Forestry Department
Food and Agriculture Organization of the United Nations

GLOBAL FOREST RESOURCES ASSESSMENT

COUNTRY REPORTS

DENMARK

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The Forest Resources Assessment Programme

Sustainably managed forests have multiple environmental and socio-economic functions important at the global, national and local scales, and play a vital part in sustainable development. Reliable and up-to-date information on the state of forest resources - not only on area and area change, but also on such variables as growing stock, wood and non-wood products, carbon, protected areas, use of forests for recreation and other services, biological diversity and forests' contribution to national economies - is crucial to support decision-making for policies and programmes in forestry and sustainable development at all levels.

FAO, at the request of its member countries, regularly monitors the world's forests and their management and uses through the Forest Resources Assessment Programme. This country report forms part of the Global Forest Resources Assessment 2005 (FRA 2005), which is the most comprehensive assessment to date. More than 800 people have been involved, including 172 national correspondents and their colleagues, an Advisory Group, international experts, FAO staff, consultants and volunteers. Information has been collated from 229 countries and territories for three points in time: 1990, 2000 and 2005.

The reporting framework for FRA 2005 is based on the thematic elements of sustainable forest management acknowledged in intergovernmental forest-related fora and includes more than 40 variables related to the extent, condition, uses and values of forest resources. More information on the FRA 2005 process and the results - including all the country reports - is available on the FRA 2005 Web site (www.fao.org/forestry/fra2005).

The Global Forest Resources Assessment process is coordinated by the Forestry Department at FAO headquarters in Rome. The contact person for matters related to FRA 2005 is:

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Introduction and sources of information

The main sources of information on forest resources in Denmark in the period 1990 - 2005 are the following:

Skove og plantager 2000
Larsen, P.H. & Johannsen,V.K. 2002. Skove og plantager 2000. Danmarks Statistik, Skov & Landskab og Skov- og Naturstyrelsen. ISBN: 87-501-1287-2
This National Forest Census is based on questionnaires to all forest owners, resulting in information on area, main species, age class distribution and productive indicators.
Note: The number of respondents for this survey was 32.300, which is considerably higher than the number of 22.300 in the 1990 survey. The number of respondents may cause the changes in the period from 1990 to 2000 more than real changes in the forest area.
Note: Since the data is based on questionnaire and not field observations, the actual forest definition may vary slightly. The basic definition is that the forest area must be minimum 0.5 ha. There is no specific guideline on the crown cover or the height of the trees.
Note: All values for growing stock are estimated based on questionnaire data on main species, ageclass and site productivity.

Skove og plantager 1990
Zangenberg, C.U. & Hansen, C.P. 1994: Skove og plantager 1990. Danmarks Statistik og Skov- og Naturstyrelsen. ISBN: 87-501-0887-5
National Forest Inventory
Based on questionnaires to all forest owners (number of respondents was 22.300), resulting in information on area, main species, age class distribution and productive indicators.
Note: Since the data is based on questionnaire and not field observations, the actual forest definition may vary slightly. The basic definition is that the forest area must be minimum 0.5 ha. There is no specific guideline on the crown cover or the height of the trees.
Note: All values for growing stock are estimated based on questionnaire data on main species, ageclass and site productivity.

AIS - Area Information System
Arealanvendelseskortet 1:25.000. Miljø- og Energiministeriet, Danmarks Miljøundersøgelser. http://www2.dmu.dk/1_Viden/2_Miljoe-tilstand/3_samfund/AIS/index.htm
Developed based on combination of several cartographic information. The area classifications may be uncertain. Here are utilised the Land Cover Plus theme. The information is based on analysis satellite images from the period 1992-1997 (AIS). The cell size was 0,0625 ha, however the minimum mapped unit was twice this size.

Forest and Nature Agency
Database on national forest land and other areas in connection with national forests. Gives information on area, species composition, coverage, age class distribution and productive indicators.

Danmarks Statistik - Official Statistics of Denmark
www.statistikbanken.dk, www.dst.dk.
Provides official statistics on total land area, trade statistics, wood removals.

Beredskabsstyrelsen, Danish Emergency Management Agency
Records all occurrences of fire, also in forest.
http://www.beredskabsstyrelsen.dk/uk/index.htm

National Forest Inventory
Performed by Forest and Landscape Denmark - KVL.
Initiated in 2002 based on continuous sampling with partial replacement. The first rotation is 5 years, with the first full data set being available after the 2006 inventory season. The first results on forest area and it's composition are expected in 2007. Hence the results from this NFI can not be utilised in this update of the FRA. For future updates of FRA the NFI will provide better data on practically all subjects. The definitions used in the NFI are consistent with the FRA guidelines.

Other references:

Danmarks Statistik 2002: Landbrug 2001. Statistik om landbrug, gartneri og skovbrug. ISBN 87-501-1263-5. 274 pp.

Johannsen, V.K. 2002: Dokumentation af beregninger i forbindelse med Skovtælling 2000. Center for Skov, Landskab og Planlægning (FSL), Skovstatistik, Arbejdsnotat nr. 6.

Jonsell, B. (eds) 2000. Flora Nordica. Bergius Foundation, Vol. 1 and 2.

Mainz, H. 2004: Eksporten i 2003. PS Nåledrys 49/04.

Madsen, S.F 1987: Vedmassefunktioner ved forskellige aflægningsgrænser og nøjagtighedskrav for nogle vigtige danske skovtræarter. The Danish Forest Experiment Station. XLI: 41-242.

Madsen, S.F. & Heusérr, M. 1993: Volume and stem-taper functions for Norway spruce in Denmark. Forest & Landscape Research 1:51-78.

Moltesen, P., 1988. Skovtræernes ved. Skovteknisk Institut, Akademiet for Tekniske Videnskaber. ISBN 87-87798-52-2.

Nihlgård, B., Lindgren, L., 1977. Plant biomass, primary production and bioelements of three mature beech forests in South Sweden. Oikos 28: 95-104.

Schöne, D. Schulte, A., 1999. Forstwirtschaft nach Kyoto: Ansätze zur Quantifizierung und betrieblichen Nutzung von Kohlenstoffsenken. Forstarchiv 70: 167-176.

Skovbrugstabeller 1990, Det Forstlige Forsøgsvæsen.

Stoltze, M. og Pihl, S. (red.) 1998: Rødliste 1997 over planter og dyr i Danmark (*Redlist 1997 for flora and fauna in Denmark*). Miljø- og Energiministeriet, Danmarks Miljøundersøgelser og Skov- og Naturstyrelsen.

Vande Walle, I. Mussche, S., Samson, R., Lust, N., Lemeur, R. 2001. The above- and belowground carbon pools of two mixed deciduous forest stands located in East-Flanders (Belgium). Annals of Forest Science 58: 507-517.

Vedel, H. 1985. Træer og buske i landskabet. Politikkens forlag. 253 pp.

Vejre, H., Callesen, I, Vesterdal, L, Raulund-Rasmussen, K. 2002. Carbon and nitrogen in Danish forest soils - contents and distribution determined by soil order. Soil Sci. Soc. Am. J. (in review).

1 Table T1 – Extent of Forest and Other wooded land

1.1 FRA 2005 Categories and definitions

Category	Definition
Forest	Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds *in situ*. It does not include land that is predominantly under agricultural or urban land use.
Other wooded land	Land not classified as "Forest", spanning more than 0.5 hectares; with trees higher than 5 meters and a canopy cover of 5-10 percent, or trees able to reach these thresholds *in situ*; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.
Other land	All land that is not classified as "Forest" or "Other wooded land".
Other land with tree cover (Subordinated to "Other land")	Land classified as "Other land", spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 meters at maturity.
Inland water bodies	Inland water bodies generally include major rivers, lakes and water reservoirs.

1.2 National data

1.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 2000	M	Forest	2000	The forest definition is in general in accordance with the FAO definition.
Skove og plantager 1990	M	Forest	1990	The forest definition is in general in accordance with the FAO definition.
Danmarks Statistik	H	Other land, Inland water bodies	1990, 2000	
AIS	M	Other wooded land	2000	

1.2.2 Classification and definitions

National class	Definition
Forest	Land spanning more than 0.5 hectares with trees. It does not include land that is predominantly under agricultural or urban land use. Includes temporarily unstocked areas and smaller open areas in the forests needed for the forest management.
Other wooded land	Forest with mountain pine, forest on heathland and Juniperus dominated heathland (from the AIS Land Cover Plus theme)
Other land	
Other land with tree cover	Insufficient data available - no data collection on this theme.
Inland water bodies	

Note: If different national data sources use different classes and definitions, a table such as above is needed for each relevant data source.

