MINISTRY OF AGRICULTURE

GENERAL SECRETARIAT OF FORESTS AND NATURAL ENVIRONMENT

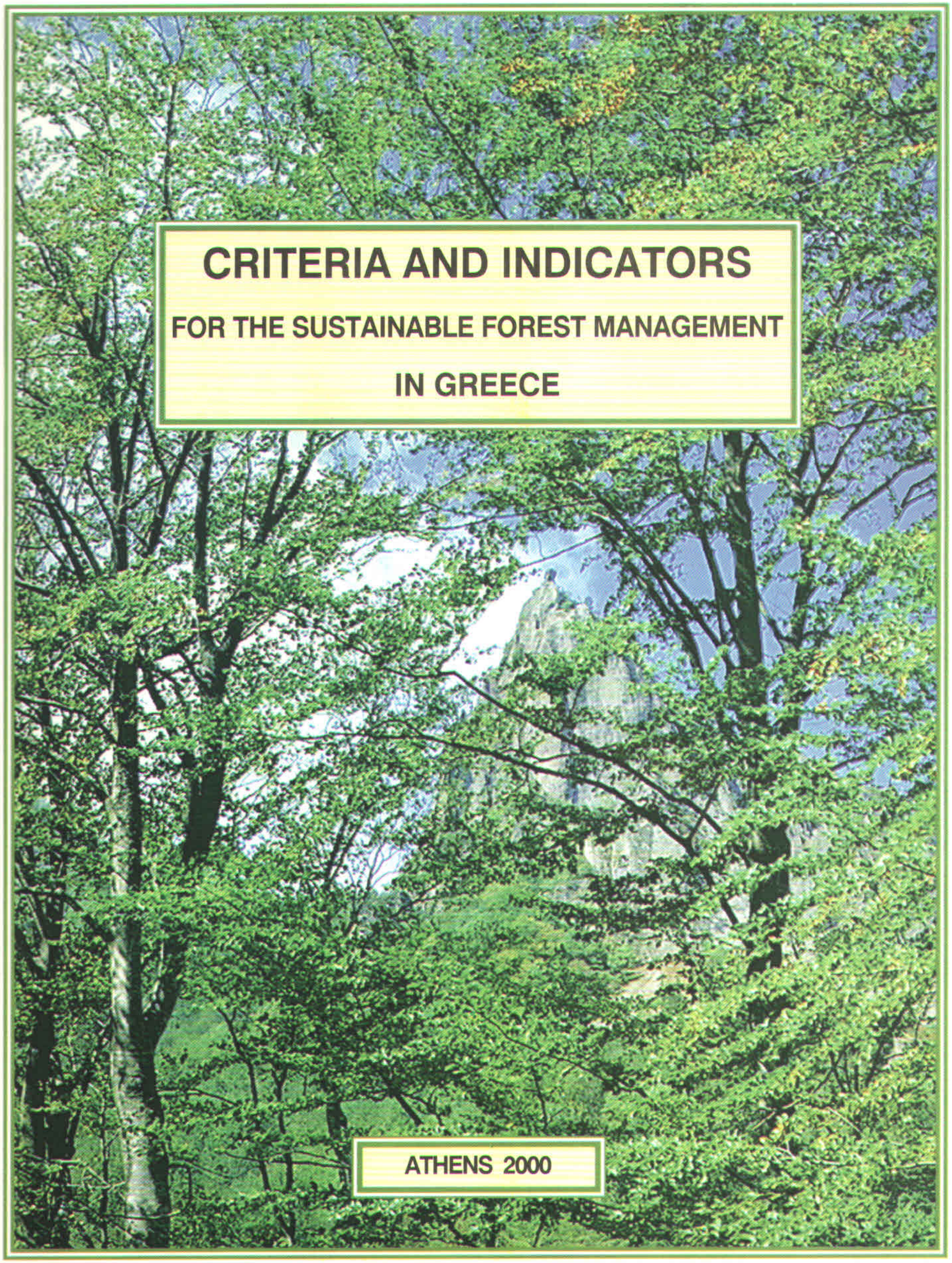
GENERAL DIRECTORATE OF DEVELOPMENT AND PROTECTION OF FORESTS AND NATURAL ENVIRONMENT

CRITERIA AND INDICATORS

FOR THE SUSTAINABLE FOREST MANAGEMENT

IN GREECE

ATHENS 2000



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MINISTRY OF AGRICULTURE
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RESOURCES AND NATURAL ENVIRONMENT
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Criteria and Indicators for the sustainable forest management in Greece

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CRITERIA AND INDICATORS FOR THE SUSTAINABLE FOREST MANAGEMENT IN GREECE

The present document entitled "**Criteria and indicators for the Sustainable Forest Management in Greece**" is a commitment undertaken by our country from its participation in the Helsinki Process, which was taken on at the Second Ministerial Conference on the Protection of Forests in Europe, held in Helsinki in 1993. All the Process member-states have committed themselves to develop criteria and indicators for sustainable forest management at the national, sub-national and forest management unit level. This document is a first attempt to develop criteria and indicators at the national level for the Greek forests.

After the extensive destruction and great deterioration suffered by the natural environment and especially the forest ecosystems all over the earth and the climatic changes, the maintenance, stabilisation and improvement of forest ecosystems and the support of their functions constitute a first priority choice and obligation. The international community in various conferences and congresses concluded that human activities should be based on the principle of sustainability, as it was developed and conceptually integrated recently.

Sustainability should be a binding principle in managing forests and natural ecosystems in general, for the material goods that can be produced by forests, as well as for their non-material goods and services. The attempt to ascertain if sustainability is implemented in forest management, made the development of evaluation tools necessary. Such tools are the criteria and indicators for sustainable forest management.

The framework for the development of criteria and indicators for the sustainable forest management at the national level is the list of Pan-European Criteria and Indicators adopted at the meetings that followed the Second Ministerial Conference held in Helsinki, in which Greece regularly participated.

In the present document six (6) criteria, sixty two (62) quantitative and twenty four (24) descriptive indicators are developed. A considerable number of information sources were used for their development, including among others the 1992 National Inventory of Forests, the 1964 Distribution of Forests in Greece, the annual statistical data of the General Secretariat of Forests and Natural Environment, the National Statistical Service of Greece, the National Observatory of Athens and NGOs for Environmental Protection. When there were no data available, the development of the indicators was based on estimations made by foresters in research and practice, specialised in the corresponding concept areas in which the indicators are included.

The indicators developed in this document are by no means definite, because progress in scientific knowledge, development of new methods for estimating the value of indicators and the active participation of the public in environmental protection will make necessary their supplementation or substitution with new indicators in the future.

Criteria and indicators can besides being tools for evaluating the progress made towards sustainable forest management, be incorporated into forest policy and used as components of analysis in the development and implementation of policies, planning and programmes.

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PREFACE

The development of criteria and indicators for sustainable forest management, which constitutes the object of the present document, took into consideration the list of Pan-European Criteria and Indicators adopted at the meeting that followed the Second Ministerial Conference held in Helsinki in 1993. **The definitions of sustainable management, criteria and indicators are quoted in Appendix I.** A considerable amount of information had to be collected for their development since criteria and indicators concern almost all forestry objectives. The main sources of necessary information collected are the following:

- First National Inventory of Forests 1992
- Distribution of Forests in Greece 1964
- Annals of Forest Statistical Data of the Greek Forestry published by the General Secretariat of Forests and Natural Environment
- Annual Report of the Forest Service activities published by the General Secretariat of Forests and Natural Environment
- Information registered in the files of the Directorates of the General Secretariat of Forests and Natural Environment
- National Statistical Service of Greece
- National Observatory of Athens
- General Secretariat of Research and Technology
- Panhellenic Confederation Union of Agricultural Co-operation (PASEGES)
- Forest Owners Association
- Treatises and research works with a forestry content
- University Forestry Schools and Technological Educational Institutes
- Centre for Renewable Energy Sources (CRES)
- Ministry of the Environment, Physical Planning and Public Works
- Non-Governmental Organisations for Environmental Protection such as WWF Hellas, Hellenic Ornithological Society, Hunting Co-federation of Greece, Hellenic Society for the Protection of Nature etc.

Although the information sources were plenty, there were difficulties in finding the necessary data. These are due to the fact that there is discontinuity in keeping statistical data by the pertinent services, and to the fact that in Greece only one National Inventory of Forests based on scientific methods has been carried out.

Due to these difficulties some of the indicators could not be developed over time. Therefore, the indicator is a simple registration of the forest characteristic instead of showing its progress throughout time.

Three of the indicators included in the list of Pan-European indicators were not developed due to lack of information. On the other hand, some indicators developed were not included in the list, because it is not an exhaustive one, since countries reserve the right to add or remove indicators taking into account the ecological, social and economic conditions prevailing in them. The indicators for which statistical data

were insufficient, but an estimation was possible of the characteristic they represent, were developed with the aid of foresters in research and practice, specialised in the corresponding concept areas the indicators belong to.

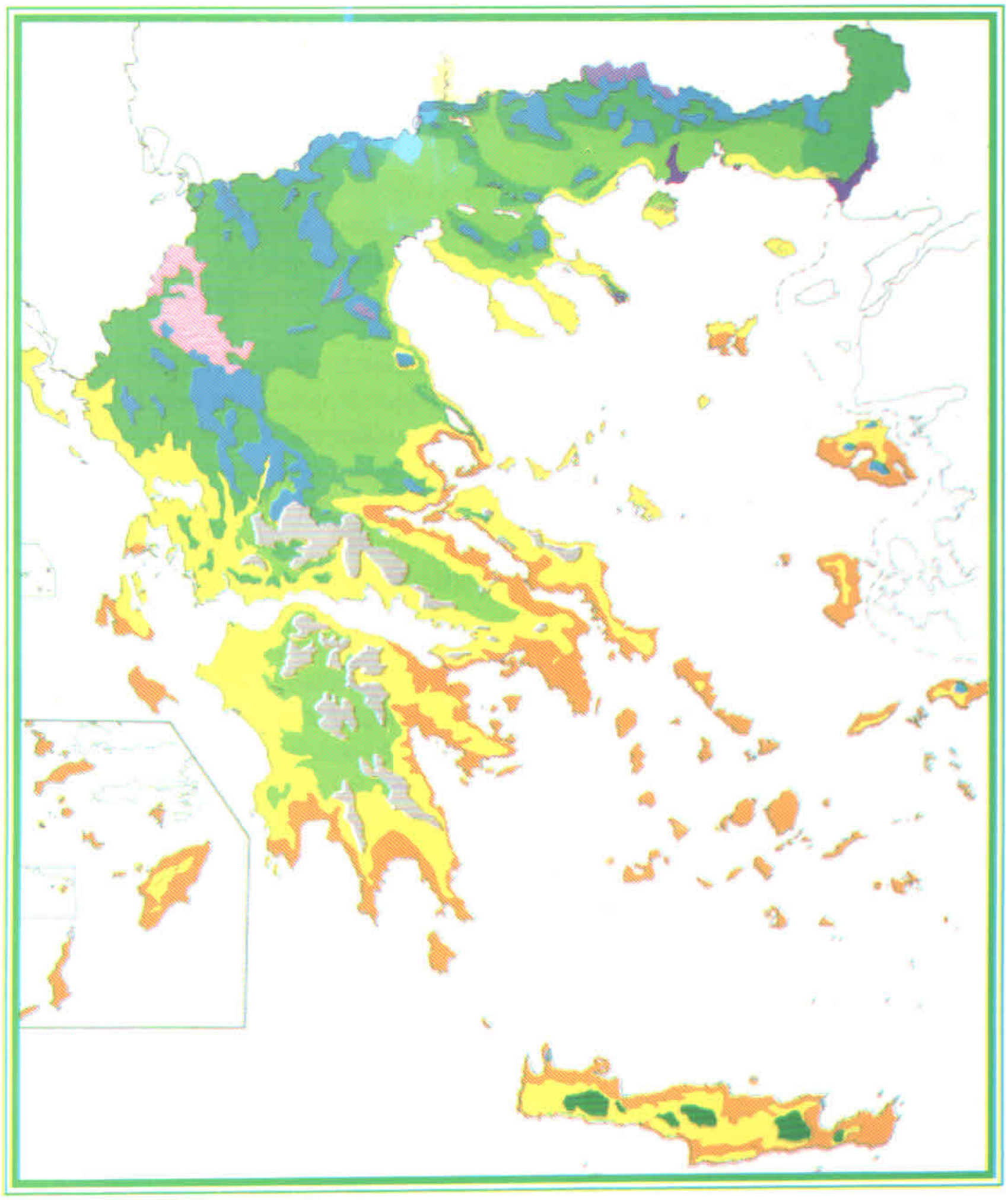
The present document consists of six (6) chapters, one chapter for each of the six Criteria. In each criterion first the quantitative indicators were developed and then the descriptive ones.

Each quantitative indicator is presented by a table or a diagramme, the source of information for evaluating the reliability of the data from which they were developed and a brief comment if necessary for a better understanding of the indicator.

Four descriptive indicators were developed for each criterion referring to the legal/regulatory framework, institutional framework, financial framework and informational data of the concept areas that constitute each criterion. These concept areas are printed at the beginning of the quantitative and qualitative indicators of each criterion. An effort was made to answer most of the questions included in the descriptive indicators of the list of Pan-European Criteria and Indicators in order to better clarify the current condition of the forest characteristics represented by the indicators.

The document includes appendices I to VII in which the definitions of some basic concepts used in the text, certain additional information that the authors of this document considered noteworthy to be cited and the references used are mentioned.

VEGETATION MAP OF GREECE



LEGEND

- *Thermo - Mediterranean formations*
- *Meso - Mediterranean formation*
- *Supra - Mediterranean formation*
- *Subcontinental thermophile formations of broadleaved oaks*
- *Oro - Mediterranean formation of Abies cephalonica and Pinus nigra*
- *Oro - Mediterranean formation of Cupressus sempervirens*
- *Oro - Mediterranean formation of oak, Abies cephalonica*
- *Oro - Mediterranean formation of Pinus nigra*
- *Oro - Mediterranean formation of Pinus nigra, spruce*
- *Azonal riparian formations on river mouth*

CRITERION 1

MAINTENANCE AND APPROPRIATE ENHANCEMENT OF FOREST RESOURCES AND THEIR CONTRIBUTION TO GLOBAL CARBON CYCLES

Concept Area: General capacity, Land Use and Forest area, Growing stock, Carbon Balance

QUANTITATIVE INDICATORS :

1.1. Area of forest and other wooded land and its changes

	1964		1992	
	Area (1000 ha)	Percentage (%)	Area (1000 ha)	Percentage (%)
Forest *	2 512	19.0%	3 359	25.5%
Other wooded land *	3 960	30.0%	3 154	23.9%
Forest and other wooded land	**6 472**	**49.0%**	**6 513**	**49.4%**
Other land uses	6 724	51.0%	6 683	50.6%
Total area	**13 196**	**100.0%**	**13 196**	**100.0%**

* Definitions are quoted in the Appendix I

1.1.1. Area of forest according to management type and its changes

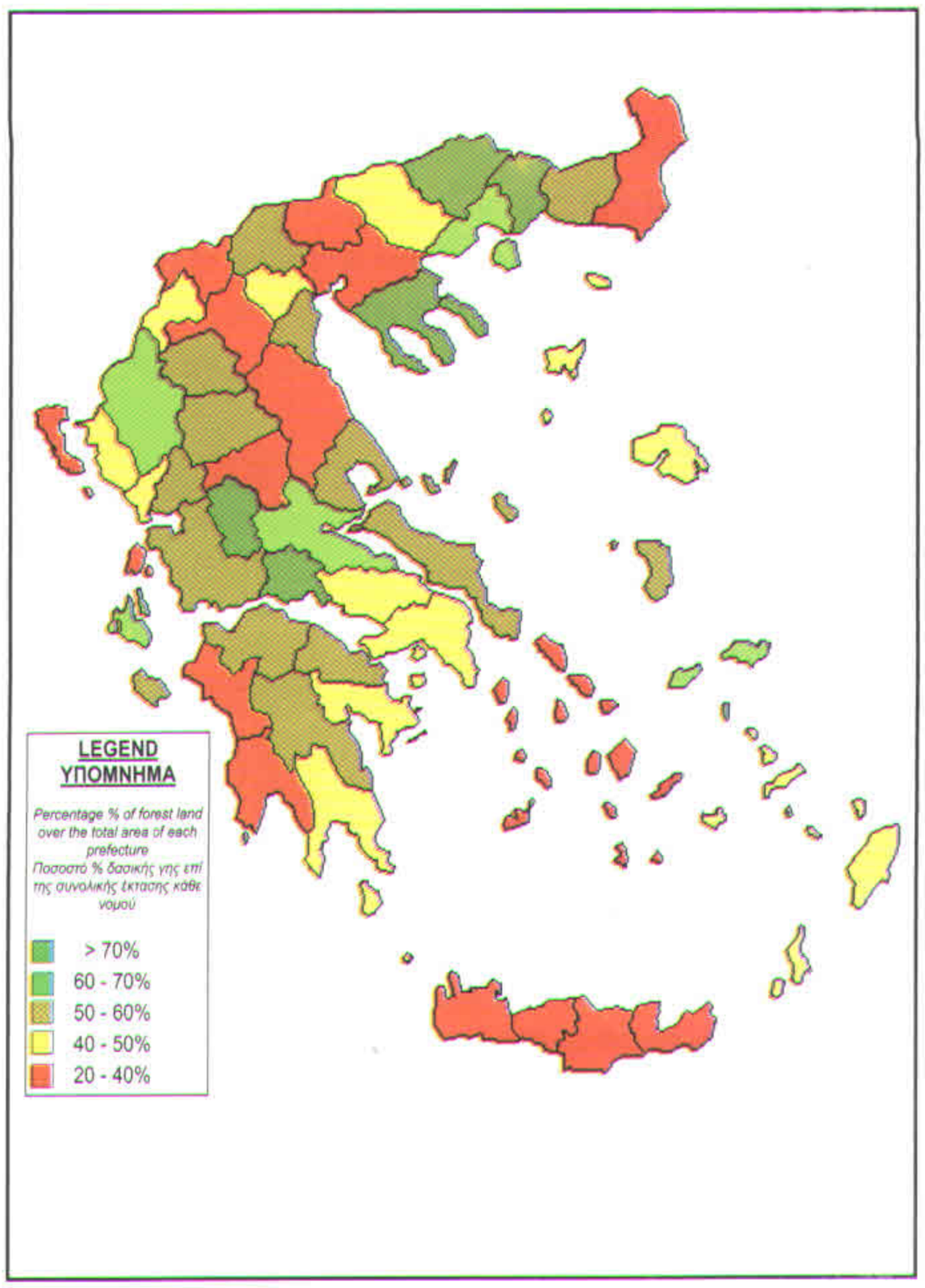
Management type	1964		1992	
	Area (1000 ha)	Percentage (%)	Area (1000 ha)	Percentage (%)
High forest	872	34.7%	1 166	34,7%
Coppice forest	1 206	48.0%	1 612	48,0%
Coppice forest with standards	434	17.3%	581	17.3%
Total	**2 512**	**100.0%**	**3 359**	**100.0%**

Source:

a) Distribution of Forests in Greece 1964, General Secretariat of Forests and Natural Environment (GSF&NE), Ministry of Agriculture

b) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

1.1.2. Grouping of the prefectures of Greece according to the percentage of forest and other wooded land over their total area



Source:

First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

An empirical inventory of the country' s forest and other wooded land was carried out in 1836 and published in 1842 by the consul of Bavaria and Hannover. At that time the total area of the country was 4,761,000 ha, i.e. 1/3 of today's total area. The new Greek state which was formed at that time included Peloponese, Central Greece and certain islands, while the remaining of today's area was under Turkish occupation. Information for this inventory comes from Kontos (1921), who adapted inventory data from the silvicultural and forest policy point of view. The results are shown on the table that follows:

Land use	Area (1000 ha)	%
Forest	805	16.9
Partly forested land	1 283	26.9
Forest grazing land	250	5.3
Other land uses	2 424	50.9
Total area	**4 762**	**100.0**

In 1929 Kontos published the results of a second inventory without providing any information on the methodology used. At this time the area of the country was almost the same as today's, differing slightly, due to the fact that in 1929 the prefecture of Dodecanese was under Italian domination.

The results of this inventory are as follows (Kontos 1929):

Land use	Area (1000 ha)	%
Forest	1 918	15.1
Partly forested land	1 370	10.8
Agricultural and arboricultural land	2 350	18.5
Other land uses	7 062	55.6
Total area	**12 700**	**100.0**

The inventories mentioned above are only of historic interest and their results are not comparable to today's data.

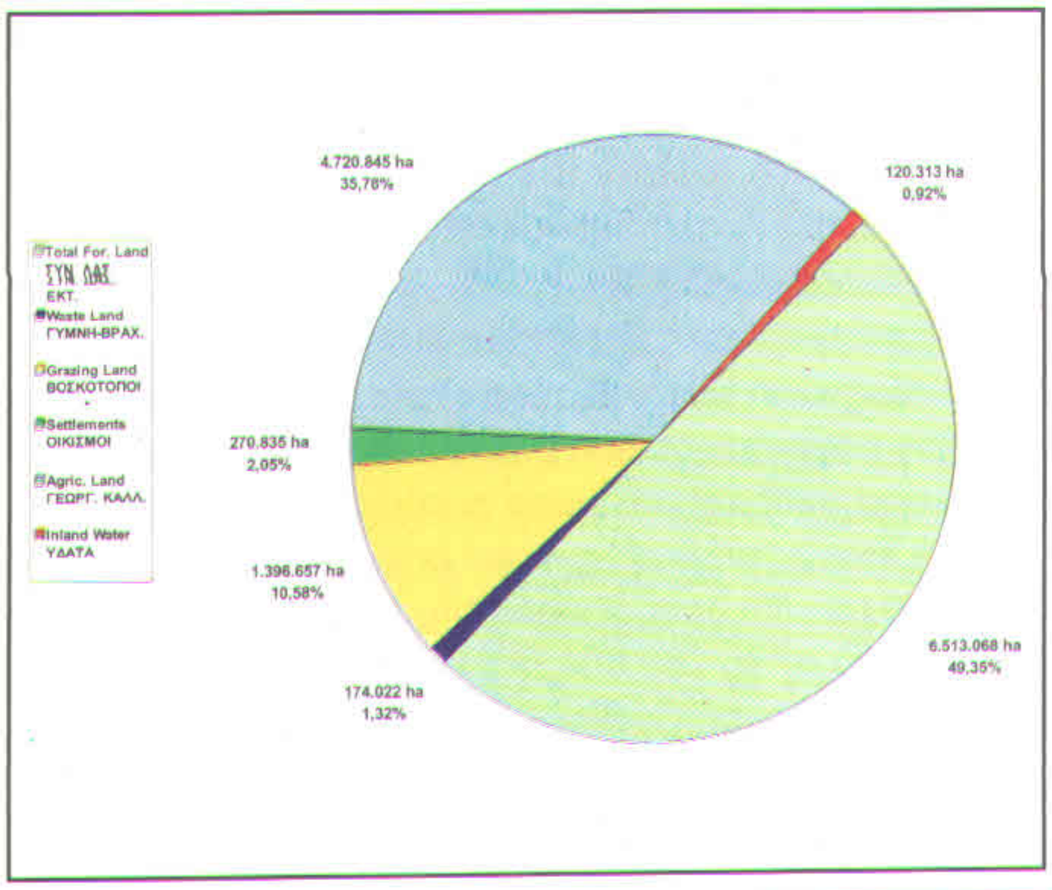
In the country, as will be discussed extensively in descriptive indicators of Criterion 1, only one National Inventory of Forests based on scientific methods has been carried out. Its results were published in 1992. An empirical inventory in 1964 entitled "**Distribution of Forests in Greece**" preceded the National Inventory of Forests, which inventoried only the area of the forests. Thus, the absence of at least a second National Inventory of Forests, makes the presentation of the development of some basic forest parameters over the years impossible. To avoid any confusion, the Distribution of Forests in Greece in 1964 will be referred to in the text as Inventory 1964 and the National Inventory of Forests in 1992, as Inventory 1992.

A comparison is attempted between the two inventories, despite reservations concerning Inventory 1964, because the indicator "area" constitutes a basic datum in describing the state of forests in a given country. It is obvious from this comparison, that while a small increase of the total forest land over the total area of the country is noted, i.e. from 49% to 49.4, the area of forest increased from 19% to 25.5%. This increase can be attributed to the reduction of human effects on other wooded land, as people living in mountainous and semi-mountainous areas, especially in the 60's, moved to urban areas or emigrated. The decline of grazing as well as the reduction of the need for fuelwood and in the number of fires on other wooded land, transformed part of the latter into forest. In the classification of European countries according to the percentage of forests over the country's total area, Greece with a percentage of 25,5%, is somewhere in the middle. The corresponding percentage for all European countries is 27,1%, while Finland with 66% is in the highest position and Iceland with 0% in the lowest one (UN-ECE/FAO 1992).

The 1992 Inventory did not distinguish among forest management types. In order to estimate them for 1992 the area of the 1992 Inventory was used and the proportion of management types referred to in the 1964 Inventory, assuming, that between the two inventories, the proportion of management types remained the same. This is supported by the fact that conversions of coppice forests to high forests in Greece are limited in terms of area. Besides, even if a conversion was attempted, the conversion time is so long, that it would not have been achieved during the time that intervened between the 1964 and 1992 Inventories.

0.32 ha of forest corresponding to each inhabitant of the country, too small a proportion compared with international norms that accept a proportion of at least 5 ha per inhabitant.

1.2. The place of forest and other wooded land in land use



Source :
First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

About half of the country's total area is covered by forest and other wooded land. The major portion of forests is composed of sub selection and selection stands while the remaining is of even-aged stands. Forests managed as coppice totally consist of even-aged stands. The structure of forests appears as one-storied, two-storied and multi-storied. A characteristic feature of uneven-aged stands is that they consist of trees belonging to all diameter classes. The performance of Greek forests in relation to the mean performance of European forests, is small. Their condition from the point of view of density, quantity and quality of the growing stock is not satisfactory due mainly to human impact of the past such as fires, grazing, land clearings, illegal fellings as well as lack of systematic silvicultural treatment. However, their productive as well as the hydrological, aesthetic, hygienic and environmental functions are very important for the country's economy and the inhabitants' quality of life. The main non-forest land uses are agricultural cultivations 36% and grazing land 10,6%. In the country's pastures goats, sheep and a few bovine and horses mainly graze.

1.3. Distribution of forest and other wooded land by altitude

Altitude (m)	Forest and other wooded land (1000 ha)	Percent (%)
0-300	518	14.2
300-600	974	26.7
600-1200	1 495	41.0
>1200	659	18.1
Total	**3 646**	**100.0**

Source :
Sotiropoulos D. and Peris J, members of the team that drew up First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

The geographical regions of Sterea Hellas, Peloponnese, Thrace and islands are not included in the distribution of forest and other wooded land by altitude, due to lack of data. Thus, the distribution of forest and other wooded land presented on the table above is based on the forest land for those regions for which there are available data, i.e. 56% of the country's total forest land. It is estimated however, that this distribution is close to the one for the country as a whole.

These altitude classes correspond to the growing spaces of the species and to vegetation zones (Dafis 1993), taking into consideration the general division of the country's area into hilly, semi-mountainous and mountainous areas.

0 - 300	Coastal and plain zone Oleo ceratonion
300 - 600	Semi-mountainous zone Quercetalia ilicis
600 -1200	Mountainous zone Quercuetalia pubescentis, in which the growing spaces of Pinus halepensis and P. brutia and all deciduous oak forests are subordinated
1200 -2000	Cool living Conifers Fagetalia and Vaccinio Picetalia
>2000	Zone of Astragalo Acantholi monetalia

1.4. Distribution of forest and other wooded land by soil slope

Slope %	Forest and other wooded land (1000 ha)	Percent (%)
0- 12%	294	6.2
13-25%	1 169	24.5
26-45%	2 030	42.5
46-75%	1 120	23.5
>75%	158	3.3
Total	**4 771**	**100.0**

Source:
Sotiropoulos D. and Peris J., members of the team that drew up First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

The geographical regions of Sterea Hellas, Peloponnese and Thrace are not included in the distribution of forest and other wooded land by soil slope, due to lack of data. Thus, the distribution of forest and other wooded land presented on the table above is based on the forest land for those regions for which there are available data, i.e. for 73% of the country's total forest land. It is estimated however, that this distribution is close to the one for the country as a whole.

1.5. Distribution of forest and other wooded land by origin of forest

	Area (1000 ha)
Natural	6 250
Man-made	224
Semi-natural	39
Poplar plantations	9.6

Source:
a) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture
b) Professor P. Smiris, Section of Forest Production, Protection and Environment, Department of Forestry and Natural Environment, Aristotle University of Thessaloniki
c) Dr. Boskos L., 1984. Poplar cultivation in Greece. Volume V, Issue 2, Journal of Forest Research

Semi-natural forests are Pinus halepensis and P. brutia reforestations, of which some stands were damaged by fires and afterwards regenerated naturally. In the semi-natural forests natural stands of P. nigra and Abies spp. should be included which regenerated naturally, but their regeneration density was low. To restore the normal density of these stands, the Forest Service reforested them by using the corresponding species. However, the area of the restored stands is not known due to lack of data. According to an inventory carried out in 1981 (source c), state poplar plantations were estimated to be 5,800 ha and their annual wood production, 143, 000 m^3. The area of privately-owned poplar plantations was 3,800 ha with annual wood production ranging from 220,000 m^3 to 280,000 m^3. 21% of the annual total wood poplar production is fuelwood and the remaining 79% stemwood for producing sawn timber or veneers, small size roundwood for small constructions, boxes and small diameter roundwood for paper, particleboard and fibreboard.

A new inventory of the state and private poplar plantations is being carried out at the moment and its results are expected to be published by the end of 1998.

1.6. Distribution of forest and other wooded land by ownership structure

	Forest (1000 ha)	Percent %	Other wooded land (1000 ha)	Percent %	Total forest land (1000 ha)	Percent %
State	2 200	65.5%	2 626	83.3%	4 826	74.1%
Community	403	12.0%	183	5.8%	587	9.0%
Private	269	8.0%	154	4.9%	423	6.5%
Other	487	14.5%	190	6.0%	677	10.4%
Total	**3 359**	**100.0%**	**3 154**	**100.0%**	**6 513**	**100.0%**

Source:
a) Distribution of Forests in Greece 1964, GSF&NE, Ministry of Agriculture
b) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

Forests were not classified by ownership structure in the 1992 Inventory. The areas of the 1992 Inventory were classified on the table above by ownership structure using the ratio ownership structure of the 1964 Inventory. This is based on the fact that changes in the country's ownership status are minimal.

The distribution of Greek forests by ownership structure is the result of historic, social, economic and political conditions. The high percentage of state forests 65.6% is considered as favourable, because it better serves the social role of forests, taking into account that in countries like Greece, the high percentage of state forests best serves the social aims of the state's forest policy (Papastavrou and Makris 1986). The more mountainous a country is the higher should the percentage of forests under state management be, since the state with the funds, personnel and framework it has at its disposal, proves to be a better manager than private forest owners. Thus, in mountainous countries the protective and social role of forests is better promoted. In Greece, the state forests' management and exploitation encounters usually various difficulties due to customary and traditional rights of grazing and fuelwood felling on forest land.

As far as the forests which belong to communities are concerned, the personal needs of the community's inhabitants are satisfied first and if there is a surplus, it is marketed. Within the category "other" on the table above are forests included which belong to monasteries and joint forest property. The latter are forests which belong to several natural or legal persons governed by public law. They are distinguished into two categories.

a) Joint forest property by state and other natural or legal persons

b) joint forest property by natural or legal persons. All non-state forests are subject to state forest policy and works carried out in them are under state control and supervision.

1.7. Distribution of forest and other wooded land by size classes and ownership structure

Size classes (ha)	State			Community		
	Number	Area (1000 ha)	Percent %	Number	Area (1000 ha)	Percent %
0-10	31	0.183	0.004	18	0.12306	0.021
11-20	18	0.289	0.006	11	0.16994	0.029
21-50	36	1.302	0.027	33	0.8497	0.145
51-100	39	0.289	0.006	44	2.344	0.400
100 & άνω	1 361	4 824.602	99.957	599	582.5133	99.405
Total	1 485	4 827	100.000	705	586	100.000

Size classes (ha)	Private		
	Number	Area (1000 ha)	Percent %
0-10	613	3.241	0.767
11-20	139	2.986	0.706
21-50	146	7.043	1.666
51-100	77	8.116	1.920
101-500	151	51.235	12.120
501-1000	56	57.93	13.704
1000-1500	27	45.707	10.813
1500 και άνω	56	246.463	58.304
Total	1 265	423	100.000

Source:

a) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

b) KEPE 1976. Development Programme 1976-1980, Forest Sector, Centre of Planning and Economic Research (KEPE), Athens 1976

Forests were not classified by ownership size in the 1992 Inventory. The areas of the 1992 Inventory are classified by ownership size on the table above, based on the proportion of the ownership size referred to source (b). The size of a forest holding is of decisive importance, because the exploitation of a small forest holding can not be carried out on competitive base. The prohibition of fragmentation of forest

property by forest law contributed to the maintenance of relatively large forest holdings. Thus, there are few small-sized state and private forests in the country. In Greece, private forest holdings of 2-50 ha constitute 3.2% of the total forest land, one of the smallest percentages in Europe.

1.8. Distribution of the areas for the main forest species

Species	Area (1000ha)	Percent %
A. Coniferous		
Fir	543.3	16.17
Aleppo Pine, Calabrian Pine	567.7	16.90
Black pine	281.7	8.39
Scots pine	21.0	0.62
Pinus leucodermis	8.3	0.25
Stone Pine	0.1	0.003
Spruce	2.8	0.08
Other coniferous	5.2	0.15
Total coniferous	**1 430**	**42.57**
B. Broadleaved		
Beech	336.6	10.02
Chestnut	33.1	0.99
Oak	1 471.8	43.82
Plane tree	86.6	2.58
Other Broadleaved	0.8	0.02
Total broadleaved	**1 929**	**57.43**
Total forest area	**3 359**	**100.00**

Source:
First National Inventory of Forests 1992,GSF&NE, Ministry of Agriculture

The mosaic of natural and man-made plant communities which cover a region in a more or less close structure, forms its vegetation. In Greece, the coexistence of various forest species and bushes of the rich native flora, resulted in a forest vegetation composition distinguished by its diversity of forms and characteristic peculiarity. The diversity of forms is due to factors which acting on jointly, affected and continue to affect our country's vegetation. The main ones are the following (Korakis 1995):

Greece's geographic position is such that can host plenty of flora elements from three different phytogeographic regions. Species from the Mediterranean, Mid Europe and Asia appear in Greece's forest vegetation and compose the rich flora in number and origin of species.

The climate with the more or less expressed Mediterranean character.

