed non-wood goods from forest and other wooded land	
	3.4 Services	Value of marketed services on forest and other wooded land	
	3.5 Forests under management plans	Proportion of forest and other wooded land under a management plan or equivalent	X
C4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems	**4.1 Tree species composition**	Area of forest and other wooded land, classified by number of tree species occurring and by forest type	X
	4.2 Regeneration	Area of regeneration within even-aged stands and uneven-aged stands, classified by regeneration type	
	4.3 Naturalness	Area of forest and other wooded land, classified by “undisturbed by man”, by “semi-natural” or by “plantations”, each by forest type	X
	4.4 Introduced tree species	Area of forest and other wooded land dominated by introduced tree species	X
	4.5 Deadwood	Volume of standing deadwood and of lying deadwood on forest and other wooded land classified by forest type	X
	4.6 Genetic resources	Area managed for conservation and utilisation of forest tree genetic resources (*in situ* and *ex situ* gene conservation) and area managed for seed production	
	4.7 Landscape pattern	Landscape-level spatial pattern of forest cover	
	4.8 Threatened forest species	Number of threatened forest species, classified according to IUCN Red List categories in relation to total number of forest species	
	4.9 Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE Assessment Guidelines	X

Criterion	Indicator	Explanation	Addressed by NFI
C5: Maintenance and Encouragement of Protective Functions of Forests	**5.1 Protective forests – soil, water and other ecosystem functions**	Area of forest and other wooded land designated to prevent soil erosion, to preserve water resources, or to maintain other forest ecosystem functions, part of MCPFE Class "Protective Functions"	
	5.2 Protective forests – infrastructure and managed natural resources	Area of forest and other wooded land designated to protect infrastructure and managed natural resources against natural hazards, part of MCPFE Class "Protective Functions"	
C6: Maintenance and Enhancement of Socio-economic Functions and Conditions	**6.1 Forest holdings**	Number of forest holdings, classified by ownership categories and size classes	X
	6.2 Contribution of forest sector to GDP	Contribution of forestry and manufacturing of wood and paper products to gross domestic product	
	6.3 Net revenue	Net revenue of forest enterprises	
	6.4 Expenditures for services	Total expenditures for long-term sustainable services from forests	
	6.5 Forest sector workforce	Number of persons employed and labour input in the forest sector, classified by gender and age group, education and job characteristics	
	6.6 Occupational safety and health	Frequency of occupational accidents and occupational diseases in forestry	
	6.7 Wood consumption	Consumption per head of wood and products derived from wood	
	6.8 Trade in wood	Imports and exports of wood and products derived from wood	
	6.9 Energy from wood resources	Share of wood energy in total energy consumption, classified by origin of wood	
	6.10 Accessibility for recreation	Area of forest and other wooded land where public has a right of access for recreational purposes and indication of intensity of use	
	6.11 Cultural and spiritual values	Number of sites within forest and other wooded land designated as having cultural or spiritual values	

According to the report State of Europe's Forests (FOREST EUROPE, UNECE and FAO 2011), most of the South-East European countries are lacking adequate forest sector information, and therefore it is "not possible to say with any objectivity whether or not forest management is sustainable." Through its National Forest Inventory, Kosovo is contributing to improved information on a number of the specific challenges listed.

Support for NFI, Kosovo Forest Agency (KFA) and MAFRD come from the Norwegian Ministry of Foreign Affairs, to further strengthen competence building in forest assessment, forest management and forest information management. The NFI is implemented by Norwegian Forestry Group in cooperation with Kosovo Forest Agency through the project Forest Management Planning with Geographic Information Systems.

Inventory system

A National Forest Inventory gives an independent overview for the current forest situation of the country. The information is based on a grid of sample plots, systematically distributed all over the country. The sample plots are first assessed and classified for land use, by using aerial images. All sample plots that might contain forest or other wooded land, are visited in the field. For all plots visited, the forest condition is assessed in details. The sample plots are permanent, which mean that the exact same plots in principle are measured at regular intervals, often every 5 years. This gives an excellent basis for monitoring growth, health and other attributes. For all Kosovo there are 3 453 plots. Of these, 1 860 plots were visited in the field.

Sampling design

The national forest inventory (NFI) consists of a grid of 4 x 4 km across all of Kosovo. In order to improve the accuracy of the inventory in areas with an expected higher proportion of valuable forest, the density of the grid was increased to 2 x 4 km. The sampling areas consist of four circular plots 200 meters apart placed at each grid intersection.

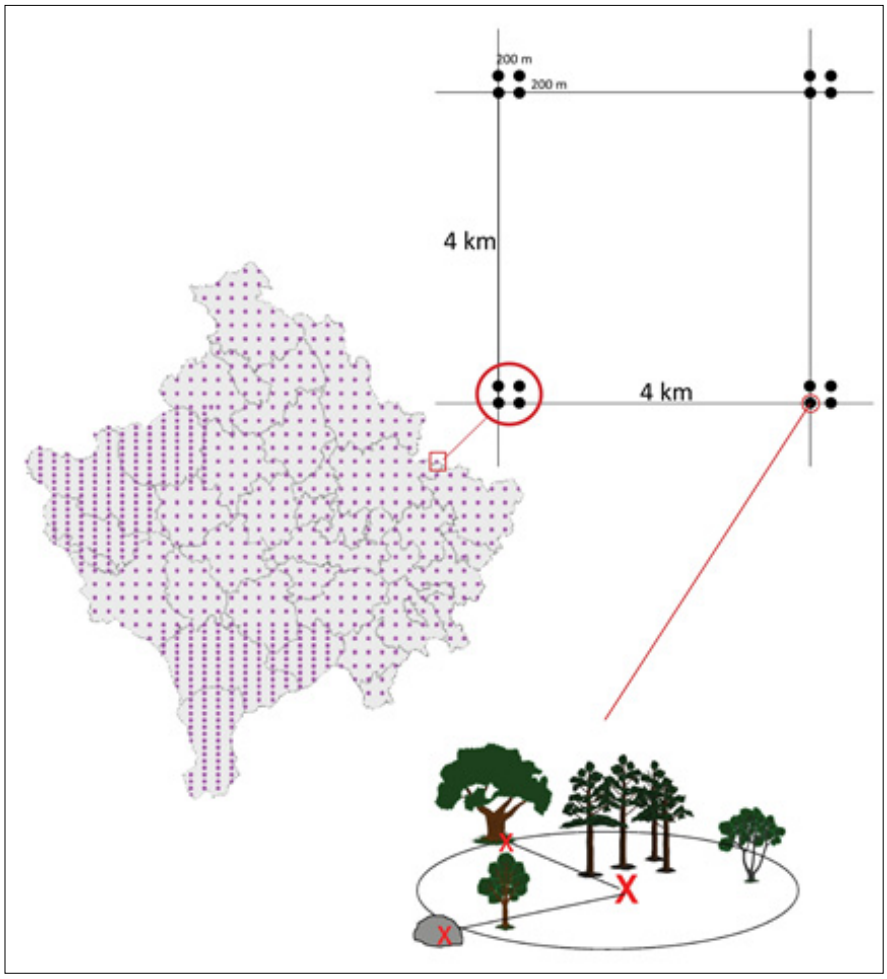


Figure 2: *Sampling design for the Kosovo National Forest Inventory*

English

In order to establish an efficient forest inventory, the NFI combines new and traditional methodology. Geographic information system for remote sensing and spatial data management was used in combination with traditional forest assessment and forest mensuration tools and techniques.

Aerial photography was used for an initial classification in order to identify the forested plots requiring field measurements, facilitating a rough classification of the forest.

Sample plots assigned to the classes “Forest” or “Other wooded land” *(see definition in appendix 1)* should in principle be selected for field measurements. From the beginning, it was expected that it would be impossible to visit all the plot locations in the field. Photo interpretation made it possible to establish a total land use class distribution for Kosovo.

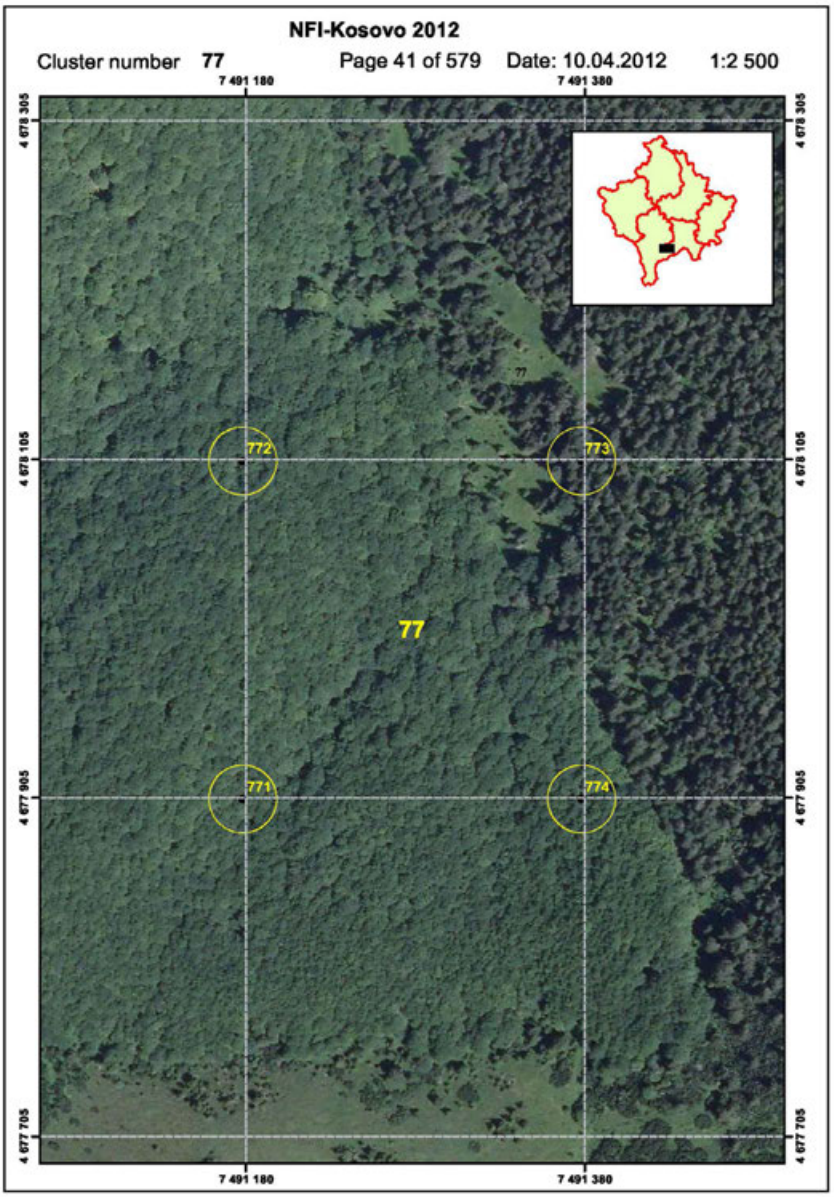


Figure 3: *Ortophoto with four sample plots 200 meter x 200 meter apart*

The permanent sample plots established in 2002-2003 were revisited in 2012, enabling confident estimates of trends in growing stock. Using data from the 2002 NFI, amongst other tree species, azimuth and distance from the plot center to each tree, field workers were able to identify the sample plots, and re-measure the exact same trees. Measuring the same trees over time provides valid statistics on increment, harvesting and natural losses.

Figure 4: *Metal stick from NFI 2002 for permanent establishment of sample plot*

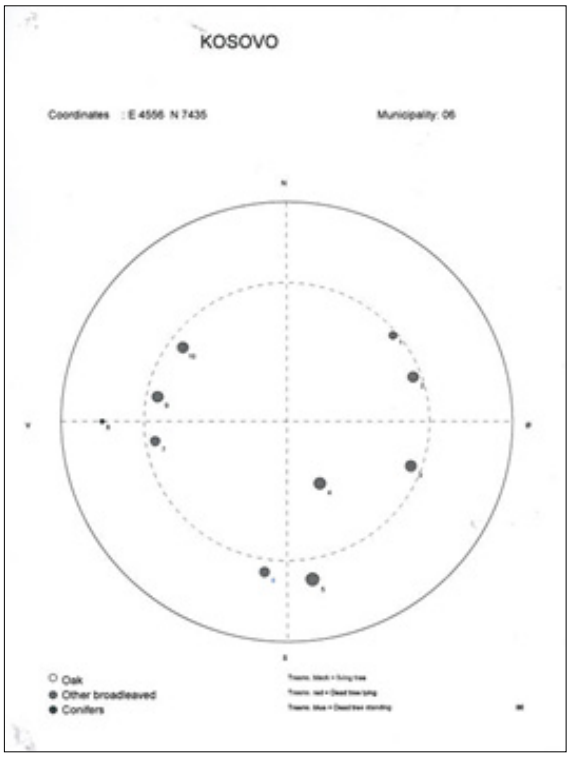


Figure 5: *Position of trees on sample plot based on azimuth, distance and other NFI 2002 data*

Figure 6: *Trees numbered for secure identification and detailed measurement*

English

Measurements and assessments

The NFI fieldwork was carried out during a six-month period in 2012 by 12 Kosovar foresters divided into six field teams.

