

Annex 1: Pilot Application of the European Forest Types

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European Forest Types: Background

In the Vienna Living Forest Summit Declaration, signed at the Fourth Ministerial Conference on the Protection of Forests in Europe (2003), the Signatory States and the European Community committed themselves to endorsing the use of the “Improved Pan-European Indicators for Sustainable Forest Management as adopted by the MCPFE Expert Level Meeting, 7-8 October 2002, Vienna, Austria”. Following this set of improved criteria and indicators, the reporting for seven out of the total of 35 quantitative indicators is required to be by forest types. It was not possible in the course of this process to come to an agreement on a new classification system of forest types. Thus, it was recommended to keep the previously employed system based on three species groups (predominantly coniferous, predominantly broadleaved and mixed forest). However, the Vienna Resolution 4 contains a commitment to “...contribute to harmonised international classification systems through developing a pan-European understanding on forest classification systems including forest types, naturalness and introduced forest species”.

In this framework the European Environment Agency (EEA) of the European Union, in cooperation with a consortium of forest experts from a number of European countries led by the Italian Academy of Forest Sciences, developed a proposal for the classification of forest types in European countries, presented in the EEA Technical Report (No 9/2006) “European Forest Types - categories and types for sustainable management reporting and policy”¹.

Since 2006 FOREST EUROPE together with UNECE/FAO and EEA has organized consultative activities with representatives from member countries to discuss the potential of applying the European Forest Types (EFTs) as a forest type framework for pan-European reporting, including a pilot test reporting for indicator 1.1 by EFTs.

Based on gained experience some improvements were introduced to refine the EFT classification in order to ensure that it is operational. The revised classification, hereafter referred to as the new European Forest Types, is briefly described in Annex Table A; within the Enquiry on the State of Forests and Sustainable Forest Management in Europe 2011, pilot reporting by EFTs has been conducted for six indicators (cf. §§ 2-3).

The EFT classification allows the breakdown of country forest area into a discrete number of smaller and more ecologically homogeneous units. This is expected to facilitate the analysis of data on pan-European indicators, as well as the interpretation of trends.

The 14 categories of the EFTs represent groups – of varying breadth – of ecologically distinct forest communities dominated by specific assemblages of trees. Notably, categories 1-10 and 13 correspond to forest communities dominated by specific assemblages of trees native to Europe. The forest physiognomy of categories 1-10 is mainly determined by the latitudinal/altitudinal zonation of European vegetation and by inner climatic and edaphic variation therein. Categories 11-12 include azonal forest communities. Category 14 identifies forest stands predominantly consisting of introduced tree species; these are mainly represented by forest plantations, but stands originating from natural regeneration also are included.

The classification is conceived to categorize stocked forest land, with the help of classification keys mainly based on forest dominant tree species. Operational guidelines for the application of the classification have been developed to allow countries to use a flexible approach to classify forest area by EFTs, based on best available data sources (NFIs ground plots and forest maps, forest management plans). Temporarily unstocked forest areas (e.g. burned forest areas, clearcut areas under regeneration, etc.) cannot be directly assigned to EFTs without the support of additional information.

¹ The report can be downloaded at http://reports.eea.europa.eu/technical_report_2006_9/en. The report currently available was revised in 2007. For further reference, see also: Barbati A., Corona P., Marchetti M., 2007 - A forest typology for monitoring sustainable forest management: the case of European forest types. *Plant Biosystems*, 141(1):93-103.a

Annex Table A: New European Forest Types

EFTs - Category level	Main characteristics
1. Boreal forest	Extensive boreal, species-poor forests, dominated by <i>Picea abies</i> and <i>Pinus sylvestris</i> . Deciduous trees including birches (<i>Betula</i> spp.), aspen (<i>Populus tremula</i>), rowan (<i>Sorbus aucuparia</i>) and willows (<i>Salix</i> spp.) tend to occur as early colonisers.
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	Latitudinal mixed forests located in between the boreal and nemoral (or temperate) forest zones with similar characteristics to EFT 1, but a slightly higher tree species diversity, including also temperate deciduous trees like <i>Tilia cordata</i> , <i>Fraxinus excelsior</i> , <i>Ulmus glabra</i> and <i>Quercus robur</i> . Includes also: pure and mixed forests in the nemoral forest zone dominated by coniferous species native within the borders of individual FOREST EUROPE member states like <i>Pinus sylvestris</i> , pines of the <i>Pinus nigra</i> group, <i>Pinus pinaster</i> , <i>Picea abies</i> , <i>Abies alba</i> .
3. Alpine forest	High-altitude forest belts of central and southern European mountain ranges, covered by <i>Picea abies</i> , <i>Abies alba</i> , <i>Pinus sylvestris</i> , <i>Pinus nigra</i> , <i>Larix decidua</i> , <i>Pinus cembra</i> and <i>Pinus mugo</i> . Includes also the mountain forest dominated by birch of the boreal region.
4. Acidophilous oak and oak-birch forest	Scattered occurrence associated with less fertile soils of the nemoral forest zone; the tree species composition is poor and dominated by acidophilous oaks (<i>Q. robur</i> , <i>Q. petraea</i>) and birch (<i>Betula pendula</i>).
5. Mesophytic deciduous forest	Related to medium rich soils of the nemoral forest zone; forest composition is mixed and made up of a relatively large number of broadleaved deciduous trees: <i>Carpinus betulus</i> , <i>Quercus petraea</i> , <i>Quercus robur</i> , <i>Fraxinus</i> , <i>Acer</i> and <i>Tilia cordata</i> .
6. Beech forest	Widely distributed lowland to submountainous beech forest. Beech, <i>Fagus sylvatica</i> and <i>F. orientalis</i> (Balkan) dominate, locally important is <i>Betula pendula</i> .
7. Mountainous beech forest	Mixed broadleaved deciduous and coniferous vegetation belt in the main European mountain ranges. Species composition differs from EFT 6, including <i>Picea abies</i> , <i>Abies alba</i> , <i>Betula pendula</i> and mesophytic deciduous tree species. Includes also mountain fir dominated stands.
8. Thermophilous deciduous forest	Deciduous and semi-deciduous forests mainly of the Mediterranean region dominated by thermophilous species, mainly of <i>Quercus</i> ; <i>Acer</i> , <i>Ostrya</i> , <i>Fraxinus</i> , <i>Carpinus</i> species are frequent as associated secondary trees. Includes also <i>Castanea sativa</i> dominated forest.
9. Broadleaved evergreen forest	Broadleaved evergreen forests of the Mediterranean and Macaronesian regions dominated by sclerophyllous or lauriphyllous trees, mainly <i>Quercus</i> species.
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	Varied group of coniferous forests in Mediterranean, Anatolian and Macaronesian regions, from the coast to high mountains. Dry and often poorly-developed soils limit tree growth. Several tree species, including a number of endemics, of <i>Pinus</i> , <i>Abies</i> and <i>Juniperus</i> species.
11. Mire and swamp forest	Wetland forests on peaty soils widely distributed in the boreal region. Water and nutrient regimes determine the dominant tree species: <i>Pinus sylvestris</i> , <i>Picea abies</i> or <i>Alnus glutinosa</i> .
12. Floodplain forest	Riparian and riverine species-rich forests characterised by different assemblages of species of <i>Alnus</i> , <i>Betula</i> , <i>Populus</i> , <i>Salix</i> , <i>Fraxinus</i> , <i>Ulmus</i> .
13. Non-riverine alder, birch or aspen forest	Pioneer forests dominated by <i>Alnus</i> , <i>Betula</i> or <i>Populus</i> .
14. Introduced tree species forest	Forests dominated by introduced tree species above categories. Introduced tree species can be identified at regional (recommended) or national level and comprise: <ul style="list-style-type: none"> • tree species that are not native to Europe (e.g. <i>Eucalyptus</i> spp., <i>Robinia pseudoacacia</i>, <i>Acacia dealbata</i>, <i>Ailanthus altissima</i>, <i>Prunus serotina</i>, <i>Quercus rubra</i>, <i>Fraxinus alba</i>, <i>Picea sitkensis</i>, <i>Pinus contorta</i>, <i>Pinus banksiana</i>, <i>Pseudotsuga menziesii</i>, <i>Tsuga heterophylla</i>); • tree species native to Europe, but not naturally occurring within the borders of individual FOREST EUROPE member states; • tree species native only in some regions of an individual FOREST EUROPE country.