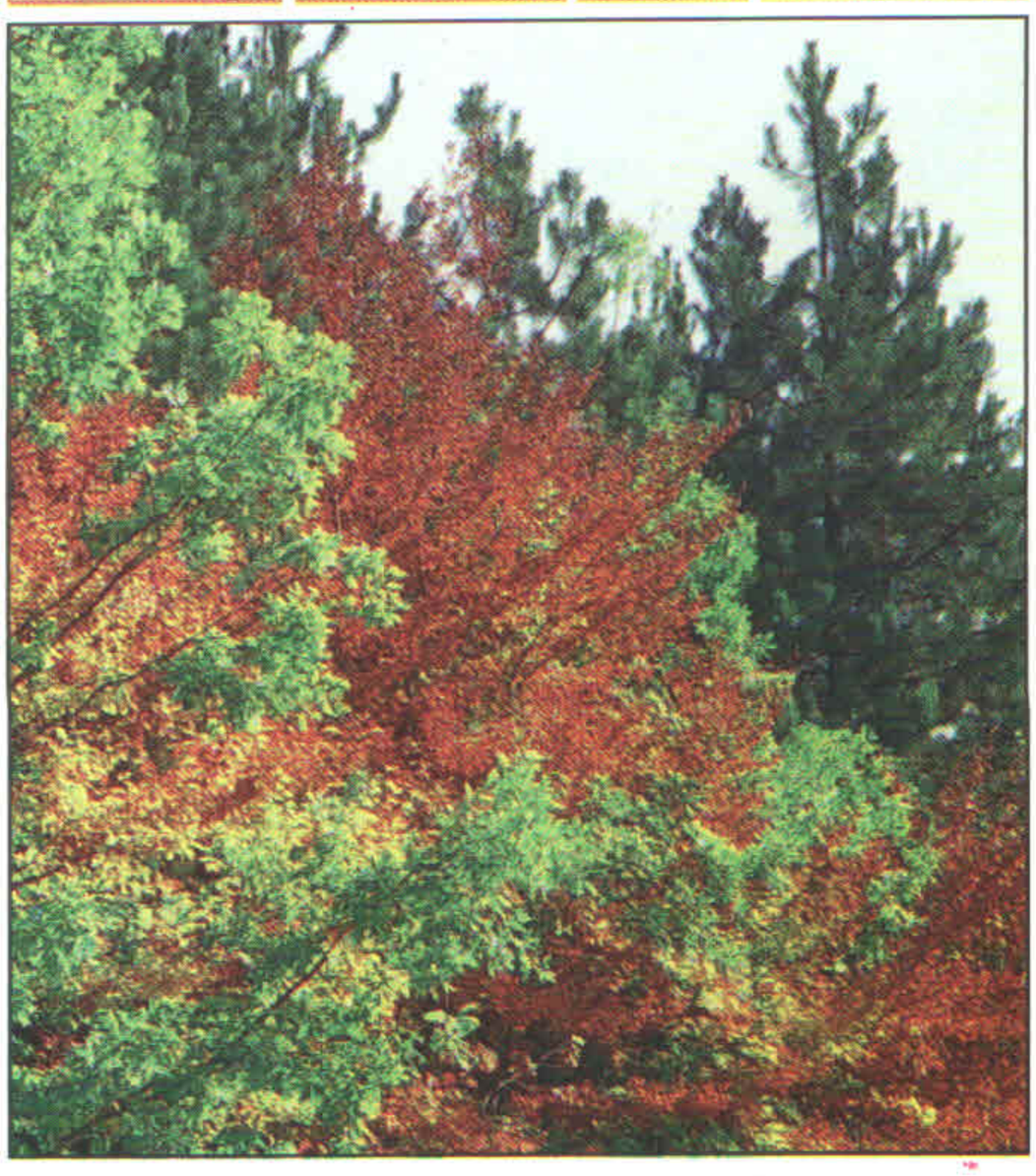
The intense relief and the massif which occupies the biggest part of the inland area as well as the extensive coastline.

The geology, i.e. the variety of the country's bedrock formations.

Finally, it should be mentioned that human factors, exerting strong influences, altered to a great extent the composition and forms of the forest vegetation in the region.

1.9. Total and per ha volume of the growing stock in forests

	Growing stock (overbark volume1000 m^3)	Area (1000 ha)	Growing stock/ha (overbark volume m^3/ha)
Coniferous	85 012	1 430	59.4
Broadleaved	66 776	1 929	34.6
Total	151 788	3 359	45.2



1.9.1. Growing stock volume for the main forest species

Forest species	Growing stock (overbark volume 1000 m³)	Area (1000 ha)	Growing stock/ha (overbark volume m³/ha)
A. Coniferous			
Fir	47 406	543.3	87.25
Aleppo Pine,			
Calabrian Pine	14 986	567.7	26.40
Black Pine	15 269	281.7	54.20
Scots Pine	2 574	21.0	122.83
Pinus leucodermis	2 230	8.3	268.67
Spruce	941	2.8	341.77
B. Broadleaved			
Beech	30 437	336.6	90.41
Chestnut	1 862	33.1	56.29
Oak	26 537	1 471.8	18.03
Plane	2 116	86.6	24.44

Source:
First National Inventory of Forests 1992, GSF& NE, Ministry of Agriculture

If we add to the forest growing stock, the volume of other wooded land of about 2.8 million m³ as well as the volume of about 2.7 million m³ of the dead wood in forest, the standing volume of the total forest land would amount to 157 million m³. The merchantable volume of forests (i.e. the volume of living trees minus the volume of the tops of the trees) amounts to 138 million m³. The lack of a second National Inventory of Forests in the country does not allow the monitoring of the quantitative and qualitative development of the growing stock. The carrying out, however, of reforestations and the application of cultivation within forests, especially after World War II when the systematic management of Greek forests started, contributed to the quantitative increase and qualitative improvement of the growing stock. In a simple estimation of the growing stock carried out in 1936, its volume was 135 million m³ (Papastavrou and Makris 1986).

The mean growing stock of the Greek forests of about 45.2 m³/ha compared to the mean growing stock of other European countries, is relatively low. However, it should become clear, that this number does not reveal the real state of Greek forests, because there are many forest complexes which are well-organised and managed for long time which support stands with a mean growing stock ranging from 350 to 400 m³/ha. The mean growing stock of the total forests has decreased significantly, because a high percentage of forests are coppice or overthinned due mainly to human actions.

1.10. Growing stock increment of forests

	Annual net increment (overbark volume 1000 m³)	Percentage increment of growing stock (%)	Annual net increment / ha (m³/ha)
Coniferous	1 918	2.26	1.34
Broadleaved	1 895	2.84	0.98
Total	**3 813**	**2.51**	**1.14**

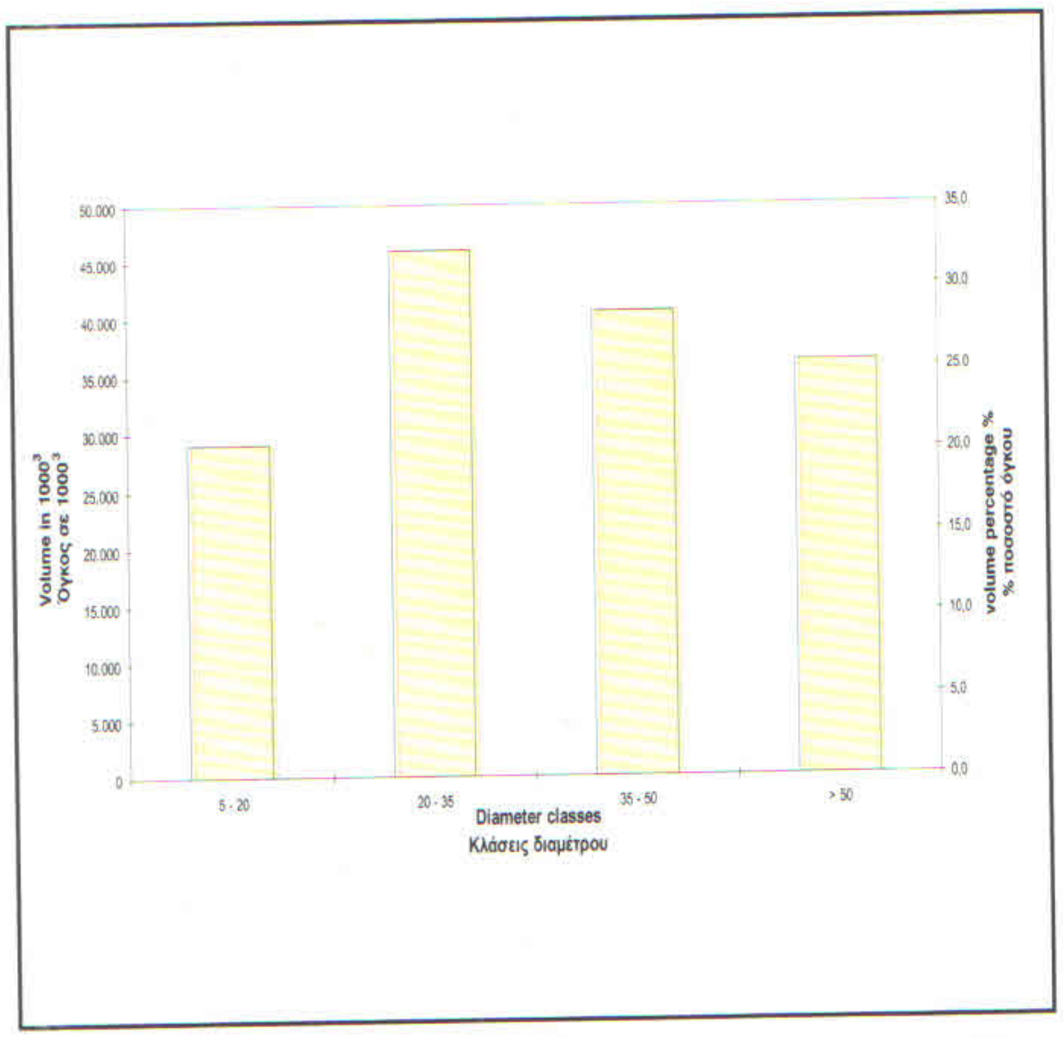
1.10.1. Growing stock increment for the main forest species

	Annual net increment (overbark volume 1000 m³)	Growing stock increment percentage (%)	Annual net increment / ha (m³/ha)
A. Coniferous			
Fir	798	1.68	1.47
Spruce	29	3.08	10.35
Pine	1 090	3.1	1.24
B. Broadleaved			
Beech	931	3.06	2.77
Oak	695	2.62	0.47

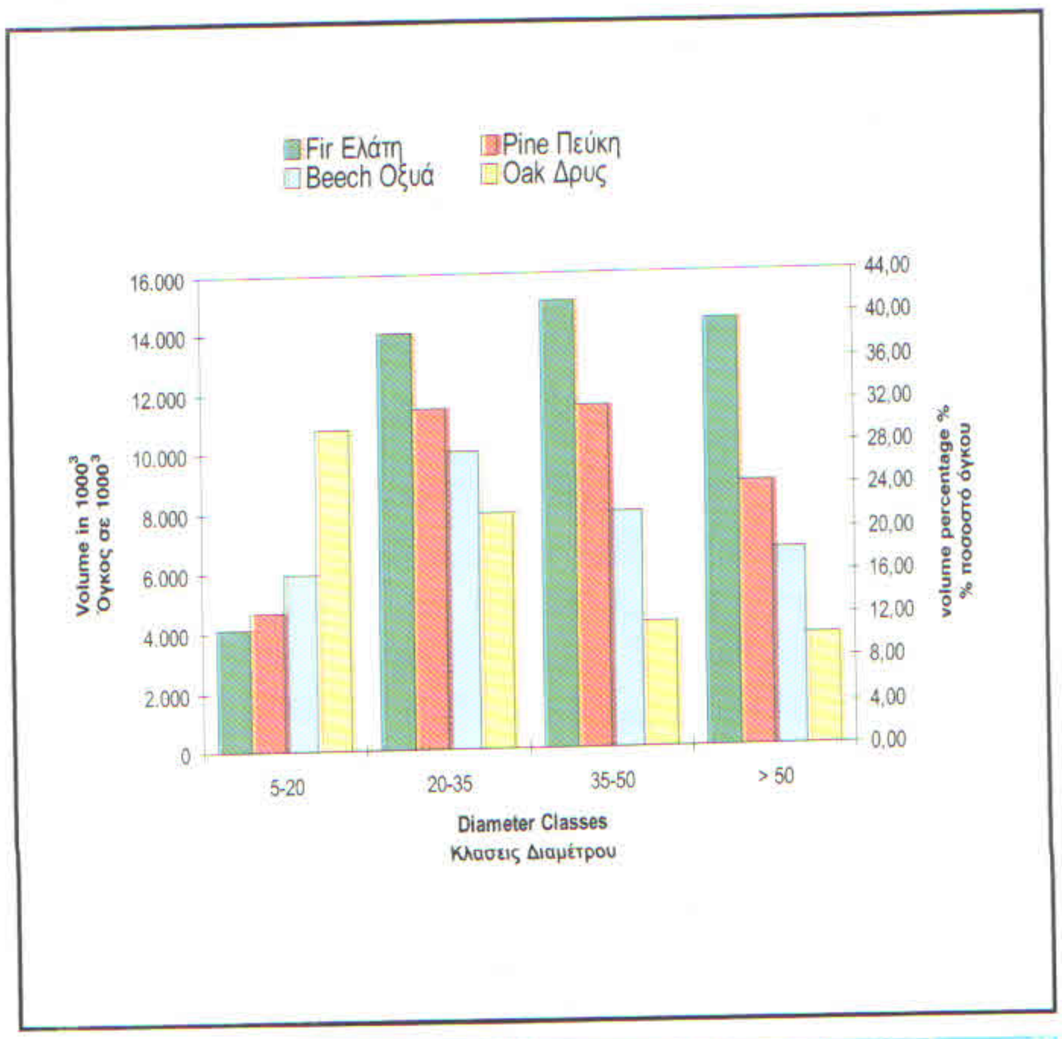
Source:
First National Inventory of Forests 1992,GSF&NE, Ministry of Agriculture

The annual gross increment of the forests is estimated at 4.1 million m³, while their annual mean mortality at 0.3 million m³. The mortality of forests cultivated, is nearly zero and this can be attributed to the improvement of their qualitative composition.

1.11. Distribution of the forest growing stock by diameter classes



1.11.1. Distribution of the growing stock by diameter classes for the main forest species



Source:

First National Inventory of Forests 1992,GSF&NE,

Ministry of Agriculture

1.12. Carbon storage in forest stands and forest soils

	1990	1995	Change over periods 1995/1990 (%)
Total annual carbon emissions in thousand tons	23 066	24 680	7.0
Total annual carbon emissions (in tons per inhabitant)	2.25	2.36	4.9

Source:

National Observatory of Athens

	Carbon stored in thousand of tons
Aerial biomass of the forests	43 363
Forest soils	35 124
Aerial biomass of the forests and forest soils	78 487

Source:

a) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

b) Section of Forest Utilisation and Product Technology, IMFE&FPT, N.AG.RE.F.

c) National Observatory of Athens 1997a. Final Report CORINAIR 94. Ministry of Environment, Physical Planning and Public Works

d) National Observatory of Athens 1997b.Climate change emissions Inventory. National inventory for greenhouse and other gases for the year 1990

e) IPCC 1996. Guidelines for National Greenhouse Gas. Intergovernmental Panel on Climate Change. Revised Edition

The estimation of carbon stored in the aerial biomass of forests was carried out by multiplying forest biomass (total stem volume of each forest tree times its oven dry density) by coefficient 0.5. According to the source (e) one (1) ton of forest biomass can withhold 0.5 tons of carbon. The estimation of carbon stored in the forest soils, according to the source (e), was conducted by multiplying the carbon

quantity stored in the aerial biomass of the forests by the 0,81coefficient.

Forests are considered one of the most important ecosystems on earth for the storage of carbon. In Greece, the quantity of carbon stored in the aerial biomass is approximately equal to two years of carbon emissions. If the quantity of carbon stored in forest soils is taken into consideration, then the total quantity of carbon stored in forests will be about equal to 3 years of carbon emissions.

In Greece, the carbon that can be stored annually, estimated by the annual net increment of forests, amounts to 1079 thousand tons. The real carbon quantity stored annually, however, calculated by subtracting annual forest fellings from the annual net increment of forests, amounts to 463 thousand tons of carbon. The carbon stored annually helps the blocking of about 2% of the annual carbon emissions in Greece.

Forests positively contribute to the mitigation of the greenhouse effect. Thus by expanding them, CO_2 concentrations on the atmosphere are reduced and a useful naturally renewable resource is created.

DESCRIPTIVE INDICATORS:

In this section the legal, institutional and financial framework is examined together with all the informational data of the concept areas of Criterion 1, i.e. the area, ownership, growing stock, the uses of the forests and the carbon balance.

Legal / Regulatory framework

The 1975 Constitution, Laws 86/1969, 998/1979 and 1650/1986 constitute the basic legal framework of the country for the protection and management of forest and other wooded land.

For the first time in the history of the country forest and other wooded land are protected by articles 24 and 117 of the Constitution.

Law 86/1969 codified almost all the laws that had been issued since 1928 and had been amended and completed by Law 4173/1929. This law constitutes the Forest Code of the country and regulates matters concerning the protection, management, real property rights on forest land, taxation, exploitation of state and privately-owned forests, forest improvement works etc. This code continues up to now to constitute the basic body of forestry legislation, although a lot of its provisions were amended and substituted by other laws such as Laws 886/1971, 996/1971, 248/1976 and 998/1979.

Law 998/1979 **"On the protection of the country' s forest and other wooded land"** determines the specific protection measures for maintaining, developing and improving forest and other forest land of the country. This in turn aims at maintaining and improving the whole natural environment by direct reference to the legal status governing their ownership and use.

Law 1650/1986 **"On the Protection of the Environment"** includes a specific chapter **"On the Protection of Nature and Landscape"** which proposes new categories of protected areas and introduces changes in the administration and management of protected areas.

The above-mentioned laws for protecting and managing forests were supplemented by Presidential decrees and Ministerial decisions. They will be separately mentioned in each Criterion.

The Presidential Decree of 19-11-1928 **"On Forest management, felling regulations, Forest taxation and rent, disposal of products, resin collection and resin cultivation etc."**, regulates legislatively sustainable forest management. With this decree, incorporated into the Forest Code, the principle of sustainability is adopted in its simple form, i.e. sustained yield. However, the management of Greek forests based on sustained yield started after the Ministry of Agriculture issued Circular No 120094/499/1937. The broadened concept of sustainability, i.e. the sustainability which besides timber yields extends to all kinds of functions and services coming from forests, is applied to the management practice after the Ministry of Agriculture issued Circular No 958/1953. This circular concerns with instructions for drawing up management plans. Finally, extensive reference to sustainable forest management in its broadened sense is made in the new specifications for the drawing up of forest management plans (Galanos 1998).

Forest law regulations secure theoretically at least forest protection from excessive interventions of owners and third persons as well as from natural factors. For land use changes and forest and other wooded land expropriation, actions which can considerably affect their protection, provisions were made in the 1975 Constitution and in the laws mentioned above. Article 24 of the Constitution prohibits forest land use changes, unless it is enforced by public interest. State and private forest and other wooded land areas destroyed by fires and other causes are obligatorily under reforestation regime and their disposal for other purposes is prohibited (par.3, article 117 of the Constitution). Expropriation of forest and other wooded land that belong to natural or legal persons governed by public law is permitted only in favour of the state, but without changing their forest character (par.4 of the same article). Law 998/17979 designates per case or category of cases the terms under which the forests or their segments can change their use or

serve other uses for reasons enforced by public interest (indicative articles 46,47 and 51-57).

National legislation and international conventions signed by the country regulate the carbon balance. They are mentioned in Criterion 2.

All the developed nations of the world have been looking during the last decades of the century for sustainably managing renewable energy sources, including forest biomass, for environmental and energy self sufficiency reasons. Development Law 2244/1994 constitutes the legal framework of the country for producing energy from wood. In 1996 energy produced by forest biomass amounted to 426 thousand tons of TOE (Tons of Oil Equivalent, 1 TOE = 10 million cal) for covering the energy needs of the household sector. Energy produced by forest biomass comes up to 1.7% of the total energy produced in the country in 1996, as it becomes obvious from the country's energy balance, which is shown on the table below:

Energy balance	%
Solid fuels	32.4
Liquid fuels	60.6
Gases	0.2
Renewable energy sources,excluding forest biomass	3.8
Forest biomass	1.7
Electricity (Imported)	1.3

Source:
Djouras N., Centre for Renewable Energy Sources (CRES)

Fuelwood, charcoals, residues from forest fellings, residues from wood using industries form the forest biomass available for energy use (Djouras 1996). It is estimated that the annual theoretical potential of residue forest fellings amounts to 1.5 million tons, but due to the high cost of extraction, the amount of residue forest fellings that can be really used is estimated at 400 thousand tons. Their energy potential amounts to 126 thousand TOE annually and corresponds to 30% of the energy potential produced by fuelwood. Wood residues produced by wood using industries are estimated to be 213 thousand tons annually corresponding to 75 thousand TOE energy potential. It should be noted, however, that 50% of these residues are used by wood-using industries for fibreboard production (Petinarakis 1992).

Institutional framework

The main body for protecting and managing the country's state forests as well as for supervising and keeping under control the private forests, is the Forest Service. This body operates under the name General Secretariat of Forests and Natural Environment (GSF&NE) and constitutes an integral part of the Ministry of Agriculture. GSF&NE consists of the Central Service and the Regional Services. The Central Service, which is the inspecting instrument of the whole administrational structure of the GSF&NE, comprises 6 Directorates. These are responsible for formulating forest policy, drawing up long-term programmes of forest development, monitoring scientific and technological development in managing forests, working out fire protection programmes, supervising and strengthening research programmes and finally promoting the country's co-operation with EU, third countries and International Organisations (Presidential Decree 352/7-8-91).

The Regional Services are the instruments for executing the instructions and forest policy in general formulated by the Central Service, but also for applying local programmes and studies. They are divided into Intraprefectural and Prefectural Services. The Intraprefectural Services are composed of 7 Specific Regional Forest Inspectorates and 13 Forest Inspectorates for each of the 13 administrative regions of the country. The Prefectural Services consist of 31 Forest Directorates with 80 Forest District Offices and 24 Directorates without Forest District Offices, while 2 Directorates of Reforestation in Attici and Thessaloniki Prefectures are in operation (Presidential Decree 1213/14-10-81). Also, within the framework of GSF&NE collective instruments such as the Revisional Council for the Property of Forests, the Forest Tech-

nical Council, the Forest Property Council and the Regional Councils and Committees (Law 300/1981) operate.

Besides the GSF&NE, other bodies that contribute to forest protection and development are the following:

• **Panhellenic Confederation Union of Agricultural Co-operation (PASEGES)** is the highest Agricultural Co-operative Organisation in the country, which represents among others, the Co-operative Movement in collaboration with the state and the other organisations. It negotiates and signs collective labour agreements, gives counsel about the cultivation and processing of agricultural products and elaborates agricultural development studies. The Forest Co-operatives are supervised by PASEGES and they will be discussed separately in Criterion 3.

• **Forest Owners Association of Greece (F.O.A.)** founded in 1926, aims at safeguarding private forest ownership, orientating production to market, and promoting domestic tree species and traditional forest cultivation methods according to the principle of sustainability. F.O.A. has 100 members with only 20 employed exclusively in forestry.

• **The Geotechnical Chamber of Greece (GEO.C.G.)** is a legal person governed by public law founded in 1971 and is under the inspection of the Ministry of Agriculture. GEO.C.G. is a scientific council of the state on matters concerning the sectors of agriculture, livestock, fisheries, forestry and mineral resources. It gives opinion for each Bill, Presidential Decree and any general measure concerning agricultural, forest and livestock policy, geotechnical education and research, environmental protection and rehabilitation. It collaborates with the Chambers of other professional groups in the country, in matters related with environmental protection and the economic, social and cultural development of the countryside. GEO.C.G. has 17,156 members including 2,374 foresters (1997 data).

• **The Hellenic Forestry Society (H.F.S.)** was founded in 1988 and has 525 members. It aims at promoting the Forest Science in Greece. It specifically seeks to investigate, diffuse and apply the knowledge related to the maintenance, protection, management and development of forests and forest resources, to recognise the social role of forests, to collaborate with corresponding scientific organisations home and abroad. These targets are implemented by organising lectures, expert meetings, national and international congresses as well as by publishing forest research works.

• **Non-Governmental Organisations (NGOs)** for Environmental protection such as the Hellenic Society for the Protection of Nature, the Hellenic Ornithological Society, the World Wide Fund for Nature Hellas, the Greek Biotope/Wetland Centre and the Arctouros Society. NGOs will be discussed in the following Criteria.

The general basic land use planning in Greece, taking into consideration the existing conditions and the prohibitions of changes in land use of forest and other wooded land, is implemented at the national and regional level by the Ministry of Environment, Physical Planning and Public Works (MEPPPW). Forest land use planning is implemented by the Forest District Offices in such a way that the selected forest uses are compatible. As a rule, the aim is to apply forestry of multiple purposes and multiple use of forests and forest lands without violating the principle of sustainability.

Forest energy plantations are still at an experimental stage in Greece. Experiments with forest species of short rotation time are carried out at the Centre of Renewable Energy Sources (CRES) and the laboratory of Forest Genetics and Improvement of Forest Species of the Department of Forestry and Natural Environment, at the University of Thessaloniki. In various regions of Greece eucalyptus plantations of short rotation times (2-3 years) and small spacing (10,000-40,000 plants/ha) have been studied. Dry matter biomass up to 35 tons/ha/year with respective energy potential up to 15TOE/ha/year has been obtained from these plantations. Black locust plantations in three successive two-year rotation times produced dry matter biomass ranging from 5.6 tons to 17.1 tons/ha/year in fertile fields. The energy potential was estimated at 8/TOE/ha/year at the third harvest (CRES 1997).

Financial instruments/economic policy framework

Compared to investments in other sectors and branches of the economy, the forestry ones are of low level. The annual percentages of gross domestic asset formation in forestry in relation to the total gross domestic asset formation in the country, ranged from 0.82 to 0.45% during the 1985-1994 period. These percentages are very low in order to protect and develop the forest resources which cover 50% of the country's total area.

The percentages above expressed in GRD amounted for forestry to 59.4 billion GRD in 1996, 28.5 billion GRD of which came from the Ordinary Budget, 14.1 billion GRD from the C.F.A.L. and Forests, 11.6 billion GRD from EU, 4.9 billion GRD from the Investment Budget and 0.3 billion GRD from other sources. It should be noted here that the Drachma (GRD), the monetary unit of Greece, is equal to 1/340 ECU (June 1998).

Therefore, forestry funding are credits coming from the Ordinary Budget, the Investment Budget, the Central Fund of Agriculture, Livestock and Forests (C.F.A.L. and Forests), the European Union and other sources.

The level of investments in non-state forestry is also very low. Expenditure for carrying out all kinds of forestry works in non-state forestry is covered by capital coming from forest owners and subsidies from national and Community sources. The Agricultural Bank of Greece grants loans to private forest owners, co-operatives, communities, monasteries aiming at improving the productivity and the general development of non-state forestry. Forest owners, however, do not enjoy any preferential treatment by the bank when they apply for a loan. The State subsidises about 60% of the expenditure paid in non-state forestry for various forestry works. To be eligible for subsidy must present a study approved by the Forestry Service for the forestry work to be carried out, while beneficiaries receive the funding after the work has been finished. Non-state forestry is also funded by resources provide for by implementing EEC Regulations Nos 2157/92, 2158/92, 2080/92, 867/90. Specific reference to these Regulations will be made in other Criteria of the present document. In 1996 credits granted to non-state forestry by the state amounted to 1.3 billion GRD, i.e. 2.1% of the credit granted to forestry as a whole.

Increase and improvement of growing stock, which forms one of the basic objectives of organised forestry, is implemented by applying sustainable forest management, timber reserves, proper sylvicultural treatment of forest stands and of course by reforestations, 90% of which are productive. 0.7 billion GRD were spent in 1996 for forest rehabilitation and improvement and 3.5 billion GRD for reforestation. These amounts correspond to 1.2% and 5.8% respectively of the total expenditure for forestry.

The Operational Programme for Energy (OPE), which is part of the Community Support Framework II, provides financial incentives for producing energy from wood. The Action 3.2. of this programme aims at providing financial incentives for the development of renewable energy source applications, including biomass. The total budget of this Action during the 5 years of OPE is 50 billion GRD. EU contribution is expected to rise up to 17 billion GRD and national contribution will be 6 billion GRD. The other 27 billion GRD are expected to come from the private sector (CRES 1997).

Informational data to implement policy framework

The contribution of the National Inventory of Forests to the evaluation of forest resources, formulation of forestry policy and planning of forest development is significant. Up to now in Greece only one National Inventory of Forests has been carried out, published in 1992. Another inventory, an empirical, one preceded it in 1964 entitled "**Distribution of Forests in Greece**". It includes data on the distribution of forest and other wooded land areas by type of ownership, management type, forest species, i.e. it is an area inventory and not one of growing stock and increment. The collection of inventory data was carried out by head foresters for each community, based on inventory cards entitled "General Forest Statistical data". They were supplemented with approved forestry plans and documents as well as maps drawn at a scale of 1:100 000 (Distribution of Forest in Greece 1994).

The carrying out of the National Inventory of Forests started in 1963 and after successive interruptions due to scientific, administrational and financial difficulties, field work was finished in 1985. Its results were published in 1992. The inventory planning was based on a double sampling system. In the first stage of sampling, a number of sampling areas of forest on aerial photographs of proper scale (photo-plots) was designated in a systematic way. Then a stereoscopic examination of photo-plots was implemented and the information, relating to forest species, crown density, mean height of trees, wood volume etc. was registered. The information collected so far, was used as basic criteria for stratification. In the second stage, by applying the statistical method of optimum sample distribution, the necessary number of sampling areas of forests for carrying out measurements on the ground (ground plots) was selected from the already classified photo-plots per stratum in a random way. In the inventory, aerial photographs at a mean scale of 1:20,000, 1:30,000 and 1:42,000, were used. 95,220 photo-plots were examined stereoscopically on Greece's total area, classified according to land use, forest species, crown density, tree height, volume stratum, erosion class, aspect class etc. 2,744 sampling areas were selected to cover the country' s total area, of which 647 were "non forest", 361 "forest without volume" and 1,736 "forest with volume" (First National Inventory of Forests 1992).

The National Inventory of Forests provides, theoretically at least, accurate data in relation to the area of forests, volume, increment, mortality, quality and category of harvested timber. The work of developing and analysing quantitative indicators became difficult due to the absence of at least a second inventory. Thus, the shortage of comparable data did not allow forest parameters to be analyzed over the time. The need to carry out a new inventory and to repeat it every ten years, as happens in Mid European countries, is absolutely necessary. It is pointed out however, that the next inventory should be planned and organised differently than the previous one, so that it can be completed and its results published within 2 years from the time it starts to be carried out. The scientific team and the technical teams who will carry out the inventory can be staffed with personnel from Universities, Research Institutes, Technological Educational Institutes and the Forest Service. The need to carry out an inventory every 10 years arises from the daily need to communicate with EU partners. This communication is based mainly on statistical information and its lack may lead the country to a loss of resources, indispensable to the protection and development of its forests. Thus, the carrying out of National Inventories of Forests regularly must constitute first priority political choice.

The drawing up of the national cadastre and the cartography of forest land contributed significantly to forest protection and development.

The drawing up of a national cadastre aims at solving the complicated ownership status of the country, the protection of the forests from encroachment, land clearings, arsons, but also at easing the friction between proprietors and the public. National cadastre is being carried out in two stages:

In the first stage by applying Law 248/1976 **"Property registration, setting boundaries to forest land and protecting public forest land"**, the land use of areas of forest interest from 1945 until today was designated and the recognised properties were ground surveyed. The vast majority of claims that were not considered legal by the Forest Service concerning areas presumed to be public land, were brought to trial. Cadastral maps and cadastral tables of about 0,3 million ha of state forest land throughout the country were drawn up by following this procedure.

In the second stage by applying Law 2308/1995 **"The National Cadastre"**, started the procedures of drawing up the country's Cadastre. It constitutes a Project incorporated into the Programme **"Environment"**, Subprogramme 5 **"The National Cadastre"** Measure 5.1 **"The Cadastre of Environmentally Sensitive Areas"**. The total budget rises up to 172 MECU and is 80% funded by the Community Support Framework II. The results produced at the first stage will be incorporated into this Project.

By implementing the programme Cartography of Forest land since 1969, the following results have been produced up to now:

• Vegetation maps drawn at a scale of 1:20,000. The maps are orthophotomaps and maps on which the forest vegetation is depicted. The maps covered the total area of the country, apart from the Crete and the Dodekanese prefectures. When the cartography work will be completed, it is planned to revise it regularly by using digital image.

• Coloured vegetation maps drawn at the small scale of 1:200,000 by prefecture. Such maps have been drawn up for the 28 of the 52 prefectures of the country up to now.

The recycling of paper is considered a measure for the protection of forests. The percentage of recycled pulp-paper in Greece, as shown on the table that follows, ranges from 29% to 33% for the last five years.

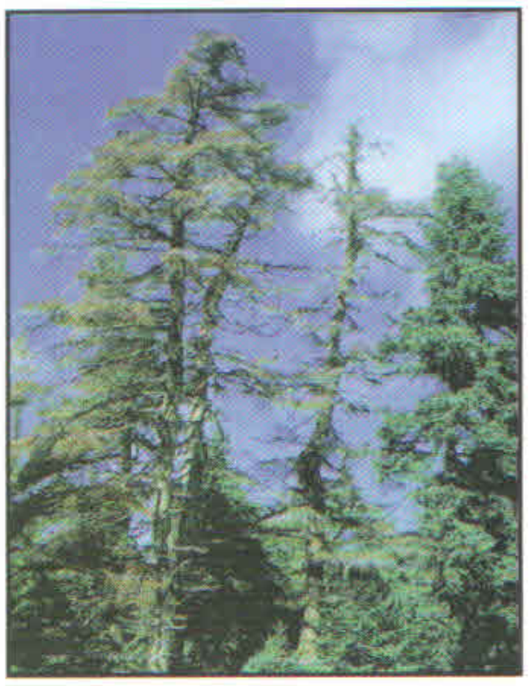
Years	Apparentconsumption of pulp paper (thousand tons)	Collection of recycled paper (thousand tons)	Percentage of recycled in the consumption of pulp paper (%)
1992	707	225	32
1993	784	245	31
1994	845	278	33
1995	902	285	32
1996	917	265	29

Source:

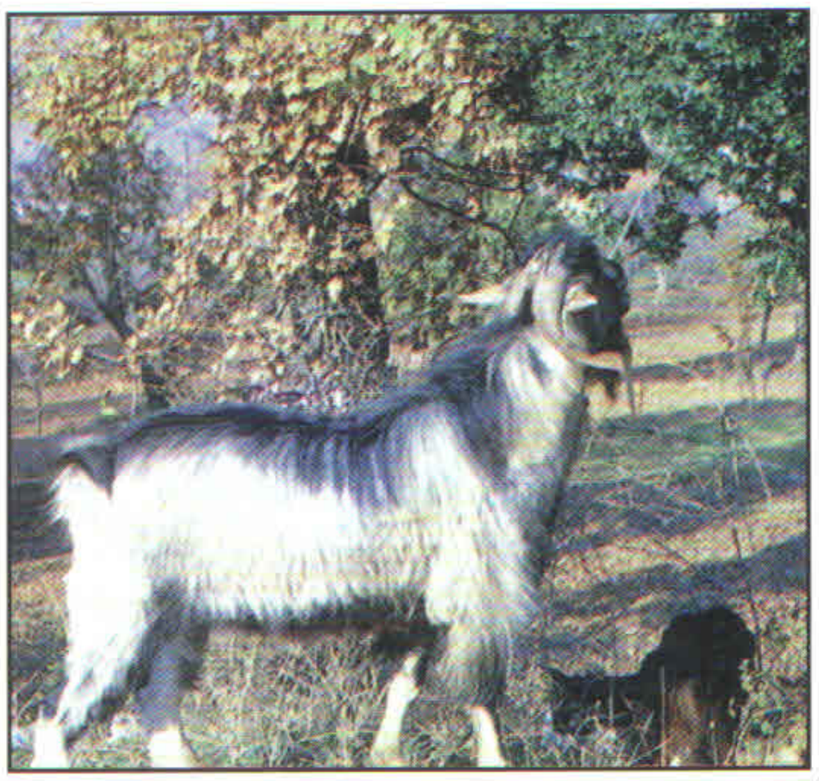
Dr. J. Papadopoulos., Carton, Carton boxes and cartboard producing company PAKO S.A.