1.2.3 Original data

Skove og plantager 1990 and Skove og plantager 2000.

FRA 2005 Categories	Area (1000 hectares)	
	1990	2000
Forest	445	486

Net afforestation for the period 1990-1999 amounts to 27 500 ha - equalling an average of 2750 ha per year (Skove og plantager 2000, p. 26).

For the other wooded land an estimate have been obtained from the AIS Land Cover Plus themes. The results refer to the period 1992-1997. The classes used for the estimate are indicated in the following table.
AIS

AIS LCP class	Area (1000 hectares)
10: Bush and grass dominated heath land	28
11: Bush dominated heath land	36
14: Bush and forest area	84
38: Juniperus dominated heath land	2
TOTAL	**150**

1.3 Analysis and processing of national data

1.3.1 Calibration

No calibration performed for the forest area.

1.3.2 Estimation and forecasting

The total land area and the inland water bodies are assumed constant for the period 2000 to 2005.
There were sent 45 % more questionnaires to respondents in the 2000 survey compared to the 1990 survey. This resulted in some differences between the two surveys, caused more by the number of respondents than by real changes in the forest area. Hence the 2000 survey is used as basis for the forecasting.
The forest area is expected to increase by 2750 ha per year for the period 2000 to 2005, resulting in an increase of 13 250 ha in the entire period.
As only one estimate (1992-1997) is available for the other wooded land area, this is used for all the reporting years.

1.4 Reclassification into FRA 2005 classes

No reclassification was done for the forest area as the results are obtained from the Forest Census.

For the other wooded land the themes are reclassified as indicated in the table of the original data. The classes used for the estimate are indicated in the following table. It is assumed that most of these areas occur in parts of minimum 0.5 ha of 20 m width. Only half the area of the "Bush and grass dominated heath land" are considered part of Other wooded land.

AIS

AIS LCP class	**Area (1000 hectares)**	**contribution (%)**	**OWL-area (1000 hectares)**
10: Bush and grass dominated heath land	28	50	14
11: Bush dominated heath land	36	100	36
14: Bush and forest area	84	100	84
38: Juniperus dominated heath land	2	100	2
TOTAL			**136**

1.5 Data for National reporting table T1

FRA 2005 Categories	**Area (1000 hectares)**		
	1990	**2000**	**2005**
Forest	445	486	500
Other wooded land	136	136	136
Other land	3662	3621	3607
...of which with tree cover [1)]	ID	ID	ID
Inland water bodies	66	66	66
TOTAL	**4309**	**4309**	**4309**

1) Area of “Other land with tree cover” is included in the area reported under “Other land” and should therefore be excluded when calculating the total area for the country.

1.6 Comments to National reporting table T1

There were sent more questionnaires to respondents in the 2000 survey compared to the 1990 survey. This resulted in some differences between the two surveys, caused more by the number of respondents than by real changes in the forest area.

Efforts are underway to obtain a more accurate estimate of the forest area for 1990 in relation to the reporting requirements for the Kyoto Protocol.

The forecasting of the forest area in 2005 is uncertain for the following reasons:
The net afforestation for the period 1990-1999 amounts to 27 500 ha - equalling an average of 2750 ha per year (Skove og plantager 2000, p. 26).

The afforestation for the period 1990-1999 included 13 200 ha with species primarily used for Christmas tree and greenery production. It is questionable whether the same rate will apply for the next reporting period.

In the state forests 3700 ha were afforestated in the period, other public afforestation amounted to 1000 ha while private afforestation with subsidies resulted in 5600 ha. Beside this some 4000 ha were privately afforested without subsidies.

Most of the afforestation occurred during the last 5 years of the period. The major wind storm in December 1999 may have an impact on the rate of afforestation in the period from 2000 to 2005.

In conclusion, the forecasting of the forest area in 2005 is uncertain, but other reliable information is not available at the time of reporting.

The information on other wooded land is based on analysis satellite images from the period 1992-1997 (AIS). The cell size was 0.0625 ha, however the minimum mapped unit was twice this size. There are some uncertainties in the classifications and whether the reclassification into the FRA2005 Other wooded land Categories. The AIS project also provides estimates of the forested area. These are giving a forested area of 441 000 ha. Considering that the forest area of AIS excludes temporarily unstocked areas and smaller open areas in the forests needed for the forest management there are no major divergence to the forest census results.

In the TBFRA 2000 (ECE/TIM/SP/17) the estimate of other wooded land was 93 000 ha. The estimate of OWL has changed primarily because of the changed method of estimation. And the applied estimation method is likely to better cover all the areas meeting the definition of OWL.

2 Table T2 – Ownership of Forest and Other wooded land

2.1 FRA 2005 Categories and definitions

Category	Definition
Private ownership	Land owned by individuals, families, private co-operatives, corporations, industries, religious and educational institutions, pension or investment funds, and other private institutions.
Public ownership	Land owned by the State (national, state and regional governments) or government-owned institutions or corporations or other public bodies including cities, municipalities, villages and communes.
Other ownership	Land that is not classified either as "Public ownership" or as "Private ownership".

2.2 National data

2.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 2000	H	Forest	2000	The forest definition is in general in accordance with the FAO definition.
Skove og plantager 1990	H	Forest	1990	The forest definition is in general in accordance with the FAO definition.

2.2.2 Classification and definitions

National class	Definition
Private ownership	The sum of three national classes: Private ownership, Funds etc. and Corporate ownership.
Public ownership	The sum of three national classes: Forest and Nature Agency, Other state forests and Other public ownership
Other ownership	No data falls under this class.

2.2.3 Original data

FRA 2005 Categories and national categories	Area (1000 hectares)		Area (%)	
	Forest		Forest	
	1990	2000	1990	2000
Privately owned forests	202	224	45	46
Foundations, organizations etc.	29	30	6	6
Joint-stock companies, partnerships, cooperative societies and other societies	74	94	17	19
Private ownership	**305**	**348**	**69**	**72**
The National Forest and Nature Agency	114	113	26	23
Other state-owned forests	5	5	1	1
Counties and municipalities	21	20	5	4
Public ownership	**140**	**138**	**31**	**28**
Other ownership	0	0	0	0
TOTAL	**445**	**486**	**100**	**100**

2.3 Analysis and processing of national data

As national data are available for all reporting years no analysis or processing was needed. There is no information available on the ownership of other wooded land, as the statistics on these areas are sparse.

2.4 Reclassification into FRA 2005 classes

National classification is paired directly with the FRA 2005 classes. No reclassification was done.

2.5 Data for National reporting table T2

FRA 2005 Categories	Area (1000 hectares)			
	Forest		Other wooded land	
	1990	2000	1990	2000
Private ownership	305	348	ID	ID
Public ownership	140	138	ID	ID
Other ownership	0	0	ID	ID
TOTAL	**445**	**486**	**136**	**136**

2.6 Comments to National reporting table T2

The share of private ownership is increasing slightly from 1990 to 2000. This is probably a result of the higher number of respondents in the 2000 survey. Most of the new respondents were private forest owners.

3 Table T3 – Designated function of Forest and Other wooded land

3.1 FRA 2005 Categories and definitions

Types of designation

Category	Definition
Primary function	A designated function is considered to be primary when it is significantly more important than other functions. This includes areas that are legally or voluntarily set aside for specific purposes.
Total area with function	Total area where a specific function has been designated, regardless whether it is primary or not.

Designation categories

Category / Designated function	Definition
Production	Forest / Other wooded land designated for production and extraction of forest goods, including both wood and non-wood forest products.
Protection of soil and water	Forest / Other wooded land designated for protection of soil and water.
Conservation of biodiversity	Forest / Other wooded land designated for conservation of biological diversity.
Social services	Forest / Other wooded land designated for the provision of social services.
Multiple purpose	Forest / Other wooded land designated to any combination of: production of goods, protection of soil and water, conservation of biodiversity and provision of social services and where none of these alone can be considered as being significantly more important than the others.
No or unknown function	Forest / Other wooded land for which a specific function has not been designated or where designated function is unknown.

3.2 National data

3.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 2000	L	Forest	2000	The information on designated areas are uncertain.
The Forest and Nature Agency	M	Forest	2000-2003	Summary statistics on Protected Forest Areas.