Pilot reporting by European Forest Types

Goals

Pilot reporting according to new European Forest Types was:

- Mandatory for two indicators -- 1.1 (forest area) and 1.2 (growing stock).
- Voluntary for four indicators -- 1.3 (Age structure and/or diameter distribution), 4.1 (Tree species composition), 4.3 (Naturalness) and 4.5 (Deadwood).

Specific pilot reporting tables were developed sharing the same format as the main tables for mandatory indicators (all reporting years); for reporting on voluntary indicators, 2005 was taken as the reference year.

The pilot reporting experience was an opportunity for:

- Testing the possibilities of acquiring the data and getting feedback from countries on technical limitations/problems with regard to the application; and
- evaluating the usefulness and added value of the information on pan-European indicators, when reported by EFTs.

As matter of fact, the three forest types based on species groups represent a feasible system to standardize forest information on a global level, but hardly serve for the interpretation of sustainable forest management

indicators. Within the vast European forest area, the information reported by pan-European indicators shows a considerable range of variation, due to natural conditions and past and present anthropogenic influences. Given this variability, it is very difficult to assess the state and trends of indicators for SFM when reducing reporting to only three forest types. The reporting of quantitative indicators by the 14 EFT categories is expected to be more ecologically sound to meet this goal. Thus, the pilot reporting aims at demonstrating this added value.

Response rate and data coverage

Many countries reported on mandatory indicators: 28 countries provided data on forest area and 26 on growing stock for at least one reporting year (Annex Table B). A complete time series (1990, 2000, 2005 and 2010) is available for 10 countries for forest area and for nine countries for growing stock.

Data available for these mandatory indicators have very good coverage across European regions: countries reporting on forest area account for 83 percent of European forest area, without the Russian Federation, while those reporting on growing stock account for 58 percent. In Central-West and North Europe there is full coverage of mandatory indicators; in South-West Europe the coverage is low only for growing stock. Thus data collected from pilot reporting for the mandatory indicators are regarded as sufficient to outline a set of key findings on EFTs (§§ 3.1 and 3.2).

A smaller number of countries, mainly northern and eastern European countries, reported also on voluntary indicators (Annex Table C).

For the remaining European countries (cf. Annex Table B).

- 12 countries did not provide national data on SFM indicators (only data based on Desktop Studies are available for these countries, compiled by UNECE/FAO but not including pilot reporting by EFTs).
- The Russian Federation delivered the Enquiry on pilot reporting, but only in a simplified form and was therefore not included in the further analysis of data.
- Five countries (the former Yugoslav Republic of Macedonia, Montenegro, Portugal, Romania and Turkey) explained that their not reporting was mainly due to a temporary lack of national data that will be collected in the future, or to the lack of time for processing national data to EFTs within the time frame of pilot reporting.

Unclassified forest area: reasons and options for the future

Various countries reporting on forest area indicated a proportion of the total forest area as unclassified. However the share of unclassified forest is, on average, 8 percent of the total forest area of the country, ranging from less than 0.1 (Hungary) to 27 (Spain).

Explanations provided by countries on unclassified forest area can be referred to three main situations:

- Permanently and temporarily unstocked forest areas (Austria, Italy, Latvia, Netherlands, Switzerland and the UK); this indicates that not all countries were able to assign unstocked forest area to EFTs.
- Stands not inventoried for different reasons (inaccessible, forest without timber production not covered by the inventory).
- Stands inventoried/mapped but characterized by species assemblages not matching EFT classes.