Table 2: *Fieldworkers in the NFI 2012*

Team leader	Field assistant
Orhan Berisha (field coordinator)	Esat Dautaj
Branko Bojovic	Slobodan Jelenic
Rrustem Dautaj	Beqe Mehmetaj
Fitim Hoxhaj	Agron Shkodra
Osman Gashi	Ekrem Krasniqi
Bedri Beluli	Shkodran Krasniqi

The circular permanent sample plots consists of an inner circle with radius 2.5 meter, mainly for assessment of regeneration and small trees, a main circle with radius 10 meter for measurements of trees with diameter at breast height >= 7 cm and an outer circle with radius 20 meter, mainly for stand condition assessments.

Figure 7: *Fieldworker measuring diameter of tree*

Using GPS receivers, the NFI field workers were able to accurately navigate to the pre-defined sample plot centre. A metal rod was placed discreetly in the centre of each sample plot in order to be physically recognizable by future NFI field workers. The markers are not visible to passersby, assuring that the sample plots are treated similarly to other forest areas nearby. This provides a more correct estimate of forest usage over time.

The NFI measures tree diameter of all living and dead trees on the sample plot in addition to height measurements on a sub-sample of the trees. Furthermore, the list of attributes comprised the most important ones for assessing the extent, structure and quality of forest resources for international and national purposes. All field data were recorded by hand into forms made available in both Albanian and Serbian (*see field record forms in appendix 2*).

Table 3: *Selected attributes included in the NFI (see appendix 1 for details)*

Assessment	Attribute
Stand	Stand age
	Stand origin
	Origin of small trees/regeneration
	Stand structure
	Treatment opportunity
	Tree species composition
	Naturalness
	Occurrence of junipers
Tree	Tree species
	Tree status
	Diameter at breast height (dbh)
	Tree height
	Azimuth from plot center to tree
	Distance from plot center to tree
	Cause of damage
	Tree quality

Approximately 1 502 sample plots in forest were assessed in detail during the 2012 fieldwork. For 921 of these, the center established in 2002 were found and the exact same trees were re-measured, enabling change analysis on approximately 60% of the forest area.

Calculations

All field data were continuously stored in a Microsoft Access database, using ArcPad software interface for the record form transfer. Consistency checks of the geographical distribution were done using ArcGIS, and the analysis of the numerical data was done using SAS-software.

Individual tree volume estimation was performed using the tables created by ***Drinić, Matić, Pavlič, Prolić, Stojanović, Vukmirović and Koprivica (1990): Tablice taksacionih elemenata visokih i izdanačkih šuma u Bosni I Hercegovini.***

In the 2002 NFI, the mathematical functions to be included in a computer program, were created through regression analysis. These functions were reused in this NFI.

High forest volume estimation is carried out in two steps: First, establishing a specific site quality class, and second estimating tree volume. Drinic et al. (1990) has established strong relationships between diameter at breast height and total tree height. For each of the tree species, five such curves have been established, each defining a specific site quality class. Based on known diameter and height of the sample trees, an estimated average site quality class for each sample plot has been calculated. With the known site quality class, volume can be estimated using functions with only diameter at breast height as an independent variable.

Figure 8: *Fieldworkers measuring height of sample trees using Vertex hypsometer (left) with transponder (right)*

Because the site quality class tables and functions are not available for broadleaved trees in coppice forests, volume functions for oak and beech were established using (Drinic et al. 1990). These could only be directly applied for sample trees with complete set of measurements. Common height curves based on all sample trees in coppice forest were calculated, to make it possible to estimate tree heights and to apply the volume functions also for trees where only diameter was known (Tomter 2003).

Increment volume functions were created by regression analysis during the NFI 2002. Measurements of width of the ten most recent annual growth rings (ten years growth) were done on a bore core extracted from sample trees. Functions were generated for the main tree species groups.

How reliable are the results?

Only the sampling error of the inventory can be estimated. In addition there are error components due to inaccurate area classification, tree measurements et cetera. It has not been possible to quantify the magnitude of the measurement errors and the assessment errors. A check assessment of a smaller sub-sample of sample plots revealed some variability between field workers regarding stand classification, but tree measurements were fairly accurate.

There is no exact method for calculating the standard errors in a systematic sampling such as the NFI. By applying the standard formula for random sampling it is possible to estimate the standard error of volume per hectare $S\%/\sqrt{n}=4.3\%$[1].

Assuming that the total number of sample plots represents the total area of Kosovo, and that the surveyed forest area constitutes 45% of the total area, the estimated standard error of the surveyed forest area would be about 1.9%. Taken together, the two error components (volume/ha and area), would add up to about 4.7%[2].

1) *S= Standard error of the mean estimate at plot level, n=number of plots.*

2) *Formula for calculation of the two error components (volume and area):* $\sqrt{(4.3^2+1.9^2)} = 4.7\%$

Main results

The main NFI results are presented in tables and diagrams. A comparison with the situation in other South-East European countries has been made for some parameters.

Land use

Land use distribution is calculated based on classification of the 3 453 sample plots for Kosovo. Results are presented below.

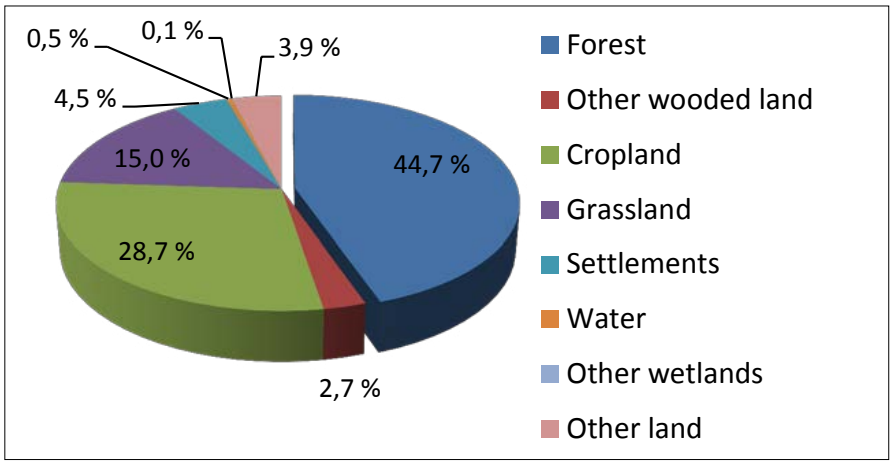


Figure 9: *Land use classes in Kosovo (% of total land area)*

Table 4: *Development of total area by land use classes.*

Land use classes	2002		2012	
	ha	%	ha	%
Forest	460 800	42.1	481 000	44.7
Other wooded land	28 200	2.6	29 200	2.7
Cropland	342 400	31.3	309 000	28.7
Grassland	153 200	14.0	161 400	15.0
Settlements	40 000	3.7	48 000	4.5
Water	4 600	0.4	5 200	0.5
Other wetlands			800	0.1
Other land	23 400	2.1	42 400	3.9
Not classified	41 600	3.8	0	0.0
Total	**1 094 200**	**100**	**1 077 000**	**100**

Kosovo's official land area is 1 090 800 ha. The discrepancy between this figure and the total area listed in Table 4 is partly due to sample plots located outside Kosovo that were erroneously included in the 2002 NFI. Kosovo's forest area has increased by 5% (20 200 ha) in the period 2002-2012. In the same period cropland area has decreased, perhaps explaining the increase in forest area by cropland conversion to forest and settlements. The increase in settlements (8 000 ha) is most likely a result of an increased demand for housing and industrial development.

In the 2002 NFI a large number of sample plots near the Serbian border were inaccessible and classified using aerial photography only.

Figure 10: *Rural settlements with surrounding cropland and forest, Leposavic*

Forest resources

Forest area

Forest area is defined as land with tree crown cover of more than 10% and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 meter at maturity *in situ* (see appendix 1 for the full definition), which is the international FAO definition.

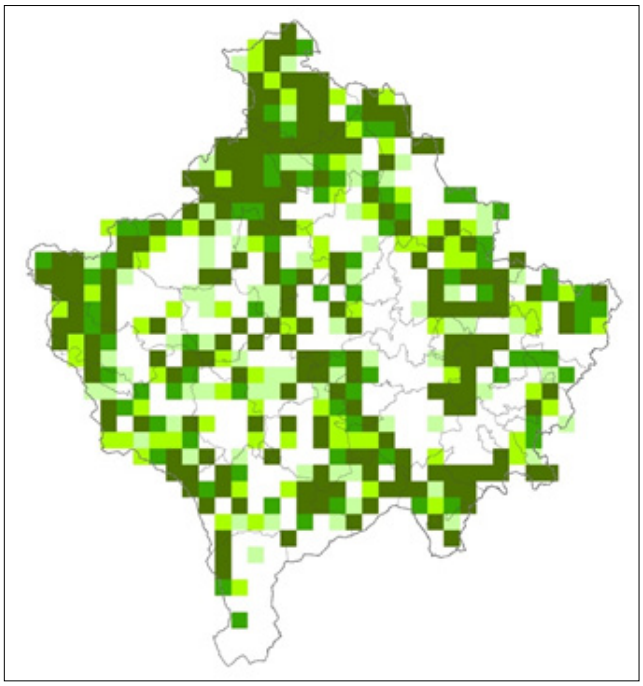


Figure 11: *Classification of clusters based on distribution of sample plots classified as forest. Graduation of green color is according to number of sample plots in one cluster classified as forest. Darkest green is shown where all 4 plots in one cluster are forest.*

Table 5: *Forest area by forest composition and stand structure (ha)*

Forest composition	Stand structure				Total
	Regeneration	Even-aged	Two-storied	Uneven-aged	
Coniferous	2 200	6 600	6 200	8 800	23 800
Mixed	0	400	3 200	4 200	7 800
Broadleaved	45 400	236 000	123 600	44 400	449 400
Total	**47 600**	**243 000**	**133 000**	**57 400**	**481 000**

Kosovo forests are dominated by broadleaved trees, covering 93% (449 400 ha; Table 5). More than half of this forest is considered even-aged. Coniferous forests cover almost 5% of the forest area (23 800 ha), and is evenly distributed between the various structure classes. The pine plantations contribute to the even-aged area. In total, 50% of the forest area is considered even-aged.

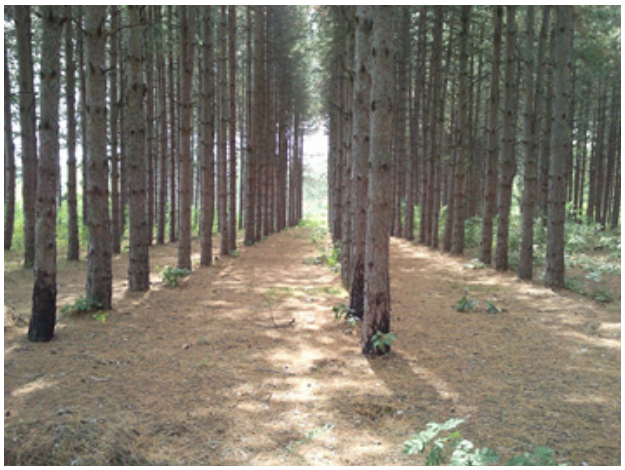


Figure 12: *Pine (Pinus nigra) plantation in Kosovo*

Half of Europe's forest is covered by conifers. The composition of Europe's forest has been stable for the last periods. But the forest cover has increased all over Europe since 1990, except for Russia, making Europe the only region in the world with growth in forest area the last 20 years. South-East Europe is the least forested region in Europe. It is also the region with the lowest reported share of forest available for wood supply, perhaps due to difficult access in mountainous areas.

Table 6: *Forest area by stand origin and ownership (ha)*

Stand origin	Ownership			Total
	Public	Private	Unknown	
Natural seeding	58 400	13 600	1 000	73 000
Planting and artificial seeding	2 000	800	0	2 800
Coppice	229 000	164 800	4 000	397 800
Coppice with standards	5 800	1 600	0	7 400
Total	**295 200**	**180 800**	**5 000**	**481 000**

A total of 180 800 ha (38%) of Kosovo's forest is classified as privately owned, and 295 200 ha (62%) classified as public forest. Coppice forest covers 84% of the total forest area. This is a result of extensive harvesting, in particular by short rotation coppice forestry for firewood production. The forest which regenerates naturally is normally beech (*Fagus spp*.), mixed beech and conifers, and pure coniferous forests located at higher elevations.