Recycled paper is collected by merchants, rag gatherers and Local Government Organisations.

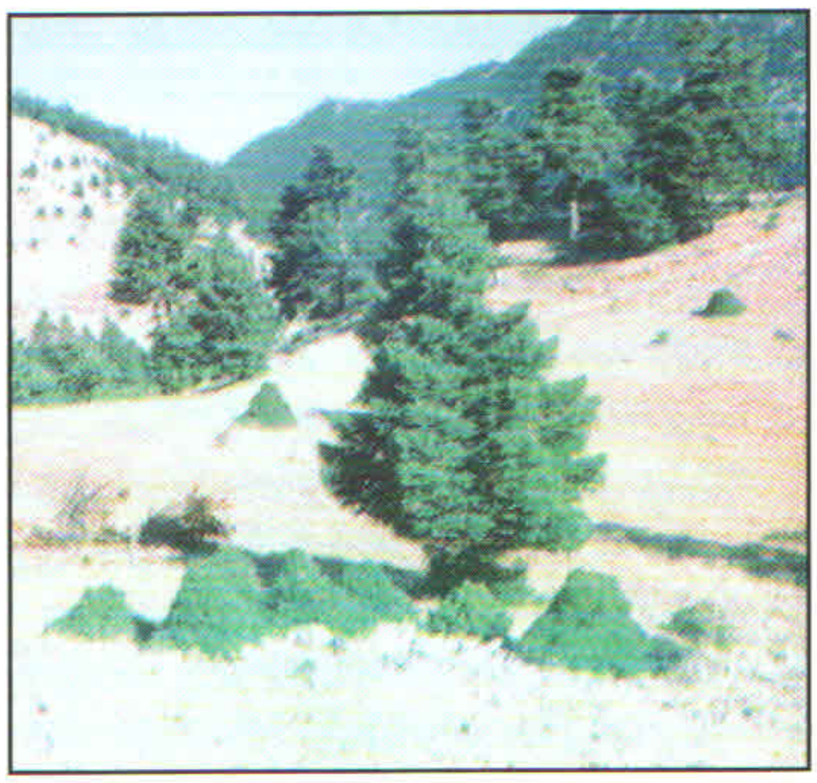
As far as the quantity of carbon stored in wood products in use is concerned, it can be estimated based on the length of the life cycle of wood products. Relative studies can be carried out by Universities, Research Institutes and Technological Educational Institutes, which possess the necessary capacity.



Fir tree mortality fungus Heterobasidion annosum



Grazing in the forest



Damages caused by grazing

Chestnut tree infection by the fungus Chryphonectria parasitica

Fire in the woods

Without defoliation (0-10%)

Slight (11-25%)

Moderate (26-60%)

Severe (61-95%)

Dead (96-100%)

Damages caused by air pollution

CRITERION 2

MAINTENANCE OF FOREST ECOSYSTEM HEALTH AND VITALITY

Concept areas: Damages caused by air pollutants, insects diseases, fires and grazing

QUANTITATIVE INDICATORS:

2.1. Emissions of air pollutants

	1990 Quantities (in thousand tons)	1995 Quantities (in thousand tons)	Changeover the periods 1995/1990 %
CO_2	84 575	90 492	7.00
CH_4	443 027	455 608	2.80
N_2O	17 286	16 884	-2.30
CO	1 280	1 448	13.13
NO_X	344	373	8.43
SO_2	509	558	9.60

Source:
S. Pesmajoglou, D. Koutentakis, National Observatory of Athens

The increase of carbon dioxide (CO_2) shown on the table above will be discussed in the descriptive indicators of this Criterion.

The increase of methane (CH_4) is affected mainly by the changes in the livestock sector, waste management (which increases every year) as well as by the increasing quantities of lignite to meet the needs of power stations. It is predicted that in the near future the mass use of natural gas will significantly contribute to the increase of methane emissions.

Although the nitrous oxide (N_2O) decreased, it is expected to increase in the following years due to the increase in the number of cars equipped with catalytic converters.

Carbon monoxide (CO), released by car exhaust systems, is relatively increased due to the increase in the number of cars in the country.

The increase of nitrogen oxides (NO_X) observed shows a rate-decrease trend, due to the increase of cars equipped with catalytic converters.

The increase of sulphur dioxide (SO_2) is due mainly to the increase of fuels for power generation by the Public Power Corporation and other energy producing sectors. Within the framework of EU policy, projects are carried out in the country concerned with the reduction of the sulphur content of liquid fuels as well the operation of desulphurisation units in the power producing stations of the Public Power Corporation.

To investigate the effects of air pollution on forest health, the following two programmes are implemented in Greece:

- **"Annual crown condition estimation and forest health inventory",** following EEC Regulation No 3528/86, and
- **"Investigations into the effects of air pollution and/or adverse climatic conditions on forest ecosystems in Greece",** following EEC Regulations Nos 1091/94, 690/95 and 1390/97(more details are given in the descriptive indicators).

The results of the first programme will be used to develop indicator 2.2, which is analysed in the next paragraph. The second programme established during the period 1994-1995, and it is estimated that by using its results it will be possible to develop indicators 2.1 and 2.4 in about 5 years time. These two indicators are quoted in the list of Pan-European Criteria and Indicators for sustainable forest management and their content is as follows:

2.1. Total amount of and, changes over the past 5 years in depositions of air pollutants (assessed in permanent plots).

2.4. Changes in nutrient balance and acidity over the past 10 years (pH and CEC); level of saturation of CEC on the plots of the European network or of an equivalent national network.

2.2. Changes in serious defoliation of forests using the UN/ECE and EU defoliation classification (classes 2,3 and 4), over the past five years

a) Analytical presentation of the indicator

BROADLEAVED

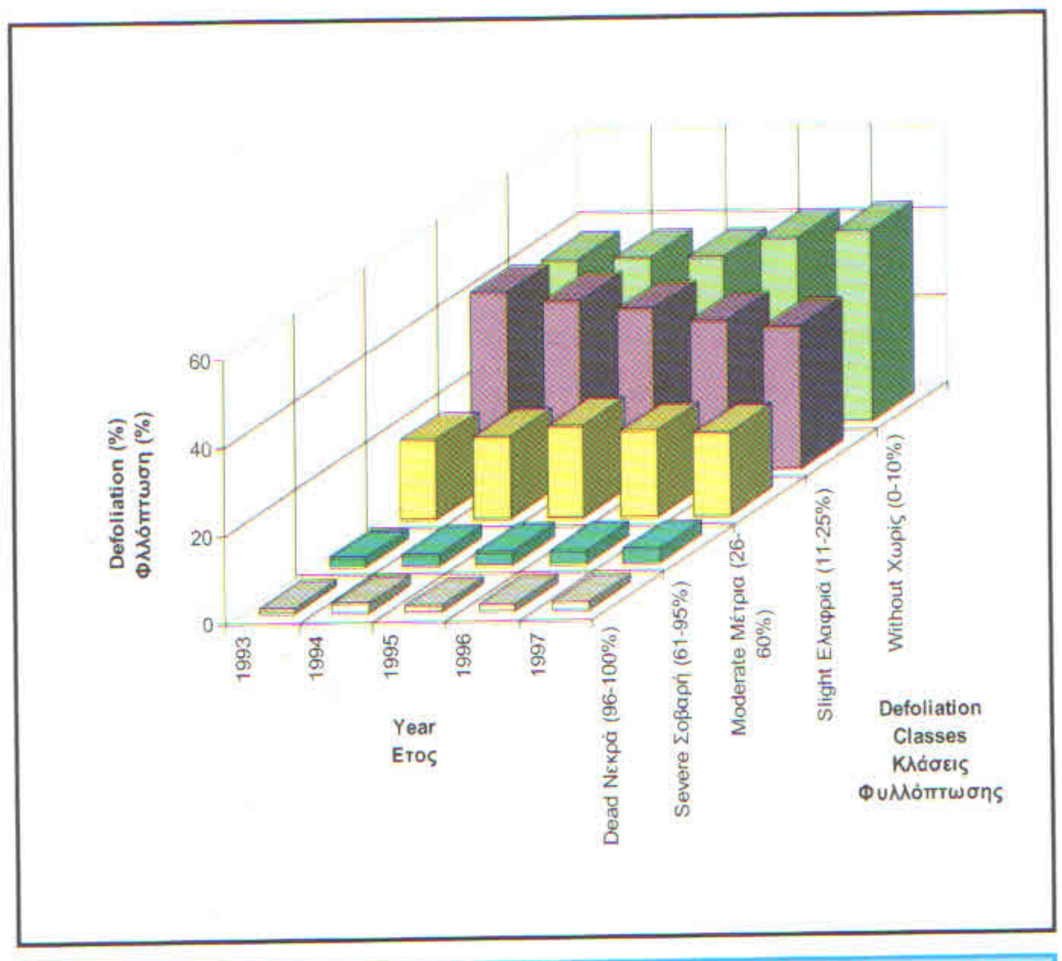
Number of trees observed											
	Quercus conferta	*Quercus petrea*	*Quercus pedunculata*	*Quercus pubescens*	*Quercus cerris*	*Quercus aegilops*	*Fagus moesiaca*	*Fagus sylvatica*	*Platanus orientalis*	Other Broadleaved	Total Broadleaved
1993	266	114	81	38	37	21	121	91	70	34	873
1994	266	114	81	38	37	21	121	91	70	33	872
1995	266	114	81	38	35	21	121	91	70	35	872
1996	266	114	81	38	35	21	121	91	70	35	872
1997	265	114	81	38	35	21	121	91	70	35	872
(%) of trees with 11-25 % defoliation											
1993	46.2	50.9	53.1	55.3	70.3	23.8	9.9	17.6	50	32.4	40.2
1994	42.1	31.6	27.2	31.6	75.7	42.9	28.1	20.9	28.6	36.4	37.6
1995	35.3	39.5	43.2	28.9	60	47.6	30.6	27.5	44.3	25.7	36.5
1996	40.6	35.1	39.5	42.1	37.1	76.2	19	13.2	31.4	22.9	33.3
1997	35.6	41.2	30.9	43.6	37.1	71.4	15.7	13.2	35.7	14.3	31.2
Average ('93-'97)	39.96	39.66	38.78	40.3	56.04	52.38	20.66	18.48	38	26.34	35.76
(%) of trees with 26-60% defoliation											
1993	4.1	36	32.1	39.5	13.5	9.5	3.3	1.1	20	11.8	25.4
1994	42.1	39.5	14.8	60.5	13.5	47.6	2.5	2.2	50	30	28.5
1995	52.7	41.2	28.4	55.3	31.4	14.3	4.9	6.6	22.9	2.9	31.4
1996	45.5	43	33.3	42.1	31.4	9.5	3.3	2.2	17.1		27.9
1997	49.1	31.6	45.7	30.8	25.7	4.8	2.5	1.1	12.9		27.3
Average ('93-'97)	38.7	38.26	30.86	45.64	23.1	17.14	3.3	2.64	24.58	14.9	28.1
(%) of trees with 61-95% defoliation											
1993	4.9	3.7	3.7		8.1	9.5			4.3		3,7
1994	7.5	3.5	3.7	2.6	8.1	4.8			10	6.1	4,7
1995	5.3	8.8	9.9	5.3	8,6	4.8			7.1	5.7	5,2
1996	6	5.3	7.4	5.3	22.9				2.9	2.9	4,8
1997	5.7	7.9	6.2	5.1	28.6				8.6		5,4
Average ('93-'97)	5.88	5.84	6.18	4.575	15.26	6.36	0	0	6.58	4.9	4,76
(%) of dead trees											
1993	0.4	0.9	1.2						4.3		0.7
1994	1.9	1.8	3.7	5.3					5.7		1.8
1995	1.9	0.9	4.9	5.3					2.9		1.6
1996	1.9	1.8	4.9	5.3					4.9	2.9	1.9
1997	1.9	1.8	6.2	5.1					4.3	5.7	2.2
Average ('93-'97)	1.6	1.44	4.18	5.25	0	0	0	0	4.42	4.3	1,64
(%) of trees with crown discoloration											
1993	1.9	1.75	3.75						14.3		2.3
1994	3.8	7	6.2	5.3			0.8		48.6		6.9
1995	7.9	0.9	4.9	5.3					15.7		4.2
1996	2.3	2.6	4.9	5.3			0.8	1,1	11.4	0.2	2.9
1997	2.3	1.8	6.2	51	2.9				17.1	5.7	3.4
Average ('93-'97)	3.64	2.81	5.19	5.25	2.9	0	0.8	1,1	21.42	2.95	3.94

CONIFEROUS

Year	Number of trees observed								
	Pinus halepensis	*Pinus nigra*	*Pinus brutia*	*Abies borisii-regis*	*Abies cephalonica*	Other Coniferous	Total Coniferous	Total Broadleaved	All Species
1993	235	235	76	179	269	21	1 015	873	1 888
1994	235	235	76	179	269	22	1 016	872	1 888
1995	210	235	77	179	269	22	992	872	1 864
1996	211	235	77	179	269	21	992	872	1 864
1997	187	235	77	179	269	21	968	872	1 840
	(%) of trees with 11-25 % defoliation								
1993	60	37	57.9	24	36.8	47.6	41.8	40.2	41
1994	50.2	31.5	53.9	24.6	43.9	40.9	39.8	37.6	38.8
1995	45.7	30.2	54.5	25.7	36.8	57.1	37.1	36.5	36.8
1996	32.2	30.6	36.4	39.1	34.6		34.6	33.3	33.9
1997	32.1	22.1	31.2	34.6	42.7		33.5	31.2	32.5
Average ('93-'97)	**44.04**	**30.28**	**46.78**	**29.6**	**38.96**	**29.12**	**37.36**	**35.76**	**36.6**
	(%) of trees with 26-60 % defoliation								
1993	15.7	7.7	15.8	4.5	15.6	4.76	11.6	25.4	18
1994	9.4	5.9	5.3	4.5	19.7		9.9	28.5	185
1995	6.7	6.8	3.9	9.5	23.4		11.4	31.4	20.8
1996	3.8	7.6	6.5	12.8	23.8		11.9	27.9	19.4
1997	3.7	9.4	5.2	13.4	20.1		11.5	27.3	18.9
Average ('93-'97)	**7.86**	**7.48**	**7.34**	**8.94**	**20.52**	**0.952**	**11.26**	**28.1**	**19.12**
	(%) of trees with 61-95% defoliation								
1993	1.3		1.3	0.6	1.1		0.8	3.7	2.1
1994	0.8	0.8	.	0.6	1.5		0.9	4.7	2.6
1995	0.5	0.4		1.1	2.6		1.1	5.2	3
1996	0.9	0.4		1.1	3.3		1.4	4.8	3
1997	0.5	0.4		1.1	3		1.3	5.4	3.2
Average ('93-'97)	**0.8**	**0.4**	**0.26**	**0.9**	**2.3**	**0**	**1.1**	**4.76**	**2.78**
	(%) dead trees								
1993	0.4			1.1	4.1		1.5	0.7	1.1
1994	0.8		6.6	1.7	5.2		2.4	1.8	2.1
1995	0	0.4	5.2	1.7	1.9		1.1	1.6	1.3
1996	0.5	0.8	1.4		2.6		1.1	1.9	1.5
1997	0.5	0.4	1.3		2.6		1	2.2	1.6
Average ('93-'97)	**0.54**	**0,32**	**2.9**	**0.9**	**3.28**	**0**	**1.42**	**1.64**	**1.52**
	(%) of trees with crown discoloration								
1993	0.9	5.3	-	4.5	19.2		6.7	2.3	4.7
1994	0.8	7.9	-	5.0	24.2		9.1	6.9	8.1
1995	1.0	5.2	-	8.4	21.2		8.2	4.2	6.3
1996	1.0	0.4	-	14.5	22.2		9.2	2.9	6.3
1997	2.7	1.3	-	11.2	18.6		8.1	3.4	5.9
Average ('93-'97)	1.23	4.01		8.68	21.08		8.26	3.94	6.26

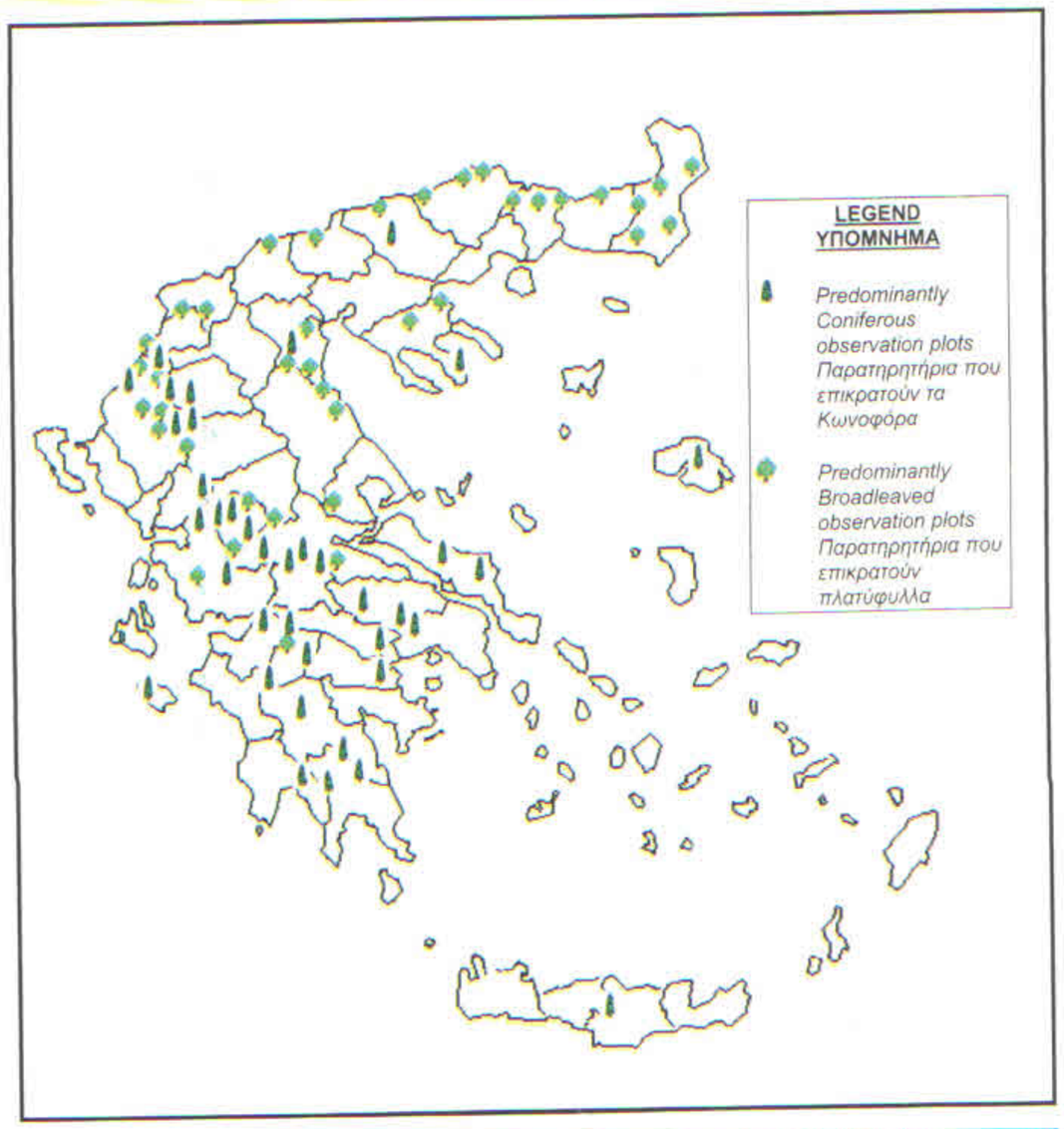
Source:
DR. G. Nakos and M. Voulala, Section of Forest Ecology, IMFE & FPT

b) Concise presentation of the indicator



Source:
Dr G. Nakos and M. Voulala, Section of Forest Ecology.
IMFE&FPT

c) Map of observation plots



Source:
Dr G. Nakos and M. Voulala, Section of Forest Ecology,
IMFE & FPT

Table and diagram are based on the results of the annual surveys carried out within the framework of the programme **"Annual crown condition estimation and forest health inventory"**, implementing EEC Regulation No 3528/86.

The general conclusions about the health condition of the Greek forests, are as follows (IMFE&FPT 1997):

- It seems that the condition of the Greek forests is determined mainly by abiotic (drought) and biotic (insects, fungi, grazing) factors and not by air pollution.
- Broadleaved species are in worse condition than coniferous species.
- Deciduous broadleaved species with "severe damage" (defoliation >60%) need more time to recover than coniferous species. Fagus spp. appears to be in a better health condition than Querqus conferta (or Q. fraineto) and Pinus nigra better than Abies cephalonica.

2.3. Damages caused by abiotic and biotic factors

2.3.1. Damages caused by insects

Inventories have not been carried out to determine the extent of losses caused by insects and diseases in Greece. However, in the following two paragraphs the most important insects and diseases occurring in Greece are listed.

Pine forests: Natural forests and plantations of *Pinus halepensis*, *P. brutia*, *P. nigra* and *P. pinaster* are frequently attacked by the needle insect *Thaumatepoea pityocampa*. Heavy attacks are quite common in forests of *P. halepensis*. Bark beetles also infest and kill pine trees during periods of drought.

Fir forests: The shoot and needle insects *Choristoneura murinana* and *Epinotia subsequana* are commonly found to attack fir forests, causing significant damage in certain areas. Heavy infestation by bark beetles and tree mortality are commonly observed in fir forests during two or more consecutive dry years.

Oak forests: *Lymantria dispar* and *Tortrix viridiana* are commonly found to attack deciduous and evergreen oaks. *L. dispar* causes local epidemics on maquis forests of *Quercus coccifera*.

Poplar plantations: Poplars suffer extensive loss

Source:
a) Dr S. Xenopoulos and Dr P. Tsopelas, Section of Forest Protection, IMFE&FPT, NAGREF
b) Dr S. Diamantis, Section of Forest Protection, Forest Research Institute of Thessaloniki NAGREF

by the leaf eating insects *Lymantria dispar*, *Stilpnotia salicis*, *Melasoma populi* and wood borers Sciapteron tabaniformis and *Melanophyla picta*.

2.3.2. Damages caused by diseases

Three fungal diseases which have been introduced to Greece have devastated their hosts. *Cryphonectria parasitica* has spread all over the country causing significant damage to coppice chestnut and fruit trees. *Seiridium cardinale* causes heavy mortality to cypress plantations and ornamental trees; it is more severe in Western and Southern Greece. *Ophiostoma ulmi* that causes the Dutch elm disease, has devastated all Greek elms.

Endemic diseases cause less damage in Greek forests. Coniferous forests are commonly attacked by the root rot fungi *Heterobasidion annosum* and *Armillaria spp. H. annosum* is more severe in forests of Pinus sylvestris and fir forests. *Phytophthora cambivora* (ink disease) has eradicated chestnuts in several localities. Also, *Dothichiza populea* attacks young poplars in the nursery, while *Marssonina brunnea* causes severe premature defoliation to all Italian poplar clones that are planted in Greece, resulting in loss of growth.

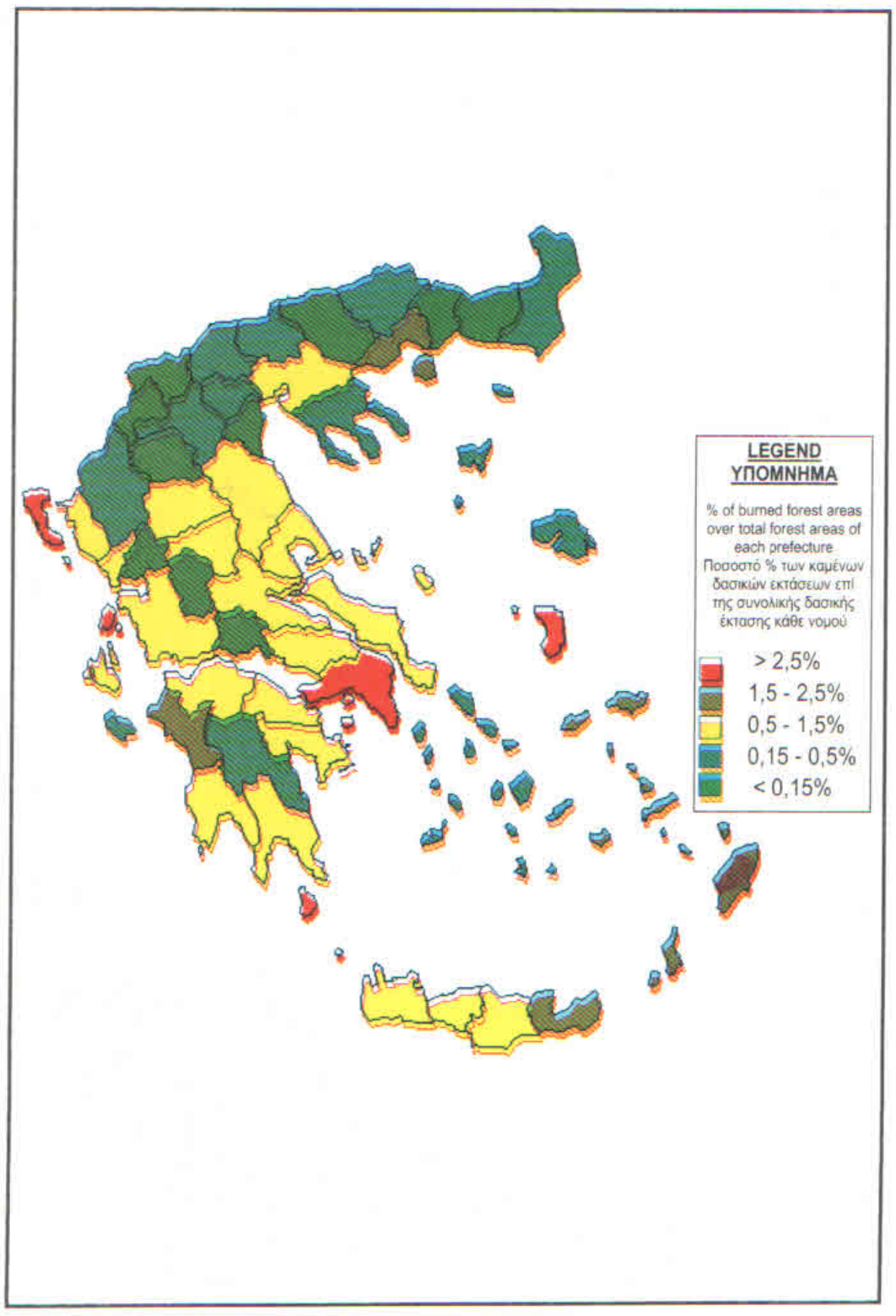
Source:
a) Dr S. Xenopoulos and Dr P. Tsopelas, Section of Forest Protection, IMFE&FPT, NAGREF
b) Dr S. Diamantis, Section of Forest Protection, Forest Research Institute of Thessaloniki NAGREF

2.3.3. Areas of forest and other wooded land destroyed by fires

Year	Forest (ha)	Other wooded land (ha)	Total (ha)
1977	29 760	10 605	40 365
1978	4 982	10 841	15 823
1979	3 877	7 336	11 213
1980	4 355	17 491	21 846
1981	38 653	35 917	74 570
1982	10 843	12 066	22 909
1983	10 907	7 668	18 575
1984	12 018	13 288	25 306
1985	48 631	43 840	92 471
1986	10 109	11 057	21 166
1987	13 605	23 667	37 272
1988	27 370	60 977	88 347
1989	23 600	12 440	36 040
1990	21 088	12 646	33 734
1991	8 000	10 239	18 239
1992	23 194	33 495	56 689
1993	24 200	23 727	47 927
1994	21 157	21 244	42 401
1995	13 896	10 399	24 295
1996	5 947	9 333	15 280
Average 1977-1986	**17 414**	**17 011**	**34 424**
Over the total area (%)	0.52	0.54	0.53
Average 1987-1996	**18 206**	**21 817**	**40 022**
Over the total area (%)	0.54	0.69	0.61
Average 1977-1996	**17 810**	**19 414**	**37 223**
Over the total area (%)	0.53	0.62	0.57

Source :
Fire Prevention and Suppression Section,
Directorate of Forests
and Forest Environmental Protection, GSF&NE,
Ministry of Agriculture

2.3.3.1. Grouping of the prefectures of Greece according to the percentage of burned forest areas over their total forest area



Source :
Fire Prevention and Suppression Section, Directorate of Forests and Forest Environmental Protection, GSF&NE, Ministry of Agriculture Statistical data of the 1985-1994 period

Forest fires constitute the biggest threat to Greek forests and especially to drought resistant forest species of the Mediterranean vegetation zone. Some of the negative effects of fires are in form of timber value reduction, soil erosion, loss of biological diversity, damage to wildlife habitats, degradation of watershed areas and deterioration of quality of life.

The most common causes of fires in Greece are as follows:

- Arson aiming at changing the use of forest land and fires caused by negligence.
- Climatic conditions characterised by long drought periods during the summer months combined with high temperatures and strong winds.
- The accumulation of large amounts of biomass especially in the overstorey as well as in the evergreen broadleaved understorey of *Pinus halepensis* and *P. brutia* forests. These species are inflammable due to their essential oil content.

Thus, the most destructive forest fires occur in the southern and lowland areas of the country, where climatic conditions favour their combustion and spreading. Drought-resistant *Pinus halepensis* and *P. brutia* as well as phrygana and evergreen shrubs (*Querqus coccifera*, *Pistacea lentiscus*, etc.) are worst affected by fire. Less inflammable are Oak spp. and Pinus nigra, while forests of *Fagus spp.* and *Abies spp.* growing at elevations of more than 900 - 1000 m. are more or less safe from fire (Kailidis 1990).

2.3.4. Damage caused by drought and frost

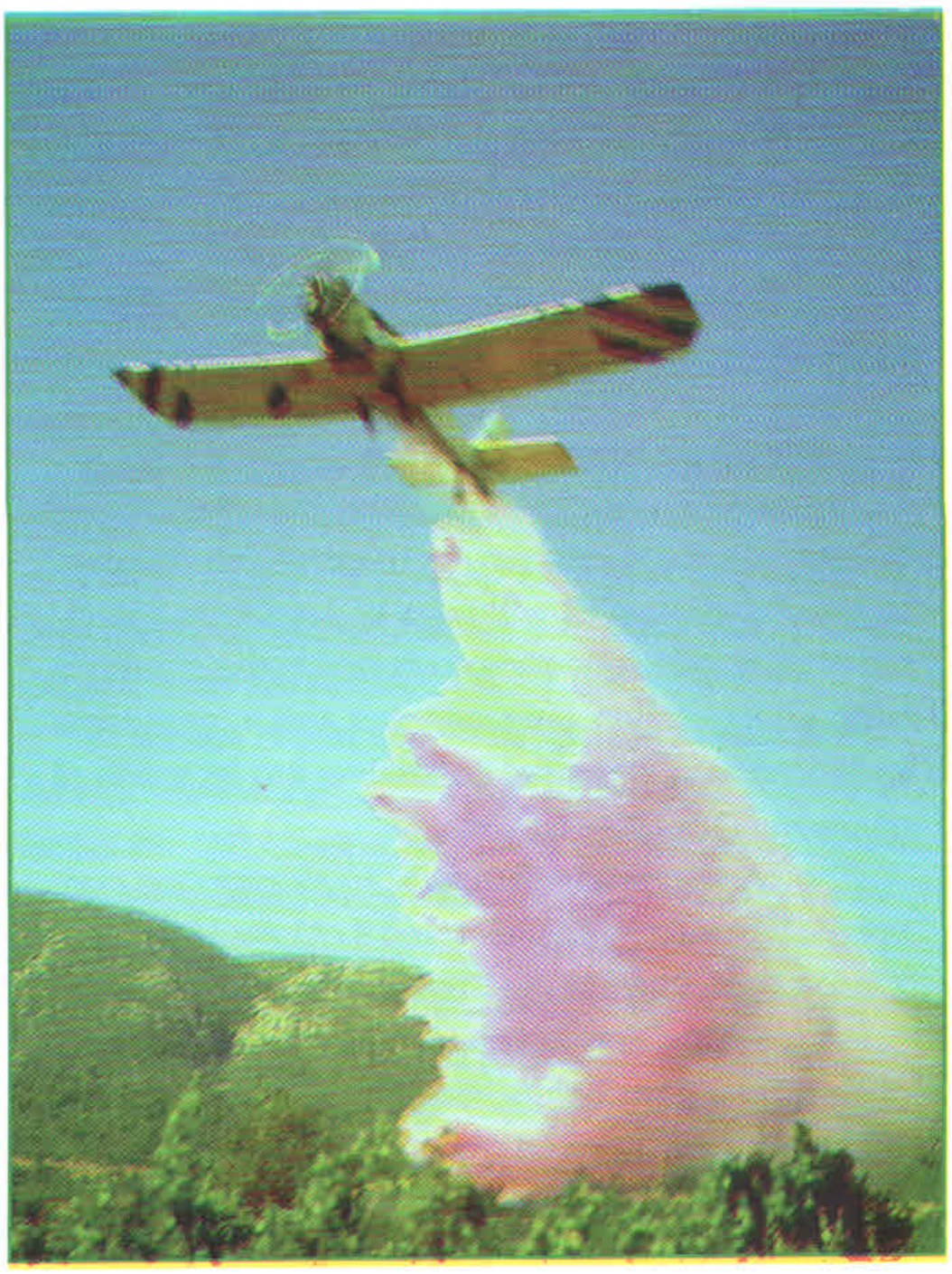
Greek forests suffer considerably by drought and consequent water stress which may be very intense in certain years. During the 1984-1994 period over 200,000 m^3 of dead fir timber (*Abies cephalonica* and *A. borisii-regis*) had to be felled because of water stress and insect infestation. Similarly, young pine plantations suffered great losses all over the country. Oak decline, a non-sufficiently explained trouble of oaks in the Mediterranean zone was intensified by the long drought. Late frosts may also cause damage to planted trees especially by frost cracks which occasionally and on a local scale may cause heavy loss to poplar plantations. Such was the case of over 500,000 8-yr-old poplar trees (clone I-214) which were cracked in 1981 (at proportion 60%) and again in 1984.

Source:
Dr S. Diamantis, Section of Forest Protection, Forest Research Institute of Thessaloniki, NAGREF

2.3.5. Damages caused by storms

Damages caused by storms in the Greek forests are restricted in area and occur periodically. This is due to the fact that the majority of forests are natural and clear cuttings do not apply to them.