These cases might derive from different situations:

- forest types that are present in the country but not covered by the EFT classification -- this is the case for Slovakia that has indicated examples of species assemblages not reflected in the EFT nomenclature. This case can be fixed by adding new types within existing categories.
- national classes not directly comparable to EFTs -- this is the case, for instance, of Italy and Spain, that adopted the label-to-label approach to reclassify national data into the EFTs. Italy uses NFI forest type classification system and Spain uses the legend classes of the NFI Forest map.

Difficulties are related to the following main reasons:

- the national class is of "comprehensive" nature and cannot be linked to EFTs because of a lack of clearly identifiable dominant species (e.g. classes like "Other coniferous forest" or "Other evergreen forest" in the Italian NFI forest types).
- the national class is characterized by mixtures of trees that are key diagnostic species of more than one category of EFTs. This case is frequent in Spain where the national forest map has a number of mixed classes that include a combination of species belonging to different categories; the most frequent are combinations of *Pinus* (EFT 10) and *Quercus* species (EFTs 8, 9) and of *Quercus ilex* (EFT 9) and *Juniperus* species (EFT 10). To further improve the feasibility of the classification, it would be useful to establish consultations with countries facing this kind of problem to find solutions for classifying stands composed of mixtures of trees that are key diagnostic of more than one category of EFTs.

Annex Table B: Data availability of mandatory indicators and coverage in the 46 countries of FOREST EUROPE. X = data available for 2010; X* = data available for 2005; X**=data available for 2000; - = data not available. Indicator coverage is quantified as percent of forest area of the country/countries with data available for the indicator out of total forest area of the region/ Europe

Country	Forest area (1000 ha)	1.1. Forest area		1.2 Growing stock	
		Data availability	Coverage (% forest area)	Data availability	Coverage (% forest area)
Belarus	8600	X	20	X	20
Czech Republic	2657	X	6	X	6
Georgia	2742	-	-	-	-
Hungary	2039	X	5	X	5
Poland	9319	X	21	X	21
Republic of Moldova	386	-	-	-	-
Romania	6573	-	-	-	-
Slovakia	1938	X	4	X	4
Ukraine	9705	X	22	X	22
Central-East Europe	43959		78		78
Austria	3857	X	10	X	10
Belgium	678	X	2	X	2
France	15954	X	43	X	43
Germany	11076	X	30	X	30
Ireland	737	X	2	X	2
Liechtenstein	7	-	-	-	-
Luxembourg	87	-	-	-	-
Netherlands	365	X	1	X	1
Switzerland	1240	X*	3	X*	3
United Kingdom	2881	X**	8		8
Central-West Europe	36882		100		100
Denmark	587	X	1	X	1
Estonia	2203	X	3	X	3
Finland	22084	X	32	X	32
Iceland	30	X	0	X	0
Latvia	3354	X	5	X	5
Lithuania	2165	X	3	X	3
Norway	10250	X	15	X	15
Sweden	28605	X	41	X	41
North Europe	69278		100		100
Russian Federation	809090	-	-	-	-
Russian Federation	809090	-	0	-	0
Albania	776	-	-	-	-
Bosnia and Herzegovina	2472	-	-	-	-
Bulgaria	3927	X	13	X	13
Croatia	1920	X	6	X	6
Cyprus	173	X	1	X	1
Greece	3903	-	-	-	-
Montenegro	467	-	-	-	-
Serbia	2713	-	-	-	-
Slovenia	1253	X	4	X	4
The former Yugoslav Republic of Macedonia	998	-	3	-	3
Turkey	11334	-	38	-	38
South-East Europe	29936		65		65

Andorra	16	-		-	
Holy See	0	-		-	
Italy	9149	X	30	X*	30
Malta	n.s.	-		-	
Monaco	0	-		-	
Portugal	3456	-		-	
Spain	18173	X	59	-	
South-West Europe	30794		89		30
Europe	1019940		0		0
EU-27	157194		0		0
Europe without Russia	210850		0		0

Annex Table C: Countries reporting on voluntary indicators by EFTs (reference year: 2005). 1: data available; 0: data not available

Country	1.3 - Age class/ diameter distribution	4.1 - Tree species composition	4.3 - Naturalness	4.5 - Deadwood
Czech Republic	1	1	0	1
Hungary	1	1	1	0
Slovakia	1	1	0	1
Central-East Europe	3	3	1	2
Switzerland	1	1	1	1
Central-West Europe	1	1	1	1
Denmark	1	1	1	1
Estonia	1	1	1	1
Lithuania	1	1	1	0
Sweden	1	1	1	1
North Europe	4	4	4	3
Bulgaria	1	0	0	0
Croatia	1	1	1	0
Slovenia	1	1	1	1
South-East Europe	3	2	2	1
Total	11	10	8	7

Main results and key findings from pilot reporting

Indicator 1.1 Forest area

Area of forest classified by European Forest Types.

Key finding

In Europe, without the Russian Federation, forest area is highly variable as to forest types; seven forest types, dominated by assemblages of tree species native to Europe, cover more than 70 percent of the total forest area of countries reporting on this indicator (174 million ha), of which 2 forest types ("Boreal forest" and "Hemiboreal and nemoral coniferous and mixed broadleaved coniferous forest") make up more than 40 percent. The proportion of forest consisting of introduced tree species is 4 percent.

Status

Reporting forest area data by EFTs enables the attainment of better insights into the diversity that exists in European forests at different levels of spatial coverage: Europe, regional groups and countries.

The relative share of EFTs in Europe, without the Russian Federation, is shown in Annex Figure A. Not surprisingly, the EFTs with higher forest share (1, 2, 11 and 13) are mostly located in North Europe, the region with the largest forest area covered by this indicator (69 million ha); more than 10 percent of forest cover is made up by temperate deciduous forest communities (5 and 8), while coniferous forests of the Alpine region account for nearly 5 percent. Below the 5 percent threshold are: forests dominated by introduced tree species (14), pure and mixed beech forests (6 and 7), broadleaved evergreen and coniferous forests mainly located in southern Europe (9 and 10), acidophilous oakwoods (4) and rare habitats like floodplain forests (12).

