



Chapter 9

Progress towards sustainable forest management

INTRODUCTION

Chapters 2 to 8 of this report focus on the results for each of the seven thematic elements of sustainable forest management. As indicated in those chapters and illustrated in Figure 9.1, forests are managed for a variety of uses and values. But how well are they managed? What does the information provided in FRA 2010 tell us about the overall progress towards sustainable forest management since 1990 at global, regional and subregional scales?

The analysis presented in this chapter focuses first on the status of forest management and then on progress towards sustainable forest management more broadly, by illustrating aggregated findings from FRA 2010 covering all seven thematic elements of sustainable forest management.

The purpose of this analysis is to shed more light on some of the complexities of sustainable forest management and stimulate additional analyses and debate, thus promoting decision-making and action for further progress.

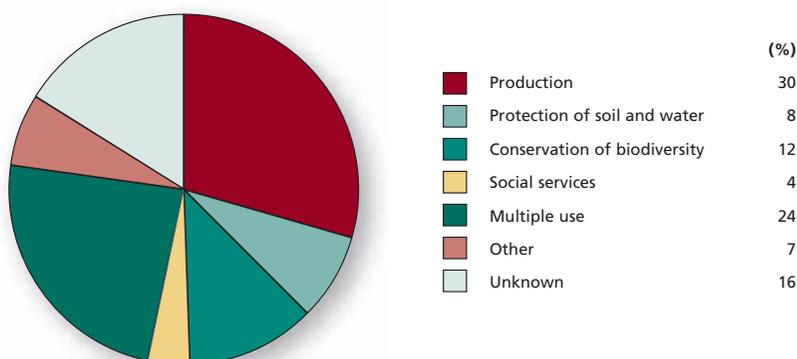
STATUS OF FOREST MANAGEMENT

In addition to reporting on the area of forest designated for specific functions, countries were asked to report on four additional variables to illustrate the status of forest management:

- the area of forest in protected areas;
- the area of permanent forest estate;
- the area of forest with a management plan;
- the area of forest under sustainable forest management.

The analysis of the data for the first variable can be found in Chapter 3 on Biological Diversity. The remaining three variables are discussed here. Country-level data can be found in Table 6 in Annex 3.

FIGURE 9.1
Designated functions of the world's forests, 2010



Area of permanent forest estate

The area of permanent forest estate indicates the area of forest designated to be retained as forest. As such, trends in this variable over time are a better indicator of progress towards sustainable forest management than trends in the total forest area in countries where certain forest areas have been set aside for future conversion to other uses (e.g. agriculture, infrastructure or urban expansion) through a transparent and technically sound decision-making process.

FRA 2010 was the first time countries were asked to report on the area of permanent forest estate and some countries clearly had difficulties identifying the equivalent designation in their national classification systems. Nevertheless, a total of 122 countries, together accounting for 84 percent of the total forest area provided information on this variable. At the global level, an estimated 52 percent of the total forest area is designated as permanent forest estate or its equivalent in 2010 (see Table 9.1).

A number of countries were unable to provide a full data series (for 1990, 2000, 2005 and 2010). However, information from 107 countries and areas (representing 77 percent of the world's forests) indicates that the permanent forest estate increased by almost 15 million hectares per year in the 1990s and close to 10 million hectares per year since 2000 (Table 9.2).

Area of forest with a management plan

The area of forest with a management plan provides another indication of progress towards sustainable forest management, although it must be noted that areas without a plan – including inaccessible areas – may also be conserved and sustainably managed, while the mere existence of a plan does not provide assurance that the plan is sound, is being implemented, or has the intended effect.

A total of 121 countries, representing 79 percent of the global forest area, reported on this variable. These reports indicate that at least 1.6 billion hectares of forest are covered by a management plan with a duration of ten years or more

TABLE 9.1
Area of permanent forest estate by region and subregion, 2010

Region/subregion	Information availability		Area of permanent forest estate	
	Number of countries	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	17	78.1	86 000	41.2
Northern Africa	6	98.8	67 147	86.2
Western and Central Africa	18	51.8	87 402	51.4
Total Africa	41	67.7	240 548	52.7
East Asia	3	95.3	230 908	95.1
South and Southeast Asia	8	73.9	167 533	77.0
Western and Central Asia	13	49.3	18 291	85.2
Total Asia	24	81.3	416 732	86.5
Europe excl. Russian Federation	29	69.7	120 459	88.2
Total Europe	30	94.1	301 155	31.8
Caribbean	6	51.2	3 182	89.7
Central America	1	16.7	164	5.0
North America	4	90.5	418 604	68.2
Total North and Central America	11	88.0	421 950	68.0
Total Oceania	7	99.0	36 854	19.4
Total South America	9	82.2	349 534	49.2
World	122	84.4	1 766 774	51.9

TABLE 9.2
Trends in area of permanent forest estate by region and subregion, 1990–2010

Region/ subregion	Information availability		Area of permanent forest estate (1 000 ha)				Annual change (1 000 ha)		Annual change rate (%)	
	Number of countries	% of total forest area	1990	2000	2005	2010	1990– 2000	2000– 2010	1990– 2000	2000– 2010
Eastern and Southern Africa	15	74.0	87 512	85 990	85 239	84 537	-152	-145	-0.18	-0.17
Northern Africa	6	98.8	66 851	66 940	67 056	67 147	9	21	0.01	0.03
Western and Central Africa	17	48.6	86 688	86 320	76 829	78 867	-37	-745	-0.04	-0.90
Total Africa	38	64.6	241 050	239 249	229 123	230 550	-180	-870	-0.07	-0.37
East Asia	2	85.5	169 677	188 718	204 352	217 759	1 904	2 904	1.07	1.44
South and Southeast Asia	8	73.9	180 756	171 634	169 992	167 533	-912	-410	-0.52	-0.24
Western and Central Asia	11	42.7	11 957	15 242	16 318	18 271	328	303	2.46	1.83
Total Asia	21	76.6	362 390	375 594	390 662	403 563	1 320	2 797	0.36	0.72
Europe excl. Russian Federation	27	66.8	105 451	113 334	115 534	118 484	788	515	0.72	0.45
Total Europe	28	93.5	249 647	299 483	301 975	299 180	4 984	-30	1.84	-0.01
Caribbean	4	50.4	2 356	2 731	2 993	3 165	38	43	1.49	1.48
Central America	1	16.7	0	164	164	164	16	0	-	0
North America	4	90.5	407 048	413 242	415 923	418 604	619	536	0.15	0.13
Total North and Central America	9	88.0	409 403	416 138	419 080	421 933	673	580	0.16	0.14
Total Oceania	6	21.0	4 795	4 950	5 072	5 073	16	12	0.32	0.25
Total South America	5	71.8	133 821	215 435	258 923	288 415	8 161	7 298	4.88	2.96
World	107	77.1	1 401 106	1 550 849	1 604 835	1 648 715	14 974	9 787	1.02	0.61

(Table 9.3). The true figure is undoubtedly higher as information was missing from many countries.

Information on trends over time was more limited with a full data series only available for 94 countries and areas, covering 64 percent of the world's forests. However, there was a clear increasing trend in the area of forest with a management plan in all regions and subregions over the last 20 years (see Table 9.4 and Figure 9.2). Particularly noteworthy is the rapid increase in this area over the last ten years, primarily in East Asia, sub-Saharan Africa and South America.