Source:
Associate Professor P. Smyris, Sector of Forest Production-Forest Protection Natural Environment, Department of Forestry and Natural Environment, Aristotle University of Thessaloniki



2.3.6. Proportion of forest regeneration area seriously damaged by game and other animals and by grazing

(1)	Area of forest regenerated annually, naturally and artificially:---	32.190 ha
(2)	Annually regenerated area seriously damaged by game and other animals :----------	0 ha
(3)	Annually regenerated area seriously damaged by grazing:----------	6.440 ha
(4)	Proportion of forest regeneration area seriously damaged by game and other animals and by grazing:----------	20%

Source:
Professors V. Papanastasis and N. Papageorgiou, Sector of Range-Wildlife and Freshwater Fisheries, Department of Forestry and Natural Environment, Aristotle University of Thesaloniki

$$(4)=\frac{(2)+(3)}{(1)}X100=\frac{6440}{32190}X100=20\%$$

Damages caused by game (deers-roe deers) are negligible due to the fact that the number of games in Greece is small compared with that of the Central European countries.

DESCRIPTIVE INDICATORS:

In this section the legal, institutional and financial framework is examined together with all the informational data of the concept areas of Criterion 2, i.e. damages caused by emissions of air pollutants, insects, diseases, fires and grazing.

Legal / Regulatory framework

Greece is participating with other developed countries in the EU endeavour to reduce air pollutants, produced mainly by the use of solid fuels. To improve air quality, specific provisions in the country's national legislation were enacted and international treaties ratified aiming at controlling the emission of gases like CO_2, SO_2, NO_X etc.

The basic provisions relative to air pollution control are included in articles 7 and 8 of Law 1650/1986 **"On the Protection of the Environment"**. In this provisions, *inter alia*, matters concerning marginal values of air quality parameters, methods of sampling and analysing them, stations of air quality monitoring and measures taken for air protection are regulated.

International conventions-agreements to which Greece is committed, for controlling air pollution, are as follows:

1) The Convention on Long-Range Transboundary Air Pollution signed in Geneva in 1979 and its related protocols:

- SO_2 protocol (Helsinki 1985 and Oslo 1994)
- NO_X protocol (Sofia 1988)
- Non-volatile organic compounds protocol (Geneva 1991) for confronting tropospheric photochemical oxidants.

2) The Vienna Convention signed in 1987 and the related Montreal protocol on substances that deplete the Ozone concentrated on the stratosphere.

3) The Geneva Convention which constitutes a modification of the Copenhagen Convention aiming at bringing cFCs chlorofluorocarbons and methylochloroform at the level before 1990.

4) The United Nations Framework Convention on Climate Change which was adopted by the plenary session of the United Nations held in Rio in 1992. Its target is the reduction and stabilisation of greenhouse gas emissions at such a level that it will prevent the dangerous anthropogenic contributions on climate. Greece ratified this Convention by Law 2205/94. According to this convention, the developed countries adopted the target to restore CO2 emissions by the year 2000 to the 1990 levels.

5) The decision 93/389/EEC of the European Ministers Council, for the establishment of a monitoring mechanism of Community CO2 and other greenhouse gas emissions, requires the member-states of the EU to report annually their national emissions and on their progress of the policies and measures for the reduction of greenhouse gas emissions. The methodology used for the estimation of annual emissions is the one specified by the emissions inventory guidelines of the IPCC (Intergovernmental Panel on Climate Change).

6) Before this decision, the Monitoring Mechanism **CORINE** (**CO**o**R**dination d' **IN**formation **E**nvironmental) had been established in 1985, aiming at collecting, manipulating and securing data related to the condition of the environment in the EU. Within this framework the **CORINAIR** project (**CORIN**e **AIR** emissions inventory) for gas emissions inventory from anthropogenic and non activities has been planned and implemented by EU member-states. The first inventory was in 1985 and concerned only the sulphur oxides, sulphur, nitrogen as well as hydrocarbonates for the EU member-states. In 1990, within the framework of the CORINAIR 90 project, second inventory was conducted for all the EU member-states and concerned 8 gases. The last CORINAIR 94, concerned besides the inventory emissions of eight (8) basic gases for European countries in 1994, the inventory of twenty (20) compounds in sixteen (16) countries outside the European Union (National Observatory of Athens 1997a).

Finally, relative to the calculation of gas emissions is the IPCC programme which was developed by the WMO[1] and the UNEP[2] in collaboration with the OECD[3] and IEA[4] on various issues and particular in the drafting of the inventory guidelines.

Forest legislation satisfactorily regulates the protection of forests from abiotic and biotic factors. In particular:

- Articles 220 and 221 of Law 86/1969 regulate forest protection from insects and diseases including terms of importation dealing with all the kinds of

timber, plants, seeds, leaves, aiming at deterring the propagation of diseases.

• Articles 209 and 219 of Law 86/1969 and articles 23-36 and 69 of Law 998/1979 regulate the preventive and suppressive measures against forest fires, the obligations of forest service employees and other bodies involved in fire fighting, areas of high fire risk, penalties imposed to offenders etc. Royal Decree 108/1973 **"Measures of forest fire fighting"** and Presidential Decree 575/1980 **"On the designation of regions of forest and other wooded land as fire proned"**, also regulate forest fire fighting matters.

• Articles 103-111 and 276-278 of Law 86/1969 regulate concession of grazing rights in state forests, grazing prohibitions and penalties against illegal grazing.

[1]World Meteorological Organisation
[2]United Nations Environment Programme
[3]Organisation for Economic Co-operation and Development
[4]International Energy Agency

Institutional / framework

Responsible for air quality control in Greece is the Directorate of Air Pollution and Control of Noise of the Ministry of Environment, Physical Planning and Public Works. This directorate entrusted to the National Observatory of Athens to collect data and draw up a report on air quality.

CO_2 carbon dioxide emissions in the European Union account for 94% of energy-related activities. 71% of the CO_2 emissions in EU in 1994 derived from 4 countries : Germany, Great Britain, Italy and France (National Observatory of Athens 1997a).

The CO_2 emissions in Greece account for 2.5% of the total EU emissions. The combustion of fossil fuels accounts approximately for 91% of the total CO_2 emissions in the country, while the remaining 9% derive from industrial processing (mainly the production of cement and lime) and solid waste incineration.

The target of EU member-states is to stabilise CO_2 emissions by the year 2000 at the 1990 levels. This target is included in the United Nations Framework Convention on Climate Change (FCCC) which was signed by 165 countries and the European Union in Rio in 1992. Within the framework of this Convention, the Greek government has agreed that a realistic objective for the country is the restriction of the overall increase of carbon dioxide to 15% ±3% of the 1990 levels by the year 2000. According to the measurements that have been carried out until 1995, the CO_2 emissions compared to 1990 levels have increased only 7%, a value that is on the right direction, since an optimistic scenario predicted a 5% increase and a pessimistic one, an 8.6% increase (National Observatory of Athens 1997b).

Systematic inventory and evaluation of the condition of Greek forests was implemented by two research programmes following the EEC Regulations Nos 3528/86, 1091/94, 690/95 and 1390/1997. These programmes are as follows (IMFE&FPT 1997) :

• **"Annual crown condition estimation and forest health inventory"**, following EEC Regulation No 3528/86. 100 observation plots (level I plots) have been established since 1988 for implementing these estimations, mainly in high and evergreen broadleaved forests of the country. Observation plots are monitored every year to estimate tree crown defoliation, grouped into five (5) defoliation classes. Besides assessing air pollution effects on forests, the general health condition of forests from the effects of biotic and abiotic factors is monitored by this programme.

• **"Investigations into the effects of air pollution and/or adverse climatic conditions on forest ecosystems in Greece"**, following EEC Regulations Nos 1091/94, 690/95 and 1390/97. Implementing this programme four (4) experimental plots (Level II plots) have been established during the period 1994-1995, on representative forest ecosystems of the country. Since 1996, the following works are being carried out :

• Detailed inventory of the health condition of forest trees and the characteristics of ground vegetation (annual).

• Study of soil properties (every 5-10 years) and soil solution analysis (twice per year).

• Measurement of the volume and increment parameters of the tree plots (every 5 years).

• Continuous measurement and study of meteorological parameters under and outside forest crown canopy.

• Study of nutritive constituents of tree leaves/needles (every 2 years).

• Continuous measurement and analysis of

weekly precipitation samples under and outside the crown canopy.

These programmes are implemented by IMFE&FPT on behalf of the GSF&NE.

The GSF&NE developed mechanisms for controlling the occurrence of serious damages caused by biotic and abiotic factors and especially against fires, grazing, insects and diseases.

The main points of the preventive and suppressive mechanism that the GSF&NE uses to face forest fires are as follows:

- The Forest District Offices are classified into three zones of fire risk. This classification affects the distribution of the credit for forest fire fighting, the number and capacity of fire extinguishing equipment, the number of seasonal forest fighters and their employment duration.
- Round the clock operation of the Forest Fires Co-ordination Centre. Its main responsibility is the co-ordination of fire fighting throughout the country.
- Drawing up of the annual forest fire fighting plan by the Forest District Offices.
- Hiring of the necessary seasonal personnel and procurement of aeroplanes and mechanical equipment.
- Construction of lookouts and fire brakes and clearing of bushes.
- Enhancing co-operation with the Fire Brigade, the Army, the Police and Local Authorities.

It is a common belief among Greek foresters that grazing of sheep and goats in forests is the main cause of their degradation and destruction. According to the data of the National Statistical Service of Greece (1995), the country raises 8,868,000 sheep and 5,520,000 goats, of which 92% and 85% are correspondingly in flocs and nomadic and graze in pastures and in 75% of the forests. The Forest Service protects forests from grazing by prohibitions and regulations with which stockfarmers sometimes agree and other times do not. The various measures taken are summarised as follows:

- An attempt to remove goats from grazing in the country' s fir forests
- Immediate removal of grazing from certain black pine, beech and high oak forests and also from dangerous watershed areas
- Management of pastures with particular emphasis on increasing and improving grass production, so that the pressure exerted to grazing forests can be eased
- Animal breeding Improvement
- Gradual conversion of nomadic livestock into domestic one.

The GSF&NE controls damages caused by insects and diseases, by taking the following measures:

- *Thaumetopoea pityocampa* and *Lymantria dispar* are controlled by insecticides
- Biological control of *Cryphonectria parasitica* is applied by using hypovirent strains of the fungus
- Canker disease of cypress (*Seiridium cardinale*) is controlled by using resistant clones of cypress
- No attempts have been made so far in the country to reduce damages caused by root rots.

Financial instruments / Economic policy framework

Matters relating to air pollution are controlled mainly by the provisions of article 3 of the Law 2242/1994. According to par. 10 of that article, a consumption tax of 5 GRD per litre of petrol and oil for internal combustion engines is levied and the money collected, rendered to the Ministry of Environment, Physical Planning and Public Works. 50% of this amount of money goes to a specific Fund and is disposed of exclusively for the elaboration of studies, research and carrying out of works that contribute to the environment protection and improvement (see descriptive indicators of Criterion 4). The other 50% is granted to the General Secretariat of Public Works of the above Ministry for the elaboration of studies and the carrying out of works that contribute to air pollution control.

The total expenditure for implementing the two programmes of monitoring the health condition of Greek forests for the 1986-1996 period amounted to 270 million GRD. 153 million GRD were spent on the Level I plots programme and the remaining 117 million GRD on the level II plots programme. These two programmes are funded 50% by EU and the remaining 50% by the Investment Budget.

Forestry benefited significantly from EEC Regulation No 2158/92 "**Protecting Community Forests**

from fires". It refers to a Community Action aiming at reducing the number of fires and burned areas and concerns state and private forests belonging to the fire proned prefectures of the country. Forestry activities funded included the construction of fire brakes, lookouts, water tanks, forest roads as well as works for improving degraded forests. By implementing this Regulation 16 billion GRD were spent in the 1987-1997 period, funded 50% by EU, 30% by the Ministry of Agriculture and 20% by investors.

The GSF&NE spends a considerable amount annually on making more effective the preventive and suppressive mechanism used for protecting forests against fires, insects, fungi, illegal cuttings, illegal take-overs etc. In 1996 11.2 billion GRD were spent for the protection of forests, i.e. 19% of the total expenditure in forestry.

Informational data to implement policy framework

Nowadays research programmes are carried out in the country by universities, forest research institutes and Technological Educational Institutes dealing with the factors and mechanisms affecting forest health and vitality. Some of these programmes are as follows:

- **"Forest Fire Management and Fire Prevention System"** The development of a PC integrated system based on the semiautomatic photointerpretation of satellite images (combustion maps), on socioeconomic risk models and on probability models, which will be used as a tool for the management of prevention measures against forest fires.
- **"Acceleration of the rehabilitation of burned pine areas in Greece"**. The project intended to demonstrate to the state and to farmers, owners of the forested areas, the acceleration of rehabilitation of burnt areas and the way of fire hazard elimination in restored areas, while creating employment for the local population.
- **"Alternative land use with fast growing trees"**. The programme aims at developing agricultural marginal lands for forage production, quality of wood and other products and services.
- **"Cypress. A flexible tree for the protection of intensive farm land and for the production of high quality wood in marginal forests subject to fire risk in the Mediterranean region"**. The programme aims at studying the ecology of cypress natural stands, evaluating and utilising resistant clones of cypress to fungus *Seiridium cardinale*, studying the effects of microclimate to disease spreading and studying the technical wood properties of various cypress provenances.
- **"Diseases of the root system in fir and Black pine"**. The programme aims at studying the pathogenes affecting the root system of fir and black pine and was also extended to *Pinus sylvestris*. Pathogenes studied are the fungus *Heterobasidion annosum* and species of *Armillaria*.
- **"Identification and spread of vc-groups of Cryphonectria parasitica in Greece aiming at the biological control of chestnut blight"**. The programme aims at studding the status of chestnut blight disease in Greece and searching the variability of this fungus. The final target is the biological control of the disease in Greek forests.

Tree felling

Shaping and debarking of logs

Logs skidding

Logs transportation

Resin collection of Pinus halepensis

Charcoal preparation

CRITERION 3

MAINTENANCE AND ENCOURAGEMENT OF PRODUCTIVE FUNCTIONS OF FORESTS (WOOD AND NON-WOOD)

Concept areas : Wood production, Non Wood production

QUANTITATIVE INDICATORS:

3.1. Balance between increment and removals over the past ten years

		Total (Overbark volume 1000m³)
(1)	Gross annual increment	4 118
(2)	Mean annual mortality	305
(3) = (1)-(2)	Net annual increment	3 813
(4)	Removals (Average of period 87- 96)	2 313
(5) = (4)/(3)*100	Removals / Net annual increment	60.7%

Source:
a) First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture
b) Directorate of Forests and Forest Environment Management, GSF&NE, Ministry of Agriculture

The quantity of timber removed annually from Greek forests is far less than their net annual increment, as is clearly stated on the above table. This shows the effort undertaken to rehabilitate and increase the density of Greek forests and constitutes a proof of course that they are sustainably managed. The proportion of removals to net annual increment, 60.7%, is lower than the corresponding proportion of 70% in the Nordic Countries, 67% in Eastern European countries and 69% in EU member-states, except in Austria, Finland and Sweden (Ministry of Agriculture and Fisheries of France 1995).

Timber production coming from state and non-state forests has fallen considerably during the last decade. The reduction in fuelwood production is sharper than in industrial roundwood. This is due mainly to the substitution of timber as heating material by solid and gas fuels in towns and villages and to a smaller extent of people moved from mountainous areas to towns. Industrial roundwood accounts for 35% of the total timber production and it is considerably lower than fuelwood. Sawlogs production is even smaller and accounts for 15% of the total yield.

Wood quality is not the best possible due to the degradation of forests by grazing, fires, illegal cuttings, selective cuttings which remove the best trees of the stands as well as usually the low productivity of forest soils. Timber consumption per inhabitant in Greece, by converting all timber products to roundwood equivalent, was in 1994 0.58 m³/inhabitant (6.3 million m³ /10.4 million population), while for the total of European countries was 0.92 m³/ inhabitant {533 million m³/ 581 million population(UN/FAO 1996)}.

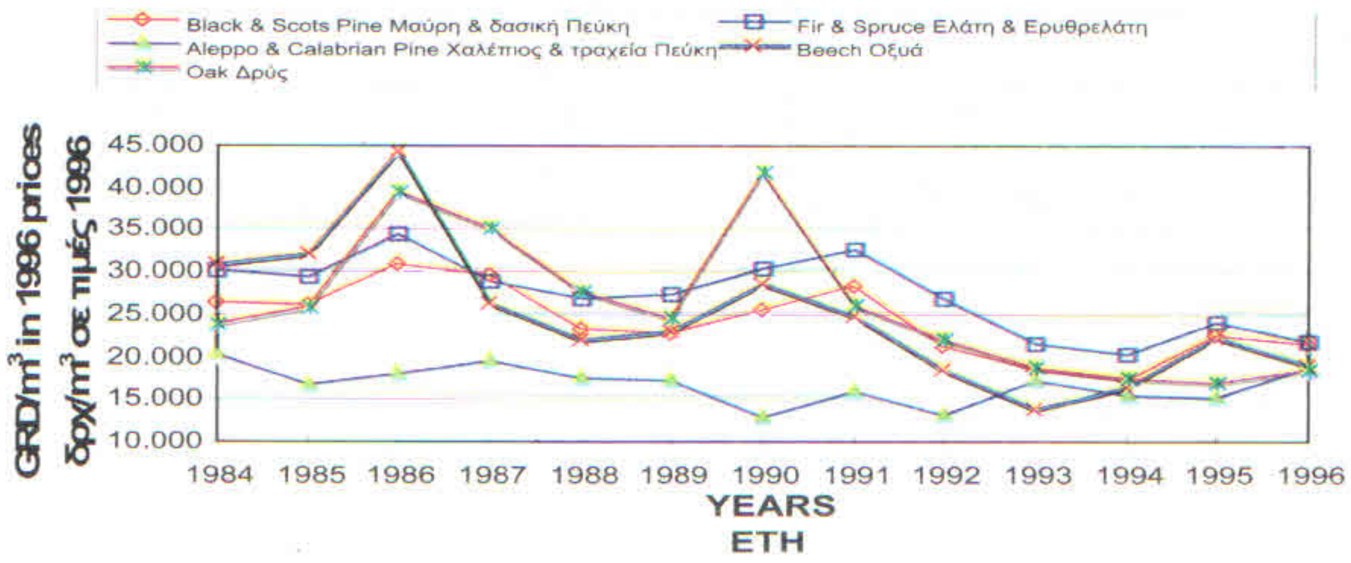
3.2. Timber production in thousand m³

	Average production in the (1984 - 1986) period			Average production in the (1994 - 1996) period			Change over the (1984-1986) (1994-1996) periods (%)		
	State Forests	Non-State Forests	Total	State Forests	Non-State Forests	Total	State Forests	Non-State Forests	Total
1. Industrial roundwood	597	224	821	559	150	709	-6.4	-33.0	-13.6
Coniferous	332	138	470	328	97	425	-1.2	-29.7	-9.6
Broadleaved	265	86	351	231	53	284	-12.8	-38.4	-19.1
2. Commercial fuelwood	637	319	956	490	220	710	-23.1	-31.0	-25.7
Coniferous	42	34	76	30	93	123	-28.6	173.5	61.8
Broadleaved	595	285	880	460	127	587	-22.7	-55.4	-33.3
3. Fuelwood collected free of charge	625	450	1 075	349	253	602	-44.2	-43.8	-44.0
Coniferous	110	62	172	59	28	87	-46.2	-54.8	-49.4
Broaleaved	515	388	903	290	225	515	-43.7	-42.0	-43.0
Total ---------->	1 859	993	2 852	1 398	623	2 021	-24.8	-37.3	-29.1
Coniferous ---------->	**484**	**234**	**718**	**417**	**218**	**635**	**-13.8**	**-6.8**	**-11.6**
Broaleaved ---------->	**1 375**	**759**	**2 134**	**981**	**405**	**1 386**	**-28.7**	**-46.6**	**-35.1**

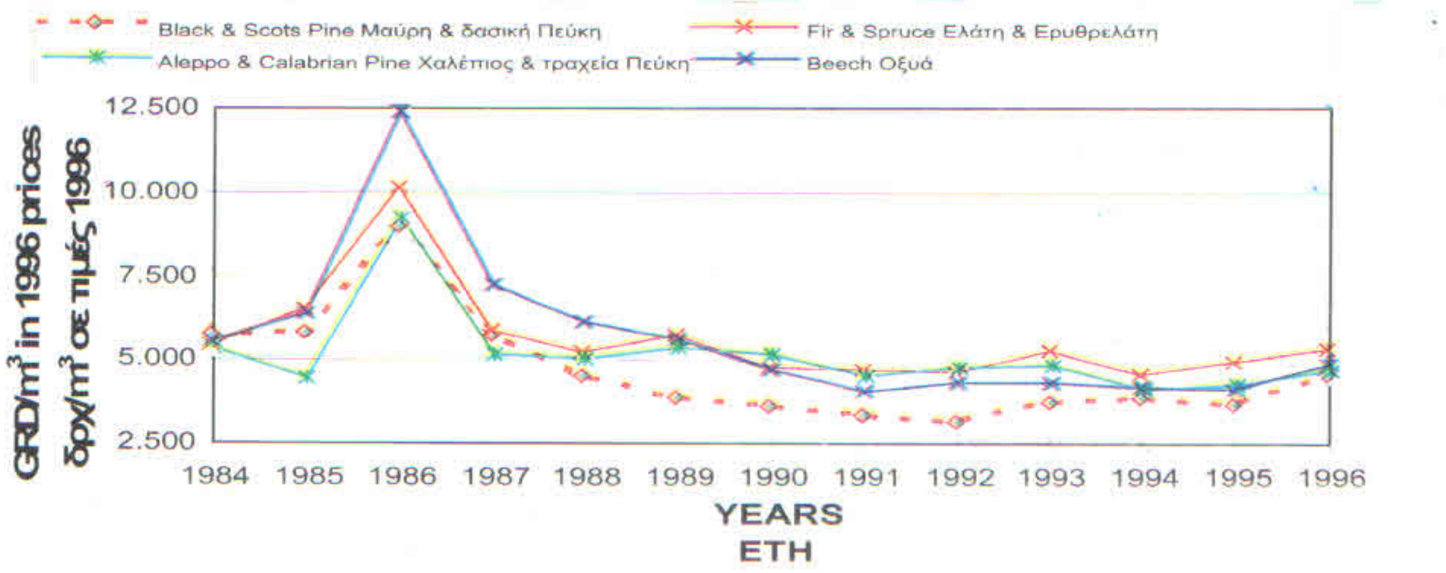
Source :
Directorate of Forests and Forest Environment Management, GSF&NE, Ministry of Agriculture

3.3. Sale prices of wood products by main category at the forest roadside

a) Roundwood timber



b) Small diameter roundwood



c) Fuelwood

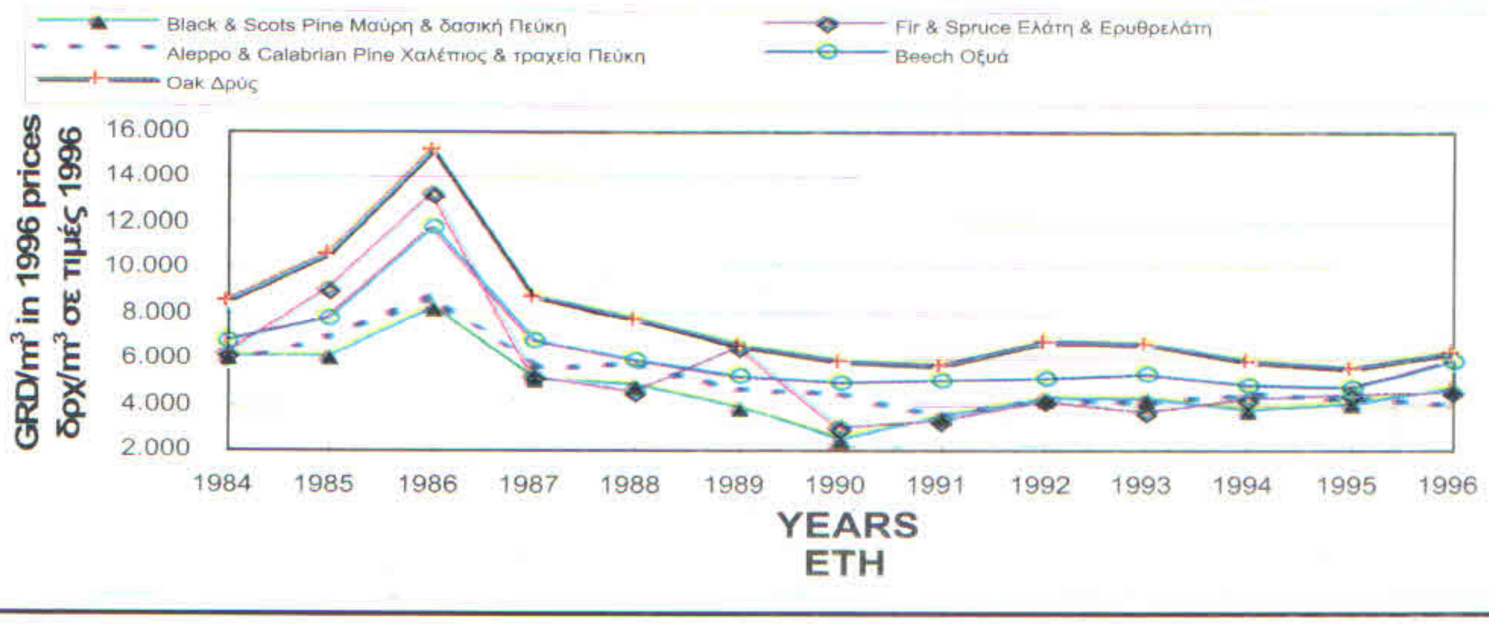


Diagram:

Sale prices of wood products by main category at the forest roadside for the main forest species during the 1984-1996 period

The sale prices on the above diagrammes concern wood products at the forest roadside for the main forest species produced in the state forests by the direct labour forest exploitation system (See descriptive indicators of Criterion 3) and sold by auction.
From the above diagrammes and the application for each wood category the regression on time equation (Y=a+bX where Y= the prices of wood products for the 1984-1995 period and x= the time), results that the sale prices of wood products at the forest roadside for the main forest species of the country, followed a downward course during the 1984-1996 period.
It proved impossible to carry out the same work for wood products produced according to the other forest exploitation systems (see descriptive indicators of Criterion 3) as well as from non-state forests, due to lack of available data.

3.4 . Percentage of forest and other wooded land managed according to a management plan

	Total area (1000 ha)	Period (1975-1985) Area under management (1000 ha)	Period (1975-1985) Percent (%)	Period (1986-1995) Area under management (1000 ha)	Period (1986-1995) Percent (%)	Change over the 75-85/86-95 period(%)
Forest	**3 359**	**979.1**	**29.1**	**1 258.9**	**37.5**	**28.6**
State	2 200	782.6	35.6	823.8	37.4	5.3
Non-state	1 159	196.5	17.0	435.1	37.5	12.1
Other wooded land	**3 154**	**470.9**	**14.9**	**543.8**	**17.2**	**15.5**
State	2 501	408.8	16.3	397.0	15.9	-2.9
Non-state	653	62.1	9.5	146.8	22.5	20.7

3.4.1. Percentage of forest and other wooded land managed according to a cutting table

	Total area (1000 ha)	Period (1975-1985) Area under management (1000 ha)	Period (1975-1985) Percent (%)	Period (1986-1995) Area under management (1000 ha)	Period (1986-1995) Percent (%)	Change over the 75-85/86-95 period(%)
Forest	**3 359**	**176.1**	**5.2**	**665.9**	**19.8**	**278**
State	2 200	98.5	4.5	609.5	27.7	518
Non-state	1 159	77.6	6.7	56.5	4.9	-27
Other wooded land	**3 154**	**182.4**	**5.8**			
State	2 501	156.7	6.3			
Non-state	653	25.4	3.9			

Source:
Directorate of Forests and Forest Environment Management, GSF&NE, Ministry of Agriculture

The percentage of forests, state and non non-state, managed according to a management plan has increased comparing the 1975-1985 period with the 1986-1995 period, but it is still quite low. This is mainly due to the reluctance of foresters employed by the state to undertake the working out of management plans combined with the tolerance shown by the forest administration. The administration does not apply existing forest law provisions which oblige all foresters to draw up management plans and Forest Directorates to provide for the elaboration of the plans (Article 12 Presidential Decree 19-11-1928).

Moreover, the appearance of fir tree mortality about ten years ago, was the cause firstly for the suspension of a considerable number of management plans, because no one could predict the evolution of this phenomenon and secondly, for the absence of new management plans for many fir forests managed regularly before the tree mortality phenomenon. The phenomenon, however, receded almost totally from all areas and thus the management of forests can continue as it was in the past.

The new specifications for the drawing up management plans elaborated by the researcher of IMFE&TFP, forester Galanos F., will considerably contribute to forest management (Galanos 1998). The principles of sustainability, conservation of biodiversity and multiple use of forests were incorporated into the new specifications. These principles are contained in the decisions and General Guidelines that were agreed in the Rio Conference in 1992 on Protection and Development and in the Helsinki Conference in 1993 on the Protection of forests in Europe.

In order for the management plans to meet the requirements of sound forest management and be uniformly drawn up for all geographical regions of the country, the setting up of a special service is deemed necessary for the elaboration of management plans, following the standards of many European countries or at least the setting up of forester teams for their elaboration. In addition, the implementation of educational programmes and seminars for the training of young foresters in the field of forest management and in the techniques of elaborating management plans, will considerably help with sound forest management.

3.5. Non-wood forest products

	Non-wood forest products	Unit	Production in 1985	Production in 1995	Change over the 95/85 period (%)	Prices in 1995 GRD/kg GRD/piece	Production value in 1995 in thousand GRD
	a	b	c	d	e	f	g [=(d)*(f)]
1	Christmas trees	Piece	70 057	95 050	35.68	2 104	199 985
2	Ornamental branches	Ton	319	179	-43.76	15	2 685
3	Briar roots	Ton	1 164	3 642	212.89	57	207 594
4	Resinous wood	Kg	3 900	4 700	20.51	9	42
5	Resin	Ton	12 430	5 830	-53.10	48	279 840
6	Laurel leaves	Kg	6 450	3 700	-42.64		-
7	Carobs	Ton	4 000	0			-
8	Pine cones	Kg	14 950	8 429	-43.62	11	93
9	Forest species seeds	Kg	3 081	1 717	-44.27	109	187
10	Grazing plant seeds	Kg	574	0			-
11	Plant soil *	Kg	407 190	153 301	-62.35	21	3 219
12	Acorns	Ton	68	0		7	-
13	Poplar cuttings	Piece	43 500	0			-
14	Sheep milk	Ton	143 600	165 720		241	39 938 520
15	Goat milk	Ton	106 860	117 984		158	18 641 472
16	Goat meat	Ton	11 630	12 160	4.56	1 181	14 360 960
17	Mutton meat	Ton	21 250	21 440	0.89	1 144	24 527 360
18	Sheep wool	Ton	2 160	2 000	-7.41	154	308 000
19	Goat hairs	Ton	280	285	1.79	95	27 075
20	Hides and skins from small animals	Piece	1 682 645	1 573 000	834.86	445	699 985
21	Hare hunting yield	Piece		96 000		8 000	768 000
22	Partridge "	"		102 000		1 700	173 400
23	Wildboar "	"		1 000		50 000	50 000
24	Turtle-dove "	"		310 000		1 200	372 000
25	Wood-pigeon "	"		480 000		1 200	576 000
26	Thrush "	"		2 800 000		1 200	3 360 000
27	Woodcock "	"		410 000		1 200	492 000
28	Honey	Ton	8 320	11 550	38.82	1 180	13 629 000
29	Forage	Ton		1 804 500		37	66 766 500

Sources:

a) Professor V. Papanastasis, Sector of Range-Wildlife and Freshwater Fisheries, Department of Forestry and Natural Environment, Aristotle University of Thessaloniki

b) GSF&NE

c) National Statistical Service of Greece

d) Directorate of Agricultural Policy and Documentation, Ministry of Agriculture

e) Directorate of Forest and Forest Environment Management, GSF& NE, Ministry of Agriculture

f) Strategy study for the development of Greek Forestry and Wood-Using Industries 1984. Grass Lands and Grazing Forests. Forest Research Institute of Thessaloniki. Ministry of Agriculture. Individual Edition.

A percentage of the total production of each livestock product coming from sheep and goats, it is considered that corresponds to the grazing of these animals in forest and other wooded land. These percentages were taken from sources a and f and are as follows:

Product	Percentage
Sheep milk	23%
Goat milk	23%
Mutton meat	26%
Goat meat	26%
Sheep wool	23%
Goat hairs	20%
Hides and skins from small animals	22%
Honey	80%

The game harvest during the 1995 - 1996 hunting season is shown on the table that follows:

Game	Game preference %	Game harvest per hunter/ outing	Number of outings per hunter/ per year	Total number of Greek hunters	Annual game harvest
Hare	15.5	0.190	12	272 000	96 000
Wildboar	9.0	0.035	"	"	1 000
Turtle-dove	5.0	1.900	"	"	310 000
Wood-pigeon	7.0	2.120	"	"	480 000
Thrush	15.0	5.340	"	"	2 800 000
Rock Partridge	6.0	0.770	"	"	50 000
Chukar Partridge	1.5	1.060	"	"	52 000
Woodcock	14	0.900	"	"	410 000

Source:

Thomaidis Ch., Logothetis G., Karabatzakis Th., Christoforidou G. Scientific team of the project "ARTEMIS" of the Hunting Confederation of Greece "Monitoring the game populations and registering the game harvest in Greece during the 1994-95, 1995-96 and 1996-97 hunting seasons"

The table above was drawn up by the scientific team that carries out the "Artemis" programme on behalf of the Hunting Confederation of Greece. This program is based on a continuous data collection concerning hunting activities. Information is gathered through a specifically designed "Personal diary - Hunter questionnaire" distributed every year to hunters. In this table the game harvest per hunter/outing is the final result of the programme, while game preference and number of outings per hunter / year are estimations made by the scientific team. Their final results will be formulated after the completion of the programme.

To calculate the values of non-wood forest products, prices were taken from the following sources:

- The price control table of forest products for the whole country in 1995, issued by source (e).
- The mean annual average weighted price table for agricultural products, issued by source (d)
- The calculation of forage was based on the annual rent per 0.1 ha of grazing land and on the mean forage production per 0.1 ha of a grazing land that belongs to the following categories: shrub land, range forests (source f). The annual rent per 0.1 ha of a grazing land is equivalent to the value of 2.5 Kg of meat of living animal and 3 kg of milk. Its value is estimated at 1 900 GRD/ 0.1 ha. The mean annual production of a range land is 52 kg per 0.1 ha (information was taken by source a).
- To estimate the value of game hunted annually in Greece, the following were taken into consideration:

Greek hunting legislation prohibits any buying and selling of game provening from hunting on open hunting areas. Only the buying and selling of game provening from Game Breeding Stations and Controlled Shooting Areas (C.S.A.) is allowed. The prices of game in free trade provening from Game Breeding Stations were not taken into consideration because it does not relate to hunting practices.