When looking at the distribution of EFTs by region, differences can be observed in the main categories that build up the forest area. (Annex Table D). For instance, in Central-West and South-East Europe, the EFTs accounting

for more than 5 percent of the total forest are classes 9 and 6, respectively, while in other regions it is class 4. There are visible differences among the four more widespread categories within regions:

- North: 1, 2, 11, 13
- Central-West: 2, 5, 14, 7
- Central-East: 2, 5, 13, 3
- South-West: 9, 10, 8, 3
- South-East: 8, 7, 6, 3

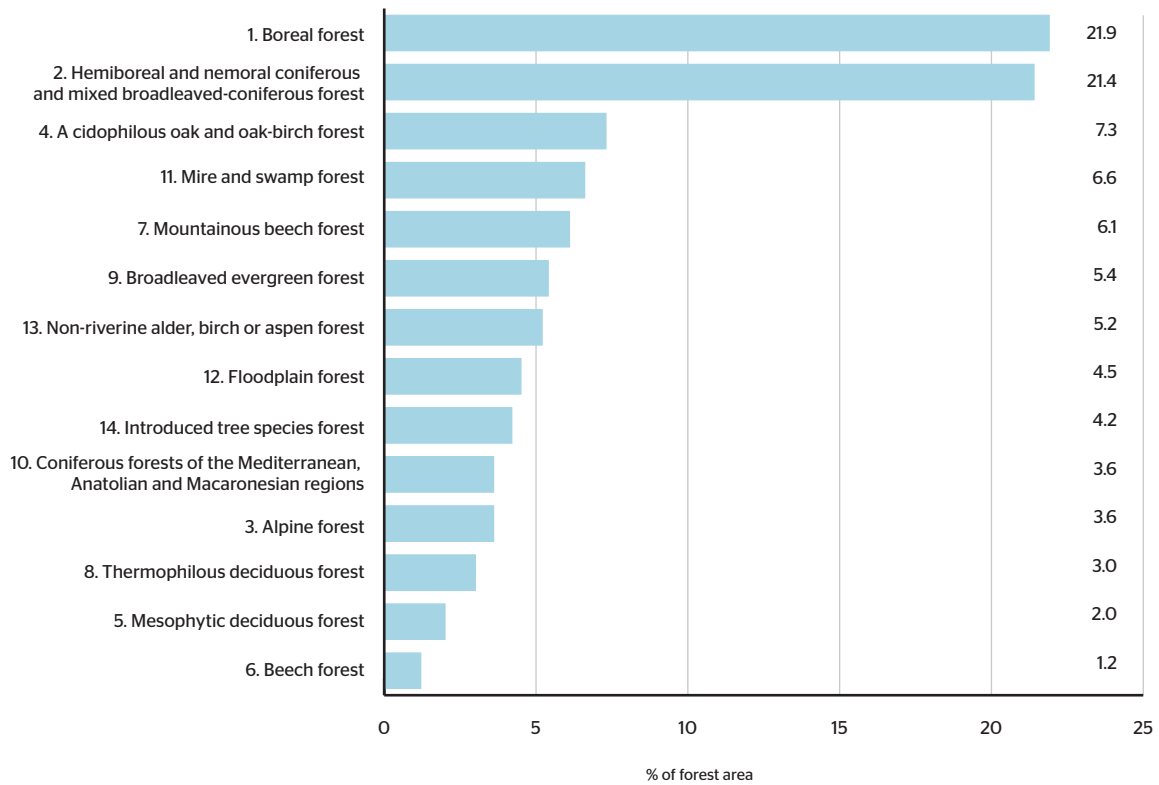
When data are presented by the three general forest types (coniferous, broadleaved and mixed), much of this information is lost and regional differences are obscured.

Trends

In all the European regions, forest area has increased since 1990. Although forest area by EFTs has been reported for a complete time series only by a subset of countries, this information allows a better understanding of which EFTs experience a forest area increase/loss at the country level (Annex Table E). Interestingly, despite a positive annual change in forest cover that has occurred since 1990 in most countries, most EFTs have either decreased (cf. min value Annex Table E) or gained area in this period since 1990, depending on the country. Thus, generalizing trends in the area of EFTs at the EU level could lead to misleading interpretations.

The analysis presented here, however, is not intended to provide an accurate picture of country trends, as data inconsistencies are to be expected (e.g. due to forecasts between reporting years); rather, it casts a new light on future perspectives for forest area trends analysis. If countries were able to reliably track changes in the area of EFTs by periodical update of national forest inventories/maps, this would enable question-driven monitoring at the country level (e.g. are forest gains due to extension of introduced tree species or expansion of native tree species? Is there any significant loss of valuable forest habitats?)

Annex Figure A: Relative share of European Forest Types in Europe. Processed from data reported by 28 countries for 2010, except for Switzerland (2005) and UK (2000)



Annex Table D: Distribution of forest area by EFTs and by forest types applied in SoEF2007 in different European regions. In bold, the four more widespread EFTs. Processed from data reported by 28 countries for 2010, except for Switzerland (2005) and UK (2000)

Region	Percent of European Forest Type area														Forest types as applied for SoEF2007			
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified forest	Predominantly coniferous forest	Predominantly broadleaved forest	Mixed forest
Central-East Europe	2	47	5	1	13	3	3	1	0	0	4	3	10	4	2	45	30	25
Central-West Europe	0	27	6	7	16	7	8	6	2	1	1	1	3	10	4	42	49	9
North Europe	54	15	4	0	0	0	0	0	0	0	13	0	12	2	0	68	15	17
South-East Europe	0	6	12	1	12	15	15	28	1	3	0	3	0	4	0	17	63	20
South-West Europe	0	2	6	1	1	1	5	19	24	20	0	1	1	4	16	29	60	11

Annex Table E: Annual variation in forest area by European Forest Types in selected European countries (calculated on a compound interest basis)