Age distribution

Age distribution explains the history of the forest, how it has been regenerated, how it has developed over the years, and also, how it probably will look in the future, i.e. future harvesting potential. Knowledge about age distribution can also provide information about biodiversity and the forest's recreational values.

Table 7: *Forest area by forest composition and age class (ha)*

Forest composition	Age class (years)						Total
	0-20	21-40	41-80	81-120	121-160	161-200	
Coniferous	4 600	3 600	11 400	3 400	800	0	23 800
Mixed	200	1 000	4 600	1 200	600	200	7 800
Broadleaved	139 600	157 200	127 800	21 800	2 800	200	449 400
Total	**144 400**	**161 800**	**143 800**	**26 400**	**4 200**	**400**	**481 000**

The age of uneven-aged forest is measured using the dominant upper-canopy level. The oldest forest in Kosovo is uneven-aged, and a relatively small area is old forest. No forest older than 200 years has been identified.

Table 8: *Even-aged forest area by forest composition and age class (ha)*

Forest composition	Age class					Total
	0-20	21-40	41-80	81-120	121-160	
Coniferous	2 200	1 400	2 400	400	200	6 600
Mixed	0	0	400	0	0	400
Broadleaved	76 600	97 000	54 000	8 400	0	235 400
Total	**78 800**	**98 400**	**56 800**	**8 800**	**200**	**243 000**

Age class distribution of even-aged forests is important for forest management. There is a distinct difference between coniferous and broadleaved forest; the vast area of broadleaved coppice forests managed for short rotation firewood production contributes to the large area in younger age classes.

In South-East Europe the proportion of old even- aged and uneven-aged forest together has been fairly stable, at slightly above 25% of the total forest area, during the last 20 years; even-aged forest between 20 and 80 years old constitutes the dominant part of the forest area (>60%).

Growing stock

Growing stock, both in cubic meters and stocking levels (m^3/ha), is an important indicator(s) for assessing sustainable forest management. Volumes in this report are given in cubic meter over bark.

Table 9: *Growing stock in forest by main tree species (dbh >= 7 cm) (1 000 m^3)*

Tree species	2002	2012
Quercus cerris	5 170	4 282
Querus petrea	4 276	3 669
Other *quercus* sp.	129	1 292
Fagus sp.	15 963	18 524
Other broadleaves	3 704	6 750
Undefined broadleaves	5 983	0
Abies alba	1 577	1 573
Picea abies	1 402	1 840
Pinus sp.	2 018	2 502
Other conifers	223	77
Total	**40 445**	**40 508**

Total growing stock has not changed much since 2002. The growing stock of the most valuable tree species for the high forest is either stable or increasing.

Assuming the forest area is fairly stable this indicates that annual increment is balanced by annual harvesting and natural losses.

Figure 13: *Beech forest in Kosovo*

Table 10: *Growing stock by main tree species group and forest and other wooded land (1 000 m^3)*

Tree species group	2002		2012	
	Forest	Other wooded land	Forest	Other wooded land
Coniferous	5 220	2	5 992	0
Broadleaved	35 225	9	34 516	14
Sub-total	40 445	11	40 508	14
Coniferous <7cm			88	21
Broadleaved <7cm			5 735	107
Sub-total			5 823	128
Total			**46 331**	**142**

English

Estimations of growing stock are more uncertain for the small trees, as data are based on counting and not individual tree measurement.

Table 11: *Growing stock in forest by tree species and diameter class (1 000 m³)*

Tree species	Diameter class						Total
	7-10	10 -20	20 -30	30 -50	50 -70	70 -	
Quercus cerris	592	1 686	923	872	127	83	4 282
Querus petrea	365	1 539	880	644	169	72	3 669
Other quercus sp.	245	646	164	57	143	37	1 292
Fagus sp.	494	2 559	3 077	6 244	3 840	2 311	18 524
Other broadleaves	883	2 274	1 233	1 246	372	742	6 750
Abies alba	34	216	364	660	183	117	1 573
Picea abies	45	286	487	829	193	0	1 840
Pinus sp.	28	181	468	1 195	472	159	2 502
Other conifers	2	10	8	57	0	0	77
Total	**2 688**	**9 397**	**7 604**	**11 804**	**5 499**	**3 521**	**40 508**

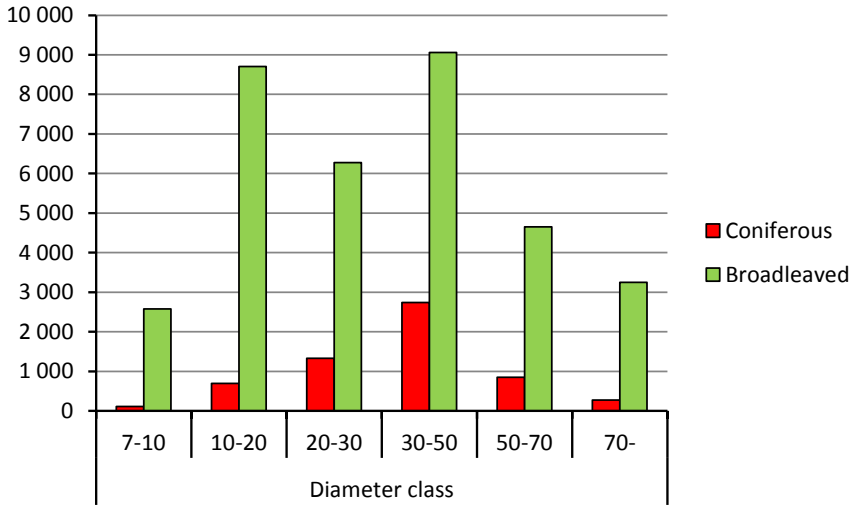


Figure 14: *Growing stock in forest by tree species group and diameter class (1 000 m³)*

The large scale short rotation coppice forestry contributes to broadleaves´ big share of growing stock in diameter class 10-20 cm. For coniferous species, the growing stock is statistically more “normally” distributed across diameter classes.

Table 12: *Growing stock in forest by tree species and elevation class (1 000 m³)*

Tree species	Elevation class						Total
	<500	500-750	750-1 000	1 000-1 250	1 250-1 500	>=1 500	
Quercus cerris	316	2 027	1 538	383	18	0	4 282
Quercus petrae	169	913	2 224	326	11	25	3 669
Other Quercus sp.	52	570	655	13	0	2	1 292
Fagus sp.	67	630	3 415	7 083	5 238	2 090	18 524
Other broadleaves	901	1 259	2 411	1 593	328	257	6 750
Abies alba	0	0	8	216	586	762	1 573
Picea Abies	0	16	10	92	277	1 446	1 840
Pinus sp.	109	127	4	69	254	1 938	2 502
Other conifers	49	1	22	5	0	0	77
Total	**1 663**	**5 543**	**10 287**	**9 780**	**6 712**	**6 520**	**40 508**

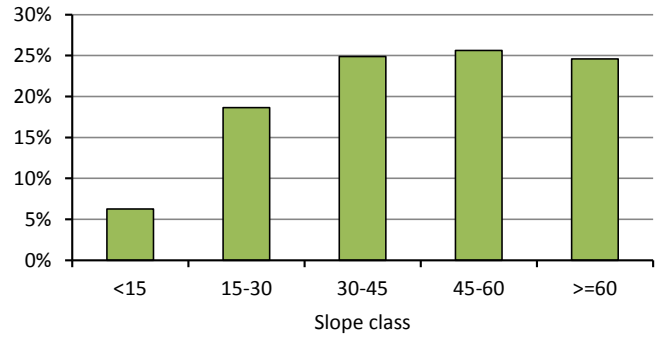
Most of the *Abies alba* and *Picea abies* is growing in high elevation levels above 1 250 metres above sea level (m.a.s.l.). The *Pinus sp.* growing below 750 m.a.s.l. is in plantations; the most dominant species is Black pine (*Pinus nigra*). The oak species are mainly growing between 500 and 1 000 m.a.s.l.

Table 13: *Growing stock in forest by tree species and slope class (1 000 m³)*

Tree species	Slope class					Total
	<15	15-30	30-45	45-60	>=60	
Quercus cerris	623	1 245	1 160	957	296	4 282
Quercus petrae	301	633	923	1 133	679	3 669
Other Quercus sp.	198	516	256	256	66	1 292
Fagus sp.	206	2 920	4 865	4 819	5 715	18 524
Other broadleaves	951	1 292	1 704	1 522	1 280	6 750
Abies alba	34	157	84	562	736	1 573
Picea Abies	117	350	297	664	412	1 840
Pinus sp.	112	393	781	438	779	2 502
Other conifers	1	50	2	23	2	77
Total	**2 543**	**7 556**	**10 072**	**10 374**	**9 965**	**40 508**

These figures could support the estimation of growing stock available for wood supply in Kosovo. Approximately 50% of growing stock is situated on slopes steeper than 45%. 31% of the Beech (*Fagus*) volume grows on slopes steeper than 60%. Harvesting and terrain transport when inclination is >45% may be difficult, and are normally more expensive. Slope length and distance to tractor road should also be taken into consideration when assessing accessibility.

Figure 15: *Total growing stock in forest by slope class (%)*



The average growing stock in Kosovo forest is 84 m^3/ha. In Europe as a whole, the average growing stock is 105 m^3/ha, which is less than the world's average of 130 m^3/ha. Some Central European countries have forests with high productivity yielding stocking levels up to 250 m^3/ha. In all European regions the growing stock have increased steadily during the past 20 years. The increase is due to both increases in forest area and stocking levels.

Before the 1999 conflict, the estimated growing stock in Kosovo's high forest was estimated at 17-18 million m^3, and the total standing volume for all forest types at approximately 30 million m^3. Due to difference in methodology and definitions of what constitutes a forest area, it is not straightforward to compare growing stock estimates from different periods and forest inventories. Previous assessments were based on the aggregation of data from stand-wise forest management plans, and mainly focused on State forests, with inventory results from private forests being negligible or non-existing.

Carbon stock

Through the process of photosynthesis, the trees' green leaves and needles convert atmospheric CO_2 into solid carbon stored in biomass. The status and change in these carbon stocks, and dead wood, litter and soils, determines the forest's status as a sink or source of CO_2. Quantifying the sink/source-status provides insight into the role of Kosovo forest in compensating greenhouse gas emissions from other sectors of society, and the forest's capacity to mitigate climate change. Forest management practices will affect the growth of trees, thus influencing the carbon storage in Kosovo's forests.

Table 14: *Woody biomass separated on above- and below-ground components, and total corresponding carbon stocks and carbon dioxide equivalents in forest by tree species group (1 000 tonnes).*

Tree species group	Basic wood density	Above-ground biomass			Below-ground biomass		Total bio-mass	Total carbon stock	Total
		Growing Stock	Biomass expansion factor	Total	Root/ shoot ratio	Total			
	tonnes/m^3	*m^3*		*tonnes*		*tonnes*	*tonnes*	*tonnes*	*tonnes*
Coniferous	0.40	6 080	1.3	3 162	0.35	1 107	4 269	2 134	7 825
Broadleaves	0.58	40 251	1.4	32 684	0.35	11 439	44 123	22 062	80 892
Total		**46 331**		**35 746**		**12 546**	**48 392**	**24 196**	**88 717**

Explanation to the table: *The biomass expansion factor adds biomass of small branches, tree tops and leaves to stem biomass. Below-ground biomass is 35% of above-ground biomass (root/shoot ratio). Dry woody biomass contains 50% carbon. The total weight of carbon dioxide molecules containing one tonne of carbon is 3.667 tonnes (CO_2/C-ratio = 44/12)[1].*

1) *Penman et al 2003.*

Over 24 million tonnes of carbon, almost 90 million tonnes CO_2, is stored in the woody biomass of Kosovo's forest.

In 2002, emissions of CO_2 from lignite-based electricity generation were 10.8 million tonnes (MESP, 2006).

In 2008, emissions were 6.2 million tonnes from Kosovo A and B plants together (Isufi 2010). The annual gross CO_2-sequestration of woody biomass is estimated at about 3 million tonnes.

However, most of the annual increment of woody biomass is removed through harvesting and decomposition, so there is practically no net accumulation of carbon dioxide in Kosovo's forests.