Area of forest under sustainable forest management

FRA 2010 is the first time countries have been asked to provide an estimate of the area of forest considered to be under sustainable forest management in the FRA process. Because there is no agreed definition or assessment methodology, this was considered a pilot assessment and countries were also asked to provide the definition, criteria and method used to assess the area under sustainable forest management. The purpose of this pilot was to obtain information on how countries might define and assess this indicator as an input to future discussions on the topic at subregional, regional and global levels, in anticipation of the need for countries to report on it as part of the assessment of progress towards the Global Objectives on Forests by 2015. Where countries did not have established assessment criteria, it was suggested that they might wish to use or adapt those applied by ITTO in its assessment of the Status of Tropical Forest Management (ITTO, 2006), which were as follows:

“Forest areas that fulfil any of the following conditions:

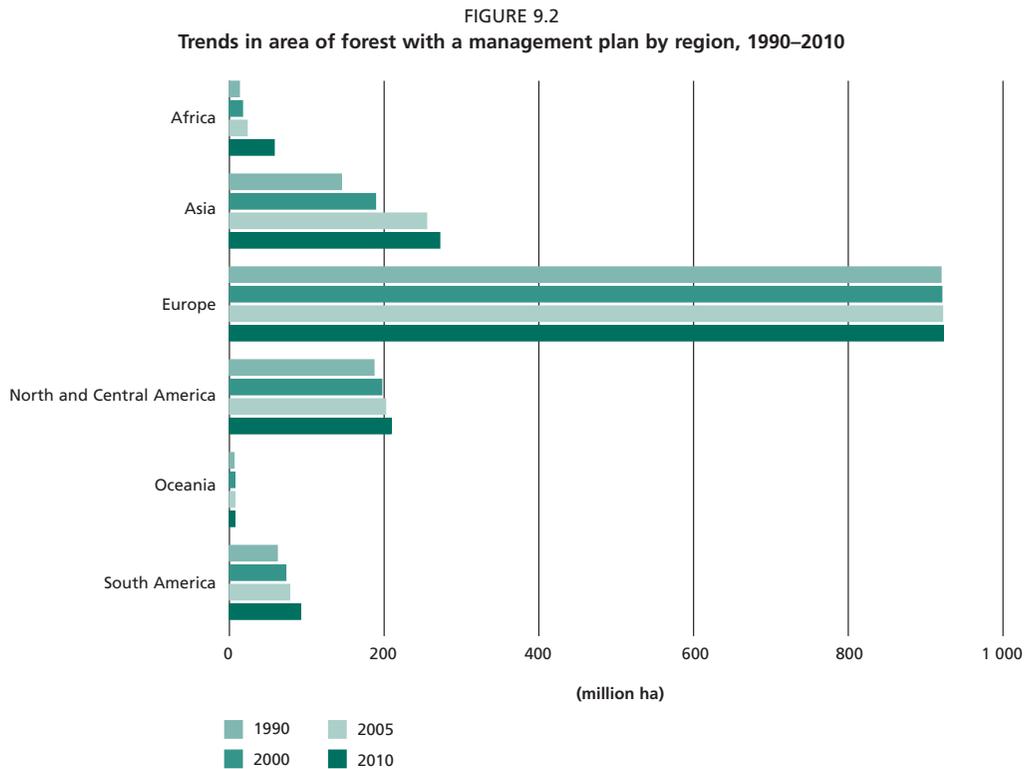
- have been independently certified or in which progress towards certification is being made;

TABLE 9.3
Area of forest with a management plan by region and subregion, 2010

Region/subregion	Information availability		Area of forest with a management plan	
	Number of countries	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	15	86.3	45 607	19.8
Northern Africa	6	98.8	17 693	22.7
Western and Central Africa	19	96.2	42 410	13.4
Total Africa	40	92.6	105 710	16.9
East Asia	4	97.8	156 920	63.0
South and Southeast Asia	8	52.9	102 131	65.6
Western and Central Asia	11	47.2	16 017	78.0
Total Asia	23	71.7	275 068	64.7
Europe excl. Russian Federation	33	91.7	127 621	71.0
Total Europe	34	98.4	936 711	94.7
Caribbean	5	46.6	2 531	78.4
Central America	4	60.7	1 247	10.5
North America	2	44.8	206 084	67.8
Total North and Central America	11	45.2	209 862	65.8
Total Oceania	7	84.0	38 728	24.1
Total South America	6	79.2	110 119	16.1
World	121	79.4	1 676 199	52.3

TABLE 9.4
Trends in area of forest with a management plan by region and subregion, 1990–2010

Region/subregion	Information availability		Area of forest with a management plan (1 000 ha)				Annual change (1 000 ha)		Annual change rate (%)	
	Number of countries	% of total forest area	1990	2000	2005	2010	1990–2000	2000–2010	1990–2000	2000–2010
Eastern and Southern Africa	11	62.5	10 982	10 845	11 126	31 157	-14	2 031	-0.13	11.13
Northern Africa	5	10.1	1 014	1 582	2 095	2 838	57	126	4.55	6.01
Western and Central Africa	15	39.5	1 238	4 750	9 571	24 167	351	1 942	14.39	17.67
Total Africa	31	45.2	13 234	17 178	22 793	58 163	394	4 098	2.64	12.97
East Asia	4	97.8	62 687	82 200	141 800	156 920	1 951	7 472	2.75	6.68
South and Southeast Asia	6	49.8	68 574	92 134	98 239	99 010	2 356	688	3.00	0.72
Western and Central Asia	9	39.8	13 631	14 398	15 123	15 709	77	131	0.55	0.88
Total Asia	19	69.7	144 891	188 731	255 162	271 639	4 384	8 291	2.68	3.71
Europe excl. Russian Federation	29	75.3	111 368	112 156	113 415	114 054	79	190	0.07	0.17
Total Europe	30	95.2	920 318	921 425	922 205	923 144	111	172	0.01	0.02
Caribbean	2	44.7	1 974	861	1 337	2 487	-111	163	-7.96	11.19
Central America	2	18.1	87	110	86	71	2	-4	2.39	-4.31
North America	2	44.8	184 679	195 731	200 907	206 084	1 105	1 035	0.58	0.52
Total North and Central America	6	44.0	186 740	196 702	202 330	208 642	996	1 194	0.52	0.59
Total Oceania	6	6.0	6 169	6 699	6 980	6 947	53	25	0.83	0.36
Total South America	2	68.0	62 344	72 605	78 229	91 970	1 026	1 937	1.54	2.39
World	94	64.1	1 333 696	1 403 340	1 487 698	1 560 504	6 964	15 716	0.51	1.07

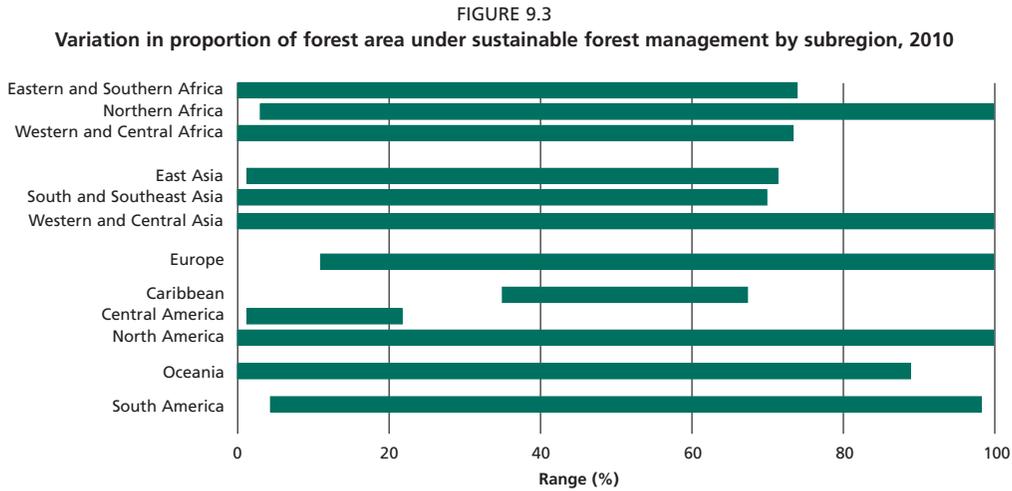


- have fully developed, long-term (ten years or more) forest management plans with firm information that these plans are being implemented effectively;
- are considered as model forest units in their country and information is available on the quality of management;
- are community-based forest management units with secure tenure for which the quality of management is known to be of high standard;
- are protected areas with secure boundaries and a management plan that are generally considered in the country and by other observers to be well managed and that are not under significant threat from destructive agents.”

Although this was not an easy task, 104 countries and areas, together accounting for 62 percent of the world's forests provided estimates of the area under sustainable forest management for 2010, and 110 countries covering 81 percent of the global forest area provided an estimate for at least one point in time. Unfortunately, they did not all provide information on the definition, assessment criteria and method used.