Country	Annual change in forest cover (percent, 1990-2010, except * 2000-2010)															
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified forest	TOTAL
Belarus	0.50	0.50	-	0.50	0.50	-	-	-	-	-	0.50	0.50	0.50	-	-	0.50
Slovakia*	-	-2.20	-0.49	-0.33	0.61	23.50	-9.77	1.08	-	-	1.13	3.92	-2.05	-0.19	0.78	0.08
Ukraine	-	0.06	0.23	0.16	0.23	0.22	0.23	0.00	-	0.34	0.18	0.24	0.70	0.24	0.24	0.23
Central-East Europe																
Belgium*	-	-	-	-0.10	0.80	0.96	-	-	-	-	1.18	0.74	-	0.00	-1.51	0.16
Ireland	-	-	-	2.66	2.75	-	-	-	-	-	2.32	3.50	2.69	2.27	-	2.33
Central-West Europe																
Estonia*	0.22	1.55	-	-	-	-	-	-	-	-	-1.49	-	-0.18	-3.31	-	-0.18
Finland	-0.10	-0.92	-0.98	-	-	-	-	-	-	-	0.58	-	0.65	2.45	-	0.04
Iceland	-	-	0.00	-	-	-	-	-	-	-	-	-	0.00	0.00	-	0.00
Lithuania*	-	0.00	-	-	0.00	-	-	-	-	-	0.00	0.00	0.00	0.00	-	1
North Europe																
Bulgaria	-	-0.37	-0.13	-	2.19	0.36	2.28	1.32	-	-3.67	-	-	-	2.24	-	0.83
Croatia	-	0.20	0.30	0.17	0.20	0.17	0.19	0.20	0.19	0.19	-	0.18	-	0.06	-	0.19
Cyprus	-	-	-	-	-	-	-	0.61	-	0.36	-	-	-	0.00	-	0.36
Slovenia	-	0.26	0.31	0.27	0.28	0.26	0.26	0.24	-	-	-	0.00	-	-	-	0.27
South-East Europe																
Italy*	-	0.90	0.90	-	0.90	0.90	0.90	0.90	0.90	0.90	-	0.90	0.90	0.90	0.90	0.90
Spain*	-	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	-	0.68	0.68	0.68	0.68	0.68
South-West Europe																
Average	0.21	0.07	0.09	0.50	0.75	3.38	-0.75	0.63	0.59	-0.20	0.71	1.14	1.44	1.02	0.21	0.90
Min	-0.10	-2.20	-0.98	-0.33	-0.85	0.17	-9.77	0.00	0.19	-3.67	-1.49	0.00	-2.05	-3.31	-1.51	-0.18
Max	0.50	1.55	0.90	2.66	2.75	23.50	2.28	1.32	0.90	0.90	2.32	3.92	8.38	7.98	0.90	6.37

Indicator 1.2 Growing stock

Growing stock density (m^3/ha) by European Forest Types.

Key finding

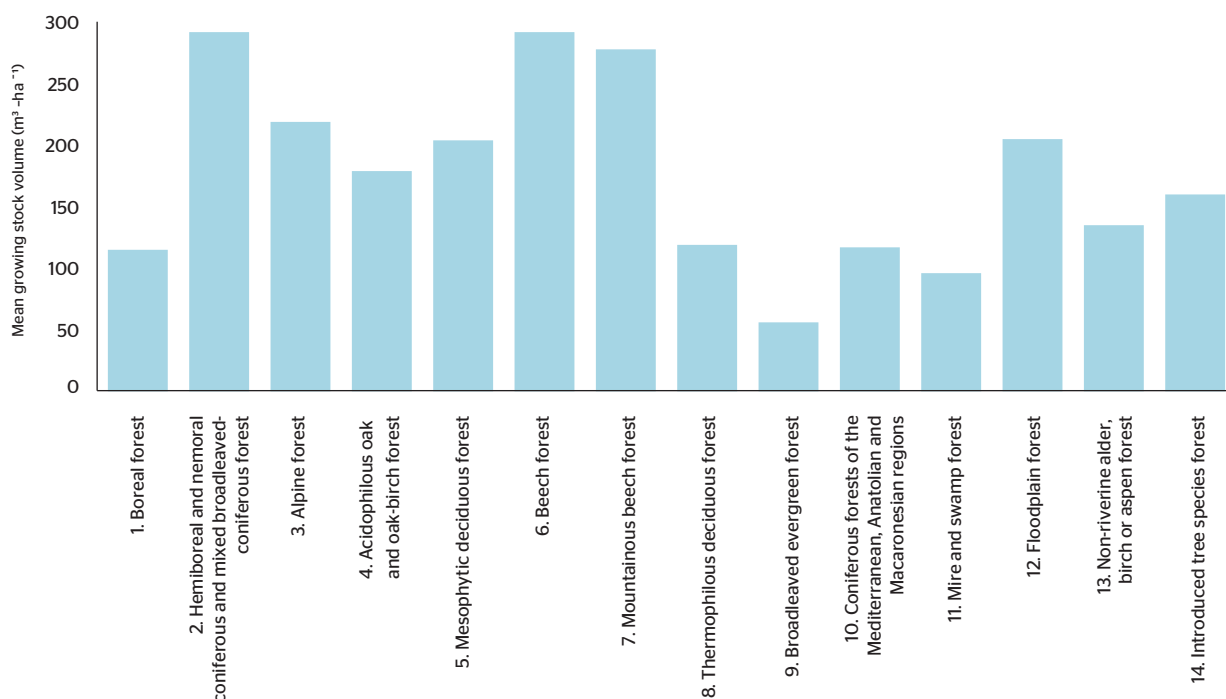
The mean volume of growing stock varies among European forest types. On average, beech dominated forest types present the highest growing stock density ($> 250 m^3/ha$), while broadleaved evergreen forest present the lowest ($< 50 m^3/ha$). This wide range of values can be explained by noticeable differences among forest types

in ecological conditions affecting tree growth, forest cover (closed vs. open) and rotation length.

Status

There is a high variability in the mean volume of growing stock in Europe: the mean value for aEurope is $112 m^3/ha$, but stocking densities found at the country level vary considerably ($15-350 m^3/ha$). Differentiating growing stock by EFTs gives a more diversified picture and allows for additional interpretation of the values (Annex Figure B, Annex Table F).