Figure 16: *The thermal power plant Kosovo A emits CO_2, toxic gases and dust. (Photo courtesy of www.xenini.com, 2004)*

Each year the European forest sequesters net 870 million tonnes carbon, coresponding to 10% of Europe's annual greenhouse gas emissions in 2008 (FOREST EUROPE, UNECE and FAO 2011).

When Kosovo becomes a signatory state to the UN Framework Convention on Climate Change (UNFCCC) and associated agreements, like the Kyoto Protocol, the country must submit annual reports on greenhouse gas emissions and removals from various sectors, including land use, land use change and forestry.

Forest health

Both biotic agents, such as virus, bacteria, fungi, insects and grazing animals, and abiotic agents, such as wind, snow, cold, fire and landslides, are often synonymous to economic loss in managed forest ecosystems.
Forest management practices can influence the way in which forests can tackle abiotic and biotic stress. Climate change can also alter the damage pattern in forests through an increase in insect outbreaks, storms and fire. At the same time, disturbances caused by biotic and abiotic stressors can pave the way for natural processes such as regeneration, selection and adaptation.

Table 15: *Damage to growing stock by tree species group and cause of damage (1 000 m^3)*

Tree species group	Cause of damage									Total
	None	Insect	Disease/ fungi	Fire	Animal	Weather	Human impact	Sup-pression	Misc.	
Coniferous	5 207	69	32	112	0	105	143	179	144	5 992
Broadleaved	29 458	840	1 087	347	32	153	457	1 063	1 079	34 516
Total	**34 665**	**909**	**1 119**	**459**	**32**	**258**	**600**	**1 242**	**1 223**	**40 508**

13.1% of coniferous trees (784 000 m^3) and 14.7% (5 058 000 m^3) of broadleaved trees were classified with damages. In total, 14.5% of the growing stock was affected by damage. Considering the large area of uneven-aged forest, some level of suppression is expected. It is likely that a significant proportion of the damaged trees eventually will recover its vitality.

Table 16: *Area of damage to small trees (more than 25% of trees with damage), by forest composition and cause of damage (ha)*

Forest composition	Cause of damage, small trees, dbh < 7 cm				Total
	Disease/fungi	Fire	Animal	Human impact	
Coniferous		600			600
Mixed				200	200
Broadleaved	400	6 400	1 200	3 000	11 000
Total	**400**	**7 000**	**1 200**	**3 200**	**11 800**

The observed damage to small trees reflects disturbance that has occurred fairly recently. The result represents area where more than 25% of the small trees has been affected. Damage by fire is the most frequently reported disturbance.

Table 17*: Area of significant stand-level damage, by forest composition and cause of damage (ha)*

Forest composition	Cause of damage								Total
	Insects	Disease/ fungi	Fire	Animal	Weather	Human impact	Suppres-sion	Misc.	
Coniferous	200	200	2 200	0	400	800	0	800	4 600
Mixed	600	400	0	0	400	200	0	200	1 800
Broadleaved	3 000	10 200	10 000	1 800	2 400	7 800	5 200	11 400	51 800
Total	**3 800**	**10 800**	**12 200**	**1 800**	**3 200**	**8 800**	**5 200**	**12 400**	**58 200**

Table 17 includes areas where more than 25 percent of the small trees have been affected, or where more than 25 percent of the growing stock of measurable trees has been affected. The data is a combination of Table 15 and Table 16. Here, fire is the single most important disturbance, affecting an area of 12 200 ha, or 2.5% of the total forest area.

Figure 17: *Area severely affected by forest fire in Radusha, Istog (234 ha burned in 2007)*

Wood harvesting and forest productivity

Maintaining or enhancing the growing stock as basis for wood supply is a key criterion of sustainable forest management. In order to maintain productivity, removal of wood cannot exceed annual increment over the long term.

Increment and fellings

All volumes of increment and wood removals are given in cubic meter over bark.

Table 18: *Annual increment of trees with dbh >=7 cm in forest in 2002 and 2012, by tree species (1 000 m³)*

Tree species	2002	2012
Quercus cerris	258	193
Querus petrea	182	158
Other *Quercus* spp.	5	68
Fagus spp.	501	576
Other broadleaves	174	329
Undefined broadleaves	228	0
Abies alba	92	82
Picea abies	51	71
Pinus spp.	70	77
Other conifers	8	2
Total	**1 567**	**1 556**

Annual increment in 2012 is similar to 2002, when the increment of forest located at inaccessible areas to a large extent was classified as "undefined broadleaves"[1] . Much of this volume is now most likely classified as either beech or other broadleaved species. The results indicate that the annual increment of *Quercus spp.* has declined slightly, whereas the increment of coniferous species has increased.

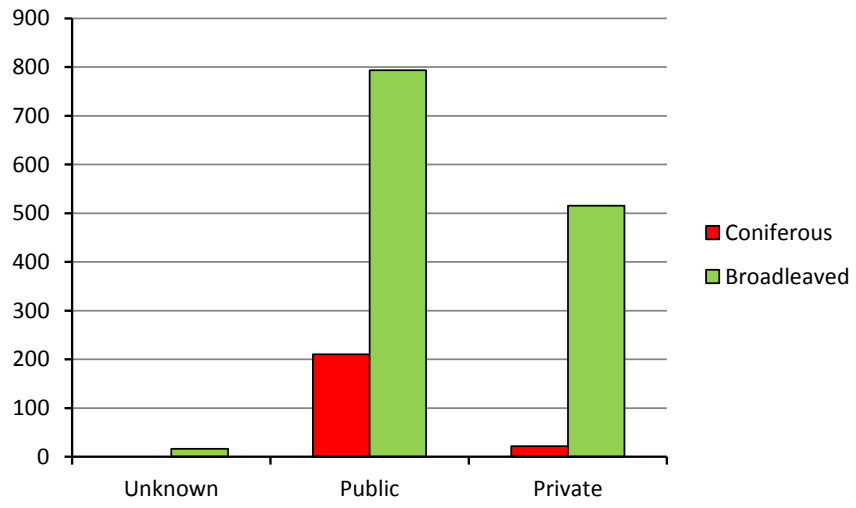


Figure 18: *Annual increment in forest by ownership and tree species group (1 000 m³)*

1) *In the NFI 2002 sample plots located closer than 5 km from the Serbian border were inaccessible due to security restrictions.*

Most of the increment is in public forest, because most of the forest is publicly owned (62%).

Table 19: *Area, mean growing stock and annual increment in forest by tree species group and ownership (ha, m^3/ha, % of growing stock)*

Ownership	Tree species group								
	Coniferous			Broadleaved			Mixed		
	area	*vol/ha*	*increm.*	*area*	*vol/ha*	*increm.*	*area*	*vol/ha*	*increm.*
Public	21 000	209	3.1	266 000	80	3.2	7 000	251	3.5
Private	2 600	152	3.8	177 200	68	3.7	600	342	3.1

89% of the coniferous forest area stocked by trees with dbh >7 cm is owned by the public, including most of the natural forest at higher altitudes. This explains the higher average growing stock in volume per ha in public forest. Also for broadleaved forest, average growing stock is higher in public forest than in private. The large portion of *Fagus* forest under public ownership may contribute to the higher mean stocking level. The relatively large portion of broadleaved forest actively managed for short rotation coppice, may explain the higher volume increment percent in private forest compared to public forest.

Table 20: *Average annual felling in forest by tree species group and ownership (1 000 m^3). Data are based on re-measured sample plots.*

Tree species group	Ownership			Total
	Unknown	Public	Private	
Coniferous	0	123	12	135
Broadleaved	2	496	326	823
Total	**2**	**619**	**338**	**959**

These figures are based on measurements on re-measured trees, i.e. exactly the same trees as in 2002. This enabled the fieldworkers to assess exactly which trees that had been harvested during the period 2002-2012. These re-found plots represent 60% of the total forest area in Kosovo. Assuming that the surveyed area is representative for the total forest area, 1.6 million m^3 have been felled annually, with 1.0 million m^3 felled in public forest and 560 000 m^3 felled in private forest.

Figure 19: *Log transport from harvesting area in Radushe, Istog*

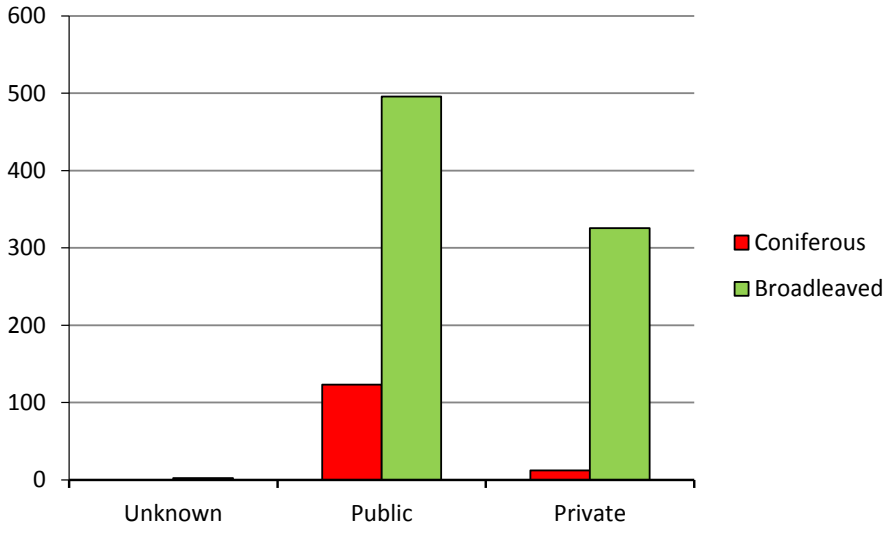


Figure 20: *Average annual felling by ownership and tree species group (1 000 m³)*

The calculation is based on 60% of the total forest area of Kosovo.

Legislation in Kosovo state that foresters from Kosovo Forest Agency must mark trees with a special hammer before harvesting. Stumps were assessed for visible signs of tree marks .

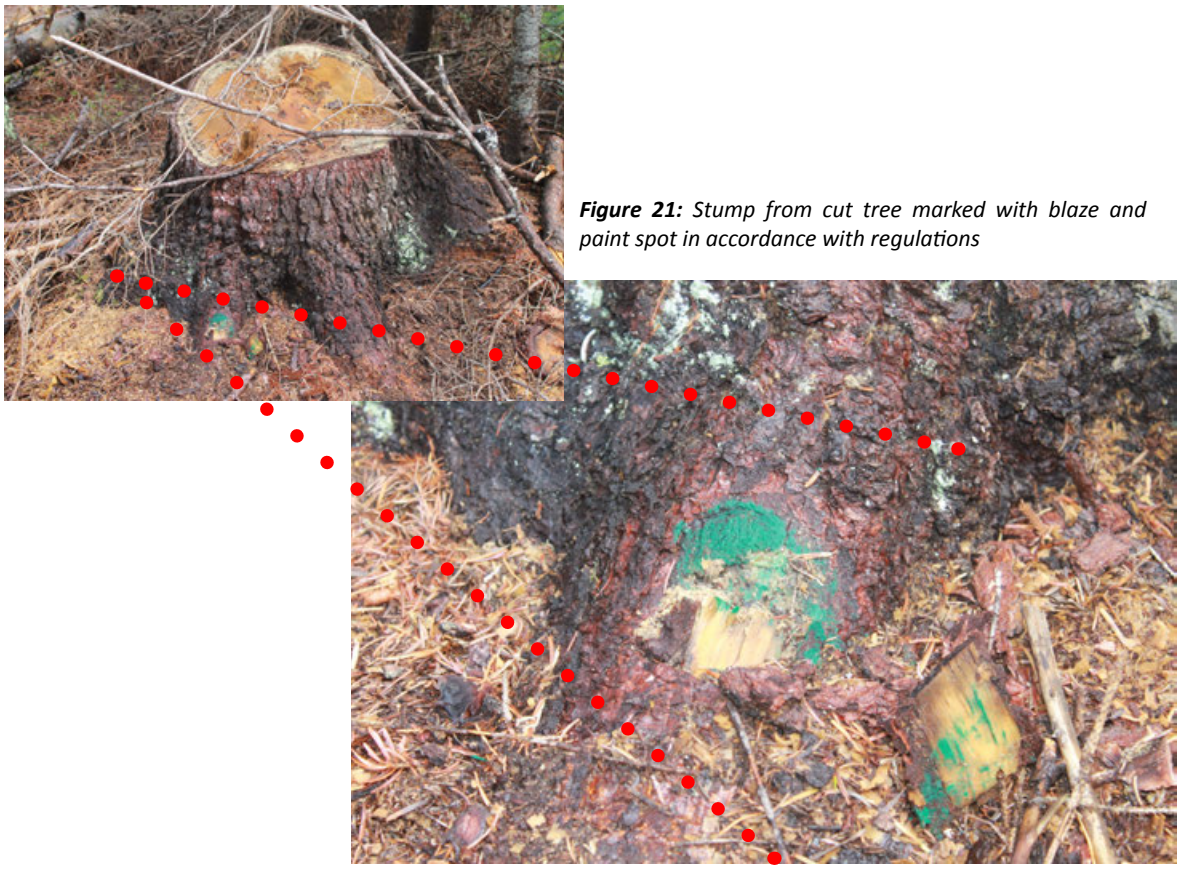


Figure 21: *Stump from cut tree marked with blaze and paint spot in accordance with regulations*

Over 90% of the annual fellings are not carried out according to regulations, with approximately 59% taking place in public forest and 34% in private forest.