Prices of game provening from C.S.A. are as follows:

Game	Price (GRD / piece)
Partridge	1 700
Wildboar	50 000
Hare	8 000
Turtle, Wood-pigeon	1 200
Thrush, woodcock	1 200

C.S.A. in Greece represent only a very small percentage of course of the total hunting areas of the country and hunting on these areas represents a small percentage of the whole hunting activity. Because C.S.A.s are state-owned (except a private one), and game prices are defined by the Ministry of Agriculture and not by the free market, they don't represent the real values that the law of supply and demand would have determined.

Consequently, the estimation of the total value of games hunted annually in Greece based on prices from the C.S.A.s, constitutes an indicative value and not the real one.

DESCRIPTIVE INDICATORS :

In this section the legal, institutional and financial framework is examined together with all the informational data of the concept areas of Criterion 3, i.e. timber production, management plans and non-wood forest products.

Legal / Regulatory framework

As it was mentioned in Criterion 1, the sustained yield is regulated by Presidential Decree 19-11-1928, while sustainability as a conceptually integrated term, was incorporated into the specifications of the drawing up of management plans in 1953 and adopted indeed by the Greek foresters. Thus, sustainable forest management today, beyond its annual, stable and sustained yields has pursued and achieved the continuity, stability and duration of the non-material values and services of forests as well.

The management plan is the tool of forest management which constitutes the basic instrument of registering and inventorying the state of forest and its socio-economic and natural environment, of analysing forest phenomena and planning future interventions in order to create the special arrangements and planning of fellings in the forest. The demand for the improvement of the level of management plans was made by the Central Administration of the GSF&NE and by the Forest District Offices, Forest Directorates and Forest Inspectorates 20 years ago. It was necessary therefore to substitute the old specifications for the elaboration of forest management plans with new ones, which would take into consideration the new conditions created in relation to environment and forests at the national and international level. In addition they would take into account the recent and future needs and demands of forest owners and society for forest products and non-material values and services and finally the new methods for inventorying forests, estimation of growing stock and increment through the use of electronic technology.

The drawing up of new specifications for the elaboration of forest management plans were completed in February 1998 (Galanos 1998). The regulations and provisions, incorporated in the new specifications besides meeting the above mentioned demand correspond to the commitments undertaken by the country after the signing of international conventions [Conference held in Rio in 1992, Resolutions H1 and H2 of 2nd Ministerial Conference held in Helsinki in 1993 (2nd Ministerial Conference 1995) etc.] concerning environmental protection, sustainable forest management, conservation of biodiversity, protection of biotopes etc. Now the State has to approve them and simultaneously amend, complete and formulate new articles, provisions of laws and regulations which will be harmonised with the specifications and international conventions signed by Greece.

Material and non-material products and services are produced through the organised management of the country's forests. Articles 134-138 of Law 86/1969 and Presidential Decree 963/1979 **"Sale of forest products produced from the state forests, by auction"**, legislatively regulate the exploitation of forests. Also important regulations on the exploitation of Greek forests were implemented by Law 1541/1985 **"The procedure of concessing the exploitation, protection and improvement of forests"** and Presidential Decree 126/1986 which was issued in application of the above law. This decree concesses the exploitation, protection and improvement of forests belonging to the State and to legal persons of the public sector to Forest Co-operatives without their paying rent.

Forest law (Law 86/1969) regulates mainly timber production, but also non - wood products and services provening from the forests such as laurel leaves, lime flowers, pine cones, Christmas trees, honey production, hunting and resin-tapping.

Institutional framework

The GSF&NE is responsible for managing state forests while non-state forests are governed by various bodies. Management is carried out through 10-year management plans, drawn up according to the specifications in force. The new specifications currently under approval, as was mentioned above, stress the principles of sustainability, conservation of biodiversity and multiple use of forest lands. The management plans for state forests are elaborated by foresters working in the Forest District Offices, while those for non-state forests are drawn-up by liberal professional foresters and approved by the Forest Service.

The exploitation of state forests is carried out by the following systems:

- **Direct labour:** The State Exploitation of Forests is a direct labour system by which felling and skidding works are entrusted to Forest Co-operatives (F.C.), which are paid per unit of product produced.
- **Hiring of the forest by F.C.:** The state leases the yield to F.C. and they pay a rent to it per unit of product produced.
- **Concession of the forest exploitation to F.C.** (Presidential Decree 126/1986). The F.C. render 12% of roundwood and 5% of fuelwood gross revenues respectively, to the Central Fund of Agriculture,

Livestock and Forestry and 5% of the gross revenues from any kind of forest product to the Local Government Organisations.

The exploitation of forests by the concession system has the following serious drawbacks (Greek Forest Society 1992) :

- Non-full utilisation of the timber felled, large amounts of small diameter logs are left to the forest.
- The F.C. exert pressure for more yields, as their active members increase due to high profits shown.
- Under-invoicing of products which results in reducing the proceeds destined for the State.
- Lack of infrastructure in Forest Co-operatives for the marketing of their products.

The few advantages of this system, i.e. fast harvesting and disposal of timber to the market and registration to the co-operatives of young wood fellers, do not offset its serious disadvantages. The exploitation of forests by this system violates the principle of sustainability, degrades the forests and creates social inequalities, because a small number of people living near stocking density and precious forests earn huge amounts of money in a short time compered with other people living in less precious forests. At the same time it deprives the state of revenue that could be invested in the protection and development of forests. The drawbacks of Presidential Decree 126/1986 have been repeatedly pointed out by foresters to the state, which should solve this complicated problem promptly.

For the 1993 - 1996 period the exploitation of state forests (production of forest products) was carried out 43% by the direct labour system, 15% by hiring and 42% by concessing to Forest Co-operatives. Non-state forests, including all categories of ownership structure, are exploited directly by their owners or by hirers. In any case, the state exercises through the Forest Service, the statutory forest policy and forest technical supervision of non-state forests.

Forest Co-operatives contribute significantly to the exploitation of forests. There are 600 F.C. in Greece which belong to the Panhellenic Confederation Union of Agricultural Co-operation (PASEGES) and have 20,000 registered members. Their activities include felling, shaping of roundwood, marketing of processed and unprocessed forest products, construction of works for conserving and improving forests and operating forest tourist units. 60% of the total domestic forest production is felled, skidded and traded by forest co-operatives according to Presidential Decree 126/1986 (Kollias and Gavril 1985).

The exploitation of the non-wood products and services is also provided for in the management plans. The gathering of leaves, flowers and fruits from forests is carried out by private parties, which pay rent to the Forest Service in state forests and forest tax in non-state ones.

The management of game resources is carried out by the Directorate of Aesthetic Forests, National Parks and Hunting of the GSF&NE in collaboration with the Hunting Confederation of Greece. The related regulations and planning of their management are analysed in a separate chapter of the management plan. The sustainability of these resources is achieved by rationally practising hunting so that the conservation and increase of game is secured. Measures taken to achieve this aim include the determination of the hunting period, prohibitions of hunting rare and threatened species, restriction in the number of animals and birds that could be hunted per outing, the creation of game refuges, game breeding stations and controlled shooting areas and the enrichment of forests with native game.

The Hunting Confederation of Greece consists of 7 Hunting Federations and 237 Hunting Clubs which collaborate with the Ministry of Agriculture and are under its control and supervision. Their main aims are, in collaboration with the State, the protection, conservation, development and management of game resources and the environmental protection in general. 50% of the Hunting Clubs' revenue, derived from the annual subscriptions of their members, is used for the improvement of the conditions of game. Forest functions and services will be dealt with in Criterion 6.

The marketing of timber produced in state forests by the direct labour system, is carried out by the Forest District Offices either by auction or by direct special agreements, in case it covers state needs. Marketing by other forest exploitation systems is carried out by co-operatives. In the case of non-state forests timber is marketed by their owners.

Financial instruments / Economic policy framework

Revenue from forest products is handed over to the Central Fund of Agriculture, Livestock and Forests and invested in the development of forests. Revenue derived from the sale of roundwood and fuelwood produced in 1996 in state forests by the three exploitation systems, mentioned in the previous paragraphs, amounted to 8 billion GRD. Revenue would have been much higher if Presidential Decree 126/1986 was not in force. By the implementation of this decree Forest Co-operatives produced 45% of the timber produced in state forests. Forest Service proceeds from the issuing of 252 524 hunting licenses amounted to 2.4 billion GRD in 1996. Expenditure

for the exploitation of state forests by the direct labour forest exploitation system amounted to 8.6 billion GRD in 1996, i.e. 14.5% of forestry's total expenditure. Expenditure was fully covered by the Central Fund of Agriculture, Livestock and Forests.

For non-state forestry, the GSF&NE approves of management plans, performs the marking of trees, monitors fellings, controls and calculates the value of timber produced, issues transport licenses, supplies forest owners with planting material, protects non-state forests and subsidises forest owners.

The exploitation of forests is considerably affected by forest taxation. According to Law 2204/1940 **"Forest taxation"**, amended by Law 86/1969, the state collects rent from the state forests and forest tax from non-state forests. The determination of the rent and of the forest tax is based on a price control table. This table is prepared by the Directorate of Forests and Forest Environment Management and ratified by a Presidential Decree, after taking the opinion of the Technical Council of the Forests. The table contains the prices of each forest product in the various forest regions of the country. The determination of the prices is based on the gross sale prices of the products in the two previous years in their production sites.

Tax levied on a forest product produced in non-state forests constitutes a percentage of the price appearing on the price control table. The percentages used are as follows (Papastavrou and Makris 1986):

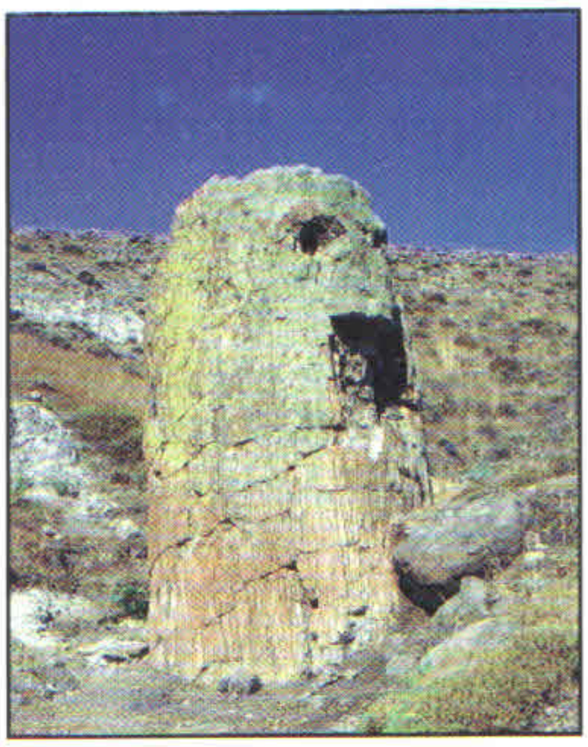
- 14% when it concerns with any kind of construction timber, resinous wood, resin, pitch, bark and forest plant.
- 10% if it concerns charcoal, fuelwood and bushes of various forest species.
- 11% of it concerns other forest products such as leaves, flowers, fruits, cones and seeds.

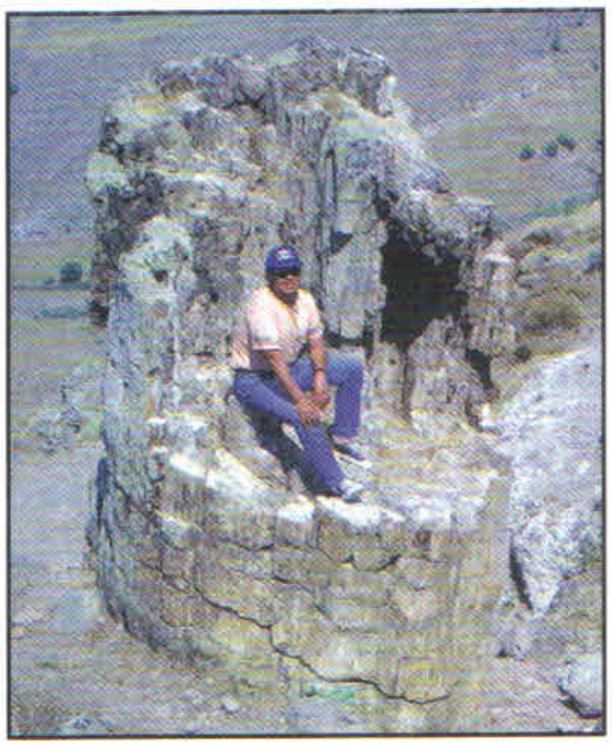
Forestry greatly benefits from the application of EEC Regulation No 867/1990 **"Improving the conditions of processing and marketing of forest products"**. It aims at improving the infrastructure of harvesting works, i.e. investing in wood felling, splitting, peeling, skidding and drying. The implementation of this regulation commenced in 1994 and 10 000 investors benefited from it from 1994 until 1997 such as forest co-operatives, forest owners and forest workers. They invested in buying machines as well as in constructing infrastructure works of wood harvesting (chainsaws, loading trucks, woodyards, warehouses). The sums invested amounted to 22 million ECU, 50% provening from the EU, 31% from the investors and 19% from the state.

Informational data to implement policy framework

A considerable number of research programmes dealing with the management and exploitation of forests is elaborated in the country by the Universities, the Research Institutes and the Technological Educational Institutes. They include the following:

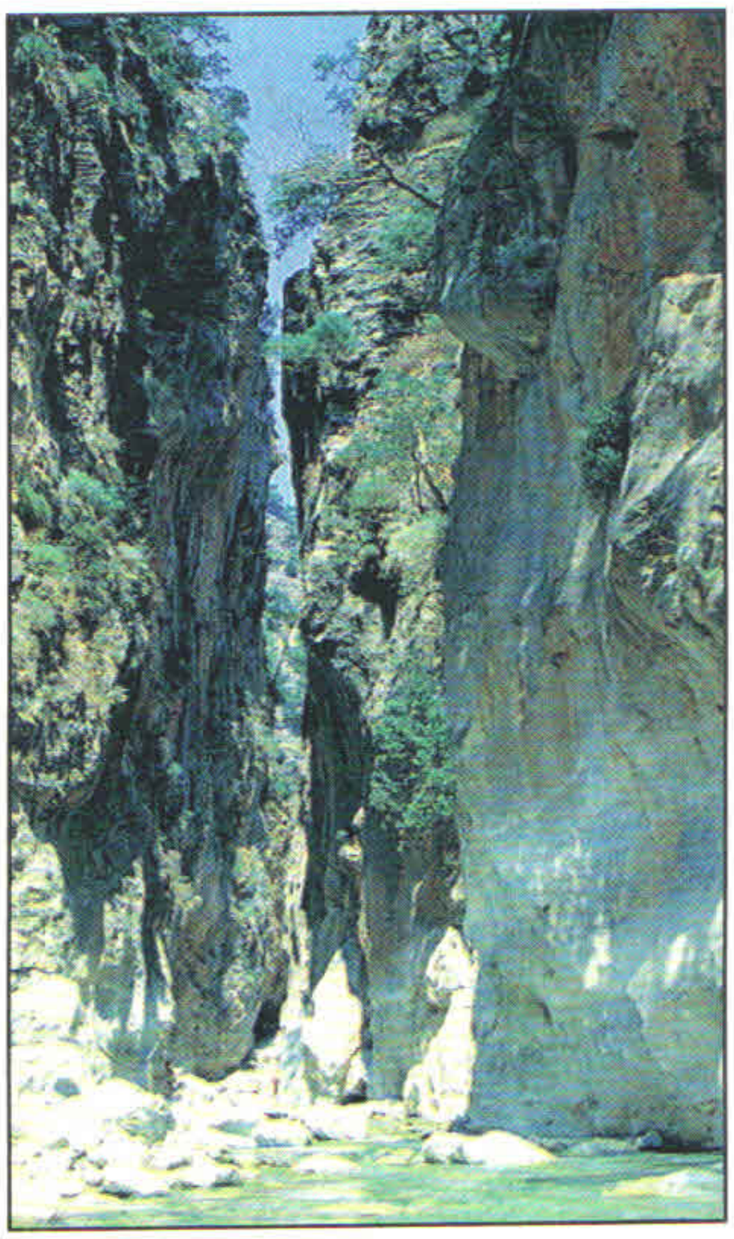
- **"The effect of the structure and treatment on the performance and on the development of forest stands in general"**. The programme aims at drawing conclusions on the recommendable number of trees, the basal area and volume per unit area, the development of forest stands and on the proper technical and forestry treatment per site quality separately, for the application of a more sound forest management.
- **"Construction of multi-meric systems and standards of estimating volume and increment of all the country's forest species, for immediate application to the forestry practice"**.
- **"Increase in the production and productivity of resin"**. The programme aims at creating the conditions for increasing the production and productivity of resin- tapping of Aleppo pine forests through the selection of better trees.
- **"Research on the possibility of utilising essential oils from residue fellings (leaves, fruits and thin branches) of coniferous forest species"**. The programme aims at estimating the quantities of essential oils that exist in the residue fellings of coniferous forest species.
- **"Monitoring the game populations and registering the game harvest in Greece during the 1994 - 1995, 1995 -1996 and 1996 -1997 hunting seasons "**. The "Artemis" programme aims at collecting information for the monitoring of the condition of game populations, registering various parameters, estimating the game harvest and utilising the results for the sustainable management of game populations.





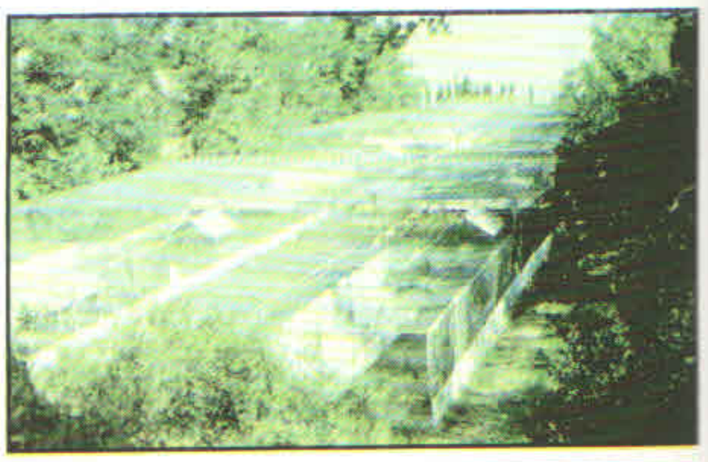
Petrified forest on Lesvos
Protected natural monument

Vine of Kalavrita
Protected natural monument

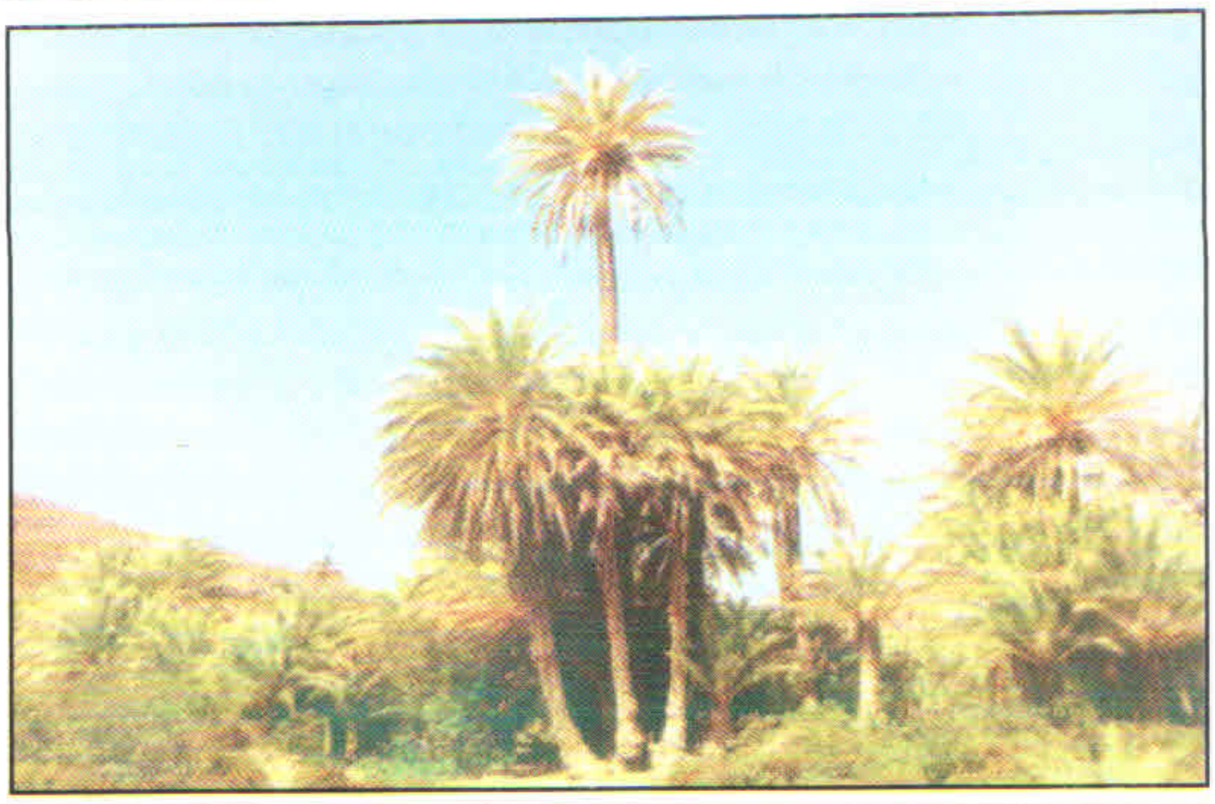


National Park of Samaria

National Park of Olympos



Game breeding station



Aesthetic forest of Vai

Indigenous species of Peloponnissos
Campanula topaliana ssp cordiifolia

CRITERION 4

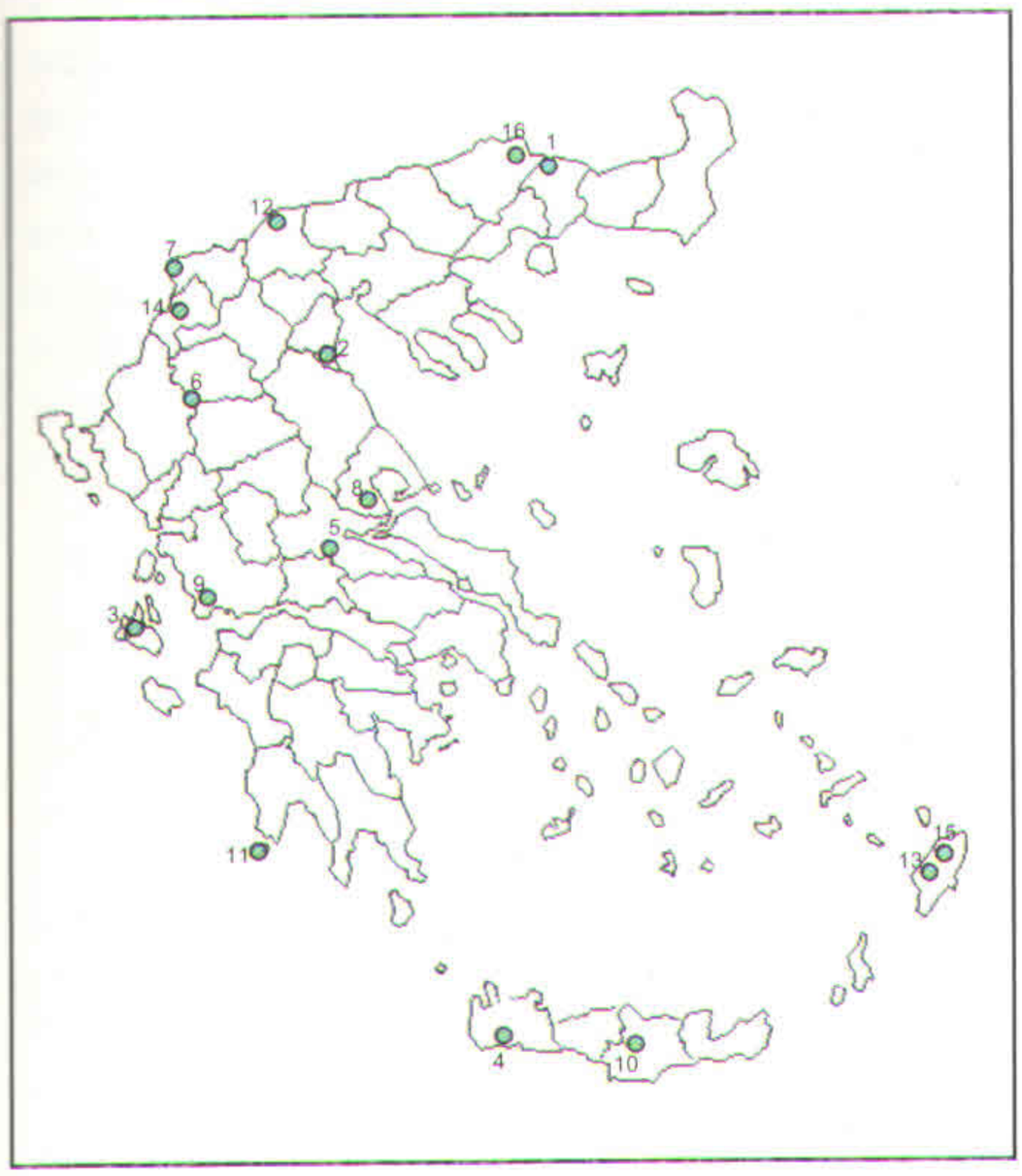
MAINTENANCE, CONSERVATION AND APPROPRIATE ENHANCEMENT OF BIOLOGICAL DIVERSITY IN FOREST ECOSYSTEMS

Concept areas: Protected Areas, Threatened species, Biological Diversity in Productive Forests

QUANTITATIVE INDICATORS:

4.1. Area of ancient seminatural forest types

The area of ancient seminatural forest types in the country is about 22,143 ha. This area consists of the 16 regions that were integrated into the European network of biogenetic reserves. These regions are shown in the following map.



LEGEND
ΥΠΟΜΝΗΜΑ

Location of ancient seminatural forest types
Θέση παλαιών ημιφυσικών δασών

1. Trachaniou Xanthi Virgin forest - Παρθένο δάσος Τραχωνίου Ξάνθης

2. Core area of Olympus National Park - Πυρήνας Εθνικού Δρυμού Ολύμπου

3. Core area of Ainos National Park - Πυρήνας Εθνικού Δρυμού Αίνου

4. Core area of Samaria National Park - Πυρήνας Εθνικού Δρυμού Σαμαριάς

5. Core area of Oeti National Park - Πυρήνας Εθνικού Δρυμού Οίτης

6. Core area of Pindos National Park - Πυρήνας Εθνικού Δρυμού Πίνδου

7. Forest of Juniperus foetidissima in the Core area of Prespes National Park - Δάσος Juniperus foetidissima πυρήνα Εθνικού Δρυμού Πρεσπών

8. Kouri-Almyros Forest - Δάσος Κουρί Αλμυρού

9. Lecini of Etoloacarnania Ash stand - Συστάδα φράξου Λεσινίου Αιτωλοακαρνανίας

10. Rouva Forest - Zaros Canyon, Heraklio, Crete - Δάσος Ρούβα - Φαράγγι Ζαρού Ηρακλείου Κρήτης

11. Sapienza island of Messinia, Forest of evergreen braodleaves - Δάσος αειφύλλων πλατυφύλλων νήσου Σαπιέντζας Μεσσηνίας

12. Promahona Likostomou Arideas stand sections of Pinus peuce - Τμήματα συστάδων πενταβέλονης Πεύκης Προμαχώνα - Λυκοστόμου Αριδαίας

13. Emponas of island Rodos natural cypress forest - Φυσικό δάσος κυπαρισσιού κλπ. Έμπονα Ρόδου

14. Gramos-Vitsi of Kastoria ancient forest stands - Εκτός διαχειρίσεως συστάδες παλαιών δασών Γράμμου - Βίτσι Καστοριάς

15. Profitis Elias of island Rodos Forest - Δάσος Προφήτη Ηλία Ρόδου

16. Paranesti Drama Virgin forest - Παρθένο δάσος Παρανεστίου Δράμας

4.2. Area of strictly protected forest reserves

Category	Number	Total area (1000 ha)	Area of forest and other wooded land (1000 ha)
National Parks*	10	110	93.5
Aesthetic Forest*	19	33	24.7
Wetlands	10	96	24.0
Total	**39**	**239**	**142.2**

* Definitions (see Appendix II)

Source:

a) Dr. K. Kassioumis, Section of Landscape Architecture, Recreation and Environment Rehabilitation, IMFE&FPT

b) P. Drougas, Directorate of Aesthetic Forests, National Parks and Hunting, GSF&NE, Ministry of Agriculture

The designation of certain areas as protected areas is implemented within the framework of a worldwide effort to conserve and maintain the environment. The designation of the 10 national parks in Greece took place between 1938 and 1974. They include some of the loveliest and most important landscapes in the country covering a wide range of ecosystems. The designation of the 19 aesthetic forests took place between 1973 and 1980.

The **"Convention on Wetlands of International Importance as Wildlife Habitat"**, known as the Ramsar Convention, is the most important convention concerning protected areas, ratified by Greece in 1974. Since 1974 eleven (11) wetlands were considered especially important for the conservation of avifauna and their natural characteristics and thus have been included in the list of protected areas. Up to now, these wetlands have not been designated as protected areas, by including them in the categories that the national forest legislation provides (Kassioumis 1994). For most of these areas however, Common Ministerial Decisions have been issued by which measures to safeguard them have been enacted within the framework of article 21 par.6 of Law 1650/86 **"On the Protection of the Environment"**. On the table above ten (10) instead of eleven (11) wetlands are quoted, because the wetland of Lake Mikri Prespa is included in the National Parks.

The geographical location of the country's most important protected areas is shown on a special map that is quoted in the Appendix II.

4.3. Area of forest and other forest land that is protected by a special management regime

Category	Number	Total area (1000 ha)	Area of forest and other wooded land (1000 ha)
Protected Natural Monuments *	14	16.5	14.0
Controlled shooting Areas	10	150.0	127.0
Game Breeding Stations	20	3.2	3.2
Game Refuges	700	950.0	807.5
Total	**744**	**1 119.7**	**951.7**

** Definitions (see Appendix II)*

Source:

a) Dr. K. Kassioumis, Section of Landscape Architecture, Recreation and Environment Rehabilitation, IMFE&FPT

b) Directorate of Aesthetic Forests, National Parks and Hunting, GSF&NE, Ministry of Agriculture

In the 14 Protected Natural Monuments mentioned on the table above, another 36 monuments should also be included concerning trees and stands of trees, without definite area, for example the Hippocrates Plane on the island Kos, the huge Cypress at Prasia in the Evritania prefecture, the evergreen Plane in Heraklio, Crete.

The enactment of hunting reserves, i.e. controlled shooting areas, game breeding stations and game refuges, empowers the Forest Service to take all appropriate measures to protect and propagate game for hunting purposes and also to preserve the natural environment of these areas. Simultaneously, hunting reserves function as forest reserves (Kassioumis and Hatziphilippidis 1997).

4.4. Changes in the number and percentages of threatened species in relation to the total number of forest species

Threatened species of plants, vertebrates and invertebrates present in various forest environments are shown on the following tables. Lists of the threatened species and references used for them are quoted in the Appendices III, IV and V of this document, respectively. The under extinction, the endangered, the vulnerable, the rare, the indeterminate and the insufficiently known are included in threatened species.

a) Threatened plant species (Dr P. Dimopoulos, Section of Botany, Biology Department, University of Athens)

1. Phanerogama - Pteridophyta. The total number of plants occurring in the studied categories of forest biotopes, amounts to 1,320 taxa (according to their frequency of exclusive or not exclusive occurrence in the Greek forests). The endemic and non endemic plants, evaluated as Important taxa of Greece' s forests, on the basis of their incorporation and protection status in the National Lists (Presidential Decree 67/81), as well as on the basis of the IUCN Red Data categories (WCMC 1997, Phitos et al. 1995, IUCN 1977, Directive 92/43/EEC), amount to 182 taxa 101 (55.5%) of which are Greek endemic.

It can be concluded, from the above mentioned data that 182 taxa or 13.7% of the total number of taxa is in-

corporated into one of the IUCN Red Data categories. From the above 182 threatened taxa:
- 88 taxa are Rare (R), 33 Vulnerable (V), 7 Endangered (E), 4 Indeterminate (I), 10 are not threatened at present (nt), 16 in the category that the dynamic status of their population is not sufficiently well known (?), 6 are included in the Annex II of the 92/43/EEC Directive and 18 are included in Annex B, Appendix I or II of the CITES: BI,BII,BI (eu): species of Appendix BII which are included in BI according to the European Union. 72 from 182 threatened taxa are protected according to the Presidential Decree 67/81.

2. Fungi. In order to draw up the List of Endangered or Rare, at national level, Macrofungi of Greece (termed Rare and Uncommon Mushrooms according to DIAMANTIS 1993), the DIAMANTIS (1993) and PANTIDOU (1987) studies were used. ING (1993) was used as bibliographic source for their incorporation in the Vulnerability, at the European level. According to ING, the Fungi species of Europe are grouped into four (4) categories, taking into consideration the following criteria: use of a Euro-index, geographical distribution, mean level of endangerment (see Appendix III).

3. Mosses (Bryophytes). There are no lists available of Rare or Endangered Mosses of Greece. The only bibliographical source for estimating the total number of Bryophytes occurring in the various habitat types of Greece (about 473 bryophytes seem to be present in Greece), is PRESTON 1984a and 1984b. *Buxbaumia viridis* is considered an Important moss and is included in Annex II of 92/43/EEC Directive. Moreover, Annex V of 92/43/EEC Directive includes the following representatives of the SPAGNACEAE family occurring in Greece: Sphagnum palustre (Ionian islands, NE Greece), *Sphagnum capillifolium* (Ionian and Aegean islands), *Sphagnum subsecundum* (Ionian islands).
As far as **Lichens** are concerned, on the basis of very recent information for the Mediterranean Lichens (Optima Newsletter-July 1998), the List of Greek Lichens is still at the preparatory stage.

b) Threatened vertebrate species (Dr A. Sfouggaris, University of Thessaly, Department of Agriculture. Plant and Animal Production)

1. Mammals. 116 mammals of the terrestrial and marine environments have been registered in Greece, according to the IUCN Red Data Book of threatened vertebrates in Greece (Karandinos 1992). Moreover, animals living in agricultural land are included in these vertebrates. 13 of them are marine. From the total of mammals in Greece, 62 belong to one of the Red Data Book categories. In the list quoted in the Appendix IV, mammals have been classified according to how closely they are linked with the forest environment. The species living mainly in the forest environment without excluding their limited presence in the non-forest environment, have been included in the "Species present in forest environments". Their relation to the forest environment is judged mainly by their preference for it, the area where they mainly breed and feed. In the "equally present in forest and open environments" species those occurring within and outside the forest environment were included without strong preference for one of these two environments. Finally, the species present in open environments, were included in the third category. It should be emphasised however, that there is a degree of subjectivity in these criteria which means that this classification could be slightly differentiated by another researcher. For example otter (*Lutra lutra*) present in wetlands and channels in agricultural lands can also be found in riparian forests or in torrents situated at conifer or broadleaved forests. In any case, riparian forests have been characterised as forest environment. "Species under extinction" cannot form a particular category according to the Red Data Book. In this book a distinction is made only for species that had become extinct and they are only birds.