Annex Figure B: Mean growing stock density by European Forest Types (processed from data of 26 countries, see Annex Table J at the end of the annex).



Annex Table F: Variability in mean growing stock density by European Forest Types (processed from data of 26 countries, see Table J at the end of the annex)

EFTs	Growing stock ($m^3 \cdot ha^{-1}$)		
	Country level		European level
	Min	Max	Mean
1. Boreal forest	105	237	114
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	142	438	291
3. Alpine forest	21	375	218
4. Acidophilous oak and oak-birch forest	96	250	178
5. Mesophytic deciduous forest	74	281	203
6. Beech forest	138	370	291
7. Mountainous beech forest	120	370	277
8. Thermophilous deciduous forest	45	245	118
9. Broadleaved evergreen forest	42	67	55
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	50	172	116
11. Mire and swamp forest	42	259	95
12. Floodplain forest	52	695	204
13. Non-riverine alder, birch or aspen forest	14	202	134
14. Introduced tree species forest	10	609	159

It is interesting to note that reporting growing stock data by previous species groups (i.e. coniferous, broadleaved and mixed) could lead to misleading interpretations of the available data in countries with high ecological variability. For example, in countries like France, Croatia or Italy there are significantly different stocking densities in beech forests (EFT 6) and broadleaved evergreen forest (EFT 9) that would be averaged within the same species group, i.e. broadleaved forest. The same consideration holds for Alpine forest (EFT 3) and Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions (EFT 10).

Voluntary indicators

Available data on voluntary indicators are useful to demonstrate how reporting by EFTs would make information on these indicators more meaningful when contextualized by EFTs. This is particularly true from the perspective of assessing long-term sustainability of forest management at the regional or country level.

Due to the more complex reporting format of voluntary indicators (more than one figure for each EFT), data reported by countries must be further processed to present information in a clear and understandable way. Thus, appropriate question-setting to effectively utilize information on these indicators is critical. Below are presented examples of data processed for indicators "4.1 Tree species composition" and "4.5 Deadwood".

Tree species composition

Data from this indicator have been summarized on the basis of the mean number of tree species per EFT calculated as a weighted average from area data reported at

the country level (Annex Table G). The EFTs that appear to be the most diversified (with at least three species) in the countries with available information are broadleaved forests of the temperate vegetation zones (EFTs 4, 5 and 8). Species richness is lower in forest types associated with more limiting growing conditions in the boreal, alpine or dry Mediterranean vegetation zones (EFTs 1, 3, 9 and 10). Within these ecological constraints, forest management can contribute to decreasing the share of single species stands to the benefit of mixed stands in all forest types. Thus, monitoring the trends using EFTs will allow for a more detailed insight into terms of development of tree species composition.

Deadwood

The weighted average volume of total deadwood (sum of standing and lying components) is about 10 m³/ha in Europe, excluding the Russian Federation (cf. indicator 4.5, main report). Reporting data by EFTs reveals variability in the amount of deadwood associated with different vegetation zones (Annex Table H). In all countries the highest per hectare deadwood levels are observed in EFTs associated with mountainous regions: Alpine (EFT 3) and Mountainous beech forests (EFT 7). This can be explained not solely by favorable growing conditions; it is likely linked to poor accessibility and thus low intensity of harvesting, resulting in a higher amount of deadwood accumulation.

Reporting the indicator 'Deadwood' by EFTs is relevant in particular for evaluating progress at the country/regional level in implementing silvicultural measures that promote biodiversity conservation in both protected forest areas and forest under active management.

Annex Table G: Country variability in tree species composition by EFTs; “-“ indicates that EFTs are not present in the country

"Category (Year: 2005)"	North				Cent-West	Cent-East			South-East		Range
	Denmark	Estonia	Lithuania	Sweden	Switzerland	Czech Rep.	Hungary	Slovakia	Croatia	Slovenia	
1. Boreal forest	-	2	-	2	-	-	-	-	-	-	2
2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3	3	2	3	3	3	-	3	2	3	2-3
3. Alpine forest	-	-	-	1	2	2	-	3	2	3	1-3
4. Acidophilous oak and oak-birch forest	3	-	-	3	4	3	3	3	3	4	3-4
5. Mesophytic deciduous forest	3	-	4	3	4	4	3	4	3	4	3-4
6. Beech forest	2	-	-	2	3	5	4	3	3	4	2-5
7. Mountainous beech forest	-	-	-	-	3	3	-	3	2	3	2-3
8. Thermophilous deciduous forest	-	-	-	-	3	6	3	3	3	4	3-6
9. Broadleaved evergreen forest	-	-	-	-	-	-	-	-	1	-	1
10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	-	-	-	-	-	-	-	-	2	-	2
11. Mire and swamp forest	2	2	3	2	2	2	2	2	-	-	2-3
12. Floodplain forest	3	-	2	2	4	4	3	3	3	4	2-4
13. Non-riverine alder, birch or aspen forest	-	3	3	3	3	3	2	4	-	-	2-4
14. Introduced tree species forest	2	3	2	3	4	3	2	2	2	-	2-4

Annex Table H: Total deadwood amount by EFTs; “-“ indicates that EFTs are not present in the country; “na” indicates that EFTs are present in the country but data are not available