This pattern of irregularities is confirmed by recent management planning. For a number of management units, and during a 5-year period, the total stand area affected by irregular logging was 23 250 ha, and close to 780 000 m^3 of timber was harvested without marking. Wood increment adds to a total of 945 000 m^3. Thus, irregular harvesting constituted approximately 80% of the increment (Norwegian Forestry Group 2013).

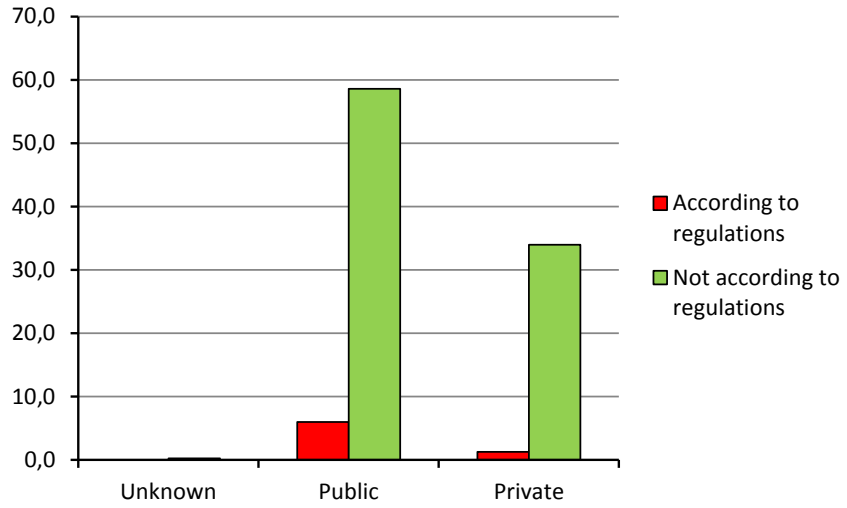


Figure 22: *Felling from 2003 until 2012 by ownership and accordance with regulations (%)*

Figure 23: *Wasteful tree harvesting: high stump, inefficient log utilization and damage to remaining trees. From Decani valley.*

Table 21: *Gross annual increment and drain of wood by tree species group (1 000 m³)*

Tree species group	Annual increment			Annual drain			
	Trees dbh>=7 cm	Small trees	**Total**	Harvest	Natural loss	Total surveyed	**Total**
Coniferous	233	6	240	135	40	175	292
Broadleaved	1 325	396	1 721	823	119	942	1 570
Total	**1 558**	**402**	**1 960**	**959**	**159**	**1 118**	**1 862**

Annual increment of small trees is based on a number of assumptions, and are more uncertain than the estimates for the measured trees (dbh >= 7 cm). Annual drain was assessed based on 60% of the total forest area, i.e. on the sample plots that were re-measured in 2012, assuming the surveyed area was representative for the total forest area.

Table 22: *Net annual increment of trees with dbh >= 7cm by tree species group and ownership (1 000 m³)*

Tree species group	Ownership			Total
	Unknown	Public	Private	
Coniferous	0	146	4	150
Broadleaved	14	733	502	1 249
Total	**14**	**879**	**506**	**1 399**

The net annual increment is annual increment minus natural losses of trees every year during the 10-year period (2003-2012).

Annual increment of trees with dbh >= 7 cm almost balances the annual harvesting (1.56 million m³ vs. 1.60 million m³). At national level it seems that annual removals and natural losses of wood are balanced by gross annual increment. Based on the share of degraded high forest and results from recent forest management planning, in certain areas over-harvesting have taken place.

Figure 24: *Intact high forest (left) and forest near-by with uncontrolled harvesting (right) in Hajle, Peje*

In Europe as a whole, harvesting has declined for the last 20 years, most markedly in Northern Europe and in the Russian Federation. Overall 2/3 of the annual increment of wood is harvested each year in Europe.

English

Previous estimates of annual felling rates in Kosovo vary considerably and reports are scarce and uncertain, in particular regarding felling of wood for heating. Kosovo has Europe's highest annual felling rate (from forests available for wood supply), i.e. felling as a fraction of net annual increment (FOREST EUROPE, UNECE AND FAO 2011). In the few South-East European countries reporting their forest inventory statistics, both net annual increment and felling rates have increased in the period 1992-2012 Among the former Yugoslavian countries, Slovenia has a felling rate of 37%, which is the lowest in Europe. South-East Europe as a whole has a felling rate of around 50%.

Annual allowable cut

It is of strategic importance for a country to know the quantity of wood that over the long-term can be harvested every year. One of the main criteria for sustainable forest management is the harvesting level. An annual harvesting level that does not exceed the growth potential of the forest, indicates sound forest management. This harvesting level is called "annual allowable cut " (AAC). Recommended sustainable cut every year is not necessarily the same. Decision-makers could also consider other factors, such as quality of information and people's needs, when arriving at the actual annual harvesting level.

Modeling sustainable harvesting levels can be more or less sophisticated, depending on the quality of available data and assumptions. In the new forest management plans, this is done management class by management class, using one of the three approaches:

- Increment
- Calculated harvesting potential from the amortization formula
- Test-marked volumes

The approach that best suits the condition of each forest management class is chosen. The same approach for modeling AAC is also used for the country-wide NFI data, with some adjustments.

The total increment for trees bigger or equal to 7 cm dbh is as described 1 550 000 m^3. The "amortization formula" is used as follows:

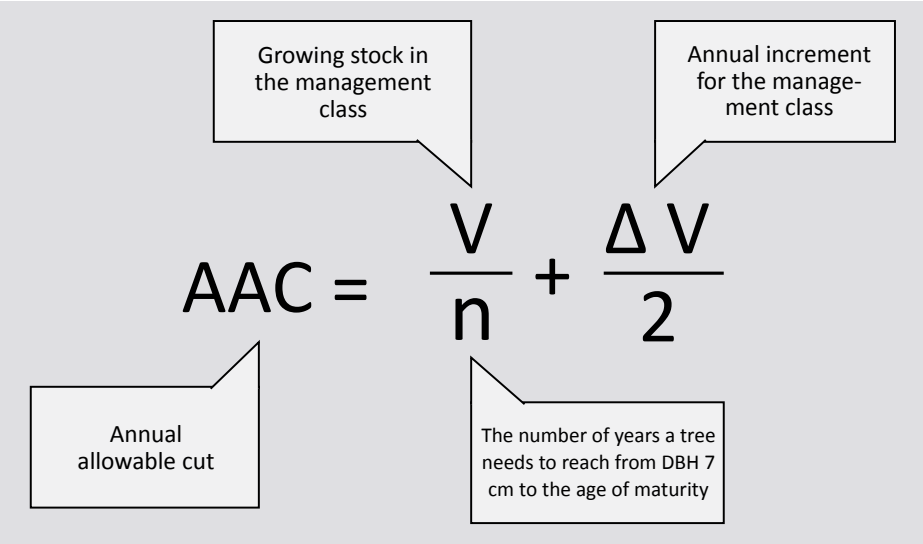


Figure 25: *The amortization formula for calculating annual allowable cut (AAC)*

Average rotation period for the trees in high forest is 80 - 100 years. To reach the dbh of 7 cm the trees will use 15 - 17 years in average. Coppice forest of oak and other broadleaved species, except for beech, are expected to have a rotation period of 50 to 60 years.

Based on experience, for degraded forest the model assumes an AAC close to 50% of the volume calculated with the formula above. The gross sustainable harvesting potential by using this method is 1 446 000 m^3 pr. year. Two other models for estimating AAC at national level have been tested and yield similar results.

The model is a simplification and yield rough estimates with considerable uncertainty. Yet, it is the most feasible to apply for Kosovo at current.

Table 23: *Estimation of annual allowable cut (1 000 m3)*[1]

Model	Forest type	dbh limit (cm)	Years	Volume > dbh limit	Increment	AAC
The FMP method	High	7	80 - 100	16 091	390	631
	Coppice	7	50 - 60	13 589	440	815
	Total					**1 446**

According to the model, an annual total harvest of 1.45 million m^3 is sustainable, with approximately 630 000 m^3 in high forest and 815 000 m^3 in coppice forest. Today, the current annual harvest is estimated at 1.6 million m^3, which is above the recommended long-term harvesting levels. Felling rate above 100% may be sustainable over a period of time, for example when responding to a high demand for timber or when carried out under a highly controlled management regime (FOREST EUROPE, UNECE and FAO 2011).

Figure 26: *Transport of firewood in Nerodime Jezerc, Ferizaj*

1) *Figures refer to the gross total volume including bark, large branches (dbh >7 cm), tops and other losses. The merchantable volume will thus be substantially lower.*

It should be noted that this analysis is based on the entire forest area, and gives the gross figures. Even though harvesting is currently executed throughout the forested terrain, some areas are considered inaccessible due to steepness and remoteness. As the general price level in Kosovo increases, more forest areas are likely to become "economically unavailable for wood supply". Moreover, the national parks, which cover a significant part of the forest area in Kosovo, are included in the figures. There will be harvesting restrictions within different zones of the parks. These areas are not known at the moment. Finally, at each harvesting plot some trees will normally be left for either environmental or purely economic reasons. How much the gross AAC should be reduced in order to reach a realistic potential utilizable harvesting volume, is difficult to state with certainty. But it is likely to be in the range of at least 10 – 20%, before any reductions for the growing stock within the national parks.

Net maximum long-term harvesting level for Kosovo is at the level of 1.2 million m^3. This estimate should be further reduced due to areas unavailable for wood supply, including National Parks.

The 2002-2003 NFI found an AAC of 720,000 m^3 in high forest and 215,000 m^3 in coppice forest. The large difference between the old estimate and the current one is mainly due to changed assumptions, including reclassification of high forest areas to coppice forest.

Forest management

Since 2006 development of new cost-efficient forest management plans (FMPs) has been a priority for the Kosovo government, and, with the aid of the Norwegian government, a total of 39 new management plans have been prepared/developed. The forest management planning method for Kosovo includes classification of forest stands according to management classes. During the NFI this classification was also applied on the sample plots, providing overall statistics for Kosovo.

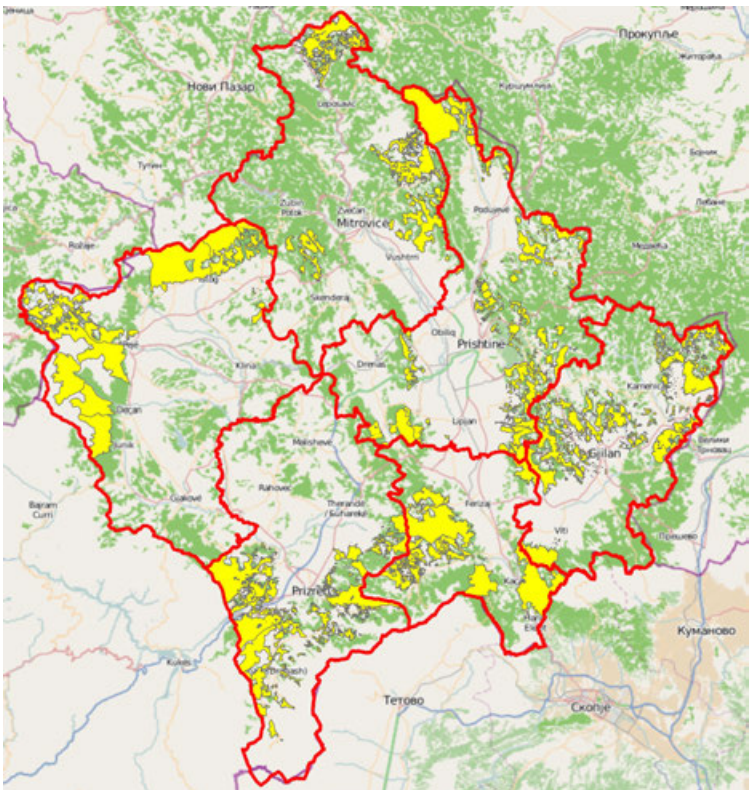


Figure 27: *The yellow area shows forest areas covered by the new forest management plans in Kosovo*

During 2013, 12 new plans have been prepared. The majority are financed by the Government of Kosovo, which for the last few years has allocated considerable funds for this purpose. Almost half of the management units will have new plans by the end of 2013.