3.2.2 Classification and definitions

National class	Definition
Forest reserve	According to the Danish Forest Act it is mandated to manage so.called forest reserve land with sustainable management - with respect to economic, ecological and social values. Approx. 85 % of the forest area is designated forest reserve land.
Strict Nature Protection Areas	Areas closed to the public due to special scientific values or very fragile ecology.

National Trust Areas	Larger areas with special (aesthetic) landscape values or natural values. The protection is maintained by the Danish Forest and Nature Agency (Ministry of Environment) irrespective of ownership.
Non-intervention forest	Smaller areas of semi-natural (deciduous) forest left unmanaged with no removal of wood and no drainage.
Areas managed according to the Strategy for Natural Forests	Smaller areas of forest designated for historic management practices, selective cutting and continuous forest cover.
Natura 2000	Include all NATURA 2000 areas according to the EU Habitat Directive and Bird Protection Areas. Available information on total land area, but not on forested area within this. Specific management restrictions are not yet implemented on the areas.
Protection of soil	Areas where forests have a protective function for the soil.
Protection of ground water	Areas designated for drinking water extraction.

3.2.3 Original data

National class	**Area (1000 hectares)**
	2000
Forest reserve	461
Strict Nature Protection Areas	5
National Trust Areas	70
Non-intervention forest	6
Areas managed according to the Strategy for Natural Forests	11
Natura 2000	ID
Protection of soil	34
Protection of ground water	288

No information available on 1990 or 2005.

It should be noted that the national classes are overlapping, with the total forest area being 486 000 ha.

There are a number of forests where one of the main functions is social services. However - the total area is not known. As a consequence of the Forest Act most forests are open to the public and hence can be seen as having social service functions.

With regard to Multiple purpose forests most forests will fall into this category. E.g. a strict nature protection area may be located in a larger area designated for drinking water extraction.

3.3 Analysis and processing of national data

3.3.1 Calibration

No calibration performed.

3.3.2 Estimation and forecasting

The figures from 2000 are applied to reporting years 2000 and 2005, with the exception that the area designated for forest production in all the reporting years are the total forest area excluding the area of Non-intervention forest.
Some areas have been designated in the period 1990 to 2000, and hence a reduction is performed for the 1990 reporting year.

Specifically following estimations have been performed:

National class	Area (1000 hectares)	Comment
	1990	
Forest reserve	433	Afforestation in the period 1990-1999 amounted to 27.500 ha. These are Forest reserves in 2000. Hence a reduction of 28.000 ha in comparison with 2000
Strict Nature Protection Areas	4	Assumed 1000 ha designated in the period 1990 to 2000
National Trust Areas	67	Assumed 3000 ha designated in the period 1990 to 2000
Non-intervention forest	1	Assumed 5000 ha designated in the period 1990 to 2000
Areas managed according to the Strategy for Natural Forests	0	Strategy for Natural Forests implemented in 1994. All areas designated in the period 1990 to 2000.
Natura 2000	ID	ID
Protection of soil	34	Assumed constant in the period 1990 to 2000.
Protection of ground water	0	Areas designated for drinking water extraction designated in 1997.

It should be noted that the national classes are overlapping, with the total forest area being 445 000 ha in 1990 and 500 000 in 2005.

3.4 Reclassification into FRA 2005 classes

As the national classes are overlapping an exact reclassification can not be performed.

It is assumed that the areas for conservation of biodiversity do not overlap with areas for protection of soil. The biodiversity classes are overlapping internally. For this reporting the areas of Strict Nature Protection and Non-intervention forest are assumed to be 100 % overlapping with the two remaining classes - National Trust Areas and Areas managed according to the Strategy for Natural forests.

The areas for protection of ground water overlaps certainly with the other classes, and most forest areas have another primary function than protection of ground water.

There are a number of forests where one of the main functions is social services. However - the total area is not known. They are included in the class of Multiple purpose forests.

The reclassification of the remaining forest area to other primary functions will result in areas for Production or Multiple purpose. The reclassification is difficult, and no data are available to guide the estimation. Areas with the primary function Production will most likely cover

more than 50 % of the remaining forest area. The rest is supposed to have Multiple purpose as primary function.

Following reclassification has been performed:

National class	**FRA 2005 classes**	**Area**		
		1990	**2000**	**2005**
Forest reserve	Production	172	185.5	192.5
Forest reserve	Multiple purpose	172	185.5	192.5
Strict Nature Protection Areas	Conservation of biodiversity	67	81	81
National Trust Areas	Conservation of biodiversity			
Non-intervention forest	Conservation of biodiversity			
Areas managed according to the Strategy for Natural Forests	Conservation of biodiversity			
Natura 2000	Conservation of biodiversity			
Protection of soil	Protection of soil and water	34	34	34
Protection of ground water	Protection of soil and water			
SUM		445	486	500

3.5 Data for National reporting table T3

FRA 2005 Categories / Designated function	**Area (1000 hectares)**					
	Primary function			**Total area with function**		
	1990	**2000**	**2005**	**1990**	**2000**	**2005**
Forest						
Production	172	186	193	444	480	494
Protection of soil and water	34	34	34	34	322	322
Conservation of biodiversity	67	81	81	67	81	81
Social services	ID	ID	ID	ID	ID	ID
Multiple purpose	172	186	193	not appl.	not appl.	not appl.
No or unknown function	ID	ID	ID	not appl.	not appl.	not appl.
Total - Forest	**445**	**486**	**500**	**not appl.**	**not appl.**	**not appl.**
Other wooded land						
Production	ID	ID	ID	ID	ID	ID
Protection of soil and water	ID	ID	ID	ID	ID	ID
Conservation of biodiversity	ID	ID	ID	ID	ID	ID
Social services	ID	ID	ID	ID	ID	ID
Multiple purpose	ID	ID	ID	not appl.	not appl.	not appl.
No or unknown function	136	136	136	not appl.	not appl.	not appl.
Total – Other wooded land	**136**	**136**	**136**	**not appl.**	**not appl.**	**not appl.**

Figures may not add up due to rounding.

3.6 Comments to National reporting table T3

There is no full information on the designated function of the Danish forests in general.

The Forest Act promotes sustainable forest management. Sustainable management shall entail the inclusion of economic as well as ecological and social values.
Sustainable management shall entail that the management of the individual areas designated as forest reserve land and the administration of the Forest Act take a holistic approach to
1) promote the establishment of robust forests,
2) ensure the production of the forests,
3) conserve and increase the biological diversity of the forests, and
4) ensure that proper attention be given to landscape, natural history, cultural history, environmental protection and outdoor recreation.

The following shall apply to the individual area designated as forest reserve land:
1) The area must be stocked with trees, which form or will come to form, a closed canopy forest of high-boled trees within a reasonable period of time.
2) Logging, except thinning, may not be carried out before the stand or the individual tree has reached the rotation age (defined by age and/or dimension).
3) No later than 10 years after such logging of a stand, the area must meet the requirement of no. 1.
4) Livestock farming is prohibited. This prohibition does not, however, apply to areas that may be legally kept without trees, cf. section 10.

It is important to note that the forest areas in the NATURA 2000 areas are not yet mapped and hence there is insufficient data for this. This means that the area for conservation of biodiversity is higher. Currently there is 360 000 hectares land area designated to Bird Protection and Habitat areas. A part of this is forest and other wooded land. The areas will be mapped during the next couple of years as a part of the monitoring process required by the Habitat directive. Similarly the NFI will be able to provide some estimates on the characteristics of the forests and other wooded land in these areas after the first full inventory (2007).

The total forest area is classified to the FRA classes, well knowing that original data contain overlapping data. The order of this are commented on in the reclassification section.

4 Table T4 – Characteristics of Forest and Other wooded land

4.1 FRA 2005 Categories and definitions

Category	Definition
Primary	Forest / Other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.
Modified natural	Forest / Other wooded land of naturally regenerated native species where there are clearly visible indications of human activities.
Semi-natural	Forest / Other wooded land of native species, established through planting, seeding or assisted natural regeneration.
Productive plantation	Forest / Other wooded land of introduced species, and in some cases native species, established through planting or seeding mainly for production of wood or non wood goods.
Protective plantation	Forest / Other wooded land of native or introduced species, established through planting or seeding mainly for provision of services.

4.2 National data

4.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 1990	M	Forest	1990	Species distribution used – areas.
Skove og plantager 2000	M	Forest	2000	Species distribution used – areas.
The Forest and Nature Agency	M	Forest	2000-2003	Summary statistics on Protective Forest Areas and Non-intervention forests.