Due to differences in definitions, it is not possible to compare the results by country or to generate regional or global totals and no attempts have been made to do so. Figure 9.3 illustrates the range in the proportion of the forest area considered to be under sustainable forest management by region. The 82 countries that provided a full data series clearly indicated a positive trend in the total forest area considered to be under sustainable forest management.

A separate publication (FAO, 2010c) provides a more detailed analysis of the definitions, assessment criteria and methods applied by countries.



PROGRESS TOWARDS SUSTAINABLE FOREST MANAGEMENT

To obtain a broad picture of progress towards sustainable forest management, a sub-set of indicators were selected for each of the seven thematic elements of sustainable forest management and data on trends were compiled and compared at global, regional and subregional levels across the seven themes. The results can be found in Tables 9.5 to 9.12.

Methodology

Variable selection

As a general rule, three variables were selected from the FRA 2010 reporting tables for each of the seven thematic elements, based on their relevance to the theme and information availability. No relative weighting of variables was applied. There were two exceptions to this rule: there was only one variable available for the protective functions of forest resources and only two variables were chosen for forest health and vitality because of poor information availability and incompatible data.

This yielded a total of 18 variables (see Table 9.5) selected from the 17 reporting tables. Some are derived from the variables reported by countries: for example, growing stock per hectare is derived from total growing stock and forest area.

An increase in the value of a variable is generally interpreted as making a positive contribution to the thematic element (with the exception of area of forest affected by fire and by insects) and thereby to sustainable forest management. The extent to which this assumption holds depends on local or national circumstances. For example, an increase in forest area is likely to be seen as a positive development in most countries, but where it is a result of abandonment of agricultural land and declining rural populations, it may not be seen as positive by policy-makers or society.

Three variables were selected for analysis of the extent of forest resources: area of forest, growing stock per hectare and total carbon stock in forest biomass.

There were no species or population-level indicators in FRA 2010 suitable for a global comparison of trends over time, so the biological diversity theme includes the area of primary forest, areas designated for conservation of biological diversity and area of forest in protected areas. Primary forests are usually associated with high levels of biological diversity, particularly in tropical regions, but in temperate and boreal ecosystems, primary forests can present a limited number of species and may not be a good indicator of species diversity. Yet area of primary forest is an important indicator of the status of the forest ecosystem as a whole.

Forest health and vitality is described by two variables indicating the area affected by fire and the area affected by insect pests. Within this theme, stable or decreasing values are seen as a positive contribution to sustainable forest management. It is recognized that a number of forest ecosystems are dependant on fire to maintain their vitality and regenerative capacity (particularly in boreal zones). However, fires frequently run wild and destroy large areas of forest, resulting in soil erosion and desertification – a serious threat to the sustainable management of natural resources.

Three variables represent the productive function of forest resources: the area of forest designated for productive purposes, the area of planted forests and total wood removals. This theme seeks to address the need to maintain a high and valuable supply of primary forest products, while at the same time ensuring that production and harvesting are sustainable and do not compromise the management options of future generations. Thus an increase in wood removals may not be positive in all cases, as the level of removals may not be sustainable in the long term. Planted forests are not all established and managed for productive purposes, but most of them represent a potential future source of wood.

The protective functions theme is depicted by only one variable indicating the total area of forest designated primarily for protection of soil and water.

Socio-economic functions of forests cover a wide range of benefits to humankind. The variables selected for this analysis are: level of private ownership, employment in the primary production of goods in forests and related support services and the total value of wood removals. The level of private ownership is a somewhat ambiguous variable. In some situations, an increase in this variable may be seen as a benefit for sustainable forest management, indicating devolution of management responsibility and control to individuals or communities. In other cases, it may mean that forest property rights are being transferred from the state and concentrated in the hands of relatively few individuals.

The legal, policy and institutional framework is represented by the area of forest with a management plan, the level of human resources in public forest institutions and the number of university students graduating in forestry annually.

Information availability

Many countries were unable to provide complete data for all variables or for each point in time. However, presenting data as global and regional aggregations overcomes some of the limitations in data availability on subregional scales. The extent to which countries can report on this limited set of variables also provides an indication of data availability and reporting capacity for the wider range of uses and values that societies expect of forests and a synthesis such as this can be used to expose weaknesses in data and identify those areas where information collection efforts should be targeted to improve decision-making.

Rules were created for handling gaps in data in the regions and subregions as follows. Information availability was determined as the sum of the area of forest of those countries reporting on a given variable, expressed as a percentage of total forest area in the region or subregion. It is rated high if the reporting countries together represent 75–100 percent of the total forest area, medium if the countries represent 50–74 percent and low if the percentage is 25–49 percent. If the reporting countries together account for less than 25 percent of the total forest area in the region or subregion, no findings are presented as there are insufficient data.

Data analysis and presentation of results

The country data included in the calculations are those for which countries have reported a complete time series for the variable for all reporting years.

The annual change rate for each variable is expressed as the compound change rate in percent for the periods 1990–2000 and 2000–2010, with a few exceptions. Thus the rate for each period is based on two different estimates, the accuracy of which is unknown.

An arbitrary threshold of ± 0.5 percent per year was selected for all variables in order to highlight large changes and to distinguish the cases where the difference between two estimates indicates an actual change from those cases where the difference may not be statistically significant.

Simple, three-coloured 'traffic light' matrices were prepared to visualize change rates in the variables listed under each thematic area for a particular region. These indicate trends in the selected variables over time and the progress they reflect towards sustainable forest management. Trends can thus be positive, negative or with no major change (less than 0.5 percent) for each of the 18 variables.

The results of this analysis are presented at global, regional and subregional levels.

Global results

Table 9.5 summarizes trends in the selected variables at the global level.

Extent of forest resources. The area of forest decreased by an average of 8.3 million hectares per year over the period 1990–2000 (0.20 percent per year) and by 5.2 million hectares per year in the last decade (0.13 percent per year). Forest carbon stocks show an annual decrease of about 0.5 Gt per year, while the growing stock per hectare is increasing slightly. However, none of the change rates exceed the threshold of 0.5 percent annually.

Forest biological diversity. The area of primary forest decreased by an average of 4.7 million hectares per year in the 1990s and 4.2 million hectares per year between 2000 and 2010. These figures exclude the Russian Federation, where large differences in the values over time were due to the introduction of a new classification system. On a positive note, the area of forest designated for conservation of biological diversity increased by about 6.3 million hectares per year during the last decade and a similar increase occurred in the area of forest in protected areas. In both cases the increase is equivalent to nearly 2 percent per year over the last decade.

Forest health and vitality. Both the area of forest adversely affected by fire and by insects show a decrease since 1990. However, information for this theme was missing for many countries, particularly in Africa, so the figures should be treated with caution.

Productive functions of forest resources. The area of forest designated primarily for productive purposes decreased by more than 50 million hectares between 1990 and 2010, while the area of planted forest increased by about 86 million hectares. While not all planted forests are established and used for productive purposes, these figures indicate that substantial areas of natural forests previously allocated for productive purposes are now designated for other uses, while the proportion of wood removals coming from planted forest is likely to significantly increase in the future. Wood removals decreased in the 1990s (particularly in the Russian Federation), but increased rapidly again between 2000 and 2005.

Protective functions of forest resources. The area of forest designated primarily for protection of soil and water increased by an average of 3.1 million hectares per year in the 1990s and by 2.8 million hectares per year since 2000, a total increase of 59 million hectares over the last 20 years.

Socio-economic functions of forests. The area of privately owned forests increased by an average of 4 million hectares per year in the period 1990–2000 and by 14.7 million hectares per year in the period 2000–2005. At the global level the reported value of wood removals showed no significant change between 1990 and 2000, but increased by more than 5 percent annually over the period 2000–2005. This suggests that roundwood prices recovered somewhat from their decline (in real terms) in the decade 1990–2000. However, since 2005 they have fallen sharply. Employment in the primary production of goods in forests decreased by about 1 percent per year in the 1990s, but levelled off in the period 2000–2005.