Most of Europe's forest is covered by some kind of forest management plan. In South-East Europe there is a long tradition of regulating forest management through management plans, both at the management unit, regional and central levels. In Serbia, 82% of the forest area is under FMP or an equivalent, Albania reports that all of their forest is covered by management plans, whereas Croatia reported 22% under equivalents and 78% under FMPs (FOREST EUROPE, UNECE AND FAO 2011).

Table 24: *Forest area, growing stock and fellings from 2003 – 2012, by management class (ha, 1 000 m^3)*

Management class	**Area**	**Growing stock**	**Average growing stock** (m^3/ha)	**Felling** (9 yrs)
Uneven-aged high forest of beech	37 600	12 708	338.0	1 361
Uneven-aged, mixed high forest of beech, fir and spruce, and other broadleaves	5 800	1 661	286.4	355
Uneven-aged high forest of pine	3 200	1 043	325.9	24
Uneven-aged high forest of oak	1 600	306	191.3	22
Uneven-aged high forest of fir	1 800	488	271.1	140
Uneven-aged high forest of spruce	6 000	1 040	173.3	236
Uneven-aged mixed high forest of conifers	3 800	1 214	319.5	131
Uneven-aged high forest of birch	2 400	506	210.8	0
Uneven-aged high forest of other broadleaves	3 600	753	209.2	32
Degraded high forest of beech due to fire	2 200	362	164.5	94
Degraded high forest of beech due to illegal harvesting	2 400	183	76.3	206
Degraded high forest of beech, fir, spruce and other broadleaves due to illegal harvesting	600	79	131.7	145
Degraded pine forest due to fire	2 200	92	41.8	117
Degraded pine forest due to illegal harvesting	200	6	30.0	0
Degraded fir forest due to fire	400	3	7.5	0
Degraded fir forest due to other reasons	200	6	30.0	119
Degraded fir forest due to illegal harvesting	400	107	267.5	101
Degraded high forest of spruce due to forest fire	600	42	70.0	26
Degraded high forest of spruce due to illegal harvesting	1 200	100	83.3	0
Even-aged pine forest	3 200	490	153.1	140
Even-aged fir forest	200	0	0	1
Even-aged spruce forest	400	57	142.5	0
Beech-dominated coppice forest	37 000	4 556	123.1	893
Mixed beech and other broadleaved coppice forest	15 800	1 066	67.5	370
Oak-dominated coppice forest	209 200	8 305	39.7	2 002
Degraded coppice forests due to forest fire	5 200	224	43.1	27
Degraded coppice forests due to other reasons	1 000	43	43.0	0
Degraded coppice forest due to improper management	18 600	213	11.5	801
Hornbeam-dominated coppice forest	23 600	897	38.0	199

Table 24 continued: **Management class**	**Area**	**Growing stock**	**Average growing stock** (m^3/ha)	**Felling** (9 yrs)
Coppice forest of other broadleaves	79 600	3 578	44.9	1 090
Bushland suited for conversion to pine forest	1 200	0	0	0
Forests of pinus mugo	1 800	30	16.7	0
Bushland not suited for conversion	5 800	349	60.2	1
Unclassified area	2 200	0	0	0
Total	**481 000**	**40 508**	**84**	**8 633**

Table 25: *Forest area sorted by treatment class and stand origin (ha)*

Treatment class	**Stand origin**				**Total**
	Natural seeding	Planting/artificial seeding	Coppice	Coppice with standards	
No treatment	45 000	2 400	311 200	3 000	361 600
Regeneration without site preparation	1 400	0	2 600	0	4 000
Regeneration with site preparation	200	0	400	0	600
Conversion	0	0	2 000	0	2 000
Cleaning-thinning	2 200	0	46 200	1 000	49 400
Thinning	11 800	400	29 800	2 600	44 600
Clearcut	0	0	400	0	400
Selection	9 600	0	3 600	600	13 800
Salvage/sanitary	2 800	0	1 600	0	4 400
Repair planting	0	0	0	200	200
Total	73 000	2 800	397 800	7 400	481 000
Total with treatment recommendation	**28 000**	**400**	**86 600**	**4 400**	**119 400**

The fieldworkers have assessed 119 400 hectare, i.e. one-quarter of Kosovo's forest area, in need of some kind of silviculture or harvesting operation. In addition to the NFI assessment, at operational level through forest management planning treatment strategies are drafted for each management class.

Figure 28: *Oak (quercus)-dominated coppice forest (left) and well-tended young coppice (right). Firewood is extracted through the tending operation. Remaining trees will have more space to grow into higher quality logs.*

Table 26: *Growing stock by tree quality and tree species (1 000 m³)*

Tree species	Quality class				Total
	High	High - average	Average - low	Low	
Quercus cerris	110	439	1 095	2 637	4 281
Querus petrea	99	251	727	2 592	3 669
Other *quercus* sp.	4	45	381	861	1 291
Fagus sp.	644	2 781	4 959	10 139	18 523
Other broadleaves	77	258	1 053	5 362	6 750
Sub-total broadleaves	934	3 774	8 215	21 591	34 514
Abies alba	690	542	302	39	1 573
Picea abies	557	890	310	84	1 841
Pinus sp.	526	953	826	197	2 502
Other conifers	13	57	1	6	77
Sub-total coniferous	1 786	2 442	1 439	326	5 993
Total	**2 720**	**6 216**	**9 654**	**21 917**	**40 508**

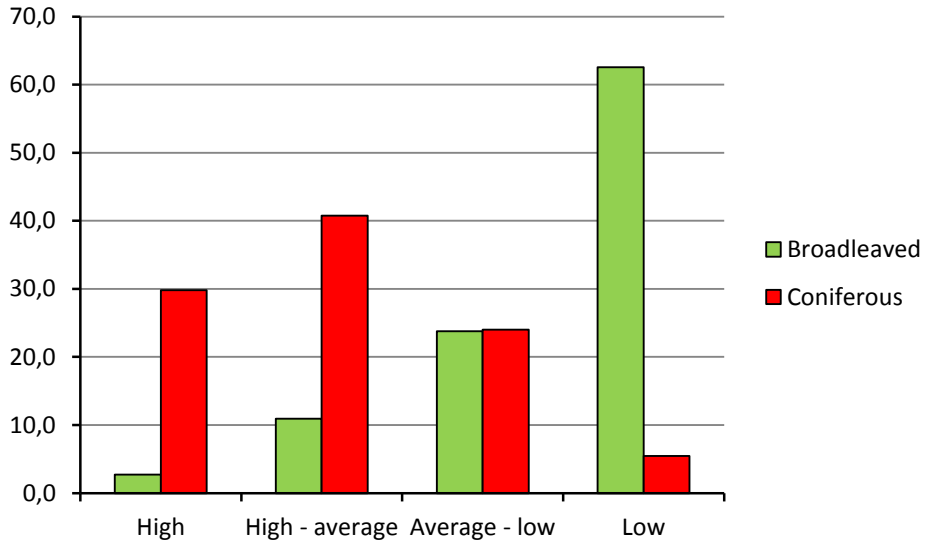


Figure 29: *Growing stock of tree species groups by tree quality class (%)*

While most of the growing stock of broadleaved species is in the poorer assortments, the largest share of growing stock of the conifer species is in the higher quality classes.

English

Biodiversity

Tree species composition

Forest biodiversity is measured by the number of species occurring in forest land and other wooded land. Species composition is affected by ecological species characteristics such as growth and reproduction, site conditions, disturbance factors and forest management. In general, mixed forest, consisting of two or more species, are often richer in biodiversity than single species forests.

Table 27: *Forest area by tree species abundance category (ha)*

Tree species abundance class				Total
1	2-3	4-5	6+	
122 000	226 800	100 400	31 800	481 000

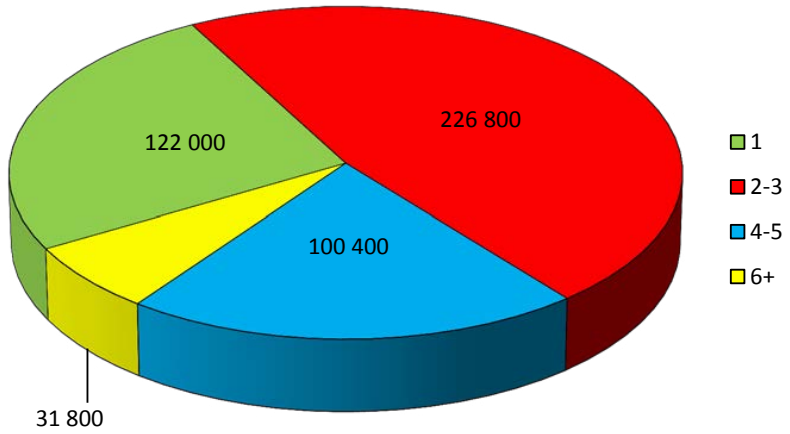


Figure 30: *Forest area by species abundance category (ha)*

The figure shows that most of the forest area in Kosovo consists of mixed species stands; 21% of the forest area consists of 4 – 5 different tree species.

Regeneration

Natural regeneration conserves genotype diversity and maintains both the natural species composition, stand structure and stand dynamics. Regeneration is crucial to the long term maintenance of forest land. A sustainable forest management can be identified by the status and change in regeneration types over time.

Table 28: *Forest area by forest composition and stand origin (ha)*

Forest composition	Stand origin				Total
	Natural seeding	Planting or artificial seeding	Coppice	Coppice with standards	
Coniferous	21 400	2 400	0	0	23 800
Mixed	6 200	0	1 600	0	7 800
Broadleaved	45 400	400	396 200	7 400	449 400
Total	**73 000**	**2 800**	**397 800**	**7 400**	**481 000**

Table 29: *Forest area by stand origin and stand structure (ha, %)*

Stand origin	Stand structure						Total
	Even-aged		Two-storied		Uneven-aged		
	ha	%	ha	%	ha	%	
Natural seeding	22 400	5	26 000	5	24 600	5	73 000
Planting or artificial seeding	2 200	0	600	0	0	0	2 800
Coppice	263 400	55	104 800	22	29 600	6	397 800
Coppice with standards	2 600	1	1 600	0	3 200	1	7 400
Total	**290 600**	**60**	**133 000**	**28**	**57 400**	**12**	**481 000**

In Kosovo, 0.5% percent of the forest is regenerated by planting or artificial seeding. Approximately 85% of the forest area is regenerated through coppice sprouting. In South-East Europe as a whole, 80% of total forest area is regenerated naturally. In 2010 Albania reported that close to 90% of their forested area was regenerated naturally and Serbia reports around 93%. South-East Europe stands out as a region with a relatively high share of forest area increase through natural expansion (FOREST EUROPE, UNECE AND FAO 2011).

Naturalness

Large, continuous tracts of undisturbed forests, i.e. forests that are undisturbed by man usually has a higher conservation value than managed forest. In such undisturbed forests natural dynamics are allowed to take place, resulting in relatively large shares of dead wood, natural species composition and variation in age structure. Most of Europe's forest area is classified as semi-natural. The forest may be marked by human intervention through forest management and other traditional land uses, and by physical constructions such as artificial water ways and other infrastructures, but retain some the characteristics of natural forest ecosystems.

Table 30: *Forest area in Kosovo by naturalness (ha, %)*

Naturalness	Area	
	ha	%
Forest undisturbed by man	4 000	0.83
Semi-natural forest	475 400	98.84
Plantation	1 600	0.33
Total	**481 000**	**100**

In Kosovo less than 1% of forest area is characterized as undisturbed by man and only 0.3 percent of the forest area is classified as plantation.

In South-East Europe, 6% of the forest is reported to be undisturbed, whereas 17% is forest plantations. This is the highest share of plantations among the European regions. Albania reported that close to 11% of their total area undisturbed by man, whereas Slovenia reported 8% . Albania reported that 14% of their forest area was plantations and Croatia 5%.

Introduced tree species

Introduced tree species are species that occurs outside its natural vegetation zone. Other terms that are used are "non-indigenous species", "exotic species", or "alien species". Introduced tree species have been introduced for various reasons, such as for forestry, erosion protection, or gardening and botanical gardens and arboreta. In some countries introduced species play a significant role in increasing the forest area through afforestation.