2. Birds. According to Handrinos and Akriotis (1997) 422 bird species have been observed in Greece. Birds are classified into 65 families and 21 classes while the multitudinous taxa of Passeriformes include 160 species. 60% of the total birds (about 240 species) nests in the Greek territory. The remaining are observed in winter as wintering or during the spring and the autumn migrations or appear in small

numbers irregularly or incidentally. There are no native species of birds in Greece. 100 birds from the total species in Greece have been classified into one of the categories of the Red Data Book vertebrates (Karandinos 1992). From the total threatened species of the Red Data Book (100 species), only 24 (about 1/4) relate, closely or remotely, to the forest environment. As regards the subjectivity of the criteria used to classify birds into one of the three categories of the list quoted in the Appendix IV, the same referred to in the mammals apply. Finally, it is evident that a number of bird species besides mammals, have not been included in the list because they are not even occasionally present in forest environments.

c) Threatened invertebrate species (Dr S. Sfendourakis, Zoological Museum, Department of Biology, University of Athens)

1. Only an approximate number of species can be given for most groups, since there have not been any detailed studies and no collective data exist up to now. The numbers given here have been calculated from the percentage of knowledge about each group and through the projection of the known species richness.

2. Greek species that have been characterised as threatened in legislation and by various conventions, directives and technical studies, are just a small fraction of the actually threatened invertebrate species. This is because only a few scattered studies have been conducted so far. Most officially designated threatened species have come from related European lists and do not reflect the real situation in Greece. There is a very large number of narrow endemic species in Greece, limited in number, since their habitats are also restricted. Such species may be encountered on many islands, alpine regions, isolated valleys and mountains etc. Their exact number remains unknown, but judging by existing data, it can be estimated that around 25% of the Greek terrestrial invertebrate species are endemic. If the total number of terrestrial invertebrate species is close to 50,000 (according to projections of recent data), then there are around 15,000 endemic species in Greece. Assuming that 1 out every 3 endemic species is in need of some kind of special protection (in fact, all endemic species should be protected), then the total number of actually threatened species should exceed 5,000.

3. The protection of the vast majority of threatened invertebrate species depends on the protection of their habitats. A large part of threatened species depends on the diversity and health condition of forest ecosystems, especially on the number of old and large trees. Also very important habitats, being more sensitive, are the freshwater, riparian and alpine ecosystems.

Threatened plant species

	Species present in forest environments		Species equally present in forest and open environments		Species occasionally present in forest environments		TOTAL		
	Number of taxa[1]	Number of threatened taxa	Number of taxa	Number of threatened taxa	Number of taxa	Number of threatened taxa	Number of taxa	Number of threatened taxa	%
Phanerogama	394	51	480	53	446	78	1 320	182	14
Pteridophyta	7	-	-	-	6	-	13	-	-
Mosses	?	?	?	?	?	?	473	?	-
Fungi*	541	234 (27)	51	31 (2)	40	33 (-)	632	298	46

[1] Taxon: Species and sub-species

* The number outside the parenthesis corresponds to the Rare and Uncommon fungi of Greece, as referred by DIAMANDIS (1993) while the numbers in the parenthesis corresponds to the number of species incorporated to one of the Groups of Endangerment in the Prodromus of the European Red Data Book for fungi (ING 1993)

Source:

Dr P. Dimopoulos, Section of Botany, Biology Department, University of Athens.

Threatened vertebrate species

	Species present in forest environments		Species equally present in forest and open environments		Species occasionally present in forest environments		TOTAL		
	Number of species	Number of threatened species	Number of species	Number of threatened species	Number of species	Number of threatened species	Number of species	Number of threatened species	%
Mammals	31	26	29	14	7	5	67	45	67
Birds	34	8	50	12	21	5	105	25	24

Source:

Dr A. Sfouggaris, University of Thessaly, Department of Agriculture. Plant and Animal Production

Threatened invertebrate species

	Species present in forest environments		Species equally present in forest and open environments		Species occasionally present in forest environments		TOTAL		
	Number of species	Number of threatened species	Number of species	Number of threatened species	Number of species	Number of threatened species	Number of species *	Number of threatened species**	%
Invertebrates									
Mollusca	~200	0	~400	30	~100	0	~700	30	**4.29**
Arachnida	~400	0	~1 000	2	~100	0	~1 500	2	**0.13**
Orthoptera	0	0	~300	11***	~20	0	~320	11	**3.44**
Odonata+	0	0	71	19	0	0	71	19	**26,80**
Trichoptera+	0	0	255	8	0	0	255	8	**3.17**
Neuroptera+	0	0	~100	3	0	0	~100	3	**3.00**
Mantoidea	0?	0	10	2	0	0	10	2	**20.00**
Lepidoptera	~500	51	~2 500	36	~500	12	~3 000	99	**3.30**
Coleoptera	~3 000	29	~8 000	12	~4 000	0	~15 000	41	**0.27**
Hymenoptera	~1 500	3	~3 000	12	~500	0	~5 000	15	**0.30**
Diptera	~1 000	4	~3 000	0	~1 000	0	~5 000	4	**0.08**

\+ species with freshwater-living larvae, adults mainly found at locations near freshwater
* only terrestrial species
** excluding strictly cavernicolous species
***cavernicolous species, occasionally found at locations not far from the entrances of caves

Source:
Dr S. Sfendourakis, Zoological Museum, Department of Biology, University of Athens

4.5. Stands managed for the conservation and utilisation of forest genetic resources (gene reserve forests, seed collection stands, etc.)

a) Seed collection stands

Species	Number of stands	Area (ha)
Abies sp	16	2 788
Picea abies	1	130
Pinus brutia	15	956
Pinus halepensis	12	385
Pinus nigra	22	2 062
Pinus leucodermis	1	100
Pinus pinea	2	63
Pinus silvestris	5	361
Cupressus sempervirens var. Horizontalis	2	110
Cupressus sempervirens var. Pyramidalis	1	50
Platanus spp	3	4
Populus spp	3	4
*Pinus radiata**	1	3
Fagus silvatica	3	493
*Robinia pseudoacacia**	1	50
Other exotics species	6	15
Total	**94**	**7 574**

* Non endemic species. The rest are autochthonous

b) Clonal seed orchards

Seed orchard	Year of establishment	Area (ha)	Number of clones	Number of grafts
Pinus nigra provenance of Peloponnese	1978	100	52	2 700
Pinus nigra provenance of Pindos mountain range	1981	180	91	4 500
Pinus nigra (provenance of Corsica)	1981	80	49	4 500
Pinus nigra	1981	6	60	1 080
Pinus halepensis	1987	110	76	328
Total		**476**	**328**	**13 108**

c) Gene bank

Seed orchard	Year of establishment	Area (ha)	Number of clones	Number of grafts
Populus spp	1978	1	10	cuttings

Source:
a) K. Panetsos, Professor Emeritus, Department of Forestry and Natural Environment, Aristotle University of Thessaloniki
b) Dr. D. Maziris, Section of Silviculture and Forest Genetics, IMFE&FPT

No protection regime for forest gene reserves has been enacted in Greece, although their value as genetic reserves is significant. It is considered however, that the core areas of National Parks, which are under a special regime of protection, constitute such reserves.

To create stands with superiority in quality traits and in growth properties, the Directorate of Reforestation and Watershed Management of GSF&NE in collaboration with IMFE&TFP selected a number of seed collection stands throughout Greece, from which reforestation seeds are collected. Their selection was based on certain criteria like: isolation, uniformity, volume production, wood quality, form and growth habit, health and resistance, effective population size, purity of stand and age and development (Matziris 1989).

For a better representation of forest species within a wide geographical range, a big number of stands was selected for collecting seeds from provenances with the same or similar ecological conditions as the areas that will be reforestated. Thus, while genetic variability is not reduced, the percentage of success in reforestation is increasing, because the most suitable provenances of the species which will used in reforestating a definite area, are selected. Attention should be given to avoiding genetic contamination by prohibiting the introduction within important forest ecosystems of species which can form hybrids with the local species or even more to displace them. For example, the Forest Service does not use Aleppo pine in carrying out reforestations on the islands of the East Aegean Sea and on the island of Crete, where important forest ecosystems of *Pinus brutia* are grown, since this species creates natural hybrids with the local species of *Pinus brutia*.

To satisfy the reforestation needs of genetically improved seeds, seed orchards have been established for the forest species of Black pine and Aleppo pine, while the establishment of new ones is planned for the rest of the forest species used in reforestations. Finally, local species and provenances are generally preferred for reforestations, while the use of exotic species is rare.

4.6. Number of indigenous and introduced forest species

Species	Introduced species	Indigenous species
Coniferous	44	25
Broadleaved	72	259
Total	116	284

Source:
a) K. Panetsos, Professor Emeritus, Department of Forestry and Natural Environment, Aristotle University of Thessaloniki
b) Dr. D. Matziris and G. Karetsos, Sections of Silviculture and Forest Genetics and Forest Ecology, IMFE&FPT
c) Athanasiadis N., 1986. Forest Botany. Trees and Bushes of Greek forests. Part II.

From the 116 introduced forest species, quoted in the list given in the Appendix II, only a small number is used on reforestations. From the introduced coniferous species, only the species *Pinus pinaster*, *P. radiata* and *Pseudotsuga spp.* were used. By using these species 21 530 ha, 2 300ha and 390 ha were reforested respectively until 1997. From the poplar species, the clones formed as crosses between *Populus nigra* and *P. deltoides* as well as the Greek clones X10, K7, Sparti1 and X3 are used in reforestations (source a).

As far as the genus *Eucalyptus* is concerned, *E. camaldulensis* is used on reforestations and *E. bicostata*, *E. viminalis* and *E. dalrympleana* as ornamental plants in gardens, parks and avenues.

4.7. Volume of dead wood in forests

	Total	per ha
Volume of dead wood in forests	2 379 000 m^3	0.71 m^3

Source:
D.Sotiropoulos, member of the team that drew up First National Inventory of Forests 1992, GSF&NE, Ministry of Agriculture

The volume of dead wood in forests refers only to standing trees. For trees lying on the ground there are no available data. Most of the trees that are dying in forests from different causes (diseases, insects, weather phenomena) remain standing in them. Only a small amount of dead wood is felled and removed from the forest. Dead wood in forests constitutes a habitat for bark beetles, wood borers, saprophytic fungi and insectivorous birds. However, during dry periods when a large number of trees die by attacks of bark beetles, their removal from the forest is suggested because the population of bark beetles in these trees is increasing rapidly. Even in those cases, just a small part of dead wood volume is removed from the forests by the pertinent services.

4.8. Proportion of annual forest area regenerated naturally, in relation to the total regenerated area

(1) Annual forest area regenerated naturally	28 000 ha
(2) Annual area regenerated by planting (average 1985-1996)	6 485 ha
(3) Annual area regenerated by seeding (average 1985-1996)	640 ha
(4) Proportion of annual forest area regenerated naturally, in relation to the total regenerated area	80%

Source:
a) Dr. L. Apatsidis, Section of Silviculture and Forest Genetics, IMFE&FPT
b) Directorate of Reforestation and Watershed Management, GSF&NE, Ministry of Agriculture

$$(4 = \frac{(1)}{(1)+(2)+(3)} \times 100 = 80\%$$

The estimation of the annual forest area regenerated naturally is based on the following data and assumptions :

a) The areas of coniferous and broadleaved species of high forests (National Inventory of Forests 1992).

b) The rotation time of coniferous and broadleaved species of high forests.

Forest species	Rotation times
Fir	130
Aleppo pine, Calabrian pine	80
Black pine	120
Scots pine	120
Pinus leucodermis	180
Spruce	80
Beech	120
Oak	180

c) The fact that 50% of high forests are managed as even-aged and 50% of them as selection stands

d) The mean rotation time of broadleaved evergreen coppice species is 25 years.

In the annually reforestated area, the area reforestated by the Forest Service the private individuals and the Local Government Organisations following EEC Regulation No. 2158/92 is included.

4.9 . Main technical interventions in the forest environment

Kind of intervention	Unit	Area or road construction (annually*)
Construction of terraces	ha	2 950
Subsoiling and tine-ridging	ha	2 950
Fertilisation	ha	537
Pesticides-Herbicides	ha	----
Insecticides-Fungicides	ha	2 510
Firebreaks	km	1 070
Road construction		
A category	km	9
B category	km	63
C category	km	1 045
Tractor-roads	km	340

*Average of the last 5 years

Source :

a) Dr K. Varelidis, Section of Sylviculture and Forest Genetics, IMFE&FPT

b) Directorates of Protection of Forests and Forest Environment and Forest and Forest Environment Management, GSF&NE, Ministry of Agriculture

Soil preparation is applied only in reforestations and not in forest stands regenerated naturally. 75% of reforestation is implemented by using heavy machinery. Due to the slope of reforestated areas, the technique of constructing terraces (soil slope 25-50%) is used on large scale. The width of terraces is 3-4 meters and planting in terrace is implemented manually in two lines which are two meters apart.

Fertilisation is not applied to natural forests and reforestations. On the contrary, fertilisers are used in the 53 nurseries owned by the Forest Service and in public and private poplar plantations which occupy 364 ha and 9 600 ha respectively. Fertilisation is also applied in 120 Ha of grazing lands.

The Forest Service does not use pesticides and herbicides even when weeding reforestations, during the first two years after their establishment.

Insecticides in forests are used only for controlling *Thaumatopoea pityocampa* and *Lymantria dispar*, while limited use of insecticides and fungicides is made in forest nurseries.

The width of fire breaks ranges from 30 to 65 meters depending on the forest fuel material, the ground topography and their construction cost. For their construction , vegetation is removed by using mechanical means and not pesticides or herbicides. In fire fighting, sometimes retardant Fire-troll 100 and foams are used. It is estimated that 80 to 100 tons of each one of these retardants is consumed annually.

Forest roads whose intensive construction started in the 1950's, contributed to the access and normal exploitation of remote forest regions as well as to their protection from fires by increasing the possibility of fire fighting vehicles to approach these regions. The role of forest roads is multidimensional. Besides transporting forest products, personnel and equipment, they are used as fire brakes. The density of the forest road network in the country is 4.37 m/ha of forest and other wooded land.

DESCRIPTIVE INDICATORS :

In this section the legal, institutional and financial framework is examined together with all the informational data of the concept areas of Criterion 4, i.e. protected areas, threatened species and biological diversity in productive forests.

Legal / regulatory framework

Protected areas were legislatively regulated for the first time in 1937 by Law 856/1937. This law was incorporated into the Forest Code (Law 86/1969) and later amended by Law 976/1971 which is still in force today. By implementing the above laws, 10 national parks, 19 aesthetic forests and 50 protected natural monuments have been designated until today. Hunting reserves are also included in protected areas which aim at protecting the country' s natural environment and maintaining and exploiting the hunting wealth and wild fauna. The foundation of hunting reserves, which include controlled shooting areas, game breeding stations and game refuges, is based on the provisions of article 253 of Law 86/1969. Also, in protected areas are included the wetlands (article 4 of Law 998/1979).

In 1986 the Law-Framework 1650/1986 "**On the protection of Environment**" was passed. This law contains a specific chapter "**On the protection of Nature and Landscape**" in which five new categories of protected areas are suggested, while it introduces changes in the administration and management of protected areas. The five new suggested categories are : Areas of strict protection of nature, Areas of nature protection, National Parks, Protected natural formations, Protected landscapes and elements of landscape and Areas of eco-developement. The Common Ministerial Decision No 69269/5387/1990, issued within the framework of the above law, has particular significance for matters concerning nature protection. A special chapter of this decision determines the content of the Specific Environmental Studies which aim at documenting the protected objective and at formulating suggestions and measures for its protection and management.

As far as protection of plant and animal species is concerned, it is provided for in article 19 of Law 998/1979 and in Presidential Decree 67/1981 "**On the protection of endemic flora and wild fauna and the determination of the procedure for co-ordinating and controlling them**", which includes a list of the protected species of plants and animals. In addition, the protection and maintenance of endemic flora and wild fauna species is provided for in article 20 of Law 1650/1986.

There is no special reference in the national forest legislation to the conservation of biological diversity or to threatened species and rare and vulnerable ecosystems.

Although the legislative framework is quite sufficient, nature is not protected effectively, because the measures taken are usually fragmentary and without strategic and long-run perspectives.

Apart from its national legislation, Greece has assumed specific obligations for the protection of nature and protected areas, within the framework of relevant international conventions and agreements.

The main conventions Greece has signed are (Kassioumis 1993) :

- "**Convention on Wetlands of International Importance as Wildlife Habitat**", known as the Ramsar Convention, ratified in 1974.
- "**Man and Biosphere Programme**". Within its framework Mount Olympus and the Samaria National Park on the island of Crete were included in the "Biosphere Reserves".
- "**Convention on the Protection of World-wide Cultural and Natural Inheritance**", ratified in 1981, by which Mount Meteora in the Tricala prefecture and Mount Athos in the Halkidiki prefecture were included as mixed values (natural and cultural values).
- "**Protocol on the Protected Regions of Mediterranean Sea**", Convention of Barcelona, signed in 1982.
- "**Convention on the Conservation of European Wildlife and Natural Habitants**", Convention of Bern, ratified in 1983.
- "**Convention on International Trade in Endangered Species of Fauna and Flora**", known as CITES, ratified in 1992.
- "**Convention on Biological Diversity**", agreed upon in the Rio Summit in 1992 on Environment and Development and on Resolutions of the Second Ministerial Conference in Helsinki in 1993 on the Protection of Forests in Europe (Resolution H2).This convention was ratified in 1994.
- Directive 79/409/EEC "**Conservation of Wild Birds**". This directive provides for the appropriate measures that should be taken for the protection, conservation and rational management of wild birds.
- Directive 92/43/EEC "**Conservation of Natural Habitats and Wild Fauna and Flora**". This directive aims at creating a European network especially for protected areas under the name "**Natura 2 000**". The state-members should include in this network all areas that are significant for the protection and conservation of biotopes and species. They are also obliged because of Community support, to manage protected areas, in such a way, that their special values are conserved.

In practising forestry and managing forests, care must be taken for their renewal and improvement, either by natural regeneration or by reforestation. According to article 17 of Law 998/1979, this obligation concerning state forests falls with the state while for non-state forests with their proprietors. In particular, article 117 of the Constitution, articles 200-201 of Law 86/1969 and articles 32-44 of Law 998/1979 provide the legal framework of reforestations.

Institutional framework

Responsible for maters relating to natural environment at the central level is principally the Directorate of Aesthetic Forests, National Parks and Hunting and partly the Directorate of Protection and Natural Environment of GSF&NE. The corresponding policy formulated by these directorates is applied to forest practice by the Forest District Offices and Forest Directorates.

Apart from the GSF&NE, which is principally responsible for the protection of the natural environment, the Ministry of the Environment, Physical Planning and Public Works formulates the general policy in relation to physical planning and environmental protection, draws up and controls the application of specific management plans and programmes of environmental protection. It does not own the necessary instruments however, to apply measures dealing with environmental protection. Responsible in this ministry at the central level for matters relating to natural environment, is the Directorate of Environmental Planning and specifically the section of Managing the Natural Environment, while at the prefectural level, responsible are the Environmental Bureaus which belong to the Town Planning Directorates.

The Directorate of Environmental Planning of this Ministry, according to article 4 of Directive 79/409/EEC, initially designated in 1986, 26 areas among them national parks and Ramsar wetlands, as Special Protected Areas (S.P.A.) of the European Community. In 1997, another 26 areas were suggested as S.P.A. to the Community, while the pertinent services of the country assumed the initiative to safeguard the protective status of these areas within the framework of the national legislation.

The various Non-Governmental Organisations (NGOs) for Environmental Protection play a significant role in natural environmental protection. The main NGOs in Greece are :

• **Hellenic Society for the Protection of Nature**. It was founded in 1951 and has 2 000 members. It represented Greece in the Ramsar of Iran and signed on behalf of the state the "Convention on Wetlands of International Importance as Wild Habitat". It became one of the first and more active members of the International Union for the Conservation of Nature Resources (IUCN) and of the European Environmental Bureau (EEB). The Society' s main activities are the organising of lectures and projections at its offices, excursions to important biotopes, participation to campaigns for the protection of the environment and the publication of the journal "Nature".

• **Hellenic Society for the Protection of the Environment and the Cultural Inheritance**. It was founded in 1972 as a public welfare and non-profit society aiming at pointing to the Greeks the value of their cultural and natural inheritance, the concept of ecological balance and the necessity of active environmental protection through the formulation and application of an environmental policy. The Society is active in five sectors, namely in protection of architectural inheritance-restoration works, the strengthening of the protection of natural environment, the raising public awareness campaigns, the environmental education and in international action.

• **World Wide Fund for Nature Hellas (WWF Hellas)**. It was founded in 1994 as a public welfare foundation funded by contributions and donations provening from home and abroad. Its activity in Greece, as a branch of the international WWF, had started in 1992. Nowadays, it has 10 000 members. WWF Hellas aims at preventing and reversing the destruction and degradation of the natural environment through the harmonious co-existence of man and nature, taking into account all social and economic parameters of local people' s life. WWF Hellas promotes the foundation of a network of protected areas in vulnerable ecosystems rich in biological diversity as well as the application of sound management in areas without protective status.

• **Greek Biotope/Wetland Centre**. Its was founded in 1991 as an autonomous organisation of public welfare character, based on an statutory approved by EU. The Centre aims at deterring the destruction and degradation of wetlands in Greece as well as in the remaining Mediterranean countries. In Greece there are 400 small and big wetlands registered of a total area of more than 200 000 ha, which are considered the most important natural, economic, social and cultural items in Greece and in Europe. The Centre in collaboration with state authorities and Greek and international NGOs of environmental protection, collects, processes and disseminates information on Greek nature, gives advice to the state for a sound manage-

ment of wetlands and strengthens the efforts of EU and the Greek state to establish and operate the European network **"Natura 2 000"**.

• **Hellenic Ornithological Society**. It was founded in 1982, has 1 500 members and is the only non-profit body in Greece which is exclusively involved in the protection of wild birds and their habitats. The society aims at registering and studying the protection of birds and their habitats in our country, collaborating with the corresponding Ornithological Societies of Europe, raising the awareness and educating the public on matters relating to birds of Greece. The main activities of the society are the carrying out of water fowl birds registration every winter in order to increase the knowledge of their population state, the ringing of birds for studying their migration and the elaboration of LIFE programs for managing and protecting threatened birds. Also, the Society for the environmental education of the public, issues a four-monthly journal, various books and posters, works out programmes of voluntary work for the conservation of bird colonies, organises excursions, festivals and exhibitions of ornithological and environmental interest.

• **Arctouros**. It was founded in 1992 as a private, non-profit society for the protection and management of wildlife and natural environment. The Society has 3 000 members and its main activity is the protection of the threatened with extinction brown bear (Ursus arctos) which is protected by the Greek, Community and International legislation. It set up the Protection of a Bear Centre in order to finally solve the problem of bear "dancers" and generally of bears that live in captivity (zoo, circus) in unhealthy conditions.

The renewal of forests is implemented mainly by natural regeneration. If this fails then reforestation is carried out. The General Guidelines for the Sustainable Management of Forests in Europe (Resolution H1 of Helsinki Ministerial Conference in 1993) are applied in managing existing forests and in developing new ones. These refer mainly to the selection of species used in reforestation and their impact on the landscape and generally on the environment. Planting stock genetically improved is used in reforestations, which is produced from the 53 state nurseries of the country with seeds collected from a relatively wide network of seed orchards and seed collection stands. Reforestation in state forests and other wooded lands is carried out by contractors based on studies drawn up by the Forest Service. The carrying out of reforestation in non-state forests is based on studies elaborated by liberal professional foresters and approved by the Forest Service which also supervises their proper execution. The money spent for the study and work of reforestation is paid by the private forest owners.

Financial instruments / economic policy framework

Credits provening from the application of EU Regulations, the implementation of European programmes as well as from GSF&NE and the Ministry of Environment, Physical Planning and Public Works (M.E.P.P.P.W.) are disposed of for the maintenance of protected areas, the protection of threatened species and the carrying out of reforestations.

a) Programmes carried out by GSF&NE

Within the framework of EEC Regulation No 2080/92 funded projects are dealing with the reforestation of agricultural lands and the improvement of forested lands. 16.8 billion GRD were spent from the beginning of this programme until 30-10-1997 to reforestate 14 677 Ha of agricultural lands and to improve forested lands by constructing roads, fire breaks, water storage tanks as well as by applying silvicultural treatments in the forests.

In application of EEC Regulation No 1973/92, the programme LIFE **"Improvement of conservation and management conditions of Greek National Parks"**, was implemented during the 1993-1996 period. Within the framework of this programme, the management plans for 9 out of 10 National Parks were elaborated, the Forest District Offices that are managing National Parks were organised and the system of guarding and organising the National Parks was strengthened. Also, the operation of National Parks by constructing buildings and infrastructure works and by providing facilities for awareness and environmental education of the public (construction, equipment and operation of Visitor Information Centres) was promoted. 2.8 million ECUs were spent of which 2.1 million ECUs was EU contribution (Proimakis 1996).

b) Programmes implemented by M.E.P.P.P.W.

(Source : Spinopoulou S., Directorate of Environmental Planing of M.E.P.P.P.W.)

• In application of EEC Directive No 79/409, 5 programmes were funded referring to the protection and management of avifauna. The total budget for the 1996-1997 period was 77 million GRD.

• Within the framework of the Operational Programme for the Environment, Subprogramme 3 **"Protection and Management of the Natural Environment"**, the Measures 1,2,3, were funded for implementing programmes dealing with the protection, management and development of habitats and wetlands for the 1995-2000 period. The total budget of

the programme amounted to 7 billion GRD of which the Greek contribution was 25%.

• Within the framework of the programme Life-Nature, the implementation of 11 programmes was funded dealing with the protection of threatened species of fauna and habitats. The total budget of this programme amounts to 11 million ECUs.

• Implementation of 28 programmes concerned with the protection, management and development of biotopes. The programmes are funded by the Specific Fund that was mentioned in the descriptive indicators of Criterion 2. The total budget of these programmes amounts to 1 020 million GRD.

Informational data to implement policy framework

To strengthen the institution of protected areas, the Directorate of Aesthetic Forests, National Parks and Hunting of GSF&NE, is planning the following :

– Implementation of management plans that were worked out recently for 9 National Parks, which contain significant changes in the organisation and infrastructure of National Parks. These changes concern the setting up of a Park Authority and recruitment of the appropriate personnel in order to start operating, the construction of the Park-administration office, warden's offices, park museums and visitor information centres and the establishment of a "**Permanent Monitoring Network**".

– The designation of new protected areas. The foundation of the tenth and last National Park in Greece, the National Park of Sounio at the prefecture of Attici, took place in 1974. Recently the GSF&NE has been carrying out studies and technical reports to examine the possibility to designate 21 new protected areas in the long-run, i.e. 11 National Parks, 6 Aesthetic Forests and 4 Protected Natural Monuments. At the first stage the possibility of enacting the area of Mount Saos is being investigated on the island Samothraki as a National Park, the areas Petalouda on the island Rodos, of Asprorema in the mountain of Agrafa in Central Greece, the birch forest on the mountains of the Rodopi prefecture as Aesthetic Forests and the area of the small island Gaidouronisi near the island of Crete, as a Protected Natural Monument.

The country, within the framework of creating the European network "**Natura 2 000**", in collaboration with the Greek Biotope/Wetland Centre, the Directorate of Environmental Planning of M.E.P.P.P.W. and GSF&NE, suggested the "National List" of the areas that would be included in the network. A total of 245 areas were designated and referred to the Community, occupying an area of 2 752 000 ha, i.e. about 15% of the country' s total area. All areas that at a certain point had been included in the various categories of protected areas had been listed. The operation of the European network of protected areas "**Natura 2 000**" is expected to be completed in 2004.

Research programmes are carried out in the country aiming at protecting and managing protected areas, threatened species and biological diversity. Some of these programmes are as follows :

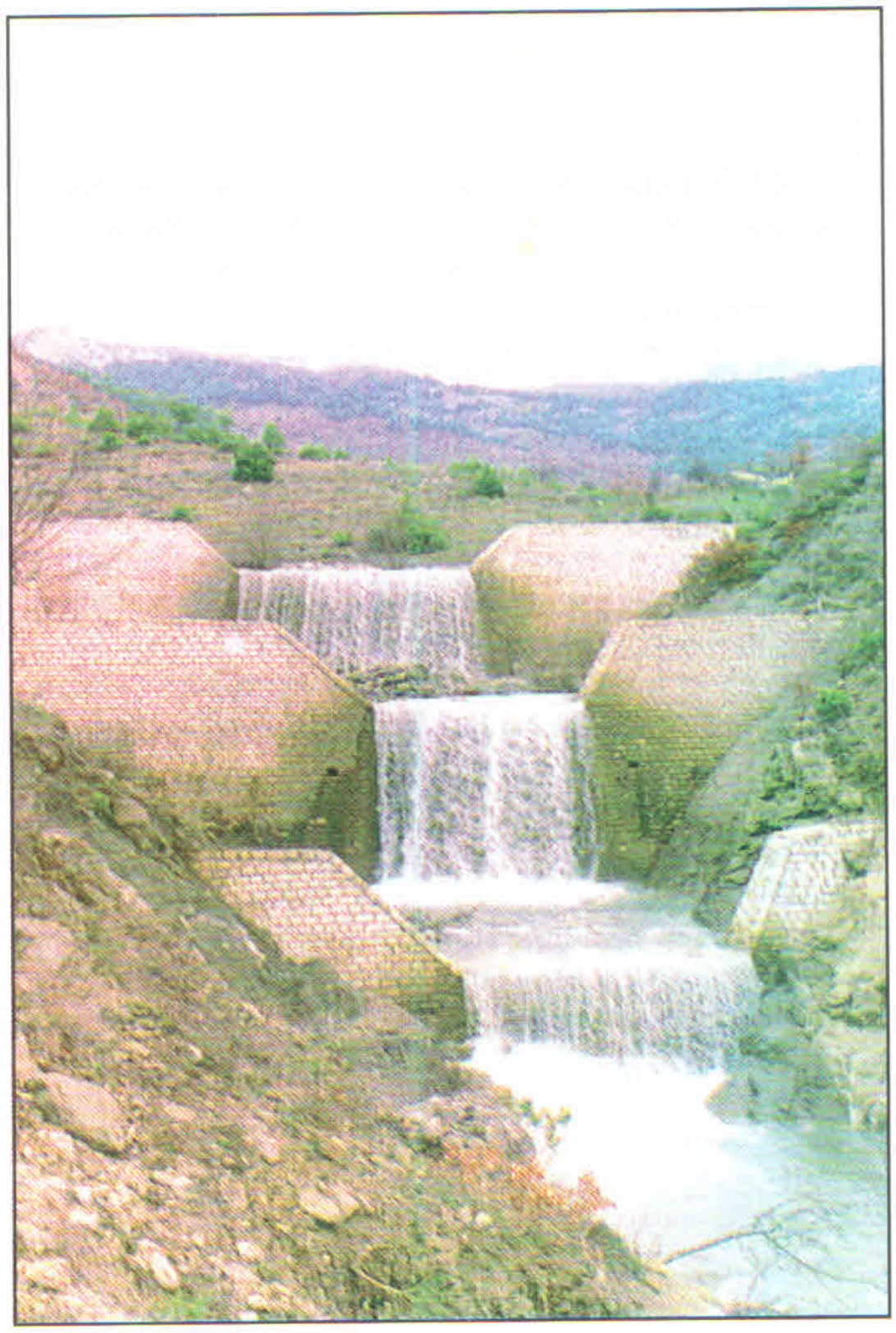
• The programme of BEAR which is carried out in two stages. In the first stage the programme entitled "**On the protection of the Brown Bear and its habitats in Greece**", was implemented over the 1994-1995 period. In the second stage the programme entitled "**On the maintenance of the Brown Bear population and habitats in Greece**", which is being conducted since 1-1-1997. These programmes are carried out by the GFS&NE and M.E.P.P.P.W. and funded partially by programme LIFE.

• The programme entitled "**The protection and conservation of wolf and its habitats in Central Greece**". This is carried out by the society Arctouros in collaboration with the GSF&NE.

• "**Research on the state of the eagle (*Aquila heliaca*) in Greece**". The programme aims at collecting data relating to the dangers that the eagle faces so that measures can be taken for its protection. More specifically, the programme aims at detecting the locations of reproduction of the last pairs of eagles in Greece.

• The programme entitled "**Mediterranean Firs and Cedars**". The programme aims at studying the genetic diversity and adaptation of these species to the Greek conditions in order to increase the percentage of success in reforestations.

• "**Genetics and Improvement of Broadleaves - Genetics and Improvement of Eucalyptus**". The programme aims at selecting species, varieties, provenances and clones of Eucalyptus for quantitative and qualitative characteristics in the various environmental conditions in Greece.



A series of dams for watershed management

Reservoir of a hydroelectric dam

Severe gully erosion in a forest area due to fire and overgrazing

Severe sheet and gully erosion perimetrically of a settlement

CRITERION 5

MAINTENANCE AND APPROPRIATE ENHANCEMENT OF PROTECTIVE FUNCTIONS IN FOREST MANAGEMENT (NOTABLY SOIL AND WATER)

Concept areas : Protection Forests, Soil erosion, Water conservation in forests

QUANTITATIVE INDICATORS:

5.1. Proportion of forest and other wooded land managed primarily for soil protection

Forest and other wooded land	Proportion of forest and other wooded land managed primarily for soil protection	Percent
ha	ha	(%)
6 513 000	6 513 000	100

Source: Dr G. Nakos, Section of Forest Ecology, IMFE&FPT, N.AG.RE.F.

On the table above appears that the forest and other wooded land are managed primarily for soil protection. From the table of indicators 3.4 and 3.4.1 of Criterion 3 however, is deducted that only part of the Greek forest and other wooded land (37.9%) is under organised management by implementing management plans or cutting tables. The discrepancy between the tables of Criterion 3 and the present one can be explained by the fact that in timber management of forest and other wooded land, which almost always extend to sloping terrains, soil protection is seriously taken into consideration.

Since the forest and other wooded land not under management for various reasons, are exclusively extend to more or less sloping terrains protect soils from erosion, we must therefore consider that 100% of forest and other wooded land have soil protection as their main function.

5.1.1. Damages caused by intensive land use

		EROSION (%)		
Region	Area (1000ha)	None	Mode-rate	Severe
W. Greece	1 125	28.39%	45.72%	25.89%
W. Macedonia	943	20.80%	55.71%	23.49%
N. Aegean	385	12.02%	80.30%	7.68%
Peloponnissos	1 551	20.86%	70.75%	8.39%
Ionian islands	231	32.45%	62.59%	4.96%
C. Macedonia	1 915	45.54%	42.96%	11.50%
Thessaly	1 406	36.00%	47.00%	17.00%
Epirus	912	19.91%	51.69%	28.40%
Sterea Hellas	1 556	24.17%	56.19%	19.64%
Attici	380	30.39%	62.41%	7.20%
Average*	**10 403**	**28.95%**	**54.37%**	**16.68%**

* The average refers to 10 of the total 13 administrative regions of the country

Source: Dr G. Nakos, Section of Forest Ecology, IMFE&FPT, N.AG.RE.F.