TABLE 9.5
Progress towards sustainable forest management at the global level, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.20	● -0.13	-8 323	-5 211	1 000 ha
	Growing stock of forests	H	● 0.13	● 0.14	n.s.	n.s.	m ³ /ha
	Forest carbon stock in living biomass	H	● -0.18	● -0.17	-538	-502	million tonnes
Forest biological diversity	Area of primary forest	M	● -0.40	● -0.37	-4 666	-4 188	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	H	● 1.14	● 1.92	3 250	6 334	1 000 ha
	Area of forest within protected areas	H	● 1.09	● 1.97	3 040	6 384	1 000 ha
Forest health and vitality	Area of forest affected by fire	M	● -1.89	● -2.15	-345	-338	1 000 ha
	Area of forest affected by insects	L	● -1.88	● -0.70	-699	-231	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● -0.18	● -0.25	-2 125	-2 911	1 000 ha
	Area of planted forest	H	● 1.90	● 2.09	3 688	4 925	1 000 ha
	Total wood removals	H	● -0.50	● 1.08	-15 616	33 701	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	H	● 1.23	● 0.97	3 127	2 768	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● 0.75	● 2.56	3 958	14 718	1 000 ha
	Value of total wood removals	M	● -0.32	● 5.77	-241	4 713	million US\$
	Employment in primary production of goods	M	● -1.20	● -0.11	-126	-10	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	M	● 0.51	● 1.07	6 964	15 716	1 000 ha
	Human resources in public forest institutions	L	● -1.94	● 0.07	-23 568	830	total staff
	Number of students graduating in forestry	L	● 15.67	● 8.83	4 384	4 081	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

Legal, policy and institutional framework. The area of forest with a management plan increased rapidly in the last ten years. However, information is missing for more than one-third of the world's forests. Human resources in public forest institutions decreased significantly between 2000 and 2005, but remained stable in the period 2005–2008. However, data availability for this variable was exceptionally poor, so the figures should be treated with caution. The number of graduates in forestry increased by more than 4 000 annually over the period 2000–2008. Again, information availability on this variable for all reporting years was relatively poor as many countries lacked information for the year 2000.

Conclusions. Overall, the situation at the global level has remained relatively stable over the last 20 years. The change in forest area is well below the threshold of 0.5 percent per year for a significant change. The largest negative rates (in percentage terms) include the decrease in the area of primary forest over the entire 20-year period; in wood removals and employment in the 1990s; and in human resources in public forest institutions during the period 2000–2005. Significant positive trends were reported in the area of forest designated for the conservation of biological diversity and the area of forest in protected areas (particularly in the last decade), the area of planted forest and the number of students graduating in forestry. Forests under private ownership and the value of wood products showed a positive trend for the period 2000–2005.

Africa

Table 9.6 summarizes trends in the selected variables for Africa.

Extent of forest resources. The area of forest decreased at an alarming rate during both periods in this region. There are indications, however, that the net loss of forests is slowing down. In the period 1990–2000 the net area change was about -4.0 million hectares per year, while in the period 2000–2010, it averaged -3.4 million hectares per year. The decrease in carbon stock was below the threshold of 0.5 percent per year. Growing stock per hectare did not change significantly, but this probably reflects the fact that few countries have more than one estimate of growing stock over time.

Forest biological diversity. The area of primary forest in Africa decreased by close to 700 000 ha annually between 1990 and 2000 and by around 572 000 ha per year in 2000–2010. However, information for this variable was missing for some countries – for example, Cameroon and the Democratic Republic of the Congo in the Congo Basin (which represents the second largest area of tropical primary forest after the Amazon Basin). Some of this decrease was caused by deforestation, some by alteration of forests through selective logging and other human interventions. This ‘altered’ forest area was subsequently classified as ‘other naturally regenerated forest’. On a positive note, there has been an increase in the area of forest designated primarily for conservation of biological diversity of about 5 million hectares since 1990 and an even greater increase in the area of forest in protected areas. Again, information is missing from several large countries in the region, so these figures are likely to be underestimates.

Forest health and vitality. Data availability was insufficient for trend analysis for both of the variables representing this theme.

Productive functions of forest resources. There was a steady increase in wood removals from 434 million cubic metres in 1990 to 558 million cubic metres in 2005, or an annual increase of about 8 million cubic metres despite the fact that the area designated for production of wood and NWFPs has decreased by more than a million hectares per year since 1990. Most of the increase in wood removals stemmed from increased production of woodfuel, particularly in Western and Central Africa. A large part of this may have been collected from areas outside forests (other wooded land and trees outside forests) and some may have come from forests designated for multiple use – including community forests – rather than from forests designated primarily for productive purposes. The area of planted forest increased by just under 2.5 million hectares in the region over the last ten years.

Protective functions of forest resources. The area of forest designated for protection of soil and water shows a slight decrease but this is below the level of 0.5 percent change per year.

Socio-economic functions of forests. The status of the information is generally quite weak and data availability is particularly low for the value of wood removals and the level of employment. The area under private ownership declined slightly in the 1990s but increased in the period 2000–2005. However, privately owned forests still account for less than 4 percent of the total forest area. While the value of wood removals declined

TABLE 9.6
Progress towards sustainable forest management in Africa, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.56	● -0.49	-4 067	-3 414	1 000 ha
	Growing stock of forests	H	● 0.17	● 0.12	n.s.	n.s.	m ³ /ha
	Forest carbon stock in living biomass	H	● -0.44	● -0.42	-262	-242	million tonnes
Forest biological diversity	Area of primary forest	M	● -1.21	● -1.12	-695	-572	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	M	● 0.28	● 0.67	142	352	1 000 ha
	Area of forest within protected areas	M	● 0.54	● 1.10	251	555	1 000 ha
Forest health and vitality	Area of forest affected by fire	–	–	–	–	–	1 000 ha
	Area of forest affected by insects	–	–	–	–	–	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	M	● -0.40	● -0.85	-825	-1 667	1 000 ha
	Area of planted forest	H	● 1.06	● 1.75	129	245	1 000 ha
	Total wood removals	H	● 1.81	● 1.45	8 549	7 767	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	M	● -0.13	● -0.45	-26	-91	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● -1.05	● 3.25	-243	758	1 000 ha
	Value of total wood removals	L	● -1.99	● 6.44	-48	156	million US\$
	Employment in primary production of goods	L	● 0.70	● 3.60	2	13	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	L	● 2.64	● 12.97	394	4 098	1 000 ha
	Human resources in public forest institutions	M	● -1.43	● 2.42	-797	1 317	total staff
	Number of students graduating in forestry	M	● 8.11	● 1.01	147	23	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

● = Positive change (greater than 0.50%)
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in the 1990s (despite an increase in the amount produced), it increased significantly during the period 2000–2005. The level of employment in the primary production of wood also increased during the 2000–2005 period. However, information availability for all the reporting years was below 30 percent of the total forest area for this variable.

Legal, policy and institutional framework. The area of forest with a management plan increased rapidly over the last ten years (a net increase of more than 4 million hectares annually). The level of human resources in public forest institutions decreased in the period 2000–2005 but increased again between 2005 and 2008. The number of graduates in forestry increased between 2000 and 2005 but has since levelled off.

Conclusions. On the whole, progress towards sustainable forest management in Africa has improved when comparing the last decade to the 1990s. The net loss of forest area has slowed down and the areas of forest designated for the conservation of biological diversity included in protected areas have increased slightly. The sharp increase in the area of forest with a management plan over the last ten years is particularly good news. The continued, rapid loss of forest area (the second largest of any region during this 20-year period) is, however, still a cause for concern, as is the loss of primary forests. A summary of information by subregion can be found in Table 9.12.

Asia

Table 9.7 summarizes trends in the selected variables for Asia.

Extent of forest resources. At the regional level, a net loss of forests of about 600 000 ha per year in the 1990s was reversed to form an annual net gain of 2.2 million hectares in the period 2000–2010. This was largely due to increased afforestation activity in the region, particularly in China, and despite a continued net loss of forests in South and Southeast Asia. In the period 1990–2010, the carbon stock in forest biomass decreased slightly in the region as a whole. There was, however, a large variation among the three subregions, with a net annual increase in East Asia and in Western and Central Asia and a significant decrease in South and Southeast Asia. Growing stock per hectare was largely unchanged, reflecting the fact that few countries had more than one estimate of growing stock per hectare over time. Over the last 20 years, the trend for this theme was largely stable or slightly negative, with some positive trends recently in a number of countries and some very large variations between subregions and countries.