Country	Total volume of deadwood m ³ ha ⁻¹														
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified stocked forests
Czech Republic	-	8.5	22.6	11.4	9.7	9.1	16.4	na	-	-	21.3	13.9	11.6	10.0	11.9
Slovakia	-	28.0	31.7	19.2	14.8	24.5	51.1	7.3	-	-	9.9	12.2	14.0	17.6	18.2
Switzerland															
Denmark	-	4.6	-	4.6	5.5	4.7	-	-	-	-	11.7	8.6	-	4.5	8.4
Estonia	-	13.3	23.2	12.0	12.8	13.5	24.0	18.8	-	-	12.6	8.3	7.2	13.0	n.a.
Sweden	9.0	7.2	na	8.5	13.5	14.4	-	-	-	-	4.2	9.1	7.5	4.8	0.0
Slovenia	-	8.6	16.0	14.2	11.6	11.6	13.2	11.1	-	-	-	10.9	-	-	0.0
Average	9.0	11.7	23.4	11.6	11.3	13.0	26.2	12.4	-	-	11.9	10.5	10.1	10.0	7.7
Min	9.0	4.6	16.0	4.6	5.5	4.7	13.2	7.3	0,0	0,0	4.2	8.3	7.2	4.5	0.0
Max	9.0	28.0	31.7	19.2	14.8	24.5	51.1	18.8	0,0	0,0	21.3	13.9	14.0	17.6	18.2

Concluding remarks

Findings from pilot reporting on EFTs overall are encouraging. The feasibility of the system has been demonstrated in the following ways:

- by the high share of the response rate on compulsory indicators: 28 countries, accounting for 83 percent of forest area in Europe (without the Russian Federation), presented forest area based on the 14 EFTs while 26 countries, accounting for 58 percent of forest area in Europe (without the Russian Federation), provided information on growing stock.
- by the availability of a complete time series (1990, 2000, 2005, 2010) for a consistent number of countries.
- by the fact that the main reason for a few countries to not report by EFTs was the lack of NFIs; countries declared that as soon as NFIs are implemented, reporting by EFTs is expected to be feasible.
- by the relatively moderate share of unclassified forest area; various countries indicated that the forest areas that were unclassified were only small proportions of their total forest share. Unclassified forest area derives partly from factors not related to the classification in itself (permanently and temporarily unstocked areas or stands not inventoried for different reasons). Further reporting of unclassified forest area was associated with species assemblages that are not reflected in the EFTs. These can be addressed in the future, based on further improvement of the EFT scheme.

The added value of the new EFTs in conveying new meaningful information on forest resources in Europe was demonstrated as well in this pilot report. Reporting data by EFTs allows countries:

- to gain insights into the large variability of forest communities that build up the European forest cover and their distribution across different countries and regions. When data are presented by previous forest types (coniferous, broadleaved and mixed), most of this information is lost and regional differences are obscured.
- to enhance the interpretation of trends in forest area development, facilitating question-driven monitoring at the country/regional level (e.g. are forest gains due to extension of introduced tree species or expansion of native tree species? Is there any significant loss of valuable forest habitats?)
- to better embed indicators (including also those currently reported on a voluntary basis, i.e. age distribution, species richness, levels of naturalness and amount of deadwood) into ecologically relevant contexts. This helps to reveal the variability in the value taken by the indicators across different EFTs. It is helpful, knowing these environmental constraints, to evaluate progress toward more sustainable forest management conditions in individual EFTs (e.g. increase in growing stock levels, promotion of multispecies stands and accumulation of deadwood).

In conclusion, the additional effort made by countries to provide information on selected indicators by EFTs seems to be largely outweighed by the valuable information provided by the new system of reporting.

Annex Table I: Extent of forest by European Forest Types. (Reference year 2010, except: * =2005; **=2010)

Country	European Forest Types Area (1000 ha)															
	1. Boreal forest	2. Hemiboreal and nemoral coniferous and mixed broadleaved-coniferous forest	3. Alpine forest	4. Acidophilous oak and oak-birch forest	5. Mesophytic deciduous forest	6. Beech forest	7. Mountainous beech forest	8. Thermophilous deciduous forest	9. Broadleaved evergreen forest	10. Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	11. Mire and swamp forest	12. Floodplain forest	13. Non-riverine alder, birch or aspen forest	14. Introduced tree species forest	Unclassified forest	TOTAL
Belarus	688	5332	0	86	86	0	0	0	0	0	1118	86	1204	0	0	8600
Czech Republic	0	1626	399	7	158	185	79	0	0	0	67	41	47	41	6	2657
Hungary	0	0	0	140	488	131	0	156	0	0	4	38	51	906	0	1913
Poland	0	5964	303	107	868	263	372	43	0	0	113	283	917	46	40	9319
Slovakia	0	143	447	6	310	475	216	31	0	0	8	29	13	41	220	1938
Ukraine	0	3133	641	31	2448	71	375	22	0	61	138	557	1279	402	588	9746
Central-East Europe	688	16199	1790	377	4357	1125	1041	252	0	61	1448	1034	3511	1436	854	34173
Austria	0	1231	1100	6	203	294	401	3	0	0	4	61	44	35	475	3857
Belgium	0	0	0	100	143	77	0	0	0	0	9	14	0	286	49	678
France	0	1797	430	2228	3092	585	1913	2009	827	392	76	381	341	744	332	15147
Germany	0	6210	133	0	1637	1474	390	0	0	0	306	0	485	441	0	11076
Ireland	0	0	0	19	47	0	0	0	0	0	16	4	21	629	0	737
Netherlands	0	111	0	39	80	13	0	0	0	0	0	0	28	91	3	365
Switzerland*	0	256	487	3	127	167	59	34	0	0	5	11	22	6	40	1217
United Kingdom**	0	91	0	271	310	48	0	0	0	0	0	56	47	1452	518	2793
Central-West Europe	0	9696	2150	2666	5639	2658	2763	2046	827	392	416	527	988	3685	1416	35870
Denmark	0	28	0	28	95	83	0	0	0	0	2	34	0	286	30	587
Estonia	950	39	0	0	0	0	0	0	0	0	304	0	909	1	0	2203
Finland	15462	451	316	0	0	0	0	0	0	0	4360	0	1462	34	0	22085
Iceland	0	0	3	0	0	0	0	0	0	0	0	0	6	21	0	30
Latvia	411	1229	0	0	0	0	0	0	0	0	267	0	1192	1	253	3354
Lithuania	0	1108	0	0	134	0	0	0	0	0	370	28	521	4	0	2165
Norway	5415	1147	1038	21	5	8	0	0	0	0	653	5	1719	239	0	10250
Sweden	15211	6380	1095	125	38	79	0	0	0	0	2860	25	2253	539	0	28605
North Europe	37449	10383	2452	174	272	170	0	0	0	0	8816	92	8062	1126	283	69279
Bulgaria	0	326	815	0	353	414	113	1690	0	9	0	0	0	207	0	3927
Croatia	0	25	34	59	415	181	564	225	80	53	0	201	0	83	0	1920
Cyprus	0	0	0	0	0	0	0	1	0	171	0	0	0	1	0	173
Slovenia	0	79	33	19	112	489	431	86	0	0	0	3	0	0	0	1252
South-East Europe	0	430	882	78	880	1084	1108	2002	80	233	0	204	0	291	0	7272
Italy	0	81	1240	0	161	63	1018	3553	913	393	0	113	131	341	1143	9149
Spain	0	400	490	146	103	89	264	1555	5565	5207	0	182	16	886	3269	18173
South-West Europe	0	481	1729	146	264	152	1281	5108	6478	5600	0	295	147	1228	4412	27322