4.2.2 Classification and definitions

National class	Definition
Coniferous plantations	The coniferous plantations in Denmark have the characteristics of productive plantations.
Deciduous forests	The deciduous forests in Denmark have the characteristics of semi-natural forests. There are areas with plantation characters, however the entire area with deciduous species are classified in this class.
Temporarily unstocked areas	Areas recently under regeneration, but without trees at the time of the census.
Assisting areas in the forests	Smaller open areas in the forests needed for the forest management.
Protection of soil	These forests are established through planting or seeding mainly for provision of services. Predominantly coniferous plantations.
Non-intervention forest	Smaller areas of semi-natural (deciduous) forest left unmanaged with no removal of wood and no drainage.

4.2.3 Original data

National Categories	Area (1000 hectares)	
	Forest	
	1990	2000
Coniferous	268	294
Deciduous	143	174
Temporarily unstocked	6	5
Assisting areas in the forests	28	13
Protection of soil *	34	34
Non-intervention forest**	1	6

*
Protection of soil: Assumed constant in the period 1990 to 2000. Figures known for 2000.
**
Non-intervention forest: Figures known for 2000. Se T3 for estimation of 1990 and 2005 data.

The areas temporarily unstocked are distributed to coniferous forests (productive plantations) and deciduous forests (semi-natural forests) according to relative area of these two groups. Similar approach is applied for the assisting areas. Hereby the areas are as follows:

National Categories	Area (1000 hectares)	
	Forest	
	1990	2000
Coniferous plantations	268	294
Deciduous forests	143	174
Temporarily unstocked		
Coniferous	4	3
Deciduous	2	2
Assisting areas		
Coniferous	19	8
Deciduous	9	5
Result		
Coniferous	**291**	**305**
Deciduous	**154**	**181**

4.3 Analysis and processing of national data

4.3.1 Calibration

No calibration performed.

4.3.2 Estimation and forecasting

Net afforestation for the period 1990-1999 amounts to 27 500 ha - equalling an average of 2750 ha per year (Skove og plantager 2000, p. 26). Most of this afforestation occurred during the last 5 years of the period. So the forest area may increase with a higher rate than 2750 ha per year, but reliable information is not available. Hence, the forest area is expected to increase by 2750 ha per year in the period 2000 to 2005, resulting in an increase of 13 250 ha for the entire period.

The species distribution is assumed to be similar to the 2000 census with 37 % deciduous forests and 63 % coniferous forests. Hence the forecasted forest area in 2005 of 500 000 hectares is distributed with 315 000 hectares coniferous forests and 185 000 hectares deciduous forests.

4.4 Reclassification into FRA 2005 classes

Coniferous forests are reclassified to Productive plantations except for the area of forests for protection of soil, which are reclassified as Protective plantations.
All the deciduous forests are reclassified as semi-natural forests, except for the area of non-intervention forests, which are reclassified as Modified-natural forests.

4.5 Data for National reporting table T4

FRA 2005 Categories	Area (1000 hectares)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Primary	0	0	0	ID	ID	ID
Modified natural	1	6	6	ID	ID	ID
Semi-natural	154	175	179	ID	ID	ID
Productive plantation	257	271	281	ID	ID	ID
Protective plantation	34	34	34	ID	ID	ID
TOTAL	**445**	**486**	**500**	**ID**	**ID**	**ID**

4.6 Comments to National reporting table T4

Regarding comments to the forecasting of the forest area in 2005 se comments to table T1.

Of the forests classified as semi-natural forests there are 11 000 hectares forest managed according to the Strategy for Natural Forests, which are areas of forest designated for old management types, selective cutting and continuous forest cover.

The area of modified natural forest is based on designation. Most of the areas have been designated in the period from 1990 to 2000 based on new knowledge and definitions, hence the increase in this category.

5 Table T5 – Growing stock

5.1 FRA 2005 Categories and definitions

Category	Definition
Growing stock	Volume over bark of all living trees more than X cm in diameter at breast height (or above buttress if these are higher). Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm.
Commercial growing stock	The part of the growing stock of species that are considered as commercial or potentially commercial under current market conditions, and with a diameter at breast height of Z cm or more.

5.2 National data

5.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 1990	M	growing stock	1990	Growing stock for 1990 recalculated in Skove og plantager 2000 based on information on species and age distribution collected in 1990.
Skove og plantager 2000	M	growing stock	2000	Growing stock for 2000 calculated in Skove og plantager 2000 based on information on species and age distribution collected in 2000.
Madsen, S.F. 1987	H	commercial stock	1990 - 2005	Deciduous and coniferous volumefunctions.
Madsen & Heusérr 1993	H	commercial stock	1990 - 2005	Volumefunctions for Picea abies.

5.2.2 Classification and definitions

National class	Definition
Growing stock	Volume over bark of all living trees more than 0 cm in diameter at breast height. Includes the stem from ground level up to a top diameter of 0 cm. Include branches to a minimum diameter of 0 cm for deciduous tree species.
Commercial growing stock	The part of the growing stock of species that are considered as commercial or potentially commercial under current market conditions, and with a diameter at breast height of 0 cm or more and a minimum diameter at top end of stem/branches of 10 cm. Growing stock in non-intervention forests are excluded.

5.2.3 Original data

FRA 2005 Categories	Volume (1000 cubic meters over bark)	
	Forest	
	1990	2000
Total	**64883**	**74313**
Deciduous	**25773**	**28983**
Fagus sylvatica / Beech	17769	18199
Quercus robur / Oak	3781	4808
Fraxinus exelsior / Ash	1010	1292
Acer pseudoplatanus / Sycamore	819	1210
Remainder deciduous	2395	3474
Coniferous	**39110**	**45330**
Picea abies / Norway spruce	20513	23067
Picea sitchensis / Sitka spruce	5793	6195
Abies procera / Noble fir	600	1206
Abies normanniana / Kaucasian Silver fir	965	1981
Abies spp. (excl. normanniana and procera)	3249	4124
Pinus spp. / Pine	2071	5662
Remainder coniferous	5920	3095

FRA 2005 Categories	Volume (million cubic meters over bark)		Commercial growing stock (million cubic meters over bark)	
	Forest		Forest	
	1990	2000	1990	2000
Growing stock - total	64.9	74.3	49.0	55.5
Coniferous	39.1	45.5	32.4	37.5
Deciduous	25.8	28.8	16.6	18.0
Growing stock - Non-intervention forests	0.3	1.5	0.2	1.1
Coniferous	0.0	0.3	0.0	0.3
Deciduous	0.3	1.2	0.2	0.8

The growing stock in Non-intervention forests is calculated for the 2000 survey. The figure on growing stock for Non-intervention forests in 1990 is 1/6 of the stock in 2000 (as the area is 1/6). The growing stock in non-intervention forest in 2005 is assumed to be the same as in 2000.

Commercial growing stock

The growing stock in the Non-intervention forests is deducted from the total growing stock before transforming into commercial volume. Commercial growing stock is estimated as a percentage of the growing stock. Based on volume functions developed based on experimental data (Madsen 1987, Madsen & Heusérr 1993) the percentages have been determined, knowing that the percentage varies with breast height diameter of the trees, stand density and tree species. However, given the available data sources, this is judged to be a sufficiently accurate estimate of the commercial growing stock.

Table: Single tree volumes for trees with dbh = 15 cm, h = 14 m and stand quadratic diameter of 15 cm.

Species	**Total volume m^3**	**Commercial volume > 10 cm m^3**	**%**
Coniferous			
Picea abies	0.1373	0.1141	83
Picea sitchensis	0.1303	0.1082	83
Pseudutsuga menziesii	0.1281	0.1062	83
Larix leptolepis	0.1364	0.1140	84
Abies alba	0.1338	0.1123	89
Abies grandis	0.1224	0.0978	80
Average			**83**
Deciduous			
Fagus sylvatica	0.1584	0.1039	66
Quercus robur	0.1556	0.1005	65
Fraxinus exelsior	0.1519	0.0974	64
Average			**65**

So - for deciduous forest the commercial growing stock is estimated to be 65 % of growing stock and for coniferous the percentage is 83 %. The average values reflect the dominance of *Picea spp*. for the coniferous group and *Fagus sylvatica/Quercus robur* for the deciduous group.
The commercial growing stock does not take special regard to the increasing use of whole tree chipping for production of wood fuel.

5.3 Analysis and processing of national data

5.3.1 Calibration

No calibration performed.