Forest biological diversity. The area of primary forest decreased at a rate of about 340 000 ha per year during the last 10 years – almost entirely in the subregion of South and Southeast Asia. The cause of the decrease was not only deforestation but also alteration of forests through selective logging and other human interventions, which resulted in a subsequent classification of such forests as ‘other naturally regenerated forest’. About 13 percent of the forest area is currently designated primarily for conservation of biological diversity, representing an average annual increase of 1.5 million hectares per year since 2000. The area of forest in protected areas has increased by a similar amount and now accounts for almost 24 percent of the total forest area of the region.

Forest health and vitality. The incidence of forest fires decreased, while the area affected by insect pests increased in the 1990s and was relatively stable in the 2000–2005 period. However, insect pests still affected a relatively small proportion of the total forest area in Asia (less than 2 percent of the 17 countries that reported on this variable).

Productive functions of forest resources. The forest area designated primarily for the production of wood and NWFPs decreased by almost 3 million hectares per year in the last decade – most of this due to a logging ban in parts of China. At the same time, the area of planted forest increased by a similar amount, the highest increase in any region. This rapid expansion took place primarily in China, where the area of planted forest increased by about 1.2 million hectares per year in the 1990s and by 2.3 million hectares per year in the period 2000–2010. Total wood removals decreased significantly during the 1990s, partly because of the logging ban in China where wood is now being imported, from both within and outside the region. However, the rate of removals increased again in South and Southeast Asia during the period 2000–2005. Several countries in the region noted that the figures for wood removals submitted do not take into account illegal removals or informal collection of woodfuel, so actual removals may be higher.

Protective functions of forest resources. The area of forest designated for protection of soil and water showed an increase over the past 20 years and grew by an average of

TABLE 9.7
Progress towards sustainable forest management in Asia, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.10	● 0.39	-595	2 235	1 000 ha
	Growing stock of forests	H	● 0.34	● -0.17	n.s.	n.s.	m ³ /ha
	Forest carbon stock in living biomass	H	● -0.11	● -0.31	-40	-112	million tonnes
Forest biological diversity	Area of primary forest	H	● -0.43	● -0.31	-504	-342	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	H	● 0.77	● 2.08	471	1 461	1 000 ha
	Area of forest within protected areas	H	● 1.45	● 1.46	1 292	1 503	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	● -2.56	● -1.53	-78	-39	1 000 ha
	Area of forest affected by insects	L	● 13.18	● 0.32	306	14	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● 0.26	● -1.21	662	-2 945	1 000 ha
	Area of planted forest	H	● 2.00	● 2.82	1 667	2 985	1 000 ha
	Total wood removals	H	● -0.64	● 0.18	-4 948	1 364	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	H	● 1.75	● 2.18	1 741	2 638	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● 4.79	● 6.27	2 930	5 572	1 000 ha
	Value of total wood removals	M	● -2.97	● 4.36	-806	1 091	million US\$
	Employment in primary production of goods	M	● -0.85	● -0.10	-73	-8	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	M	● 2.68	● 3.71	4 384	8 291	1 000 ha
	Human resources in public forest institutions	H	● -2.14	● 0.16	-22 922	1 633	total staff
	Number of students graduating in forestry	M	● 23.89	● 10.80	3 856	3 522	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

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2.6 million hectares per year over the last decade, reflecting greater attention to the role of forests in the conservation of soil and water, as well as other protective functions.

Socio-economic functions of forests. The area of forest under private ownership increased significantly during the period 1990–2005, particularly since 2000. China almost entirely accounted for this increase (some 5.6 million hectares per year on average between 2000 and 2005). The value of wood removals decreased in the 1990s, but between 2000 and 2005 increased at a faster rate (in percentage terms) than the volume of wood removed, indicating an increase in wood price. Employment showed a reduction in the 1990s, but is now stable.

Legal, policy and institutional framework. The area of forest with a management plan increased significantly and more than 80 million hectares were added in the last ten years. Most of this increase took place in East Asia (China in particular), while South and Southeast Asia accounted for the largest increase in forest area with a management plan in the 1990s. The level of human resources in public forest institutions decreased between 2000 and 2005 but was relatively stable between 2005 and 2008, while the number of graduates in forestry increased very rapidly in China between 2000 and 2008, strongly affecting the regional totals.

Conclusions. Overall, the forest area in Asia is about 16 million hectares larger in 2010 than it was in 1990 as a result of large-scale afforestation efforts during the last 10–15 years, particularly in China. The decrease in area of primary forest is cause for concern, while the increase in the forest area designated for conservation of biological diversity, the area of forest in protected areas and forests designated for protective functions is commendable. The area affected by fire decreased while that affected by insects increased sharply between 1990 and 2000, but then levelled off. Variables representing the legal, policy and institutional framework are largely positive or stable and information availability in the region is generally good. In short, there has been mixed progress over the last 20 years at the regional level with large variations between countries and subregions. A summary of information by subregion can be found in Table 9.12.

Europe

Table 9.8 summarizes trends in the selected variables for Europe.

Extent of forest resources. The forest area in Europe increased by an average of 776 000 ha per year over the last 20 years. The total carbon stock in forest biomass increased both as a result of the increase in forest area and because forests in Europe became more densely stocked. Average volume per hectare increased from 105 to 112 cubic metres per hectare (from 132 to 156 cubic metres per hectare if the Russian Federation is excluded, an annual increase of 1.2 cubic metres per hectare per year).

Forest biological diversity. Although the Russian Federation provided information for all four reporting years, it was excluded from the analysis of primary forest because there was a large difference in the reported change rate (from +1.6 million hectares per year in the 1990s to -0.5 million hectares per year in the period 2000–2005). This is primarily due to a change in the classification system used rather than actual changes in primary forest area. As a result, the information availability for Europe falls below the threshold of 25 percent of the total forest area, so no results are presented at the regional level for this variable. Four percent of forest area is currently designated primarily for the conservation of biological diversity. If the Russian Federation is excluded, this proportion rises to 10 percent. There has been a large increase in this area since 1990 (more than 900 000 ha per year on average). The area of forest in protected areas has also increased steadily.

Forest health and vitality. The area affected by forest fires increased between 1990 and 2000 but decreased between 2000 and 2005. A similar trend was noted for the area of forest affected by insect pests.

Productive functions of forest resources. The total volume of wood removals decreased in the 1990s. This was caused by a sharp decline in removals in the Russian Federation in the early 1990s – a result of the transition from a centrally-planned to a market-based economy. However, removals in Europe including the Russian Federation have since been moving back towards their 1990 level. The area of planted forest increased slightly over the 20-year period, while the area of forest used primarily for wood production decreased by about 33 million hectares, with corresponding gains in the areas of forest designated for multiple use, conservation and protective functions.

TABLE 9.8
Progress towards sustainable forest management in Europe, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● 0.09	● 0.07	877	676	1 000 ha
	Growing stock of forests	H	● 0.28	● 0.32	n.s.	n.s.	m ³ /ha
	Forest carbon stock in living biomass	H	● 0.23	● 0.41	100	181	million tonnes
Forest biological diversity	Area of primary forest	–	–	–	–	–	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	H	● 4.65	● 2.32	1 074	759	1 000 ha
	Area of forest within protected areas	H	● 3.94	● 1.80	911	556	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	● 4.47	● -2.03	49	-27	1 000 ha
	Area of forest affected by insects	H	● 5.14	● -9.43	285	-566	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● -0.65	● 0.04	-3 538	195	1 000 ha
	Area of planted forest	H	● 1.01	● 0.60	627	401	1 000 ha
	Total wood removals	H	● -1.92	● 2.76	-13 475	18 424	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	H	● 1.67	● 0.24	1 386	221	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● 1.09	● 0.63	1 012	624	1 000 ha
	Value of total wood removals	–	–	–	–	–	million US\$
	Employment in primary production of goods	H	● -4.32	● -1.36	-60	-14	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	H	● 0.01	● 0.02	111	172	1 000 ha
	Human resources in public forest institutions	–	–	–	–	–	total staff
	Number of students graduating in forestry	–	–	–	–	–	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)

M = Medium (reporting countries represent 50–74% of total forest area)

L = Low (reporting countries represent 25–49% of total forest area)

● = Positive change (greater than 0.50%)

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Protective functions of forest resources. The area of forest designated primarily for protection of soil and water increased by more than 16 million hectares during the period 1990–2010, most of this between 1990 and 2000, and now accounts for 9 percent of the total forest area in Europe.