Soil erosion in Greece is extensive and combined with the destructive action of torrents, it constitutes the most serious perhaps environmental problem of Greek countryside. The extent and intensity of erosion is directly connected with the mountainous character, the geologic conditions, the soil type, the climate characteristics and principally with the history of the country concerning land use (Baloutsos 1993). The long intensive and negative human influence on the country' s natural resources complemented by repeated forest fires, overgrazing, uncontrolled cutting, forest clearing and cultivation of sloping terrains without protection measurements, resulted in the erosion of 1/3 to 1/2 of the country' s agricultural and forest soils.

In mountainous areas, erosion control is achieved by constructing dams and other technical works as well as by reforesting on the watersheds of some torrents.

In the eroded agricultural sloping soils, the nutritive constituents lost, are temporality replaced by adding relatively large amounts of chemical fertilisers very often burdening the environment.

5.2. Proportion of forest and other forest land managed primarily for water protection

Forest and other wooded land	Proportion of forest and other wooded land managed primarily for water protection	Percent
ha	ha	(%)
6 513 1000	6 513 1000	100

Source:

a) A. Vouzaras and Dr. G. Baloutsos Section of Forest Hydrology, IMFE&FPT

b) G. Kapetanopoulos, Directorate of Reforestation and Watershed Management, GSF&NE, Ministry of Agriculture

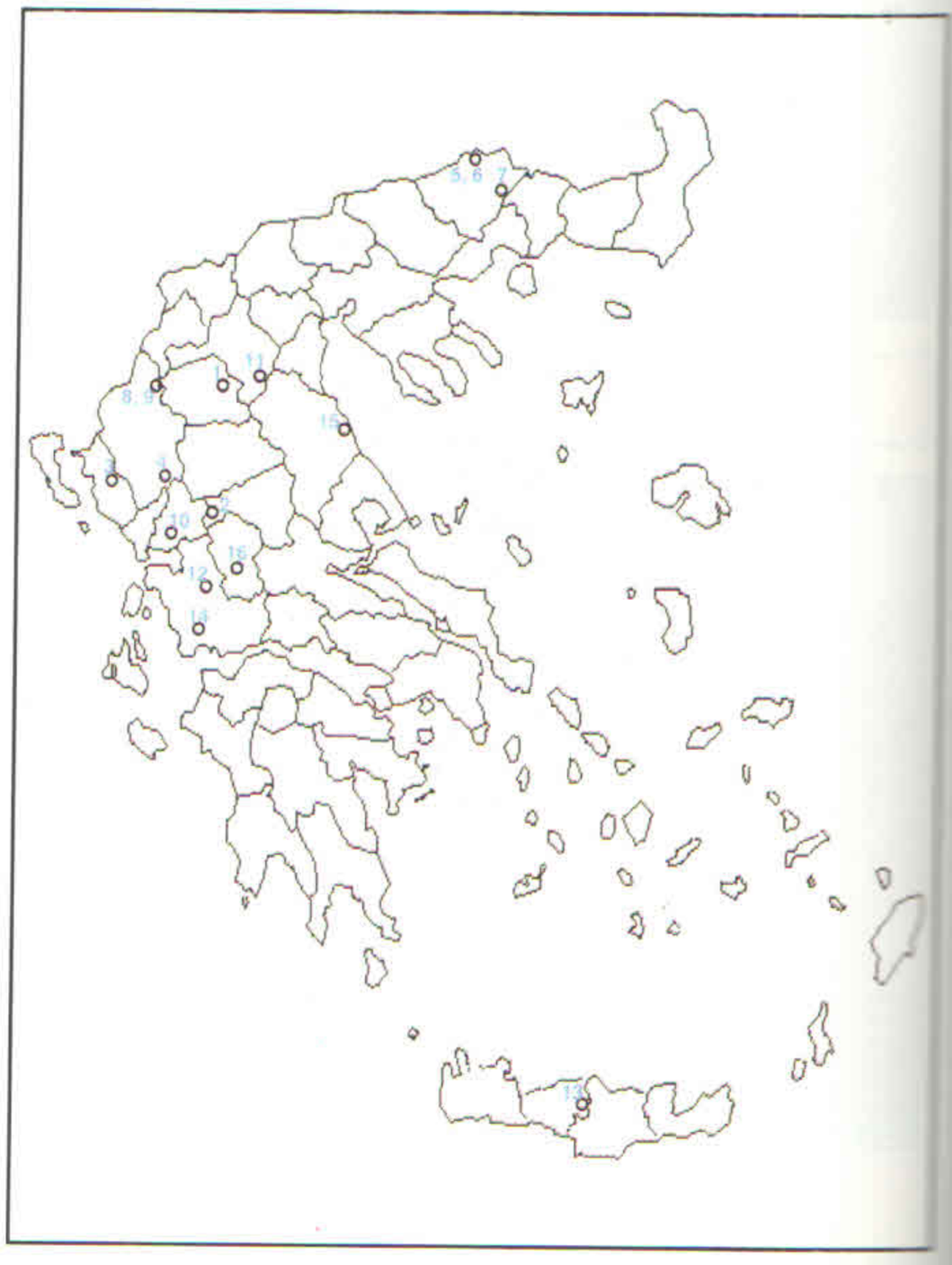
It appears from the above table that 100% of forest and other wooded land are managed primarily for water protection. The explanation is the same as that referred to in Indicator 5.1.

The mountainous character of the country, the geologic and the climatic conditions combined with human influences, favour erosion and torrential phenomena. The forests of the country, which occupy mainly the semi-mountainous and mountainous areas, through their protective function, reduce the extent and intensity of the erosion and torrential phenomena. In addition, forests enhance the storage of large quantities of water which satisfy the requirements of settlements, agriculture, livestock and industry. Consequently, soil protection and support of the hydrologic function of Greek forests, should be first priority targets in their management.

5.2.1. Water Quality in forest watersheds

On the following table, the concentrations of chemical parameters of water in forest watersheds are shown. The concentrations provide precious information for the understanding of the hydrological cycle of forest species nutrients.

Location of water quality sampling points



Source:

a) Dr. G. Baloutsos, Dr. P. Michopoulos, Sections of Forest Hydrology and Forest Ecology, IMFE&FPT

b) Pubic Power Corporation (PPC), Directorate of Hydroelectric Plans Development

c) General Directorate of Land Reclamation Works and Rural Structures, Directorate of Land Reclamation Works Planning, Section of Protection of Irrigation Works

Water quality in certain locations of forest watersheds

Name of waterstream	sampling point	Watershed area (Km^2)	Period or year of sampling	pH	Dissolved oxygen (mg/l)	Material in suspension (mg/l)	Conductivity (μs/cm)	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	NH_4-N (mg/l)	NO_3-N (mg/l)	Total-N (mg/l)	Cl- (mg/l)	Alkalinity (HCO_3-) (μeq/l)
Aliakmonas	Venetiko	817.70	'72-'82			100										
Aheloos	Avlaki	1 349	'77-'84			580										
Kalamas	Kioteki	1 481	'66-'74			1 080										
Arahtos	Plakas Bridge	970	'61-'78			1 790										
Nestos	Papadon Bridge	3 278	'72-'82			310										
Nestos	Papadon Bridge	3 278	'90,'95,'96	7.73	11.35		272.20									
Nestos	Temenos	4 393	'72-82			470										
Aoos	Konitsa's Bridge	665	'75-'83			950										
Aoos	Konitsa's Bridge	665	'95,'96	8.12	10.75		283.41									
Arahtos	Arta's Bridge	1 855	'62-'76			3 900										
Aliakmonas	Ilarionas Monastery	5 005	'90,'95,'96	8.21	12.27		423.10									
Aheloos	Kastraki Dam	4 250.00	'95,'96	8.03	12.20		307.10									
Kourtaliotis	St. Nicolas	121	'95,'96	8.06	11.60		484.62									
Aheloos	Varetada	1.17	'97	8.03			418.20	55.96	6.00	1.05	12.11	0.35	0.25	1.59	12.73	3 734.50
Kakoskali	Ossa	2.60	'97	8.13			107.76	9.19	2.59	0.88	4.93	0.38	0.19	1.51	5.92	841.80
Aheloos	Karpenissi	1.47	'97	7.50			172.28	19.19	3.57	0.80	5.66	0.31	0.22	1.52	5.93	1 396.00

Source:

a) Dr. G. Nakos, Dr. G. Baloutsos, Dr. P. Michopoulos, Sections of Forest Ecology and Forest Hydrology

b) Pubic Power Corporation (PPC), Directorate of Hydroelectric Plans Development

c) General Directorate of Land Reclamation Works and Rural Structures, Directorate of Land Reclamation Works Planning, Section of Protection of Irrigation Works

DESCRIPTIVE INDICATORS :

In this section the legal, institutional and the financial framework is examined together with all the informational data of the concept areas of Criterion 5, i.e. protection forests and protection of soil and water resources.

Legal / Regulatory framework

As has already been mentioned, forests in Greece regressed and are confided to the semi-mountainous and mountainous areas. For this reason, almost all of them are protective. The most significant protective functions of the Greek forests are the protection against erosion and winds and their hydrological, climatic and hygienic effect.

Especially protective are the forests that cover the watersheds of torrents, an area of 1 300 000 ha (Papastavrou and Makris 1986). Although the protective role of all forests is guaranteed, some have an enhanced protective function and mission. Thus, they are under a special protection status and management. These forests are called protection forests.

Protection forests are governed by articles 67-72 of Law 86/1969 (Forest Code) and article 4 paragraph 1 of Law 998/1979. The relative provisions distinguish into absolutely protection and simply protection forests. This distinction is based on criteria dealing with ground topography, watershed protection and anti-erosion function of the forests. To designate a forest as protection forest, a ministerial order should be issued.

The vital soil and water resources are protected by many forest law provisions and regulations. Relative to the above are articles 104, 105, 107, 113, 294 of Law 86/1969, articles 4, 16, 38, 46, 47 of Law 998/1979, articles 12,11 of Law 1650/1981 and Presidential Decree 437/1981 "**On the study and execution of forest technical works**".

Institutional framework

To fulfill their protective function, forests should be managed observing specific and strict restrictions. Thus, it is forbidden in these forests:

- To change their land use and forest species.
- To carry out intensive fellings which disrupt the cohesion of the stands and strip the soil.
- Any kind of felling in order to secure their reforestation.
- Reforestation and watershed management of the torrents that possibly exist in these forests is enforced for the stabilization and prevention of erosion phenomena.

The Directorate of Reforestation and Watershed Management of the GSF&NE, implements watershed management programmes in about 250 mountainous watersheds since 1932 for the protection and development of their soil and water resources. Although the torrential problem on many of these watersheds has lessened, it still continues to be acute. It is estimated that 25% of the total torrential erosion-source areas have been controlled so far. This relatively small percentage is due to low funding, organizing difficulties, bureaucracy, constraints and the time consuming procedures of workers and technicians recruitment, reactions of the people living in mountainous areas and especially animal breeders as well as the customary and traditional rights of grazing and fuelwood felling. The total works constructed to control the torrential phenomenon, between 1930 and 1996, are shown on the following table:

Category of work	Unit	Quantities
Cement dams	m^3	1 353 650
Wire dams	m	226 909
Wooden dams	m^3	29 955
Masonry dams	m^3	422 622
Earth works	m^3	2 687 295
Woven-wattles	m	543 319
Underground drainage ditches	m	481 977
Roads	km	946
Fencing of unstable slopes		
Plantings	m	3 894 400
	ha	32 900

Source:
Directorate of Reforestation and Watershed Management, GSF&NE, Ministry of Agriculture

Soil and water protection is seriously taken into consideration in the drawing up of management plans and especially in their implementation. Trees are marked for felling with outermost care so that neither the soil is stripped nor the stand remains very dense, because the latter does not favour water interception.

The GSF&NE in collaboration with the Forest Research Institutes and the Forestry Schools issues guidelines on the protection of soil and water resources of forested lands, especially in the watersheds. According to these guidelines, clear cutting (excluding coppice forests) and clearing of sloping soils is prohibited, the construction of technical works in the

opening up forest roads is obligatory, disturbing the soil during wood skidding is avoided, grazing in vulnerable soils and in areas designated under reforestation after fire is prohibited, the use of fertilizers and herbicides to maintain the quality of groundwater is avoided, special measures of terracing agricultural lands is enforced etc.

Financial instruments / economic policy framework

In privately-owned protection forests, yield constraints are enforced without compensation to the proprietors. Moreover, the cost of engineering and biological works necessary to stabilise the soils of these forests is covered by their owners. In addition, in case private forest owners cannot carry out the above works, the Ministry of Agriculture can proceed with the expropriation of these forests. The above strict regulations are justified because of the identification of the protective character of the country' s forests. Nevertheless, the state is obliged to amend these regulations and provide for compensations to private forest owners in case yield constraints are enforced and works for stabilising the soils of private forests are carried out.

The GSF&NE spent 1 billion GRD in 1996, i.e. 16% of the total expenditure for forestry for the protection of mountainous soil and water resources. The expenditure was covered by the Investment Budget.

Informational data to implement policy framework

The corresponding sections and laboratories of the Forest Research Institutes, the Forestry Schools and the Directorate of Reforestation and Watershed Management of the GSG&NE have the capacity to conduct inventories and research for the protection of mountainous soil and water resources. Some of the most significant programmes that have been carried out or are still in progress for the protection of the mountainous soil and water resources, are the following :

- A programme entitled **"The Land Resource Survey of Greece"**, which started in 1979 and was completed in 1997.The purpose of the programme was to provide ecological information for proper land use planning and integrated land management in order to maximise the economic, social, cultural and ecological values of the land and reduce competition between users of the various resources. This programme covered the mountainous and hilly areas of the country and was part of the national soil and land resources survey and evaluation programme (Nakos 1983). When the programme was completed, two series of maps at a scale of 1: 50 000 were plotted, in particular a land resources map and a land capability map for forestry. These maps have been distributed to all Forest Service Offices and to certain other state services and are bought there by third parties. The ecological information on 10 of the total 13 administrative regions of the country has been analyzed.
- **"Research on Factors affecting stream flow and sediment yield characteristics in forested mountainous watersheds.** This programme aims at investigating forest treatment effects, on water quantity, quality and regime, applied in forested experimental watersheds, in three different physiographic regions of Greece".
- **"Precipitation characteristics on mountainous watersheds in Greece".** The above programme aims at investigating the rain and snowfall characteristics as well as the time and space distribution in the western, central and eastern part of Greece. The last two, long-term experimental projects are carried out by the IMFE&TFP in a network of 11 small experimental watersheds since 1970.
- **"Development and harmonization of inventory and monitoring systems for managing forests in Europe"**. The programme aims at improving the methodology of inventorying and evaluating the protective functions of forests against erosion and land slides phenomena.
- **"Investigations into the effects of air pollution and/or adverse climatic conditions on forest ecosystems in Greece"**. The programme has been mentioned in Criterion 2.
- The GSF&NE is planning to carry out presently an inventory of the country' s forests that have been designated or are considered to be protection forests.

Sawmill (logs yard)

Seeds collection

Organised forest recreation areas

School of wood engraving in Kalambaka

Forest exhibition

CRITERION 6

MAINTENANCE OF OTHER SOCIO-ECONOMIC FUNCTIONSAND CONDITIONS

Concept areas :

Significance of the forest sector,
Recreational services,
Provision of employment, Research and Professional education,
Public awareness, Public participation,
Cultural values

Quantitative indicators :

6.1. Share of the Forest Sector from the Gross Domestic Product (GDP)

	in 1995 prices	
	1985 (million GRD)	1995 (million GRD)
Forestry GDP	44 674	26 105
Wood-Using Industry GDP	281 803	208 696
Forest Sector GDP	326 477	234 801
Agricultural Sector GDP	3 038 420	2 409 928
Total GDP	17 462 546	17 816 664
Forestry Share from the Agricultural GDP	**1.47%**	**1.08%**
Forestry Share from the GDP	**0.26%**	**0.15%**
Wood-Using Industry Share from the GDP	**1.61%**	**1.17%**
Forest Sector Share from the GDP	**1.86%**	**1.32%**

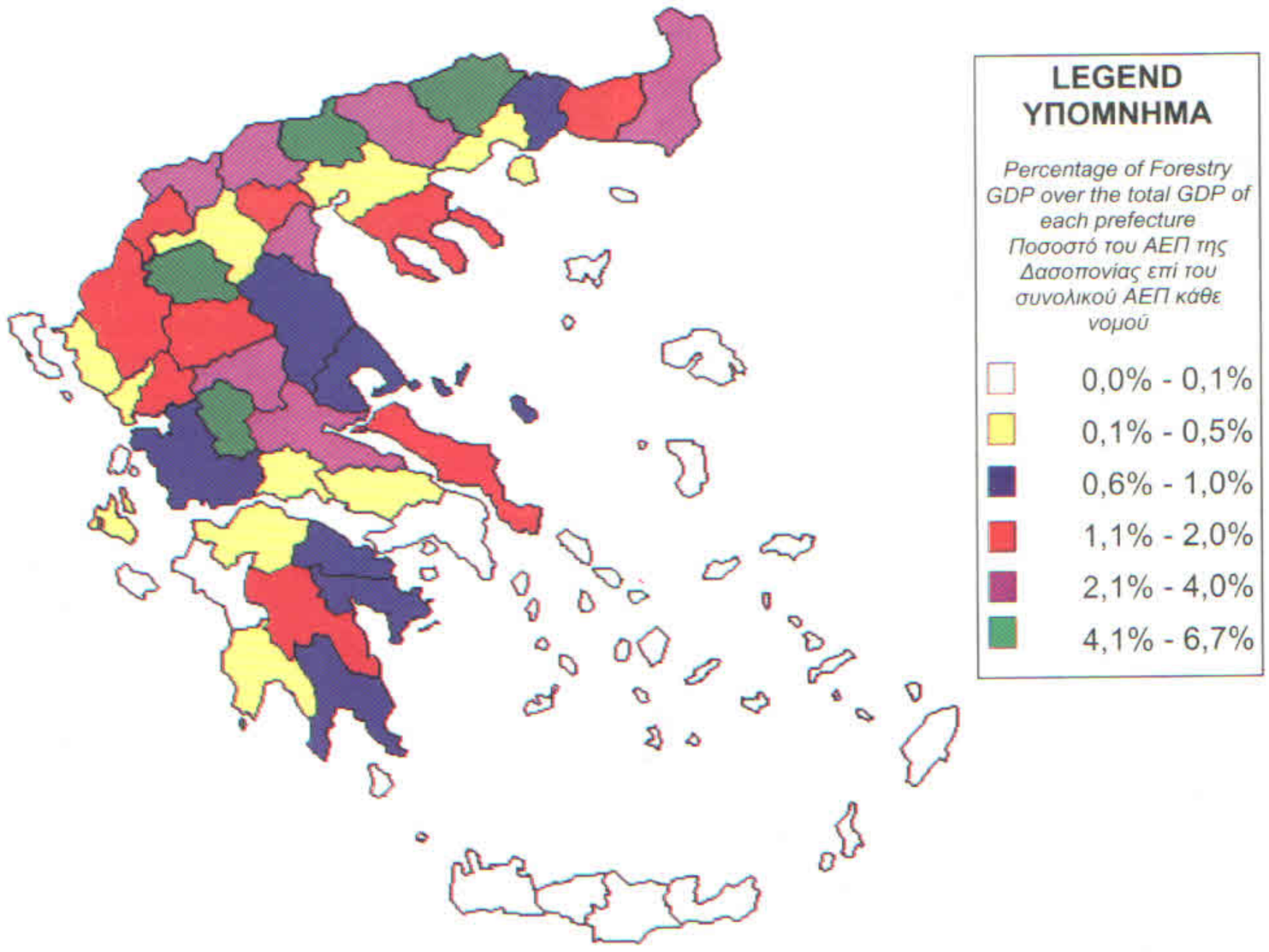
Forestry is closely related to the economy of mountainous and semi-mountainous areas of the country, considering that 3 065 of the country's 5 500 communities are mountainous and semi-mountainous, 2 486 of which or 81% of them have forests in their regions. The Forest Sector share however of the GDP is generally low. Over the last decade, in particular a further significant reduction was observed. The low contribution of the Forest Sector to the GDP is due firstly to the fact that the forests of the country are of low productivity as their role is protective in general, and secondly the benefits resulting from this role, can not be assessed in money terms and thus are not registered in the national accounts.

As regards the reduction of the Forestry contribution to the GDP over the last decade, this can be attributed to the higher productivity achieved by the other sectors of the national economy. Moreover, the higher than Forestry' s contribution of the Wood-Using Industry to the GDP, can be attributed to the higher added value of the Wood-Using Industry.

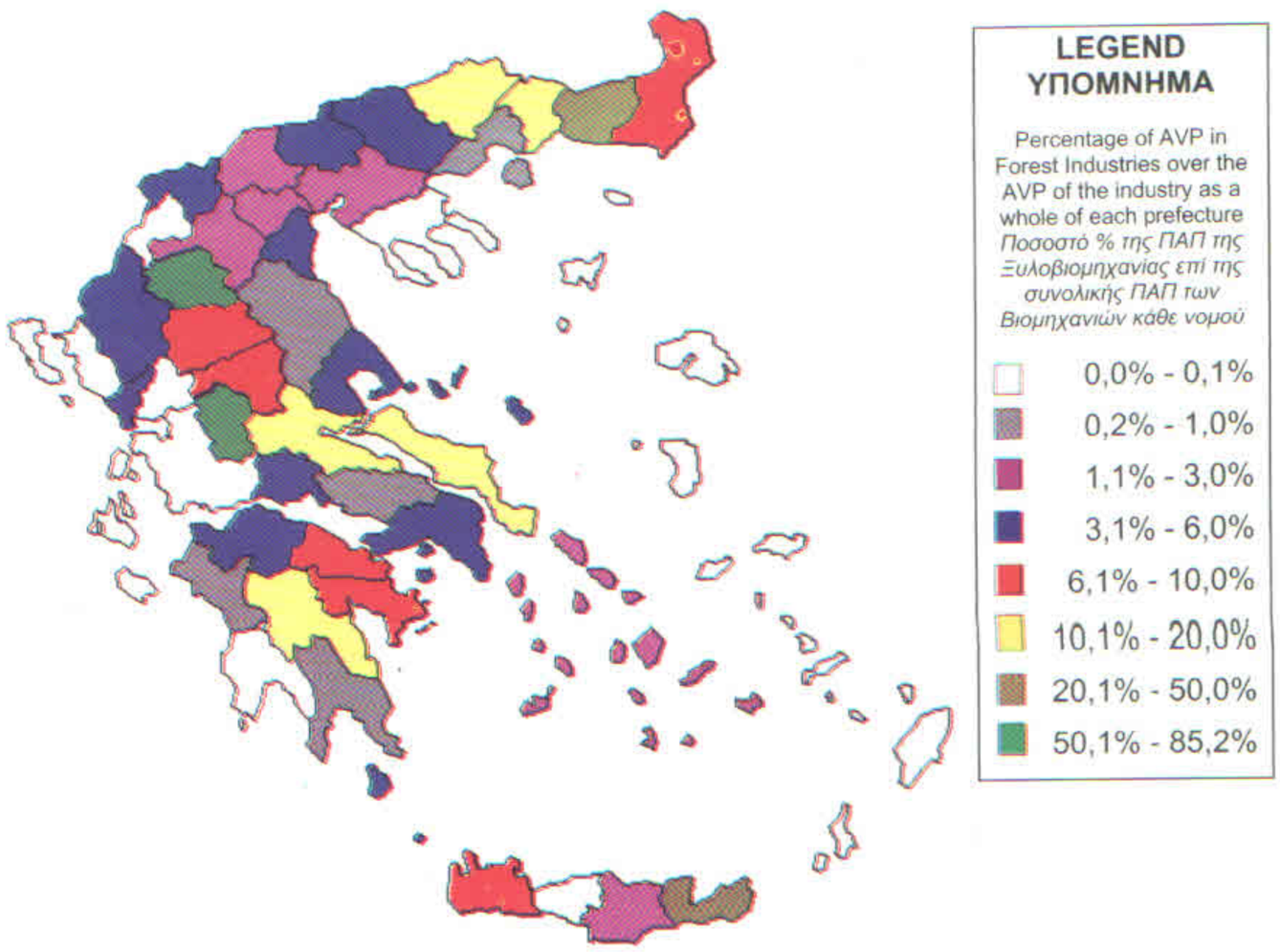
Source:
Directorate of National Accounts, General Secretary of National Statistical Service of Greece (NSSG), Ministry of National Economy

6.2. Forest Sector contribution to the regional economy

6.2.1. Grouping of the prefectures of Greece according to the percentage of Forestry GDP over the total GDP



6.2.2. Grouping of the prefectures of Greece according to the percentage of Added Value of Production (AVP) in Forest Industries over the AVP of the Industry as a whole



Source:
Directorate of National Accounts, General Secretary of National Statistical Service of Greece, Ministry of the National Economy

6.3. Value of imports and exports of forest products

Values in million of GRD

Year	Total value of imports (in 1994 prices)	Value of forest product imports (in 1994 prices)	Value of forest product imports over total value of imports(%)	Total value of exports (in 1994 prices)	Value of forest product exports (in 1994 prices)	Value of forest product exports over total value of exports (%)	Value of forest product exports over value of forest product imports (%)
1984	5 054 197	184 475	3.65	2 530 530	27 470	1.09	14.89
1985	5 521 602	192 213	3.48	2 458 638	28 984	1.18	15.08
1986	5 027 005	193 290	3.85	2 509 836	27 440	1.09	14.20
1987	5 096 918	210 446	4.13	2 606 851	26 173	1.00	12.44
1988	4 224 588	170 270	4.03	1 866 885	24 802	1.33	14.57
1989	5 552 605	240 579	4.33	2 603 076	37 229	1.43	15.47
1990	5 509 199	228 075	4.14	2 225 624	26 400	1.19	11.58
1991	5 764 329	223 504	3.88	2 322 427	29 323	1.26	13.12
1992	5 688 123	180 352	3.17	2 385 788	31 598	1.32	17.52
1993	5 599 738	172 599	3.08	2 143 667	31 034	1.45	17.98
1994	5 206 797	194 714	3.74	2 288 289	29 284	1.28	15.04

Source:

a) Annual Accounts of Forest Services' Activities, GSF&NE, Ministry of Agriculture

b) Th. Giavroglou, Directorate of Computer Science, Ministry of Agriculture

Greece is a net importing country of wood and wood products, i.e. it depends to great extent on wood imports either in unprocessed form or processed products like wood pulp, which is used for the manufacture of paper and paper products. Moreover, the country imports wood products of secondary processing. The main supplier countries of forest products are the Nordic countries, France, Austria and the Eastern countries. Greece exports mainly paper, rosin, briar woods, laurel leaves, carobs and acorns.

6.4. Area of forest with access per inhabitant, % of the total forest area

Area of forest with access per inhabitant: 0.61 ha

% total forest area: 98 %

Source:

Dr. K. Kassioumis, Section of Landscape Architecture, Recreation and Rehabilitation of Environment, IMFE&FPT

It is estimated that :

1) In 5% of the forest protected area, i.e. in 54 695 ha, access is prohibited.

2) 3% of the total forest area is military area and 40% of it, i.e. in 78 156 ha, access is prohibited.

Thus, the forest area without access is about 132 851 ha (54 695 ha + 78 165 ha) and the forest area with access is about 6 380 149 ha (6 513 000 ha - 132 851 ha). The later area constitutes 98% of the country's total forest area and corresponds to 0.61 ha per inhabitant {6 380 149 ha/ 10 454 000 inhabitants (Greece's population in 1995)}.

The forest area with access per inhabitant (0.61 ha) in Greece, is lower than in Nordic countries with 3.39 ha, but higher than in Eastern European countries with 0.26 ha and in EU member-states, excluding Austria, Finland and Sweden, with 0.21 ha (Ministry of Forests and Fisheries of France 1995).

6.5. Area of forest and other wooded land appropriate for recreational services

Category	Number	Area (1000 ha)
National Parks	10	93.5
Aesthetic forests	19	24.7
Protected natural monuments	14	14.0
Wetlands	10	24.0
Organised recreational areas	1 329	9.3
Sub-urban forests	109	150.0
Forest areas along coastlines		13.5
Forest areas along national roads		3.7
Forest areas around lakes		5.0

Source:
a) Dr. K. Kassioumis, Section of Landscape Architecture, Recreation and Rehabilitation of Environment, IMFE&FPT
b) Papastavrou A. and Makris K., Forest Policy (especially in Greece), Volume B, Thessaloniki 1985

6.5.1. Organised forest recreational areas

Categories*	Number	Area (1000 ha)
Outdoors recreational areas	633	8 478
Picnic areas	164	518
Vantage points	145	106
Car parking areas	191	166
Playgrounds	96	13
Other areas	147	64
Total	**1 376**	**9 345**

* Definitions (See in the Appendix VI)

Source:
G. Douros, Directorate of Aesthetic Forests, National Parks and Hunting, GSF&NE, Ministry of Agriculture

6.5.2. Sub-urban forests

	Number	Area (1000 ha)	% of area
Artificial sub-urban forests	73	96 002	63.9
Natural sub-urban forests	24	20 678	13.8
Mixed sub-urban forests	12	33 513	22.3
Total	**109**	**150 193**	**100.0**

Source:
G. Douros, Directorate of Aesthetic Forests, National Parks and Hunting, GSF&NE, Ministry of Agriculture

The above organised forest recreational areas were constructed mainly by the Forest Service and to some extent by Local Government Organisations during the 1982-1996 period. 680 new recreational areas in the country are planned to be constructed. To meet the requirements of visitors, the recreational areas dispose of drinkable water, benches and tables for eating foods, kiosks, stony springs, barbecues, basket ball and volley ball grounds, playgrounds, small refreshment rooms, litter-bins, metallic awareness signposts etc.

Forests surrounding settlements of more than 3 000 inhabitants, excluding Athens and Thessaloniki, are included in sub-urban forests. The ownership status of sub-urban forests is the following (Douros 1998):

Ownership Category	Area (1000 ha)	% of area
State	103 347	68.8
Municipal	23 174	15.4
Owned by monasteries	350	0.2
Private	5 322	3.6
Joint forest property	18 000	12.0
Total	**150 193**	**100.0**

6.6. Number of visitors in forest recreational areas

Category	Number	Number of visitors
National parks	10	357 000
Aesthetic forests	19	300 000
Protected natural monuments	14	54 000
Wetlands	10	50 000
Recreational areas	1 329	200 000

Source:
Dr K. Kassioumis, Section of Landscape Architecture, Recreation and Rehabilitation of Environment, IMFE&FPT

Visitors entrance to the above forest recreational areas is free of charge, with the exception of the Samaria National Park in Crete and the Petrified forest on Lesvos, which belongs to the Protected natural monuments. The entrance fee to these places was 1 200 and 500 GRD per person, respectively in 1996. The number of visitors in these two areas corresponds to the number of tickets issued, which for 1996 was 247 000 and 3 500 persons, respectively.

The number of visitors for the remaining recreational areas is based on estimations made by Dr. Kassioumis.

6.7. Changes in the employment of the Forest Sector

Categories	1985 (persons)	1995 (persons)	Change (%) over the 1995/1985 period
Administration - Management	8 087	5 636	-30.3
Harvesting works	11 078	8 100	-26.9
Protection of forests	2 950	5 410	83.4
Other forest works	26 612	3 745	-85.9
Forestry	**48 672**	**22 891**	**-53**
Wood	7 141	4 918	-31.1
Paper	8 486	8 348	-3.5
Wood-Using Industry	**15 627**	**13 266**	**-15.1**
Forest Sector	**64 299**	**36 157**	**-43.8**
Primary sector employment	972 091	781 900	
Country's employment	3 388 518	3 871 900	
Forestry employment over primary sector employment	5.00%	2.90%	
Forestry employment over country's employment	1.40%	0.60%	
Forest Sector Employment over the country's employment	1.90%	0.93%	

Source:
a) GSF&NE, Ministry of Agriculture
b) Directorate of Industry and Export Trade, National Statistical Service of Greece (NSSG), Ministry of National Economy

Characteristic of the country's forestry is that it offers mainly supplementary employment to the inhabitants of the mountainous areas. The employment decrease observed over the last decade is due a) to a great extent to the fact that forest works are carried out more by contractors and less by direct labour (Forest Service), thus the number of workers employed by contractors is not registered and b) to some extent to forest works mechanisation, especially in reforestation and road construction.

The number of people employed in forestry vary considerably within a year. More people work in summer and less in winter. This is due to the fact that all harvesting works in the country are carried out over the summer period.

The proportion of wages in primary production in relation to wages in wood manufacture is 1 : 2.5, i.e., one wage in the forest corresponds to 2-2.5 wages in wood manufacture (Papastavrou and Makris 1986).

It should be noted that the National Statistical Service of Greece inventories wood manufacturing units that employ more than 10 employees. Thus, employment in the branch of wood-using industry seems to be lower than the real one, because many sawmills that belong to this branch, employ less than 10 employees.

6.8. Number of persons educated in forestry

	Department of Forestry and Natural Environment	Technological Educational Institute of Forestry in Drama	Technological Educational Institute of Forestry in Karditsa	Technological Educational Institute of Forestry in Karpenissi	School of wood engraving
	(persons)	(persons)	(persons)	(persons)	(persons)
1986	59		19	10	17
1987	63		8	36	17
1988	90		36	45	17
1989	134	10	65	66	17
1990	146	36	87	70	17
1991	116	52	68	68	17
1992	115	55	57	44	17
1993	126	36	49	47	17
1994	115	38	33	47	17
1995	74	54	38	41	17
1996	92	44	32	36	17
Total	**1 130**	**325**	**492**	**510**	**187**

Source: a) Department of Forestry and Natural Environment, Aristotle University of Thessaloniki
b) Technological Educational Institutes of Forestry
c) GSF&NE, Ministry of Agriculture

Forest and game guards are trained in special schools according to the needs of the Forest Service. The duration of their training is two months and one week respectively. Airborne forest fighters are trained through rapid training seminars lasting 15 to 20 days. The years and the number of forest guards, game guards and airborne forest fighters that have been trained, are given on the following table.

Year	Forest guards	Game guards	Airborne forest fighters
	(persons)	(persons)	(persons)
1987		400	
1991	350		
1993	150		150
1994			350
1995			320
1996			695
1997			-----

6.9. Number of Foresters and Forest Technicians with post-graduate studies in forestry and professional and technical in service training

a) Foresters and Forest Technicians that followed post-graduate studies to obtain a Ph.D. or Master of Science (M.Sc.) degree in a forestry discipline

Category	Ph.D. holders	M.Sc. holders
Foresters	168	83
Forest Technicians	3	2

75 foresters obtained their Ph.D. degrees from the Department of Forestry and Natural Environment of Aristotle University of Thessaloniki, 36, 4 and 10 foresters from foreign universities with a scholarship from the Greek State Scholarships' Foundation, the legacy of Chlorou and the Directorate of Technical Aid of the Ministry of Coordination, respectively. The rest 43 Ph.D. degrees were obtained from foreign universities with study expenditures covered by either other sources than the ones mentioned above or by the foresters themselves. 25 and 6 foresters obtained their M.Sc. diploma from the Mediterranean Agronomic Institute of Chania and the Post-graduate Section of the Agriculture Department of the Aristotle University of Thessaloniki, respectively. Finally, Forest Technicians obtained their M.Sc. and Ph.D. degrees from foreign universities.

b) Professional and technical in-service training

The productivity and effectiveness of Foresters and Forest Technicians employed by the state is improved by in-service training. They attend seminars organised by the Forest Service, the University and the Institute of Continuing Education. The years, the number of Foresters and Forest technicians, the duration of the seminar and the subjects of their training are given on the following table.