5.3.2 Estimation and forecasting

Growing stock 2005 - forecasting

The forecast of growing stock for 2005 is based on the assumption that the volume per hectare is constant for the period 2000 to 2005. The changes are hence only a result of changes in area allocated to deciduous and coniferous forests, as forecasted in T4.

Forecasting 2005

Categories	**Area 2005**	**Volume per ha (2000 - 2005)**	**Growing stock**	**Growing stock - Non intervention forests**	**Commercial growing stock**
	ha	**m^3/ha**	**1000 m^3**	**1000 m^3**	**1000 m^3**
Deciduous	178340	165.2	29453	1163	19144
Coniferous	303660	154.8	47003	358	39012
Forested area	482000		76456	1521	58157
Temporarily unstocked and assisting areas	18000				
Total	500000				

5.4 Reclassification into FRA 2005 classes

No reclassification done.

5.5 Data for National reporting table T5

FRA 2005 Categories	Volume (million *cubic* meters over bark)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Growing stock	64.9	74.3	76.5	ID	ID	ID
Commercial growing stock	49.0	55.4	58.2	ID	ID	ID

Specification of country threshold values	Unit	Value	Complementary information
1. Minimum diameter at breast height of trees included in Growing stock (X)	cm	0	Applies to all calculations
2. Minimum diameter at the top end of stem (Y) for calculation of Growing stock	cm	0	
3. Minimum diameter of branches included in Growing stock (W)	cm	0	Only included for deciduous trees.
4. Minimum diameter at breast height of trees in Commercial growing stock (Z)	cm	0	A minimum diameter of stem/branches included in the commercial growing stock of 10 cm is applied.
5. Volume refers to "Above ground" (AG) or "Above stump" (AS)	AG / AS	AG	
6. Have any of the above thresholds (points 1 to 4) changed since 1990	Yes/No	No	
7. If yes, then attach a separate note giving details of the change	Attachment	-	

5.6 Comments to National reporting table T5

In the analysis of the forest census 2000 (Skove og plantager 2000) the estimates of annual increment is higher than the current wood removal, indicating a build up of growing stock of 1-2 million cubic meters per year. However the forecasting presented is based on an assumption of no build up, only an increase in forest area. The NFI will by 2007 provide reliable estimates of the current growing stock.

6 Table T6 – Biomass stock

6.1 FRA 2005 Categories and definitions

Category	Definition
Above-ground biomass	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage.
Below-ground biomass	All living biomass of live roots. Fine roots of less than 2 mm diameter are excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead wood biomass	All non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

6.2 National data

6.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 1990	M	Total biomass	1990	Total biomass for 1990 recalculated in Skove og plantager 2000 based on information on species and age distribution collected in 1990.
Skove og plantager 2000	M	Total biomass	2000	Total biomass for 2000 calculated in Skove og plantager 2000 based on information on species and age distribution collected in 2000.
Moltesen, P., 1988	M	conversion factors	1990-2005	
Nihlgård, B., Lindgren, L., 1977	M	conversion factors	1990-2005	
Vande Walle, I. Mussche, S., Samson, R., Lust, N., Lemeur, R. 2001.	M	conversion factors	1990-2005	

6.2.2 Classification and definitions

National class	Definition
Total biomass	All living biomass including stem, stump, branches, bark, seeds, foliage and roots > 2 mm.

6.2.3 Original data

FRA 2005 Categories	Volume (million cubic meters over bark)		Biomass (million metric tonnes oven-dry weight)	
	Forest		Forest	
	1990	2000	1990	2000
Total	65	74	44	51
Coniferous	39	45	27	31
Deciduous	26	29	17	20

There is no data on dead wood biomass.

The following constants and methods are used to estimate biomass based on growing stock estimates.

Density factors for Danish forest tree species used to estimate biomass from growing stock volume:

	Density t oven dry biomass / m^3 volume
Picea abies	0.38
Picea sitchensis	0.37
Abies spp.	0.38
Pseudotsuga menziesii	0.41
Pinus sylvestris	0.43
Pinus mugo	0.48
Pinus contorta	0.37
Fagus sylvatica	0.56
Quercus robur	0.57
Acer pseudoplatanus	0.49
Fraxinus exelsior	0.56

Expansion factors used to estimate total biomass from growing stock biomass:

	t total Biomass / t growing stock biomass
Deciduous	1.2
Coniferous	1.8

The calculation method is to multiply species wise growing stock volume with species specific density factor and expansion factor. Hereby the estimates of total biomass are obtained.

The average values for belowground to aboveground biomass ratios are applied to obtain above and below ground biomass estimates (IPCC Good Practice Guidance for LULUCF - Table 3A.1.8 - Appendix 5 in the Guidelines). For deciduous forest a value of 0.26 is used. For coniferous forest the value of 0.32 is used. The values are chosen based on the average aboveground biomass per hectare (generally 100-120 t/ha).

6.3 Analysis and processing of national data

6.3.1 Calibration

6.3.2 Estimation and forecasting

The forecast of growing stock for 2005 is based on the assumption that the volume per hectare is constant for the period 2000 to 2005. The changes are hence only a result of changes in area allocated to deciduous and coniferous forests, as forecasted in T4.

Reclassification	Gowing stock	Total biomass	Above ground biomass	Below ground biomass
	1000 m^3	1000 T	1000 T	1000 T
1990				
Deciduous	25773	17296	13727	3569
Coniferous	39110	26833	20328	6505
Total	64883	44129	34055	10074
2000				
Deciduous	28983	19433	15423	4010
Coniferous	45330	31404	23791	7613
Total	74313	50836	39213	11623
2005				
Deciduous	29453	19792	15708	4084
Coniferous	47003	32150	24356	7794
Total	76456	51942	40064	11878

6.4 Reclassification into FRA 2005 classes

The data are reclassified into the FRA 2005 classes according to the factors indicated in the previous paragraph.

6.5 Data for National reporting table T6

FRA 2005 Categories	**Biomass (million metric tonnes oven-dry weight)**					
	Forest			**Other wooded land**		
	1990	**2000**	**2005**	**1990**	**2000**	**2005**
Above-ground biomass	34	39	40	ID	ID	ID
Below-ground biomass	10	12	12	ID	ID	ID
Dead wood biomass	ID	ID	ID	ID	ID	ID
TOTAL	**44**	**51**	**52**	**ID**	**ID**	**ID**

6.6 Comments to National reporting table T6

The NFI will provide data on the dead wood biomass, but these results are not available before 2007. Similar applies to the information on Other wooded land.

7 Table T7 – Carbon stock

7.1 FRA 2005 Categories and definitions

Category	Definition
Carbon in above-ground biomass	Carbon in all living biomass above the soil, including stem, stump, branches, bark, seeds, and foliage.
Carbon in below-ground biomass	Carbon in all living biomass of live roots. Fine roots of less than 2 mm diameter are excluded, because these often cannot be distinguished empirically from soil organic matter or litter.
Carbon in dead wood biomass	Carbon in all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.
Carbon in litter	Carbon in all non-living biomass with a diameter less than a minimum diameter chose by the country for lying dead (for example 10 cm), in various states of decomposition above the mineral or organic soil. This includes the litter, fumic, and humic layers.
Soil carbon	Organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series.

7.2 National data

7.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 1990	M	Carbon stock	1990	Total biomass for 1990 recalculated in Skove og plantager 2000 based on information on species and age distribution collected in 1990.
Skove og plantager 2000	M	Carbon stock	2000	Total biomass for 2000 calculated in Skove og plantager 2000 based on information on species and age distribution collected in 2000.
Moltesen, P., 1988	M	conversion factors	1990-2005	
Nihlgård, B., Lindgren, L., 1977	M	conversion factors	1990-2005	
Vande Walle, I. Mussche, S., Samson, R., Lust, N., Lemeur, R. 2001.	M	conversion factors	1990-2005	

7.2.2 Classification and definitions

National class	Definition
Total carbon stock	Carbon in all living biomass including stem, stump, branches, bark, seeds, foliage and roots > 2 mm.

7.2.3 Original data

FRA 2005 Categories	Volume (million cubic meters over bark)		Carbon (Million metric tonnes)	
	Forest		Forest	
	1990	2000	1990	2000
Total	65	74	22	25
Coniferous	39	45	13	15
Deciduous	26	29	9	10

There is no data on carbon in dead wood, litter or soil.