Socio-economic functions of forests. The area of forest under private ownership increased by more than 1 million hectares per year in the 1990s but, while still increasing, the rate of change slowed down between 2000 and 2005. To a large extent this is a result of the recent privatization process in central and eastern European countries. The level of employment in the primary production of goods in forests decreased, probably due

to an increase in mechanization and organizational streamlining. There are insufficient data for an analysis of trends in the value of wood removals due to a lack of information from the Russian Federation for 1990.

Legal, policy and institutional framework. The vast majority of the forest area in Europe (95 percent) is subject to a management plan, so the increase in this variable in recent years is insignificant. The information availability is insufficient to carry out a trend analysis for the other two variables representing this theme.

Conclusions. Data availability was generally high for Europe, although results were strongly influenced by the Russian Federation. The status of forest resources in Europe has essentially been stable over the last 20 years. While the area of forest is expanding, the focus of forest management in Europe has clearly shifted away from productive functions towards conservation of biological diversity, protection and multiple uses – a shift already evident at the end of the 1990s. The main negative trends are found in employment and – when analysing figures excluding the Russian Federation – in human resources in public forest institutions between 2005 and 2008, as well as in the value of wood removals in the 1990s. Table 9.12 shows the trends for Europe including and excluding the Russian Federation.

North and Central America

Table 9.9 summarizes trends in the selected variables for North and Central America.

Extent of forest resources. Forest area for the region as a whole (705 million hectares in 2010) is almost the same as in 1990 (3 million hectares less, or 0.4 percent lower). While there was a decrease in forest area in Central America of about 6 million hectares for the period 1990–2010, the area of forest in North America increased by about 2 million hectares, mainly due to afforestation in the United States of America, and in the Caribbean by about 1 million hectares, largely as a result of natural expansion onto abandoned agricultural land, during the same period. As in Europe, the total carbon stock in forest biomass increased and the forests became more densely stocked.

Forest biological diversity. The area of primary forest has remained fairly stable overall, although there has been a significant decrease in relative (percentage) terms in Central America. The area of forest designated for conservation of biological diversity increased by more than 8 million hectares since 1990, while the area of forest in protected areas increased by more than 16 million hectares over the same period and now equals 10 percent of the total forest area of the region.

Forest health and vitality. The area adversely affected by forest fires has increased over time, while the area affected by insects decreased between 1990 and 2000, only to increase again between 2000 and 2005. North America reported the highest area of insect disturbance for 2005 of any region (some 22 million hectares or 3.4 percent of the forest area). This included major outbreaks of the mountain pine beetle (*Dendroctonus ponderosae*), which has devastated more than 11 million hectares of forest in Canada and the western United States of America since the late 1990s – an unprecedented outbreak exacerbated by higher winter temperatures.

Productive functions of forest resources. The most prominent change over time was the increase in area of forest designated primarily for productive purposes, which contrasts with the decrease in this designation in most other regions. The area of planted forest also increased, particularly in the 1990s, while total wood removals decreased by just under 3 million cubic metres per year over the last 20 years, or 0.4 percent annually.

Protective functions of forest resources. The area of forest designated for the protection of soil and water showed a significant increase in relative (percentage) terms during the last 15 years. However, in absolute terms the increase was fairly small in comparison with other variables. It should be noted that the forest areas managed for the purposes of soil and water conservation in North America are generally included

TABLE 9.9
Progress towards sustainable forest management in North and Central America, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.04	● n.s.	-289	-10	1 000 ha
	Growing stock of forests	H	● 0.24	● 0.69	n.s.	1	m ³ /ha
	Forest carbon stock in living biomass	H	● 0.19	● 0.28	74	109	million tonnes
Forest biological diversity	Area of primary forest	H	● -0.06	● 0.02	-167	50	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	H	● 0.27	● 0.61	255	612	1 000 ha
	Area of forest within protected areas	H	● 0.55	● 2.32	284	1 361	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	● 1.15	● 1.98	34	64	1 000 ha
	Area of forest affected by insects	H	● -4.52	● 1.60	-1 246	349	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● 0.79	● 1.03	680	970	1 000 ha
	Area of planted forest	H	● 4.16	● 2.48	1 013	840	1 000 ha
	Total wood removals	H	● -0.36	● -0.38	-2 914	-2 982	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	H	● 2.07	● 2.21	23	30	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● -0.12	● -0.14	-246	-273	1 000 ha
	Value of total wood removals	H	● 4.62	● 5.07	1 054	1 626	million US\$
	Employment in primary production of goods	L	● 2.55	● -0.51	3	-1	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	L	● 0.52	● 0.59	996	1 194	1 000 ha
	Human resources in public forest institutions	–	–	–	–	–	total staff
	Number of students graduating in forestry	M	● 2.42	● 8.43	98	400	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

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under the primary designated function of ‘multiple use’ rather than under ‘protective function’. This influences the figures from this region as a whole.

Socio-economic functions of forests. The area of forest under private ownership decreased slightly over the last 20 years, but the annual change rate was below the threshold of 0.5 percent. The value of wood removals increased between 1990 and 2005, despite the slight decrease in the amount of wood removals indicating an increase in price. The level of employment in the primary production of goods in forests and related services showed an increase in the 1990s followed by a decrease since 2000.

Legal, policy and institutional framework. The area of forest with a management plan increased steadily over the last 20 years, adding an average of some 1 million hectares annually – primarily in the United States of America. However, information on this variable was missing from several of the larger countries in the region, including both Canada and Mexico. The number of graduates in forestry increased in both periods, while there was insufficient information on the level of human resources in public forest institutions to analyse trends over time.

Conclusions. Progress towards sustainable forest management was generally positive in North and Central America as a whole during the period 1990–2010, with the notable exception of the significant negative trends noted for the area of forest affected by fire and by insect pests and the slight decrease in the level of employment. There was, however, considerable variation among subregions, as can be seen in Table 9.12.

Oceania

Table 9.10 summarizes trends in the selected variables for Oceania.

Extent of forest resources. The area of forest was essentially stable over the period 1990–2000, but has decreased at an average rate of some 700 000 ha per year since 2000. This net loss seems to be increasing and is reported to be more than 1 million hectares per year in the last five years. This is due to large losses of forests in Australia, where severe drought and forest fires have exacerbated the loss of forest since 2000. However, as mentioned in the Country Report from Australia: “It is unclear at this stage whether the climatic-induced reduction is a temporary or permanent loss of forest.” Information availability was insufficient to determine trends in the remaining two variables under this theme.

Forest biological diversity. There has been a decrease in the area of primary forest of almost 6 million hectares since 1990. Information availability was insufficient to identify trends in the area of forest designated for conservation of biological diversity and the area of forest in protected areas (1990 data were missing for Australia).

Forest health and vitality. Data availability was insufficient for trend analysis for both variables.

Productive functions of forest resources. The area of forest designated for productive purposes increased significantly in the 1990s but rose only slightly after 2000. The area of planted forest increased by more than 2 percent annually over the last 20 years but is still relatively small (4 million hectares or 2 percent of the total forest area in the region). The amount of wood removals has increased by around 1.5 million cubic metres annually since 1990.

Protective functions of forest resources. Information availability was insufficient on the area of forest designated primarily for the protection of soil and water (1990 data were missing for Australia).