Figure 31: *Field personnel in black locust forest*

The most common introduced tree species in Kosovo is Black locust (*Robinia pseudoacacia*) which is native to the southeastern United States. It has been present in Europe for several hundred years, and was introduced mainly to prevent soil erosion and in order to stabilize the soils. In some locations, the tree has spread and is considered a challenge to the natural forest.

The black locust covers 2 400 hectares, and including larch (*Larix spp.*) and Douglas fir (*Pseudotsuga menziesii*), the total area dominated by introduced tree species is estimated at 3 200 hectares, only 0.6% of the total forest area.

As a percentage of total forest area, Black locust covers a smaller fraction than what is reported for Slovenia. The trend in South-East Europe between 2000 and 2010 is that the area covered by introduced tree species is increasing.

Dead wood

Dead wood often contains various habitats each associated with a certain group of species. Insects, fungi, birds and small mammals depend on standing and lying dead biomass in the forest for their survival. In order to conserve biodiversity, leaving dead biomass in the forest has become an important management practice, and it plays an important role in forest management certification.

The quantity of dead wood depends on tree species, natural disturbance, stand successional stage, climate and soils. Branches and other tree parts left in the forest after harvesting constitute an important part of this, but some species require standing and lying trees of a certain size in order to survive. In general, lying dead trees host more biodiversity that standing dead trees.

Table 31: *Total volume of dead wood and quantity of deadwood per hectare (m^3, m^3/ha)*

Status	**Volume** (m^3)			**Volume by forest composition** (m^3/ha)			
	Salvageable	Not salvageable	Total	Coniferous	Mixed	Broadleaved	**Total**
Lying	226 000	399 000	625 000	10.9	0.96	0.79	1.30
Standing	556 000	555 000	1 111 000	20.3	5.55	1.3	2.31
Total	**782 000**	**954 000**	**1 736 000**	**31.2**	**6.51**	**2.09**	**3.61**

Volumes of dead wood are not included in the growing stock figures.

Salvageable volume may still be utilized, whereas non-salvageable volume is heavily decomposed and not useful for any purpose. Forests that are dominated by coniferous trees represent a much smaller area compared to area dominated by broadleaves, but contribute with a much higher average growing stock per area unit.

The extensive use of firewood by Kosovo's rural population may partly explain the low volume of dead wood registered by the NFI. It could also be that the assessment of dead wood has underestimated the quantity.

In Europe, country level estimates of dead wood vary considerably. South-East Europe has the highest reported regional mean of dead wood, at 15 m^3/ha.

Croatia reported 14% and Slovenia 19% dead wood; lying dead wood constituted the largest portion.

Figure 32: *Decaying coniferous wood due to wind and snow damages in Koshuten, Peje*

Protected forests

In Kosovo there are two forest areas that have been designated by the government as national parks: Sharri in southern Kosovo and Bjeshket e Nemuna in the western part of Kosovo. Both national parks are located in high elevation forested areas.

Table 32: *Forest area and growing stock in national parks by forest composition (ha, m^3)*

National park	Resource	Forest composition			Total
		coniferous	mixed	broadleaved	
Sharri	Area (ha)	2 000	600	15 000	17 600
	Growing stock (m^3)	410 000	171 000	5 335 000	5 916 000
Bjeshket e Nemuna	Area (ha)	17 600	5 400	19 000	42 000
	Growing stock (m^3)	3 910 000	1 614 000	2 860 000	8 384 000
Total	Area (ha)	19 600	6000	34 000	59 600
	Growing stock (m^3)	4 320 000	1 785 000	8 195 000	14 300 000
Share of total for Kosovo	**Area (%)**	**82**	**77**	**8**	**12**
	Growing stock (%)	**90**	**91**	**24**	**36**

90% of total growing stock in coniferous forest and mixed coniferous and broadleaved forest in Kosovo, are located within the park borders. It is obvious that in the major parts of the parks forest management for wood production will still be possible. Only the Sharri national park has so far been delineated and classified into zones according to management objectives.

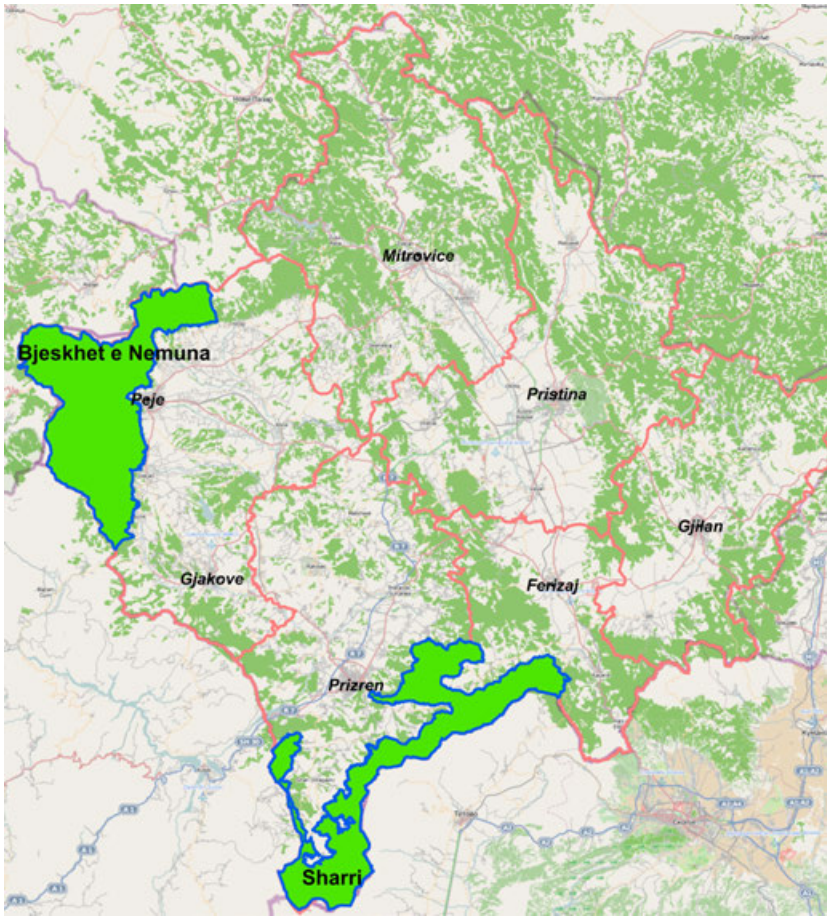


Figure 33: *Location of national parks in Kosovo (above) and forested landscape in Decani (below)*

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Appendix 1: Land use classes and definitions

Land use

Land use class	Code	Definition
Forest	01	Wooded land meeting the definition of "forest".
Other wooded land	10	Wooded land not meeting the definition of "forest".
Cropland	30	Cultivated land excluding meadows and pastures.
Grassland	31	Rangelands and pasture land that are not considered cropland. Any woody vegetation must fall below the threshold values of Forest.
Settlements	40	Cities, villages, infrastructure etc. Include public roads, but not forest roads.
Water	50	Lakes, major rivers, reservoirs.
Other wetlands	51	Land that is covered and saturated by water for all or part of the year (e.g. peatland) and that does not fall into the forest, other wooded land, cropland, grassland, water or settlements categories.
Other land	20	Un-managed land areas that do not fit into any of the other categories; unproductive land, bare soil, rock

Forest

Land with tree crown cover of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ.
May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground: or of open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent or tree height of 5 m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest.

Lightly built roads (skidding roads) like this should be considered an integral part of the forest.

Includes: Forest nurseries and seed orchards that constitute an integral part of the forest; forest roads, cleared tracts, firebreaks and other small open areas within the forest; forest in national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and a width of more than 20 m.

Excludes: Land predominantly used for agricultural practices.

Note that a forest road (predominantly used for forestry purposes) constituting an integral part of the forest should be considered "forest", while a public road through a forest should be considered "settlements".

Other wooded land

Land either with a tree crown cover of 5-10 percent of trees able to reach a height of 5 m at maturity in situ; or a crown cover of more than 10 percent of trees not able to reach a height of 5 m at maturity in situ (e.g. dwarf or stunted trees) and shrub or bush cover.

Excludes: Areas having the tree, shrub or bush cover specified above but of less than 0.5 ha and width of 20 m, which are classed under “other land”; Land predominantly used for agricultural practices.

Note that the minimum size of continuous forest and/or other wooded land should be 0.5 ha (a square of 71x71 m, or corresponding). Areas having some tree cover, but, at the same time do not meet the requirements for forest or other wooded land, should be assigned to one of the other categories.

Cropland

Includes arable and tillable land, and agroforestry systems where the vegetation structure falls below the thresholds used for the Forest Land category, and is not expected to exceed those thresholds at a later time. Cropland includes all annual and perennial crops as well as temporary fallow land (i.e., land set at rest for one or several years before being cultivated again). Annual crops include cereals, oils seeds, vegetables, root crops and forages. Perennial crops include trees and shrubs, in combination with herbaceous crops (e.g., agroforestry) or as orchards and vineyards, except where these lands meet the criteria for categorisation as Forest Land. Arable land which is normally used for cultivation of annual crops, but which is temporarily used for forage crops or grazing as part of an annual crop-pasture rotation (mixed system) is included under cropland.

Naturalness

Class	Code	Definition
Forest undisturbed by man (primary forest, virgin forest)	1	Areas where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed. This includes areas where collection of non-wood forest products occurs, provided that human impact is small. Individual trees may in some cases have been removed.
Semi-natural forest (normal situation)	2	Areas of naturally regenerated species where there are clearly visible indications of human activities. This includes, but is not limited to selectively logged-over areas, areas naturally regenerating following agricultural land use, areas recovering from human-induced fires etc. This type is the most common form of naturalness for most forest types in Kosovo.
Plantation (Pinus nigra etc.)	3	Areas of introduced tree species and in some cases native species, established through planting or seeding mainly for the production of wood or non-wood goods. This includes all stands of introduced species established for production of wood or non-wood goods, and may include areas of native species characterized by few species, straight tree lines and/or even-aged stands.

For the assessment, the minimum size of the area of a particular form of naturalness is 0,5 ha.

Forest undisturbed by man: In addition to no clearly visible indications of human activities, the area should not have been affected by surrounding installations, like roads, buildings, ditches etc. Other indicators of forest undisturbed by man are concentrations of dead wood at different stages of decay, trees of old age and uneven-aged stand structure. However, all of these indicators do not need to exist simultaneously.

Management classes

Code	Unevenaged high forest
1100	Beech forests (and other broadleaves in area of beech forests); *More than 80 % of the tree volume in the stand should be beech.*
1200	Mixed forest of beech, fir (and spruce), and other broadleaves in area of this forests; *No separate specie or gruop of species should add up to more than 80 % of the tree volume.*
1300	Pine forests; *More than 80 % of the tree volume should be pine.*
1400	Oak forests; *More than 80 % of the tree volume should be oak.*
1500	Fir forests; *More than 80 % of the tree volume should be fir.*
1600	Spruce forests; *More than 80 % of the tree volume should be spruce.*
1700	Mixed forest of conifers; *More than 80 % of the tree volume should be pine, fir or spruce.*
1800	Birch forest; *More than 80 % of the tree volume should be birch.*
1900	Forests of other broadleaves; *More `han 80 % of the tree volume should be broadleaves,* *and dominated by other species than beech, oak or birch.*

	Degraded high forest *More than 50 % of the trees are dead, damaged or missing or of in optimal species due to mismanagement or some other specific reason, in a way that makes it impossible for the stand by itself to recover to a normal situation of high forest.*
2100	Degraded high forest of beach
2200	Degraded high mixed forest of beech fir and spruce and other broadleaves.
2300	Degraded pine forest.
2500	Degraded forest of fir
2600	Degraded spruce forest
2700	Degraded mixed forests of fir and spruce
2900	Degraded forest of other broadleaves

	Even aged high forest. *At least 80 % of the tree volume in the stand is even aged, in the sense that the age of each tree is not more than 20 % higher or lower than the average age of these trees.*
3300	Even aged pine forest
3500	Even aged fir forest
3600	Even aged spruce forest

	Coppice forest *Forest mainly composed of stool-shoots or root suckers with or without scattered bigger trees.*
4100	Beech dominated coppice forest
4200	Mixed beech and other broadleaves coppice forest
4400	Oak dominated coppice forest
4800	Hornbeam dominated coppice forest
4900	Coppice forest from other broadleaves

	Bush-land *Forest mainly composed of stool-shoots or root suckers with or without scattered bigger trees.*
5100	Bush land suited for converting to beech forest
5200	Bush land suited for converting to mixed forest of beech, fir and other conifers.
5300	Bush land suited for converting to pine forest
5330	Forest of *pinus mugo*
5900	Bush land not suited for conversion.