The carbon content is estimated by multiplying total biomass with a factor of 0.5 tC/t biomass. The conversion from growing stock to biomass is described for T6: Biomass stock.

The average values for belowground to aboveground biomass ratios are applied to obtain above and below ground biomass estimates (IPCC Good Practice Guidance for LULUCF - Table 3A.1.8 - Appendix 5 in the Guidelines). For deciduous forest a value of 0.26 is used. For coniferous forest the value of 0.32 is used. The values are chosen based on the average aboveground biomass per hectare (generally 100-120 t/ha).

7.3 Analysis and processing of national data

7.3.1 Calibration

No calibration performed.

7.3.2 Estimation and forecasting

The forecast of growing stock for 2005 is based on the assumption that the volume per hectare is constant for the period 2000 to 2005. The changes are hence only a result of changes in area allocated to deciduous and coniferous forests, as forecasted in T4. In practice this will not be the exact case, as newly established forest has virtually no growing stock, but in lack of better information the assumption is applied here.

Reclassification	Growing stock	Total biomass	Above ground biomass	Below ground biomass	Above ground Carbon	Below ground Carbon	Total Carbon
1990	1000 m^3	1000 T	1000 T	1000 T	Gg C	Gg C	Gg C
Deciduous	25773	17296	13727	3569	6863	1785	8648
Coniferous	39110	26833	20328	6505	10164	3253	13417
Total	64883	44129	34055	10074	17028	5037	22065
2000							
Deciduous	28983	19433	15423	4010	7711	2005	9716
Coniferous	45330	31404	23791	7613	11895	3807	15702
Total	74313	50836	39213	11623	19607	5811	25418
2005							
Deciduous	29453	19792	15708	4084	7854	2042	9896
Coniferous	47003	32150	24356	7794	12178	3897	16075
Total	76456	51942	40064	11878	20032	5939	25971

7.4 Reclassification into FRA 2005 classes

The data are reclassified into the FRA 2005 classes according to the factors indicated in the previous paragraph.

7.5 Data for National reporting table T7

FRA 2005 Categories	Carbon (Million metric tonnes)					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Carbon in above-ground biomass	17	19	20	ID	ID	ID
Carbon in below-ground biomass	5	6	6	ID	ID	ID
Sub-total: Carbon in living biomass	**22**	**25**	**26**	**ID**	**ID**	**ID**
Carbon in dead wood	ID	ID	ID	ID	ID	ID
Carbon in litter	ID	ID	ID	ID	ID	ID
Sub-total: Carbon in dead wood and litter	**ID**	**ID**	**ID**	**ID**	**ID**	**ID**
Soil carbon to a depth of _____ cm	ID	ID	ID	ID	ID	ID
TOTAL CARBON	**22**	**25**	**26**	**ID**	**ID**	**ID**

8 Table T8 – Disturbances affecting health and vitality

8.1 FRA 2005 Categories and definitions

Category	Definition
Disturbance by fire	Disturbance caused by wildfire, independently whether it broke out inside or outside the forest/OWL.
Disturbance by insects	Disturbance caused by insect pests that are detrimental to tree health.
Disturbance by diseases	Disturbance caused by diseases attributable to pathogens, such as a bacteria, fungi, phytoplasma or virus.
Other disturbance	Disturbance caused by other factors than fire, insects or diseases.

8.2 National data

8.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 2000	M	Windfall	2000	
Beredskabsstyrelsen	H	Fire	2002	

8.2.2 Classification and definitions

National class	Definition
Other disturbance	Same as FRA 2005. Reflects primarily windfall.
Forest fire	Same as FRA 2005

8.2.3 Original data

Rough estimates of amount of area affected by windfall in the December 3rd 1999 windstorm: 20 000 ha. On the majority of this area there was practically no standing trees left. The storm of 1999 damaged the largest forest area in Denmark during the recent history. Previous large storms occurred in 1902, 1934, 1967 and 1981. Only minor storms in other years.

There has been collected information on the number and area of forest fires in 2002. This year is representative of most years. Occasionally larger forest fires occur, but still they are in the range of 20-100 hectares.

	Number	Hectares
1. Forest and other wooded land	4	<1
1.1. High forest	1	<1
(a) Coniferous		
(b) Non-coniferous		
1.2. Coppice and coppice with standards		
1.3. Other wooded land	3	<1

There is insufficient data on areas with insect or diseases.

8.3 Analysis and processing of national data

8.3.1 Estimation and forecasting

The area affected by windfall is difficult to forecast, and there is currently no accurate recording of windfall areas in general. Often the areas affected by windfall are scattered. The damages caused by wind storms range from broken tops to "clear felling" of larger areas. Hence an estimate of 3000 hectares annually is likely to cover most years, considering that large windfalls (as 1999) occur only once in a while. This estimate is used for the 1990 reporting year. For 2000 an estimate of 4000 hectares is used on the basis of the large wind storm in 1999.

On average the number of forest fires in Denmark is very low, and below the threshold for the reporting unit for FRA 2005.

8.4 Reclassification into FRA 2005 classes

No reclassification done.

8.5 Data for National reporting table T8

FRA-2005 Categories	Average annual area affected (1000 hectares)			
	Forests		Other wooded land	
	1990	2000	1990	2000
Disturbance by fire	0	0.001	0	0
Disturbance by insects	ID	ID	ID	ID
Disturbance by diseases	ID	ID	ID	ID
Other disturbance	3	4	ID	ID

8.6 Comments to National reporting table T8

An estimate of 3000 hectares affected annually by wind storms (other disturbances) are likely to cover most years, considering that large windfalls of 20 000 hectares as in 1999 occurs only once in a while.

9 Table T9 – Diversity of tree species

9.1 FRA 2005 Categories and definitions

Category	Definition
Number of native tree species	The total number of native tree species that have been identified within the country.
Number of critically endangered tree species	The number of native tree species that are classified as "Critically endangered" in the IUCN red list.
Number of endangered tree species	The number of native tree species that are classified as "Endangered" in the IUCN red list.
Number of vulnerable tree species	The number of native tree species that are classified as "Vulnerable" in the IUCN red list.

9.2 National data

9.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Redlist 1997	H	All	2000	Under update
Vedel, H. 1985	H	Native tree species	2000	Woody plants and their natural growth area.
Jonsell et all, 2000	H	Native tree species	2000	Woody plants and their natural growth area.

9.2.2 Classification and definitions

National class	Definition
Identical to FRA 2005	

Note: If different national data sources use different classes and definitions, a table such as above is needed for each relevant data source.

9.2.3 Original data

The following tree species are in 1997 judged to be rare in the Danish forests:

Sort pil *(Salix nigricans)*	R	Mm,Me
Klipperøn *(Sorbus rupicola)*	R	Oo,Ok
Tarmvridrøn *(Sorbus torminalis)*	R	Sl,Sg,Sb,Oo,Ok
Taks *(Taxus baccata)*	R	Sl,Sg
Storbladet lind *(Tilia platyphyllos)*	R	Sl,Sg,Sb
Skærmelm *(Ulmus laevis)*	R	Sb,Sl,Sg
Småbladet elm *(Ulmus minor)*	R	Sb,Sl,Sg

There are no vulnerable, endangered or critically endangered tree species in Denmark.

The number of native tree species is by forest geneticists based on available information of which much is collected in the publication "Flora Nordica" (Jonsell 2000). Based on this there are 38 tree species native to Denmark (heights above 5 m), of which 10 in some locations only reach a bush like height (less than 5 m). Furthermore there are identified 38 woody bush species native to Denmark, contributing to the cover in the other wooded land. This number may be slightly larger, depending on the number of subspecies included This gives a total of 76 woody species native to Denmark.

9.3 Data for National reporting table T9

FRA 2005 Categories	**Number of species (year 2000)**
Native tree species	38
Critically endangered tree species	0
Endangered tree species	0
Vulnerable tree species	0

9.4 Comments to National reporting table T9

On the IUCN red list the species *Betula Oycoviensis* is mentioned for Denmark. However that species do not appear on the Danish red list. The species is a hybrid, and it is not native to Denmark and is not known to exist in Denmark. Hence there seem to be an error in the IUCN red list concerning Denmark.

10 Table T10 – Growing stock composition

10.1 FRA 2005 Categories and definitions

List of species names (scientific and common names) of the ten most common species.

10.2 National data

10.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 1990	M	Growing stock	1990	Growing stock for 1990 recalculated in Skove og plantager 2000 based on information on species and age distribution collected in 1990.
Skove og plantager 2000	M	Growing stock	2000	Growing stock for 2000 calculated in Skove og plantager 2000 based on information on species and age distribution collected in 2000.