Socio-economic functions of forests. The number of people employed in the primary production of forest goods and services and related activities increased slightly from 1990 to 2000 but declined slightly between 2000 and 2005. Information availability was insufficient for an analysis of the other variables.

Legal, policy and institutional framework. Data availability was insufficient for trend analysis for all three variables representing this theme.

Conclusions. Data availability is largely determined by Australia, since it accounts for 78 percent of the forest area in this region. With information missing from Australia for 1990 for many of these variables it is impossible to assess long-term trends in this region for most of the themes. The loss of primary forest and the increase in the net loss of forest area in the region are cause for concern, despite the fact that part of the latter may be a temporary loss of forest cover due to an extensive drought in Australia.

TABLE 9.10
Progress towards sustainable forest management in Oceania, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.02	● -0.36	-36	-700	1 000 ha
	Growing stock of forests	–	–	–	–	–	m ³ /ha
	Forest carbon stock in living biomass	–	–	–	–	–	million tonnes
Forest biological diversity	Area of primary forest	H	● -0.55	● -0.99	-222	-370	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	–	–	–	–	–	1 000 ha
	Area of forest within protected areas	–	–	–	–	–	1 000 ha
Forest health and vitality	Area of forest affected by fire	–	–	–	–	–	1 000 ha
	Area of forest affected by insects	–	–	–	–	–	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● 4.44	● 0.34	394	39	1 000 ha
	Area of planted forest	H	● 2.55	● 2.12	74	78	1 000 ha
	Total wood removals	H	● 3.65	● 2.97	1 446	1 514	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	–	–	–	–	–	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	–	–	–	–	–	1 000 ha
	Value of total wood removals	–	–	–	–	–	million US\$
	Employment in primary production of goods	H	● 1.95	● -1.53	n.s.	n.s.	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	–	–	–	–	–	1 000 ha
	Human resources in public forest institutions	–	–	–	–	–	total staff
	Number of students graduating in forestry	–	–	–	–	–	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

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● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

South America

Table 9.11 summarizes trends in the selected variables for South America.

Extent of forest resources. Forest area in South America decreased at an alarming rate in the 1990s and continued to do so in the period 2000–2010, although it did show signs of slowing down, particularly in the last five years. The annual net loss during the period 1990–2000 was 4.2 million hectares, falling to 4.0 million hectares in the period 2000–2010, the highest annual net loss of any region. It has further dropped to 3.6 million hectares annually in the last five years. It should be noted that the figures for the Amazonia in Brazil related to areas of forest cleared, without taking into account the clear-cut areas that may have regenerated and returned to

forest. Net loss for the region as a whole may thus be overestimated and was below the threshold of 0.5 percent per year for the period 1990–2010. Carbon stock in forest biomass followed the trend of total forest area, while growing stock per hectare reportedly did not change significantly – probably reflecting the fact that few countries had more than one estimate of growing stock over time.

Forest biological diversity. Primary forests currently account for 76 percent of total forest area in the region but continue to decrease rapidly by an average of around 3 million hectares per year in the period 1990–2010. Apart from deforestation, the decrease was caused by alteration of forests through selective logging and other human interventions, which resulted in a subsequent reclassification of such forests as ‘other naturally regenerated forest’. On a positive note, the area of forest designated primarily for conservation of biological diversity increased by about 3.2 million hectares per year in the last ten years, or a total of 43 million hectares since 1990, while the area of forest in protected areas increased by 2.4 million hectares annually in the last ten years and now encompasses an estimated 17 percent of the total forest area in the region.

Forest health and vitality. Data availability was insufficient for trend analysis for both variables.

Productive functions of forest resources. The area of forest designated for productive functions has increased steadily by about half a million hectares annually since 1990. The area of planted forest also increased. South America reported a significant reduction in wood removals in the 1990s, from 349 million cubic metres in 1990 to 306 million cubic metres in 2000, mainly because of a reduction in the production of woodfuel. However, after 2000 removals bounced back to the level of 1990, primarily as a result of an increase in the production of industrial wood.

Protective functions of forest resources. The area of forest designated for the protection of soil and water resources remained stable over the last 20 years.

Socio-economic functions of forests. The area of forest under private ownership increased by more than 40 million hectares during the period 2000–2005, primarily as a result of changes reported by Colombia. The value of wood removals decreased in the 1990s but increased between 2000 and 2005, following the global trend. Data availability on employment was insufficient for trend analysis.

Legal, policy and institutional framework. The area of forest with a management plan continues to increase in the region – currently at a rate of 1.9 million hectares annually. The number of students graduating in forestry annually has also increased significantly since 2000. Information on human resources in public forest institutions was too limited to permit a trend analysis.

Conclusions. Overall, progress towards sustainable forest management was mixed in South America. The rate of net forest loss continues to be a cause for concern although significant progress has been made, particularly in the last five years. The rate of loss of primary forest also remains alarmingly high. Nonetheless, there were also positive signs, e.g. in the increased areas of forest designated for conservation of biological diversity and in protected areas. The decrease in removals of woodfuel may reflect a reduced demand for this product in the region, but this was partly offset by an increase in removals of industrial wood since 2000. The area of planted forests increased and may meet a larger proportion of the demand for wood in the future. The increase in the area of forest with a management plan is also a positive sign.

Subregional trends

Subregional trends were determined using the same method as that used for the regions, and following the division into subregions adopted for FRA 2010 reporting (see Chapter 1). Three regions (Africa, Asia and North and Central America) that have significant intraregional differences were divided into three subregions each. No

TABLE 9.11
Progress towards sustainable forest management in South America, 1990–2010

Thematic element	FRA 2010 variables	Data availability	Annual change rate (%)		Annual change		Unit
			1990–2000	2000–2010	1990–2000	2000–2010	
Extent of forest resources	Area of forest	H	● -0.45	● -0.45	-4 213	-3 997	1 000 ha
	Growing stock of forests	H	● 0.07	● 0.07	n.s.	n.s.	m ³ /ha
	Forest carbon stock in living biomass	H	● -0.37	● -0.39	-406	-404	million tonnes
Forest biological diversity	Area of primary forest	H	● -0.46	● -0.46	-3 096	-2 961	1 000 ha
	Area of forest designated primarily for conservation of biodiversity	H	● 2.59	● 4.83	1 187	3 167	1 000 ha
	Area of forest within protected areas	M	● 0.44	● 3.01	302	2 431	1 000 ha
Forest health and vitality	Area of forest affected by fire	–	–	–	–	–	1 000 ha
	Area of forest affected by insects	–	–	–	–	–	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	● 0.69	● 0.64	501	496	1 000 ha
	Area of planted forest	H	● 1.97	● 3.23	178	376	1 000 ha
	Total wood removals	H	● -1.30	● 2.37	-4 275	7 614	1 000 m ³
Protective functions of forest resources	Area of forest designated primarily for protection of soil and water	H	● n.s.	● -0.02	1	-11	1 000 ha
Socio-economic functions of forests	Area of forest under private ownership	H	● 0.51	● 6.39	562	8 180	1 000 ha
	Value of total wood removals	M	● -2.20	● 6.98	-109	352	million US\$
	Employment in primary production of goods	–	–	–	–	–	1 000 FTE
Legal, policy and institutional framework	Forest area with management plan	M	● 1.54	● 2.39	1 026	1 937	1 000 ha
	Human resources in public forest institutions	–	–	–	–	–	total staff
	Number of students graduating in forestry	H	● 9.56	● 6.30	117	107	number of students

Notes: No forecasting to 2010 was done for areas affected by fire and by insects or for the amount and value of wood removals. For these variables estimates were provided for 1990 (an average of the period 1988–1992), 2000 (average of 1998–2002) and 2005 (average of 2003–2007). Data on ownership and employment were requested only for 1990, 2000 and 2005. In all these cases change rates were calculated for the periods 1990–2000 and 2000–2005. Data for human resources in public institutions and the number of forestry graduates are from 2000, 2005 and 2008; change rates are calculated for 2000–2005 and 2005–2008.

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–74% of total forest area)
L = Low (reporting countries represent 25–49% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

subregional divisions were made of Europe, Oceania and South America, which can be considered relatively homogeneous with respect to the variables studied. The possible exception is Europe, where the Russian Federation dominates because of its size, so figures are presented for Europe as a whole, as well as for Europe excluding the Russian Federation. Table 9.12 summarizes the results for each subregion and illustrates some important intraregional differences.