Annex Table J: Growing stock (volume) in forests by European Forest Types

Country	European Forest Types growing stock (1000 m ³ o.b.)							
	Boreal forest	Hemiboreal and nemoral coniferous and mixed broad-leaved-coniferous forest	Alpine forest	Acidophilous oak and oak-birch forest	Mesophytic deciduous forest	Beech forest	Mountainous beech forest	Thermophilous deciduous forest
Belarus	125288	970982	0	15661	15661	0	0	0
Czech Republic	0	508635	119845	1406	34550	46865	20952	35
Hungary	0	0	0	31626	105929	43201	0	25030
Poland	0	1508095	94525	18373	207086	71572	125027	10520
Slovakia	0	40451	124371	1408	77747	141072	60764	7662
Ukraine	0	788000	212000	4000	477000	22000	124000	1000
Central-East Europe	125288	3816163	550741	72474	917974	324710	330743	44247
Austria	0	455813	361003	1393	42950	99017	135521	416
Belgium	0	0	0	20332	28476	17987	0	0
France**	0	296114	78985	384451	529597	120323	466996	223379
Germany	0	2108465	49935	0	407865	508434	144219	0
Ireland	0	0	0	1855	3490	0	0	0
Netherlands	0	20200	0	6500	14200	3300	0	0
Switzerland*	0	112244	172707	667	34687	58912	14564	7290
Central-West Europe	0	2992836	662630	415198	1061265	807973	761299	231085
Denmark	0	4149	0	3443	15619	30674	0	0
Estonia	225376	5922	0	0	0	0	0	0
Finland	1625023	64254	6609	0	0	0	0	0
Iceland	0	0	168	0	0	0	0	0
Latvia	84070	295770	0	0	0	0	0	0
Lithuania	0	276791	0	0	28084	0	0	0
Norway	595118	169120	37285	3121	1318	1348	0	0
Sweden	1706161	1071655	n.a.	25338	8001	21268	0	0
North Europe	4235748	1887662	44062	31902	53022	53290	0	0
Bulgaria	0	66500	219800	0	46800	57000	13600	228700
Croatia	0	3820	8430	14748	104786	49022	143196	14538
Cyprus	0	0	0	0	0	0	0	226
Slovenia	0	32231	9423	3878	31480	169703	152941	15219
South-East Europe	0	102551	237653	18626	183066	275725	309737	258683
Italy*	0	19799	346352	0	21348	9749	230261	372132
South-West Europe	0,0	19799	346352	0	21348	9749	230261	372132

Annex Table J: Growing stock (volume) in forests by European Forest Types (cont.)

Country	European Forest Types growing stock (1000 m ³ o.b.)							
	Broad-leaved evergreen forest	Coniferous forests of the Mediterranean, Anatolian and Macaronesian regions	Mire and swamp forest	Floodplain forest	Non-riverine alder, birch or aspen forest	Introduced tree species forest	Unclassified forest	TOTAL
Belarus	0	0	203593	15661	219254	0	0	1566100
Czech Republic	0	0	13723	10967	6248	5264	858	769348
Hungary	0	0	632	8564	10260	130468	1	355709
Poland	0	0	18375	67733	165420	9353	7889	2303968
Slovakia	0	0	1596	6736	1782	6287	44217	514093
Ukraine	0	9000	14000	125000	182000	44000	117000	2119000
Central-East Europe	0	9000	251919	234660	584964	195371	169965	7628218
Austria	0	0	541	12918	8898	9749	11718	1139937
Belgium	0	0	985	2998	0	78698	18424	167900
France**	34742	34322	11205	56463	38609	152966	25042	2453193
Germany	0	0	79268	0	75776	118029	0	3491991
Ireland	0	0	741	218	1303	66693	0	74300
Netherlands	0	0	0	0	3500	22300	30	70030
Switzerland*	0	0	1259	2014	2564	1922	n.a.	408830
Central-West Europe	34742	34322	93999	74612	130650	450357	55214	7806182
Denmark	0	0	368	7658	0	51445	0	113355
Estonia	0	0	42738	0	166783	609	0	441427
Finland	0	0	358052	0	149858	3436	0	2207232
Iceland	0	0	0	0	82	200	0	450
Latvia	0	0	33810	0	210200	258	8722	632830
Lithuania	0	0	66959	5077	101932	535	0	479378
Norway	0	0	27707	873	108403	53458	0	997751
Sweden	0	0	144105	3392	228473	34203	0	3242596
North Europe	0	0	673738	17000	965731	144143	8722	8115020
Bulgaria	0	1000	0	0	0	23000	0	656400
Croatia	5147	5162	0	48290	0	12758	0	409897
Cyprus	0	8603	0	0	0	n.a.	0	8829
Slovenia	0	0	0	2085	0	0	0	416960
South-East Europe	5147	14765	0	50375	0	35758	0	1492086
Italy*	58519	64941	0	12735	14404	32959	86218	1269416
South-West Europe	58519	64941	0	12735	14404	32959	86218	1269416

Reference year 2010, except *: 2005, **: data available only for forest area available for wood supply