10.2.2 Original data

	1990	2000
Species names (scientific and common)	**mio. m^3**	**mio. m^3**
Picea abies / Norway spruce	20.5	23.1
Fagus sylvatica / Beech	17.8	18.2
Picea sitchensis / Sitka spruce	5.8	6.2
Pinus spp. / Pine	2.1	5.7
Quercus robur / Oak	3.8	4.8
Abies spp. (excl. normanniana and procera)	3.2	4.1
Abies normanniana / Kaucasian Silver fir	1.0	2.0
Fraxinus exelsior / Ash	1.0	1.3
Acer pseudoplatanus / Sycamore	0.8	1.2
Abies procera / Noble fir	0.6	1.2
Remainder	8.3	6.6
Total	**64.9**	**74.3**

10.3 Analysis and processing of national data

10.3.1 Calibration

No calibration needed.

10.3.2 Estimation and forecasting

Data available for both reporting years.

10.4 Data for National reporting table T10

FRA 2005 Categories / Species name (Scientific name and common name)	**Growing Stock in Forests (million cubic meters)**	
	1990	**2000**
Picea abies / Norway spruce	20.5	23.1
Fagus sylvatica / Beech	17.8	18.2
Picea sitchensis / Sitka spruce	5.8	6.2
Pinus spp. / Pine	2.1	5.7
Quercus robur / Oak	3.8	4.8
Abies spp. (excl. *normanniana* and *procera*)	3.2	4.1
Abies normanniana / Kaucasian Silver fir	1.0	2.0
Fraxinus exelsior / Ash	1.0	1.3
Acer pseudoplatanus / Sycamore	0.8	1.2
Abies procera / Noble fir	0.6	1.2
Remainder	8.3	6.6
TOTAL	**64.9**	**74.3**

10.5 Comments to National reporting table T10

Some of the categories are a group of species. There is a difference between the two data sources with respect to the species group *Pinus spp*. In 1990 it only included *Pinus mugo*, whereas it in 2000 included all pines, especially *Pinus sylvestris*.

The species *Fagus sylvatica, Pinus sylvestris, Quercus robur, Fraxinus exelsior* and *Acer pseudoplatanus* are considered native tree species. The remaining trees are introduced species.

11 Table T11 – Wood removal

11.1 FRA 2005 Categories and definitions

Category	Definition
Industrial wood removal	The wood removed (volume of roundwood over bark) for production of goods and services other than energy production (woodfuel).
Woodfuel removal	The wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

11.2 National data

11.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Danmarks Statistik	H	Industrial wood and woodfuel	1990, 2000, 2003	Data can be downloaded on the webpage www.statistikbanken.dk.

11.2.2 Classification and definitions

National class	Definition
Industrial wood	Round wood.
Fire wood	Round wood, typically of small dimensions.
Woodchips	In 1990 and 2000 including all fuel wood, from 2003 only woodchips.
Fuel round wood	Fuel round wood.

Note: If different national data sources use different classes and definitions, a table such as above is needed for each relevant data source.

11.2.3 Original data

Wood removal, 1000 m3 - 1988 - 1992

National class	1988	1989	1990	1991	1992
Industrial wood	1690.4	1680.3	1612.2	1451.8	1430.1
Fire wood	472.6	421.5	305.3	463.1	364.3
Woodchips			100.5		121.1
Woodchips					
Fuel round wood					
Total wood removal	2163.0	2101.8	2017.8	1914.9	1915.5

Wood removal, 1000 m3 - 1998 - 2003.

National class	1998	1999	2000	2001	2002	2003
Industrial wood	1162.8	1158.7	2972.2	1107.5	876.7	900.4
Fire wood	362.7	357.9	420.2	425.0	405.1	438.2
Woodchips	183.7	198.5	278.7	260.2	325.1	
Woodchips						326.4
Fuel round wood						142.6
Total wood removal	1709.2	1715.1	3671.1	1792.7	1606.9	1807.7

11.3 Analysis and processing of national data

11.3.1 Estimation and forecasting

Wood removal, 1000 m3 - averages

FRA 2005 Categories	1990	2000	2005
Industrial wood	1573	1456	900
Woodfuel	450	643	907
Total wood removal	2023	2099	1808

The available data for 2003 is used as an estimate of the reporting year 2005.

11.4 Reclassification into FRA 2005 classes

The National classes for fire wood, woodchips and fuel wood are added to provide data for the woodfuel removal. The industrial wood class matches the FRA 2005 class.

11.5 Data for National reporting table T11

FRA 2005 Categories	Volume in 1000 cubic meters of roundwood over bark					
	Forest			Other wooded land		
	1990	2000	2005	1990	2000	2005
Industrial round wood	1573	1456	900	ID	ID	ID
Woodfuel	450	643	907	ID	ID	ID
TOTAL for Country	2023	2099	1808	**ID**	**ID**	**ID**

11.6 Comments to National reporting table T11

There is an increase in the use of woodfuel for energy production, whereas the prices of industrial round wood cause a decrease in the use of this product. The high amount of wood removal in 2000 is highly influenced by the windfall caused by the severe windstorm December 3rd 1999. This affects the average for the reporting year 2000.

12 Table T12 – Value of wood removal

12.1 FRA 2005 Categories and definitions

Category	Definition
Value of industrial wood removal	Value of the wood removed for production of goods and services other than energy production (woodfuel).
Value of woodfuel removal	Value of the wood removed for energy production purposes, regardless whether for industrial, commercial or domestic use.

12.2 National data

12.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Landbrug 2001	H	Industial wood and woodfuel	1996-2003	

12.2.2 Classification and definitions

National class	Definition
Value of industrial wood removal	Same as FRA 2005.
Value of woodfuel removal	Same as FRA 2005.

Note: If different national data sources use different classes and definitions, a table such as above is needed for each relevant data source.

12.2.3 Original data

Value in million (10^6) DKR.								
	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Industrial wood	421	419	417	409	767	365	271	274
Woodfuel	151	157	139	139	151	146	143	172
Exchange rate used	6.300	6.300	6.386	7.399	8.021	8.410	7.082	5.958

Averages are based on the value converted to USD for each year.

12.3 Analysis and processing of national data

12.3.1 Estimation and forecasting

The value of the 2000 wood removal is exceptionally high due to the windfall in December 1999. This affects the average for 1998-2002 given as value for the reporting year 2000. However, the unit prices for industrial wood in 2000 was lower than average.

The other years (1996-1999) reflect a more normal situation. The average value pr. m3 industrial wood and woodfuel from the years 1996-1999 is used to estimate the value of the wood removal for 1990. The average price for industrial wood is 350 kr/m3 and for woodfuel the price is 250 kr/m3. With the estimate of removal from Table T11 the value can be estimated and the exchange rate for 1990 applied. The resulting values are given below.

	Amount	**price, kr/m3**	**mio. kr**	**Exchange rate**	**1000 USD**
Industrial wood	1573	350	550	5.776	95317
Woodfuel	450	250	113	5.776	19477
Total	2023		663		114794

The value for 2003 is used as basis for an estimate of 2005.

12.4 Data for National reporting table T12

FRA 2005 Categories	**Value of roundwood removal (1000 USD)**					
	Forest			**Other wooded land**		
	1990	**2000**	**2005**	**1990**	**2000**	**2005**
Industrial roundwood	95317	59574	45989	ID	ID	ID
Woodfuel	19477	19386	28869	ID	ID	ID
TOTAL for Country	114794	78960	74857	**ID**	**ID**	**ID**

12.5 Comments to National reporting table T12

There is an increase in the use of woodfuel for energy production, whereas the prices of industrial round wood cause a decrease in the use of this product. The value of wood removal in 2000 is highly influenced by the windfall caused by the severe windstorm December 3rd 1999.