In Africa, the Western and Central Africa subregion showed more positive trends than negative ones. Eastern and Southern Africa demonstrated predominantly negative trends in the 1990s but a more balanced mix for the last ten years. In Asia, East Asia

TABLE 9.12
Progress towards sustainable forest management by subregion, 1990–2010

Themes and variables	Africa						Asia					
	Eastern and Southern		Northern		Western and Central		East					
	R1	R2	R1	R2	R1	R2	R1	R2				
Extent of forest resources												
Area of forest	H	●	●	H	●	●	H	●	●	H	●	●
Growing stock of forests	H	●	●	H	●	●	H	●	●	H	●	●
Forest carbon stock in living biomass	H	●	●	H	●	●	H	●	●	H	●	●
Forest biological diversity												
Area of primary forest	H	●	●	H	●	●	L	●	●	H	●	●
Area of forest designated primarily for conservation of biodiversity	H	●	●	H	●	●	M	●	●	H	●	●
Area of forest within protected areas	H	●	●	–	–	–	L	●	●	H	●	●
Forest health and vitality												
Area of forest affected by fire	L	●	●	–	–	–	–	–	–	H	●	●
Area of forest affected by insects	–	–	–	–	–	–	–	–	–	H	●	●
Productive functions of forest resources												
Area of forest designated primarily for production	H	●	●	H	●	●	M	●	●	H	●	●
Area of planted forest	H	●	●	H	●	●	H	●	●	H	●	●
Total wood removals	H	●	●	H	●	●	H	●	●	H	●	●
Protective functions of forest resources												
Area of forest designated primarily for protection of soil and water	H	●	●	H	●	●	M	●	●	H	●	●
Socio-economic functions of forests												
Area of forest under private ownership	H	●	●	H	●	●	H	●	●	H	●	●
Value of total wood removals	–	–	–	H	●	●	L	●	●	H	●	●
Employment in primary production of goods	L	●	●	–	–	–	–	–	–	H	●	●
Legal, policy and institutional framework												
Forest area with management plan	M	●	●	–	–	–	L	●	●	H	●	●
Human resources in public forest institutions	H	●	●	H	●	●	L	●	●	H	●	●
Number of students graduating in forestry	M	●	●	H	●	●	L	●	●	H	●	●

Notes:

R1 = Reference period 1: 1990–2000 with a few exceptions, see footnote to Table 9.5

R2 = Reference period 2: 2000–2010 with a few exceptions, see footnote to Table 9.5

H = High (reporting countries represent 75–100% of total forest area)

M = Medium (reporting countries represent 50–74% of total forest area)

L = Low (reporting countries represent 25–49% of total forest area)

● = Positive change (greater than 0.50%)

● = No major change (between -0.50 and 0.50%)

● = Negative change (less than -0.50%)

– = Insufficient data to determine trend

had a strong set of positive trends, but also a few that were strongly negative, while Western and Central Asia and South and Southeast Asia showed less significant changes in relative terms. South and Southeast Asia showed a clear negative trend in the extent of forest resources compared with the positive trends in the other two subregions. Europe, excluding the Russian Federation, had more positive trends for the 1990s than when the Russian Federation was included, but the opposite was true for the 2000–2010 period. The most significant intraregional difference occurred in North and Central America, where North America and the Caribbean showed a majority of positive trends, while Central America had a preponderance of negative ones.

Asia		Europe				North and Central America						Oceania		South America			
South and Southeast		Western and Central		Total Europe		Europe excl. Russian Federation		Caribbean		Central America		North America					
R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
H	●	H	●	H	●	H	●	H	●	H	●	H	●	H	●	H	●
H	●	H	●	H	●	H	●	H	●	H	●	H	●	-	-	H	●
H	●	H	●	H	●	H	●	H	●	H	●	H	●	-	-	H	●
H	●	H	●	-	-	M	●	M	●	H	●	H	●	H	●	H	●
H	●	H	●	H	●	H	●	M	●	L	●	H	●	-	-	H	●
H	●	L	●	H	●	H	●	L	●	-	-	H	●	-	-	M	●
H	●	L	●	H	●	H	●	M	●	-	-	H	●	-	-	-	-
-	-	L	●	H	●	M	●	-	-	-	-	H	●	-	-	-	-
H	●	H	●	H	●	H	●	M	●	L	●	H	●	H	●	H	●
H	●	H	●	H	●	H	●	M	●	H	●	H	●	H	●	H	●
H	●	H	●	H	●	H	●	H	●	M	●	H	●	H	●	H	●
H	●	H	●	H	●	H	●	M	●	L	●	H	●	-	-	H	●
H	●	H	●	H	●	H	●	M	●	L	●	H	●	-	-	H	●
M	●	M	●	-	-	H	●	L	●	-	-	H	●	-	-	M	●
L	●	M	●	H	●	M	●	-	-	L	●	L	●	H	●	-	-
L	●	L	●	H	●	H	●	L	●	-	-	L	●	-	-	M	●
M	●	L	●	-	-	M	●	-	-	-	-	-	-	-	-	-	-
L	●	L	●	-	-	M	●	L	●	L	●	M	●	-	-	H	●

Clearly, the division into subregions reveals trends and patterns that are not prominent on a regional scale, just as the regional breakdown highlights variations that are masked at the global scale.

Discussion

Approach and limitations

Several disclaimers must be advanced regarding the methodology and findings presented in this chapter:

- Information availability is not satisfactory for all variables, which leaves a number of gaps in the analysis.
- Selection of variables is subjective and may not be valid in other contexts or scales.
- Indications of positive or negative values for trends can be argued in several cases, particularly if the trend is seen in a bigger policy perspective.

- Indications of positive or negative trends are not presented in relation to the current status of forests and their management. For example, the positive trend in the area of forest with a management plan is more striking in Africa than in Europe, where most of the forest already had a management plan in 1990.
- Although no weights are explicitly applied in the analyses, the selection of certain variables is in itself a weighting.
- Aggregation of trends by region and subregion obscures positive or negative trends in individual countries. Results cannot therefore be seen as applicable to individual countries in any region.

The analysis is clearly sensitive to the selection of variables. The variables that could be selected were limited by the set of FRA 2010 reporting tables and further reduced by the limited information availability for several of these. It was particularly difficult to obtain information on negative aspects, such as forest degradation and illegal logging, due to a lack of common definitions and assessment methodologies. Other variables, such as progress in the revision of forest policies and legislation, did not easily fit into this type of analysis. It should also be noted that forest benefits generated in secondary production and trade were explicitly excluded from FRA 2010. Some relevant parameters were not included because of a lack of information at the global level. The list of potential variables for selection was therefore limited and the resulting selection may be somewhat skewed. In addition, there is a high covariation between some variables, which must be considered before drawing far-reaching conclusions from the findings.

The methodology used to illustrate these key trends does not take into account value judgments or variations in stakeholder perceptions of forest benefits and the relative importance of different variables. While such evaluation methodologies exist, the objectives of this chapter are to illustrate how existing information, collected as part of FRA 2010, can be used in an initial analysis of progress towards sustainable forest management and to stimulate further discussion and more detailed analyses.

In conclusion, the analyses and presentations in this chapter are limited by the variables and data available in the FRA 2010 reporting tables. Nevertheless, the results provide an overview of key trends with respect to the management and use of forest resources and should be seen as an illustration of progress, or lack of progress, towards sustainable forest management at global and regional levels. A more detailed analysis must take into consideration the variations in conditions between regions and countries.

Is there progress towards sustainable forest management?

There are many good signs and positive trends at the global level, particularly in the last ten years, but many negative trends remain at regional, subregional and national levels. While the area of planted forest and conservation efforts are on the rise, the area of primary forests continues to decline at an alarming rate as these forests come under use or are converted to other uses. As the analyses above illustrate, the answer depends on the suite of indicators selected and the scale at which they are applied. Given this and the complexity of the question, the answer cannot be definitive.