	Non productive area
6100	Forest roads
6110	Areas for wood storage
6200	Agricultural areas in use.
6210	Meadows and pastures
6300	Agricultural areas not in use, suitable for afforestation.
6410	Water
6420	Bogs
6430	Unforested bare rocks
6440	Low productive forested areas with scattered trees.
6450	Area above tree line.
6460	Erosion areas
6999	Other open areas

Stand origin

Stand origin	Code	Definition
No existing stand	0	No trees with diameter more than 7 cm
Natural seeding	1	Naturally regenerated high forest (more than 50%)
Planting or artificial seeding	2	Artificially regenerated high forest (more than 50%)
Coppice	4	Low forest composed of stool-shoots (more than 50%)
Coppice with standards (middle forest)	5	As previous class, but with scattered bigger trees

High forest:
Forest normally composed of trees of seedling origin, but may also include trees from vegetative reproduction, e.g. poplars. Includes stands in process of transformation into high forest.

Coppice and coppice with standards (low forest):
Forest composed of stool-shoots or root suckers with or without scattered bigger trees (standards), which may be of seedling or coppice origin.

Stand structure

Stand structure	Code	Definition
Temporarily without trees	0	Forest temporarily without trees as a result of human intervention or natural causes
Even-aged stand	1	Even-aged forest
Two storeyed stand	2	Forest clearly divided into an overstorey and an understorey
Uneven-aged stand	3	Uneven-aged forest, the trees distributed into several layers

Even-aged stand:
Forest in which the predominant proportion of the trees falls into the same age class, generally resulting in a single storey forest. The age difference between the oldest and youngest trees should as a guideline be less than 20% of the stand age when mature. Even-aged stands are usually produced by cutting all trees within a relatively short period, by natural disturbances that eliminate most vegetation in the previous stand, or by systematically removing all trees except from one specific age class.

Two storeyed (two-aged) stand:
Forest clearly divided into an overstorey and an understorey. The age difference between the oldest and youngest trees should as a guideline be at least 20% of the stand age when mature.

Uneven-aged stand:
Forest in which there is a mixture of different age classes. Usually, the trees cannot be separated into different storeys. This can be either achieved through selection treatment interventions or naturally in mixed species stands, where species with different growth performance and top heights have been established.

Uneven-aged:
A stand with trees of three or more distinct age classes, either intimately mixed or in small groups.

Two-aged:
A stand with trees of two distinct age classes separated in age by more than plus or minus 20% of the rotation age.

Even-aged:
A stand composed of a single age class of trees in which the range of tree ages is usually plus or minus 20 % of the rotation age.

Treatment opportunity class

Treatment opportunity identifies the physical opportunity to improve stand conditions by applying management practices. The need for forest intervention that already exists or is expected to emerge during the next 5 years should be decisive for this assessment.

Treatment opportunity class	Code	Definition
No treatment	0	No treatment
Regen. without site preparation	1	Regeneration without site preparation
Regen. with site preparation	2	Regeneration with site preparation
Conversion	3	Stand conversion
Cleaning-thinning	4	Cleaning-thinning (pre-commercial)
Thinning	5	Thinning (commercial)
Clearcut, strip clearcut harvest	6	Clear cut harvest, strip clearcut harvest
Selection	7	Partial cut harvest, selection felling
Salvage/sanitary felling	8	Salvage or sanitary harvest
Repair planting	9	Supplementary planting/seeding

No treatment:
Stand is characterized by an adequate stock of growing-stock trees in reasonably good condition.

Regeneration without site preparation:
The area is characterized by the absence of a manageable stand because of inadequate stocking of growing stock. Growth will be much below the potential for the site if the area is left alone. Prospects are not good for natural regeneration. Artificial regeneration will require little or no site preparation.

Regeneration with site preparation:
The area is characterized by the absence of a manageable stand because of inadequate stocking of growing stock. Growth will be much below the potential for the site if the area is left alone. Either natural or artificial regeneration will require site preparation.

Stand conversion:
The area is characterized by stands of undesirable, chronically diseased, or off-site species. Growth and quality will be much below the potential for the site if the area is left alone. The best prospect is for conversion to a different forest type or species.

Cleaning-thinning:
The stand is characterized by a dense stocking of seedlings and saplings (pre-commercial). Stagnation appears likely if left alone. Stocking must be reduced to help crop trees attain dominance.

Thinning:
The stand is characterized by a dense stocking of growing stock. Stocking must be reduced to prevent stagnation or to confine growth to selected, high quality crop trees.

Clear cut harvest:
The area is characterized by a mature or overmature sawtimber stand of sufficient volume to justify a commercial harvest. The best prospect is to harvest the stand and regenerate. This harvesting method is forbidden according the legislation in Kosovo, and demands a special permit. Areas where this harvesting method should be considered is even-aged forest of spruce or degraded forest which needs to be artificially reestablished.

Partial cut harvest, selection felling:
The stand is characterized by poletimber or sawtimber size trees with sufficient merchantable volume for a commercial harvest, which will meet intermediate stand treatment needs or prepare the stand for natural regeneration. The stand is of a favored species composition and may be even or uneven aged. Under this code are assigned stands suitable for the selection system to maintain an uneven age stand, including Femelschlag system etc.

Salvage or sanitary felling:
The stand is characterized by excessive damage to merchantable timber because of fire, insects, disease, wind, ice, or other destructive agents. The best prospect is to remove damaged or threatened material.

Repair planting:
The area is insufficiently regenerated (artificially or naturally). Less than 70% of the area is stocked. Additional planting is required to fill gaps and to fully utilise growing space in order to achieve a growth according to the site potential. The treatment applies to stands in the seedling development stage.

Tree quality

Tree quality grade	Code	Definition
High quality	1	Big share of high quality sawlogs and veneer wood in the stem
High to average quality	2	Some high quality and some low quality sawlogs in the stem
Average to low quality	3	Mostly low quality sawlogs and firewood in the stem
Low quality	4	Trees of low quality. Large irregularities, bent or forked; firewood

Appendix 2: Field record forms

PLOT RECORD FORM

Team leader.....

dd mm yy

X								
Y								

Cluster Nr. : Plot no in cluster:

Inventory status (all): Plot Status (f, owl) Size of Partial Plot (f, owl):

Orientation (all)	Azimuth (°)	Distance (dm)	Type (*comments for easy ID of plot center*)
O. mark 1			
O. mark 2			
O. mark 3			

Elevation (all, m)	Slope (f, owl, %)	Aspect (f, owl, °)	Land use (all)
0000	00	000	00

Ownership (f, owl)	*pole*	0	
Naturalness (f, owl)	*r=20*	0	
Management class (f, owl)	*r=20*	0000	
Stand age (f)	*r=20*	000	
Lorey mean height (f) (dm)	*r=20*	000	
Current stand origin (f)	*r=20*	0	
Origin of small trees/regener. (f)	*r=20*	0	
Stand structure (f)	*r=20*	0	
Treatment opportunity (f)	*r=20*	0	
Crown cover percentage (f, owl) (%)	*r=20*	00	
Litter cover (f, owl)	*r=10*	0	
Soil type (f, owl)	*r=10*	0	
Soil depth (f, owl)	*r=10*	0	
Damage small tree/regeneration (f)	*r=2,5*	0	
Intensity of damage small/regen. (f	*r=2,5*	0	
Occurrence of dead biomass (f, owl)	*r=10*	0	
Occurrence of junipers (f, owl)	*r=10*	00	

Tree species composition (f, owl) (%) *r=20* 00						
11	12	13	19	21	22	29

Regeneration (0) *r=2,5*	Coniferous	
	Broadleaves	

No. of trees w. dbh < 3,5 (*r=2,5*)	Conifer-ous	
	Broad leaved	

No.of trees 7> dbh >=3,5 (*r=2,5*)	Conifer -ous	
	Broad leaved	

Litter cover	*Code*
0 - 2 cm	1
2-4 cm	3
4 - 6 cm	5
6 – 8 cm	7
> 8 cm	9

Soil type	*Code*
Mineral soil	1
Organic soil	2

Soil depth	*Code*
< 25 cm	1
25 - 50 cm	2
50 - 80 cm	3
> 80 cm	4

Damage small/regen.	*Code*
None	0
Insect	1
Disease/fungus	2
Fire	3
Animal	4
Weather	5
Human impact	6
Suppression	7
Miscellaneous	8

Intensity of damage	*Code*
0 – 5 %	0
6 – 25 %	1
26 – 50 %	2
51 – 75 %	3
76 – 100 %	4

Dead biomass	*Code*
No dead biomass	0
Dead biomass	1

Management. class	*Code*
see separate code form	

Plot number	*Code*
2 3	1
	2
	3
1 4	4

Inventory status	*Code*
Visit, old centre found	11
Visit, old centre not found	12
Not visit, map/photo class	21
Not visit, visual assessm	22

Plot status	*Code*
Full plot	1
Partial plot	2

Land use class	*Code*
Forest	01
Other wooded land	10
Cropland	30
Grassland	31
Settlements	40
Water	50
Other wetlands	51
Other land	20

Ownership status	*Code*
Unknown	0
Public	1
Private	2

Naturalness	*Code*
Undisturbed by man	1
Semi-natural forest	2
Plantation	3

Tree species comp.	*Code*
Fir	11
Spruce	12
Pine	13
Other conifers	19
Beech	21
Oak	22
Other broadleaves	29

Current stand origin	*Code*
No existing stand	0
Natural seeding	1
Planting or artific.seeding	2
Coppice	4
Coppice with standards (middle forest)	5

Origin of small/regen.	***Code***
No existing small/regen.	0
Natural seeding	1
Planting or artific.seeding	2
Coppice	4

Stand structure	*Code*
Temp. without trees	0
Even-aged stand	1
Two storeyed stand	2
Uneven-aged stand	3

Treatment opportunity	*Code*
No treatment	0
Regen.without site prep.	1
Regen.with site prep.	2
Conversion	3
Cleaning-thinnng	4
Thinning	5
Clearcut	6
Selection	7
Salvage/sanitary	8
Repair planting	9

TREE RECORD FORM

Team leader:..

Date: [ ] [ ] [ ] Day mm yy   Cluster Nr: [ ] 001-999   Plot No: [ ] 1-4

Tree number	Tree species	Tree status	Azimuth (°)	Distance (cm)	Diameter h. 1.3 (mm)	Vol. reduction 00 – 99 (%)	Damage	Tree quality	Tree type	Tree height (dm)
000	000	0	000	0000	0000	00	0	0	0	000

Plot number	*Code*
2 3	1
[ ]	2
1 4	3
	4

Tree species	*Code*
At instruction	

Tree status	*Code*
Live	1
Downed tree, salvageable	2
Downed tree, not salvageable	3
Snag, salvageable	4
Snag, not salvageable	5
Removed by legal harvesting	6
Removed by illegal harvesting	7
Removed by natural causes	8
Tree not found	9

Volume reduction	***Code***
Look at instruction	

Cause of damage	*Code*
None	0
Insect	1
Disease/fungus	2
Fire	3
Animal	4
Weather	5
Human impact	6
Suppression	7
Miscellaneous	8

Tree quality grade	***Code***
High quality	1
High to average	2
Average to low	3
Low quality	4

Tree Type	*Code*
Tally tree	1
Sample tree	2

Appendix 3: List of personnel involved in the NFI 2012

Project team, Norwegian Forestry Group:

Name	Main responsibilities
Orhan Berisha	Geographic information management, fieldwork, data quality control.
Erling Bergsaker	NFI reporting. Calculation of annual allowable cut.
Tormod Dale	Training. Data quality control. NFI reporting.
Svein Dypsund	Programming field PDAs.
Jens Kolstad	Database management. Geographic information management.
Ibrahim Muja	NFI coordination. Fieldwork support. Data quality control. Translation.
Dr. Stein M. Tomter	Methodology development. Calculation of results. NFI reporting.

External support:

Name	Organisation	Tasks
Tahir Ahmeti	Leader of Section, Department of Forestry, Ministry of Agriculture, Forestry and Rural Development/NFG	Methdology development support
Kemajl Kadriu	Leader of Section, Department of Forestry, Ministry of Agriculture, Forestry and Rural Development/NFG	Ortophoto interpretation for preliminary classification. Data entry.
Ahmet Zejnullahu	Managing director, Kosovo Forest Authority	Steering committee leader

NFI fieldworkers:

Team leader	Field assistant
Orhan Berisha (field coordinator)	Esat Dautaj
Branko Bojovic	Slobodan Jelenic
Rrustem Dautaj	Beqe Mehmetaj
Fitim Hoxhaj	Agron Shkodra
Osman Gashi	Ekrem Krasniqi
Bedri Beluli	Shkodran Krasniqi

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