13 Table T13 – Non-wood forest product removal

13.1 FRA 2005 Categories and definitions

The following categories of non-wood forest products have been defined:

Category
Plant products / raw material
1. Food
2. Fodder
3. Raw material for medicine and aromatic products
4. Raw material for colorants and dyes
5. Raw material for utensils, handicrafts & construction
6. Ornamental plants
7. Exudates
8. Other plant products
Animal products / raw material
9. Living animals
10. Hides, skins and trophies
11. Wild honey and bee-wax
12. Bush meat
13. Raw material for medicine
14. Raw material for colorants
15. Other edible animal products
16. Other non-edible animal products

13.2 National data

13.2.1 Data sources

References to sources of information	**Quality (H/M/L)**	**Variable(s)**	**Year(s)**	**Additional comments**
Skove og plantager 2000	M	Ornamental plants	1990 - 2000	Based on articles in Skoven and PS Nåledrys on production and export.
Mainz 2004 - PS Nåledrys 49/04	M	Ornamental plants	2003	

13.2.2 Classification and definitions

National class	**Definition**
Christmas trees	Trees, mostly Abies spp. used for ornamental use for Christmas celebrations. Counted in numbers.
Greenery	Branches, mostly Abies spp. used for ornamental use for Christmas celebrations. Counted by weight.

13.2.3 Original data

National Categories	Scale factor	Unit			
			1990	2000	2003
6. Ornamental plants					
Christmas trees - in numbers	1000	unit	5965	8425	9900
Greenery		tonnes	19900	31200	36500

The value for 1990 is the average of the period 1988-1992.
The value for 2000 is the average of the years 1998 - 2000 and 2003.
The value for 2003 is used directly.

13.3 Analysis and processing of national data

13.3.1 Estimation and forecasting

In order to be able to provide the data in mass the number of Christmas trees have to be converted to mass. An average tree of 2 m height and diameter of 7 cm will have a stem volume of 0.007 m3, equalling a total biomass of approx 3.9 kg. (density of 0.38 and an expansion factor of 1.4 for the above ground biomass.) A tree of 1.5 m height and diameter of 4 cm will weigh 1.4 kg and a tree of 3 m height and 10 cm diameter will weigh 8.7 kg. The trees are assumed to be without roots. It is assumed that the typical tree is 2 m high. Hence - the number of trees are multiplied with 3.9 to obtain the mass.

The forecasting is based on the figures from 2003, as the overall production seems to be stabilising at the current level.

National Categories	Scale factor	Unit			
			1990	2000	2003
6. Ornamental plants					
Christmas trees		tonnes	23264	32858	38610
Greenery		tonnes	19900	31200	36500
Sum		**tonnes**	**43164**	**64058**	**75110**

13.4 Reclassification into FRA 2005 classes

See table above.

13.5 Data for National reporting table T13

FRA 2005 Categories	Scale factor	Unit	NWFP removal		
			1990	2000	2005
Plant products / raw material			ID	ID	ID
1. Food			ID	ID	ID
2. Fodder			ID	ID	ID
3. Raw material for medicine and aromatic products			ID	ID	ID
4. Raw material for colorants and dyes			ID	ID	ID
5. Raw material for utensils, handicrafts & construction			ID	ID	ID
6. Ornamental plants	1000	tonnes	41	61	71
7. Exudates			ID	ID	ID
8. Other plant products			ID	ID	ID
			ID	ID	ID
Animal products / raw material			ID	ID	ID
9. Living animals			ID	ID	ID
10. Hides, skins and trophies			ID	ID	ID
11. Wild honey and bee-wax			ID	ID	ID
12. Bush meat			ID	ID	ID
13. Raw material for medicine			ID	ID	ID
14. Raw material for colorants			ID	ID	ID
15. Other edible animal products			ID	ID	ID
16. Other non-edible animal products			ID	ID	ID

13.6 Comments to National reporting table T13

There is minor production of other products. However, the amount is small and there is not sufficient data to provide national estimates.
The values reported includes all production, whether small or large scale production units.
The estimates are based partly on export statistics from Statistics Denmark and partly on production information collected by the Forest Association.

14 Table T14 – Value of non-wood forest product removal

14.1 FRA 2005 Categories and definitions

The following categories of non-wood forest products have been defined:

Category
Plant products / raw material
1. Food
2. Fodder
3. Raw material for medicine and aromatic products
4. Raw material for colorants and dyes
5. Raw material for utensils, handicrafts & construction
6. Ornamental plants
7. Exudates
8. Other plant products
Animal products / raw material
9. Living animals
10. Hides, skins and trophies
11. Wild honey and bee-wax
12. Bush meat
13. Raw material for medicine
14. Raw material for colorants
15. Other edible animal products
16. Other non-edible animal products

14.2 National data

14.2.1 Data sources

References to sources of information	**Quality (H/M/L)**	**Variable(s)**	**Year(s)**	**Additional comments**
Skove og plantager 2000	M	Ornamental plants	1990 - 2000	Based on articles in Skoven and PS Nåledrys on production and export.
Mainz 2004 - PS Nåledrys 49/04	M	Ornamental plants	2003	

14.2.2 Classification and definitions

National class	**Definition**
Christmas trees	Trees, mostly Abies spp. used for ornamental use for Christmas celebrations. .
Greenery	Branches, mostly Abies spp. used for ornamental use for Christmas celebrations.

14.2.3 Original data

	1988	1989	1990	1991	1992	1998	1999	2000	2003
Total value mio kr	310	370	435	615	520	640	800	1000	1100
Exchange rate	6.874	6.607	5.776	5.914	6.255	6.386	7.399	8.021	5.958
1000 USD	45097	56001	75312	103991	83133	100219	108123	124673	184626

National Categories	**Value**			
		1990	**2000**	**2003**
6. Ornamental plants				
Christmas trees and greenery	mio kr	450	885	1100
Christmas trees and greenery	1000 USD	72707	129410	184626

The value for 1990 is the average of the period 1988-1992.
The value for 2000 is the average of the years 1998-2000 and 2003.
The value for 2003 is used directly as estimate of 2005.
Averages are based on the value converted to USD for each year.

14.3 Analysis and processing of national data

Historical exchange rates are applied for currency transformation.

14.4 Data for National reporting table T14

FRA 2005 Categories	**Value of the of NWFP removed (1000 USD)**		
	1990	**2000**	**2005**
Plant products / raw material			
1. Food			
2. Fodder	ID	ID	ID
3. Raw material for medicine and aromatic products	ID	ID	ID
4. Raw material for colorants and dyes	ID	ID	ID
5. Raw material for utensils, handicrafts & construction	ID	ID	ID
6. Ornamental plants	72707	129410	184626
7. Exudates	ID	ID	ID
8. Other plant products	ID	ID	ID
	ID	ID	ID
Animal products / raw material	ID	ID	ID
9. Living animals	ID	ID	ID
10. Hides, skins and trophies	ID	ID	ID
11. Wild honey and bee-wax	ID	ID	ID
12. Bush meat	ID	ID	ID
13. Raw material for medicine	ID	ID	ID
14. Raw material for colorants	ID	ID	ID
15. Other edible animal products	ID	ID	ID
16. Other non-edible animal products	ID	ID	ID
TOTAL	ID	ID	ID

14.5 Comments to National reporting table T14

The values reported includes all production, whether small or large scale production units. The estimates are based partly on export statistics from Statistics Denmark and partly on production information collected by the Forest Association.

15 Table T15 – Employment in forestry

15.1 FRA 2005 Categories and definitions

Category	Definition
Primary production of goods	Employment in activities related to primary production of goods, like industrial roundwood, woodfuel and non-wood forest products.
Provision of services	Employment in activities directly related to services from forests and woodlands.
Unspecified forestry activities	Employment in unspecified forestry activities.

15.2 National data

15.2.1 Data sources

References to sources of information	Quality (H/M/L)	Variable(s)	Year(s)	Additional comments
Skove og plantager 2000	H	Employment	1990, 2000	Contains information on both 1990 and 2000.

15.2.2 Classification and definitions

National class	Definition
Primary production of goods	Employment in activities related to primary production of goods, like industrial roundwood, woodfuel and non-wood forest products.
Provision of services	Employment in activities directly related to services from forests and woodlands.

15.2.3 Original data

FRA 2005 Categories	Employment (1000 person-years)	
	1990	2000
Primary production of goods	3.6	3.6
Provision of services	0.6	0.6
Unspecified forestry activities	0	0
TOTAL	**4.2**	**4.2**

15.3 Analysis and processing of national data

15.3.1 Estimation and forecasting

As data are available for all the reporting years no estimation or forecasting is done.

15.4 Reclassification into FRA 2005 classes

No reclassification needed.

15.5 Data for National reporting table T15

FRA 2005 Categories	**Employment (1000 person-years)**	
	1990	**2000**
Primary production of goods	3.6	3.6
Provision of services	0.6	0.6
Unspecified forestry activities	0	0
TOTAL	**4.2**	**4.2**