Year	Personswith in service training	Duration (hours)	Training subjects
1986	180	1100	Interpretation of airphotography Watershed management
1987	220	300	Forest awareness
1988	330	750	Forest protection, Forest awareness
1990	150	150	Forest protection
1991	80	150	Forest protection
1992	40	500	Mapping
1993 - 1997	17	300	Administration and computerisation
1997	30	225	Computer application

6.10. Number of researchers in Forest Sector

	Disciplines of Forest sectors	Researchers (persons)	Teaching Researchers (persons)	Total (persons)	Percentage %
1	Forest management Forest economics	20	14	34	23.0
2	Silviculture Forest genetics	16	10	26	17.6
3	Forest protection (Diseases - Insects - Fires)	6	2	8	5.4
4	Forest hydrology and Forest technical works	12	10	22	14.9
5	Landscape architecture, Recreation, Rehabilitation of environment	5	1	6	4.1
6	Forest ecology	8	5	13	8.8
7	Forest utilisation and Forest products technology	11	7	18	12.2
8	Range management	8	5	13	8.8
9	Game management	5	3	8	5.4
	Total	**91**	**57**	**148**	**100.0**

Source: IMFE&FPT

Basic and applied research on the forest sector is carried out mainly by the two Forest Research Institutes, the Forestry School of the Aristotle University of Thessaloniki and the Technological Educational Institutes of Forestry and to a lesser extent by wood-using industry (more details are given in the descriptive indicators of Criterion 6). Research findings are implemented through the Section of Forest Research of the Directorate of Forest Resources Development, GSF&NE.

All research programmes are in line with forest policy framework implemented by the state. A forest research plan based on the requirements and priorities of the Forest Service, was recently drawn up by representatives from research and practice.

The proportion between researchers and forest and other forest area is 2.3 : 100 000 ha.

6.11. State funding of forest research compared with the total state funding for research

The funds allocated to forest research from state funds amounted to 1,009 million GRD in 1995 and correspond to 1.3% of the total state funding for research.

Source:
a) State Funding of the Scientific and Technological Research, Annual Report 1995. General Secretariat of Research and Technology, Ministry of Development
b) Annual Report 1995, University School of Forestry, Technological Educational Institutes of Forestry, Forest Research Institutes

$$\frac{SFRF}{STFR} X100 = \frac{SFRU+SFRT+SFRI}{STFR} X100 = \frac{214+141+654}{78332,5 \text{ εκ.δρχ}} = \frac{1009}{78332,5} = 1,3\%$$

where:

STFR = State Total Funding for Research

SFRF = State Funding of Research in Forestry

SFRU = State Funding of Research in the University School of Forestry

SFRT = State Funding of Research in the Technological Educational Institutes

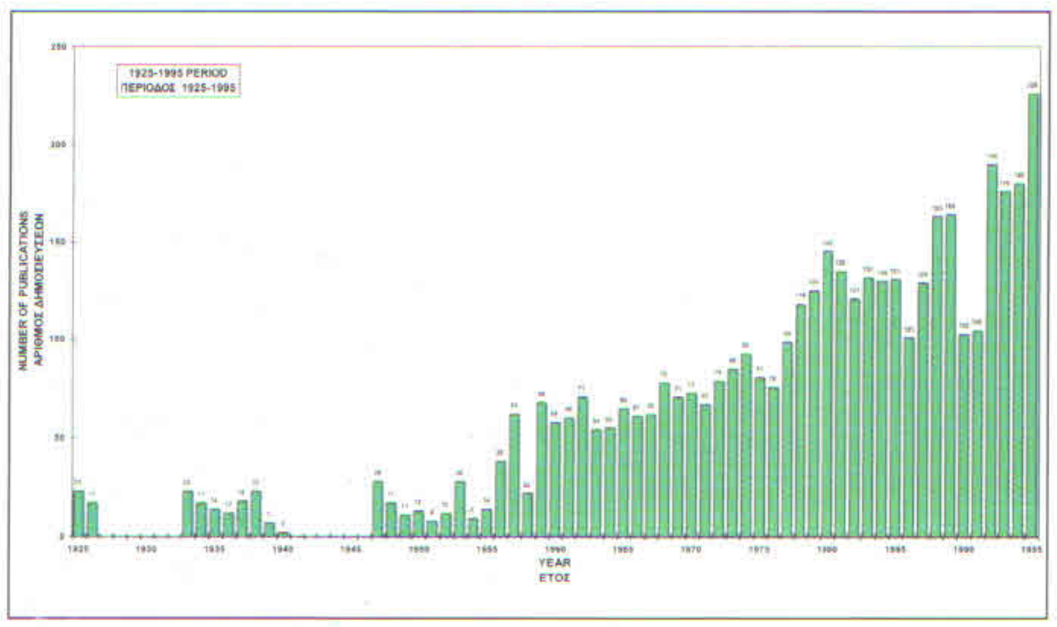
SFRI = State Funding of Research in Forest Research Institutes

University Forestry School and Forest Technological Educational Institutes are funded by the state in order to implement education and research programmes. The estimation of the funds dedicated exclusively to research carried out in these bodies, was done by the methodology applied by the General Secretary of Research and Technology (OECD methodology described in Manual Frascati). The percentages used to estimate funding for research in relation to total funding, in each funding category, are as follows :

Salaries of Teaching and Research Personnel	42%
Salaries of Special Administrative and Technical Personnel	46%
Equipment	27%
Building Construction	14%

The state funding of the Scientific and Technological Research in relation to the country' s GDP, ranged over the 1989-1994 period from 0.19 to 0.25%.

6.12. Change over the number of scientific publications



Source:
Boskos L., 1997. Greek Forest Bibliography, Period 1991-1995. Independent edition, Athens 1997

6.13. Informational means of raising public awareness and education on the importance of the forest

In order to raise the awareness of the public on matters relating to forest and environmental protection, the following informational material was issued during the 86-87 period:

a) Informational material issued by the Directorate of Agricultural Extension of the Ministry of Agriculture

Type	number	subjects
Films	60	forest and natural environment
Video	39	forest and natural environment
Spots	1	forest and natural environment

b) Informational material issued by GSF&NE of the Ministry of Agriculture (Central Service)

Type	number	subjects
Films	6	Forests and water Our forests Let's get to know the forest Protection from fires Mediterranean vegetation The significance of forest
TV spots	20	Forestry matters
Radio spots	17	Forestry matters
Slides	40 (series)	Protected Areas
Pictures (50X100cm)	150	National Parks
Pictures	4000	Forest fires
Posters	9 (series)	Forest fires
Leaflets	5 (types)	Forest fires
Metallic awareness signposts		Forest fires
Stickers	8 (types)	Forest fires
Metallic logos in badges		Forest fires

Informational material is also issued by the regional Forest Services.

The Natural History Museums, the environmental and forest exhibitions and the newspapers and magazines with forest ecological and environmental content, significantly contributed to the raising of public awareness and education on forests and the environment.

There are 4 Natural history Museums in Greece. Namely: The Museum of the Oeti National Park, the Museum of the Samaria National Park, the Goulandris Natural History Museum in Athens and the Zoology Museum of Athens University.

The GSF&NE has its own stand every year in the Agrotica exhibition which takes place in Thessaloniki and organises forest exhibitions in different cities every year during the celebration of the International Day of Forestry and on Environment Day. It also participated in the Forest exhibition that was organised within the framework of the 10th Worldwide Forest Congress in Paris, in 1991.

(A list of well-known magazines and newspapers with forest, ecological and environmental content is quoted in the Appendix VI).

6.14. Archaeological sites and Landscapes of Special Natural Beauty on forest and other forest land

	Number	Area (1000 ha)
Archaeological sites on forest and other forest land	57	52 000
Landscapes of Special Natural Beauty on forest and other forest land	112	170 000

Source:
Professor K. Chatzimbiros, Section of Water Resources, National Technical University of Athens

Landscapes of Special Natural Beauty (LSNB) are provided by Law 531/1932, which was later amended by Law 1469/1950. By decisions taken over the years from the Ministry of Culture, 400 areas were designated as LSBN including Archaeological and Historical Sites and pure LSBN. These areas have not been delimited or managed by a special management status from the Ministry of Culture so far. Since 1987, the Landscapes of Special Natural Beauty came under the jurisdiction of the Ministry for the Environment, Physical Planning and Public Works (M.E.P.P.P.W.) by the force of Law 1650/1986, while the Archaeological and Historical Sites remained under the supervision of the Ministry of Culture. The M.E.P.P.P.W. in order to delimit and protect these 400 areas, assigned to the National Technical University of Athens the drawing up of a research programme entitled **"Delimitation and determination of protection measures for Landscapes of Special Natural Beauty"**. The project is still in progress and 260 out of the 400 areas have been studied so far. The drawing up of the table above is based on the 260 areas that have been studied.

DESCRIPTIVE INDICATORS:

In this section the legal, institutional and financial framework is examined together with all the informational data of the concept areas of Criterion 6, i.e. the significance of the sector, the recreational services, employment provision, research and professional education, public awareness raising and participation, cultural values in forests.

Legal / regulatory framework

The economy of mountainous and semi-mountainous areas, depends mainly on the activities of the primary sector and to a lesser extent to the secondary and tertiary sectors. This results of the development policy of the State, which disproportionately favoured the urban and plain areas over mountainous and semi-mountainous areas (Stamou 1989). Forestry, as an economic activity of the primary sector, mainly practised in the mountainous and semi-mountainous areas of the country, was not favoured by the state despite the recognition -especially over the last decade- of its protective role to the environment and its positive contribution to agricultural development (water supply and protection and support of mountainous and semi-mountainous soils).

Besides forestry, the wood-using industry is being developed. Sawmills' units of wood-using industry are small, equipped with obsolete technological equipment, do not utilise their capacity fully, do not apply fully standardisation and quality control and have a low degree of integration. On the contrary, the units of the wood composite panels are characterised by advanced technology, full use of their capacity as well as full application of standardisation and quality control. Wood-using industry development is restrained in general by the lack of quantitative and qualitative home grown raw material, the high cost of roundwood production and the shortage of skilled personnel.

In the wood-based industry 680 sawmills, 44 units producing parquets, 153 palettes, 173 wooden boxes, 9 veneers, 2 plywood, 6 blockboard, 7 particleboard, 1 fibreboard, 1 wood pulp, 12 paper and 6 resin industries are in operation (Petinarakis 1992).

The forest sector-forestry and wood-using industry- as productive sector of the economy, is governed by development Law 1892/1990 "**On modernisation and development and other provisions**", which was later amended and completed by Law 2234/1994. This law and the other legislative provisions mentioned in the previous Criteria, provide an adequate legal framework to the forest sector, and thus one of the basic conditions for its development is fulfilled. Consequently, its development course will be judged by the government choices of development strategies.

The forest sector employs a work-force which -especially in the case of forestry- comes from the same areas where forests grow. Manpower employed in forestry is divided into permanent and seasonal personnel. Permanent personnel employment is legislatively regulated by the Code of Officials (Presidential Decree 611/1977) which determines the relations between state and officials, Law 2470/1997 which is concerned with the payroll of employees and Law 2084/1992 which determines the insurance status of employees. The labour relations of the seasonal personnel are usually regulated by annual agreements, namely for skilled workers by Special Branch Agreements and for unskilled workers by the National Collective Agreement. The labour relations of the scientific, technical, administrative and unskilled personnel of the wood-based industry are also regulated by the above mentioned agreements.

Forest recreation is not satisfactorily regulated by forest law, particularly as its significance is continuously growing and tends in many regions of the country to become a primary forest use, which in turn leads to the intensification of the competition among the various forest uses. Direct reference to recreation is made in article 4 of Law 998/1979 and an indirect one in articles 3, 5, 16 and 48 of the same law. Important for recreation, are Ministerial Decisions Nos 66102/970/1995 "**Regulating matters concerning outdoors recreation within forests and other wooded land**" and 91874/1845/1996 by which Local Government Organisations have the right to set up small recreational facilities within forests.

Some basic laws that govern forest education in our country are -for university education- Law 1268/1982 "**On the infrastructure and operation of higher education foundations**" and for technical education, Law 1404/1983 "**On the infrastructure and operation of Technological Educational Institutes (Polytechnics) (T.E.I.)**". The operation of Forest Research Institutes is based on founding Law 1845/1989 "**Development and Exploitation of Agricultural Research and Technology**" and laws Nos 2040/1992 and 2538/1997 which supplement the previous law.

Public raising awareness on the significance of forest is regulated by articles 203 and 204 of Law 86/1969 and by article 21 of Law 998/1979, while forest law does not provide for public participation in the formulation of forest policy and in the decision making concerning forests.

Finally, the archaeological and historical sites within forests and other wooded land are governed by the provisions of articles 4 and 5 of Law 998/1979, Law 531/1932 "**On antiquities**" and Law 1469/1950 which supplements and extends the previous law.

Institutional framework

Programming projects and works constitutes a basic condition for the development of the forest sector at the regional and the national level. The GSF&NE adopted development programmes of a 5-year duration for the forest sector. Such programmes had been planned and implemented in the 1973-1977, 1978-1982, 1982-1987 periods. By the implementation of these programmes, road construction, watershed management, reforestation, harvesting and cultivation of forests, was accelerated. This in turn aided forestry to develop and maintain an efficient physical infrastructure to facilitate the supply and disposal of forest products.

After 1987 development programmes of a six-year duration at the central and regional level, were drawn up for the carrying out of forest technical works funded by the Investment Budget and the EU. As far as the management, exploitation and production of forests is concerned, these are clearly defined in management plans which are drawn up for a ten-year duration. The application of long-term programmes by the GSF&NE, such as the national inventory of forests, land resource survey of forest land, inventory of wood-based industry, national cadastre and cartography of forest land, mentioned in the previous Criteria, greatly contributed to the forest sector development.

As regards wood-using industry, the GSF&NE has since 1947 founded, 6 sawmills, 1 unit of particleboard production, 2 units of wood structures and prefabricated houses. Nowadays 2 sawmills and one unit of wood structures are in operation. Forest cooperatives have also constructed since 1982 and maintain in operation up to now 4 sawmills, 1 unit of medium density fibreboard (M.D.F), 1 unit of side glued wood panels, 1 unit of blockboard and 1 unit of parquet production. As far as the private units of wood-using industry are concerned, the target of the owners is to modernise their units, not to increase their capacity or establish new ones (especially sawmills), due to a shortage of raw material.

The training of Foresters and Forest Technicians is carried out through seminars organised infrequently by the Ministry of Agriculture and other bodies. Training seasonal personnel employed in forest fire fighting is carried out through short duration training programmes, while those employed in harvesting works, are self-taught and work based on experience. The setting up and operation of the Training Centre at the Villia village of Attiki prefecture, is expected to contribute positively to the productivity improvement of those employed in forestry. The Centre is administratively independent and is supervised by the Ministry of Agriculture. The Centre aims at training Forest Service personnel on management and protection issues, improving the professional abilities of Forest Service employees, training the seasonal personnel and collaborating with Higher Educational and Technological Institutes and other educational and professional bodies home and abroad (Presidential Decree 51/7-3-1997).

Recreation in Greek forests dates back to the '70's and coincides with the improvement of the people's standard of living. The first forest recreational works within state forests and other wooded land had been carried out by the GSF&NE since 1982. These works are of small scale, low cost, placed discreetly in the area and don't change the physiognomy of the landscape and ecosystem (Douros 1997). In outdoors forest recreation areas, the construction of works such as arboreta, playgrounds, vantage points, trails and paths, sports grounds and car parking areas are allowed. The right to organise forest recreational areas, besides the GSF&NE, have the Local Government Organisations and natural persons within community and private forests, respectively. Also, in works of active recreation (skiing, climbing) 20 skiing centres and 45 mountainous refuges should be mentioned that have been constructed mainly by the National Tourist Organisation of Greece and the Greek Mountaineering Confederation (Tsekouras and collaborators 1991).

Forest education at the university level is provided by the Department of Forestry and Natural Environment of the Aristotle University of Thessaloniki, which is divided in five "Sectors":

Forest Production - Forest Protection
Natural Environment
Range - Wildlife and Freshwater Fisheries
Planning and Development of Natural Resources
Forest Techniques and Torrent Control Works
Harvesting and Technology of Forestry Works

Students' training in practice and part of forest research, is carried out in the two university forests, one 33 000 ha in the area Pertouli of the Pindos mountain range and the other 14 500 ha in the area Taxiarchis of the Chalkidiki prefecture (Studies guide 1997).

Forest education at the technical level is provided by the Technological Educational Institutes (T.E.I.) of Forestry, which offer theoretical and practical education to Forest Technicians. There are 3 T.E.I. of Forestry which are located at the prefectures of Drama, Karditsa and Karpenissi, respectively.

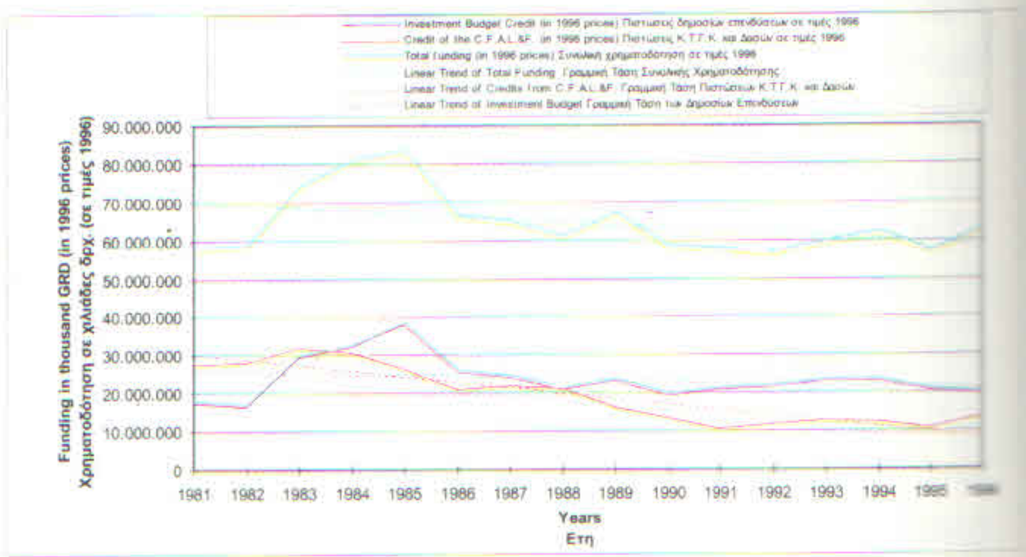
Forest research in the country, besides Forestry Schools at the university and technical level, is carried out by two Research Institutes. The Institute of Mediterranean Forest Ecosystems and Forest Products Technology in Athens and the Forest Research Institute of Thessaloniki, which belong to the National Agricultural Research Foundation (N.AG.RE.F). N.AG.RE.F is in charge of undertaking agricultural research for the development of techniques and know-how and forwarding recommendations to the Minister of Agriculture, regarding solutions to concrete problems in farming. 57 researchers are working in these Institutes who carry out and develop research programmes and technological activities in all forest disciplines.

Responsible for the raising of public awareness and the development of a friendly attitude of people towards the forest, is the Section of Forest Applications of the Directorate of Forest Resources Development of the GSF&NE. NGOs of Environmental Protection, mentioned in previous Criteria, are also contributing to public awareness raising.

According to article 5 of Law 998/1979, the care of the protection and development of forests, public gardens, groves within archaeological sites and for a 3.000 m radius from their centre, belongs to the services of the Ministry of Culture (Archaeological Service). These services, if there is a need, ask for the GSF&NE's assistance.

Financial instruments / economic policy framework

As it was pointed out in Criterion 1, investments in other sectors and branches of the Greek economy are much higher than those in forestry. Moreover, the state funding of forestry is continuously being reduced.



Source:
Annual Reports of the Forest Service activities, GSF&NE, Ministry of Agriculture

As it is shown in the above figure for the 1981-1997 period, the trend of credit provening from the Investment Budget, the Central Fund of Agriculture, Livestock and Forests (C.F.A.L.&F.) and the total funding, in 1996 prices, is downward.

The forest sector, as it was mentioned in the previous Criteria, benefited by adhering to EEC Regulations Nos 2158/1992, 2080/1992, 867/1990, 1973/1992 and 3528/1986. The forest sector has also significantly benefited from the application of the following programmes:

- Interreg I carried out on behalf of Community Support Framework II entitled **"Pilotic game breeding and tourist development of game breeding stations"**. For the carrying out of the programme works 375 million GRD were spent between 1989 and 1993. 50% of the funding came from EU, 30% from the investors themselves and 20% from the Ministry of Agriculture.

• Communal Initiative Interreg II external borders and in particular subprogramme 3 on the trans-boundary collaboration between Greece and Bulgaria for the prefectures of the country, namely of Evros, Rodopi, Xanthi, Drama and Kavala. The programme aims at managing and protecting forests against fires, protecting soil and developing the forest of Fractos at the prefecture of Drama. The total budget of these works amounts to 1.6 billion GRD and 400 million GRD were invested in 1997.

• Regional Operation Programmes concerning regional development projects. Within the framework of these programmes forest projects within the forests and other wooded land are funded, aiming at protecting and developing the forests. The total budget of these projects amounts to 45 billion GRD and 60% is covered by the EU.

• The funding of Greece's economy by the Cohesion Fund for the convergence of its economy with the economies of the rest of the EU countries (implementing the criteria of the Maastricht's Treaty). Projects for the protection of forests and soils and reforestation works were funded by this Fund. The total budget of these works amounts to 4 billion GRD and 85% is covered by the EU.

To increase the positive contribution of Greek forestry to the environment and the economy, the State must constantly pursue new financial resources home and abroad.

In 1996 128 new recreational areas were constructed and 412 improved and maintained, of a total budget of 60 million GRD. Revenues from the visiting recreational areas amounted to 278 million GRD in 1996 provening from the entrance fees of the Samaria National Park in Crete and the Petrified Forest on Lesvos.

The GSF&NE spent 60 million GRD from the C.F.A.L.&F in 1996 for the raising of public awareness and the development of a friendly relationship between man and forest.

Informational data to implement policy framework

Advanced technology and market research constitute two significant inputs for the development of the forest sector. Advanced technology in forestry is applied in forest protection by supplying modern land mechanical equipment as well as aeroplanes and helicopters for fire fighting. In the wood-based industries, it is implemented on the line quality control, the use of computers for organising product warehouses, CAM systems (Computer Aided Manufacturing systems), vacuum dryers, use of high frequency in wood gluing etc. No market research has been carried out in Greece for forest products of primary and secondary production so far.

A key element in the planning of recreational activities in national parks and other recreational areas, is the awareness of the visitors' preferences. To this end, a research programme is currently under way entitled **"Investigation on the needs and perceptions of National Parks' visitors for the improvement of their management methods"**. This programme in particular aims at studying the preferences of National Parks' visitors and investigating the motives, satisfaction, behaviour and perception of visitors. These parameters of human behaviour are in turn incorporated into the procedure of the integrated management of National Parks.

Christmas trees, resin production and livestock raising, contribute significantly to the employment and income of people living in the mountainous communities of the country.

63% of Christmas trees are grown in private plantations, 30% in chestnut orchards and the remaining in state and non-state forests. 500,000 Christmas trees are produced annually and it is estimated that the Greek market can consume 1 million Christmas trees per year and that on semi-mountainous and mountainous regions there are areas available for such production (Christodoulou et al 1992). Its production advantages are its low capital cost, the fact that its production expenses are mainly the cost of wages, an important factor for the underemployed and low income inhabitants of the semi-mountainous and mountainous regions and the fact that it is a friendly to the environment activity. The cultivation and trade of Christmas trees can contribute to the remaining of people in the mountainous regions, by the improvement of their income.

Resin cultivation was a significant source of income for the inhabitants in many regions of Greece until 1975. Resin-tapping is carried out by peeling (wounding) a small section of the tree and greasing it with sulphur acid paste (Megalophonos 1978). The

resin produced is processed in the country's 6 specialised industrial units.

A continuous reduction in resin production has been observed since 1975, from 20,313 tons in 1975 was 5,965 tons in 1996. There is a 5.7% annual production reduction due to the increased supply of low price imported resin, the turn of resin collectors to other professions less tiring and better paid e.g. tourism and to the resin industry' s restricted fund to modernise its equipment.

Resin is exclusively produced by the resin-tapping of 25% of the Pinus halepensis forests. Pinus brutia resin-tapping stopped few years before second World War II. According to the data of the GSF&NE, resin sale price to resin industries amounted to 50-55 GRD/Kg for 1996. This price, fixed by the market mechanisms, is considered low for a product produced through such a tiring work, thus forcing resin collectors to abandon their profession and look for another job. To support their income and keep resin collectors in the forests for resin-tapping but mainly for protecting the forests by removing the inflammable understorey biomass, the state subsidises resin production. The subsidy which aims at strengthening the income of resin collectors amounted to 114 GRD/Kg in 1996. Even this considerable subsidy wasn't enough to keep resin collectors in the profession. They continue to abandon it at the same rate.

Livestock raising in mountainous areas is practised in the traditional manner, i.e. livestock is mostly pastoral (in flocks and nomadic) and contributes significantly to the income of the mountainous population, taken into account that a major part of it is employed in livestock raising. Livestock grazing within forests, as was pointed out in Criterion 2, causes serious damages. Thus, a target of forest policy is the harmonious coexistence of forest and livestock, so that this productive activity is maintained for the mountainous populations and the national economy in general, causing the least damage to the forest.

Foresters can pursue post-graduate studies in all forestry specialties. They can obtain their Master of Science diploma from the Mediterranean Agronomic Institute of Chania, the Postgraduate Section of the Agriculture Department of the Aristotle University of Thessaloniki and from universities abroad. While a Ph.D. degree can be obtained by the Department of Forestry and National Environment of the Aristotle University of Thessaloniki, other university schools of related disciplines and foreign universities. Forest Technicians can obtain their M.Sc. and Ph.D. diploma only from universities abroad.

The following contribute to the raising of public awareness on forest and environmental issues, which constitute a sensitive and very significant sector.

- Hiring foresters by schools of secondary education to educate pupils on environmental issues.

- Organising meetings and lectures by representatives of the GSF&NE, universities, research institutes and NGOs.

- Organising forest exhibitions in collaboration with the GSF&NE, and Prefectural Services.

- Organising national and international congresses in collaboration with the GSF&NE, universities and research institutes.

- Projecting films and broadcasting messages of environmental content in the mass media.

- Distributing of informational material.

- Public participation in reforestation works within sub-urban forests.

Although public participation in forest policy formulation and decision-making on forest issues is not legally provided for, there is dialogue at the central and regional level between the GSF&NE and NGOs, local authorities and citizens to jointly promote forest protection and development issues.

APPENDIX I

Definitions of sustainable forest management, criterion, indicator, forest, other wooded land (2nd Ministerial Conference 1995, Starr et al 1995, ISCIa 1996, UN-ECE/FAO 1992, Galanos 1996)

Sustainable forest management: Sustainable forest management means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local , national, and global levels, and that does not cause damage to other ecosystems.

Criterion: Criterion are distinguishing elements or sets of conditions or processes by which a forest characteristic or a management practice is judged. The role of criteria is to characterise or define the essential elements or set of conditions or processes by which sustainable forest management maybe be assessed.

Indicator: Indicator means a quantitative, qualitative or descriptive measure that, when periodically measured and monitored, shows the direction of change. Quantitative, or in few cases qualitative indicators provide information mainly on the conditions and functions of forests, and on the values or benefits associated with the goods and services that the forest provides. Descriptive indicators provide information on existence of forest policy instruments and conditions, and the extent to which these forest policy instruments support and enhance the achievement of sustainable forest management. Quantitative and descriptive indicators are interrelated and in common, they provide a full picture of the forests condition and forest management in a country.

Forest: Land with tree crown cover (stand density)of more than about 20% of the area. Continuous forest with trees usually growing to more than about 7 m in height and able to produce wood. This includes both closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground and open forest formations with a continuous grass layer in which tree synusia cover at least 10% of the ground.

Other wooded land: Land which has some forestry characteristics but is not forest as defined above. It includes: open woodland and scrub, shrub and brushland, whether or not used for pasture or range. It does not include land occupied by "Trees outside the forest "

APPENDIX II

Definitions of biological diversity (2nd Ministerial Conference 1993) and protected areas (Kassioumis 1994, Kassioumis and Hatziphilippidis 1997)

Biological diversity: Biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

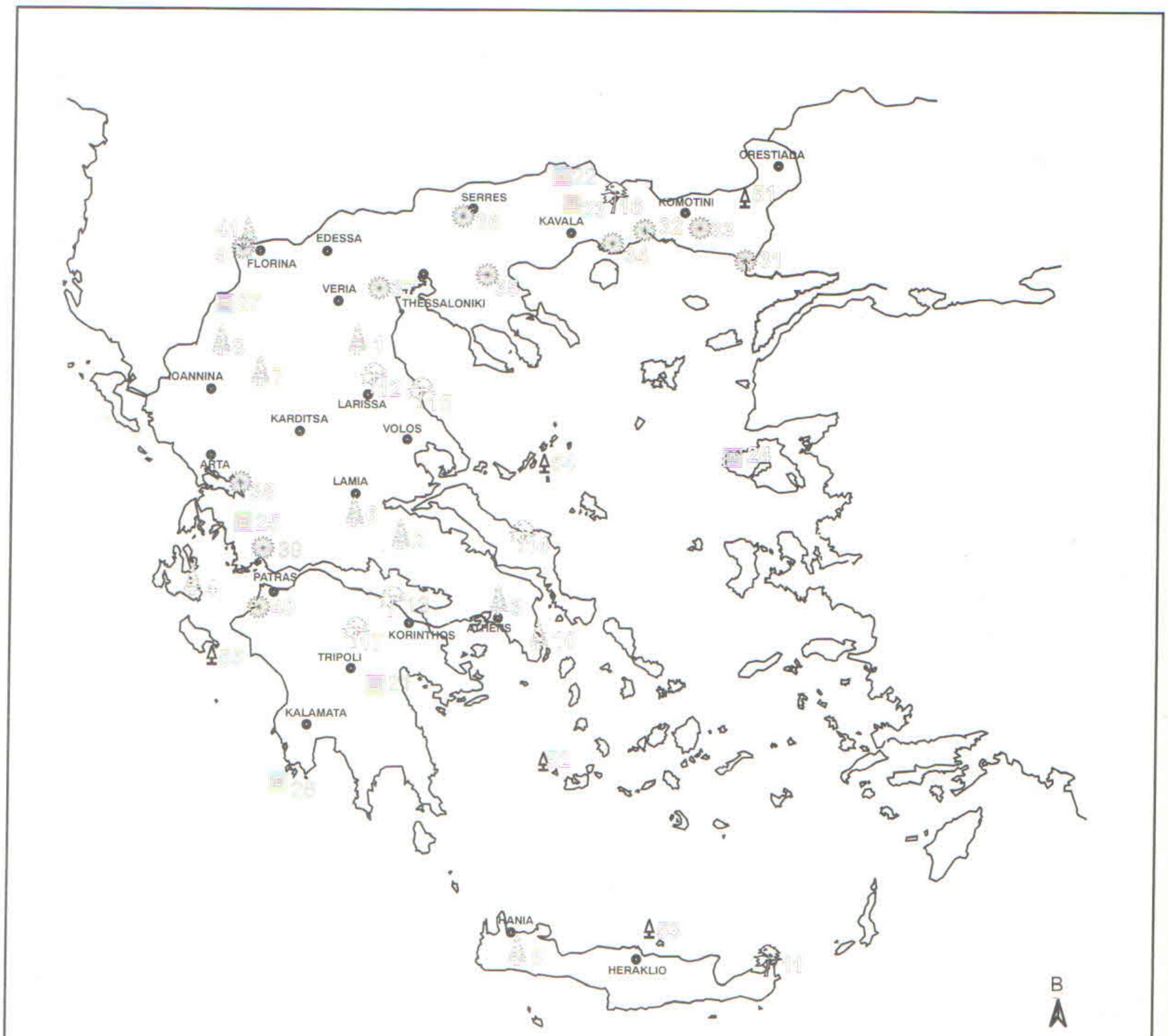
National Parks: National Parks is the main category of protected areas. They are designated and managed in the framework of forest legislation (Law 996/1971), which is part of Forest Code (Law 86/1969). They include areas mostly of forest character with a special scientific and ecological significance which are under a status of strict protection.

National Parks consist of a core area of at least 1,500 hectares, which is strictly protected, and a peripheral zone of a size at least equivalent to the core area. In the core area of National Park activities such as excavation and exploitation of minerals, digging, placement of advertising billboards, industrial activities, housing and other construction, as well as agricultural and forestry activities, pasturing, hunting and fishing, are prohibited. In the peripheral zone all activities are controlled by the Forest Service, to avoid any negative effects to the core areas.

Aesthetic Forests: A category of protected areas in which landscapes with a particular aesthetic and ecological significance are usually included aim besides protecting nature at giving the opportunity to the public to meet and enjoy nature though various recreational activities. In the aesthetic forests regulations similar to those in the peripheral zones of the National Parks are applied.

Protected Natural Monuments: These include areas that have a special palaeontological, geomorphological, or historical significance; and trees, clumps of the trees or rare species of plants having a special botanical, phytogeographical aesthetic, or historical significance. The prohibitions applying in the core areas of National Parks also apply to the Protected Natural Monuments.

MAP OF PROTECTED AREAS IN GREECE



LEGEND

NATIONAL PARKS	AESTHETIC FORESTS (SELECTION)	PROTECTED NATURAL MONUMENTS (SELECTION)	WETLANDS OF INTERNATIONAL IMPORTANCE	OTHER CATEGORIES OF PROTECTED AREAS (SELECTION)
1. OLYMPUS	11. VAI	21. KYNOURIA CEDARS	31. EVROS RIVER DELTA	51. DADIA-LEUKIMI FOREST
2. PARNASSOS	12. TEMPI VALLEY	22. RODOPE VIRGIN FOREST	32. VISTONIDA LAKE	52. ANTIMILOS ISLAND
3. PARNITHA	13. KYLLINI-STRO PINE	23. XANTI THRUSH FOREST	33. MITRIKOU LAKE	53. DIA ISLAND
4. AINOS	14. STENI EUBOEA	24. LESVOS PETRIFIED FOREST	34. NESTOS RIVER DELTA	54. N. SPORADES SEA PARK
5. SAMARIA	15. OSSA	25. LECHINI ASH FOREST	35. LAGADA & VOLVI LAKES	55. ZAKYNTHOS SEA TURTLES
6. OITI	16. NESTOU	26. SAPIENTZA ISLAND FOREST	36. KERKINI LAKE	
7. PINDOS	17. KALAVRITON	27. GRAMOS KASTORIA FOREST	37. AXIOS-LOUDIAS-ALIAKMON DELTA	
8. VIKOS - AOOS			38. AMVRAKIKOS GULF	
9. PRESPES			39. MESSOLOGI GULF	
10. SOUNIO			40. KOTICHI LAKE	
			41. PRESPES LAKES	

Source:

Kassioumis K., 1994. Nature Protection in Greece. Legislation, Protected Areas and Conservation Authorities. Volume 5, Issue 3. Geotechnical Scientific Issues. Trimonthly Edition of Geotechnical Chamber of Greece.

Introduced Forest Species

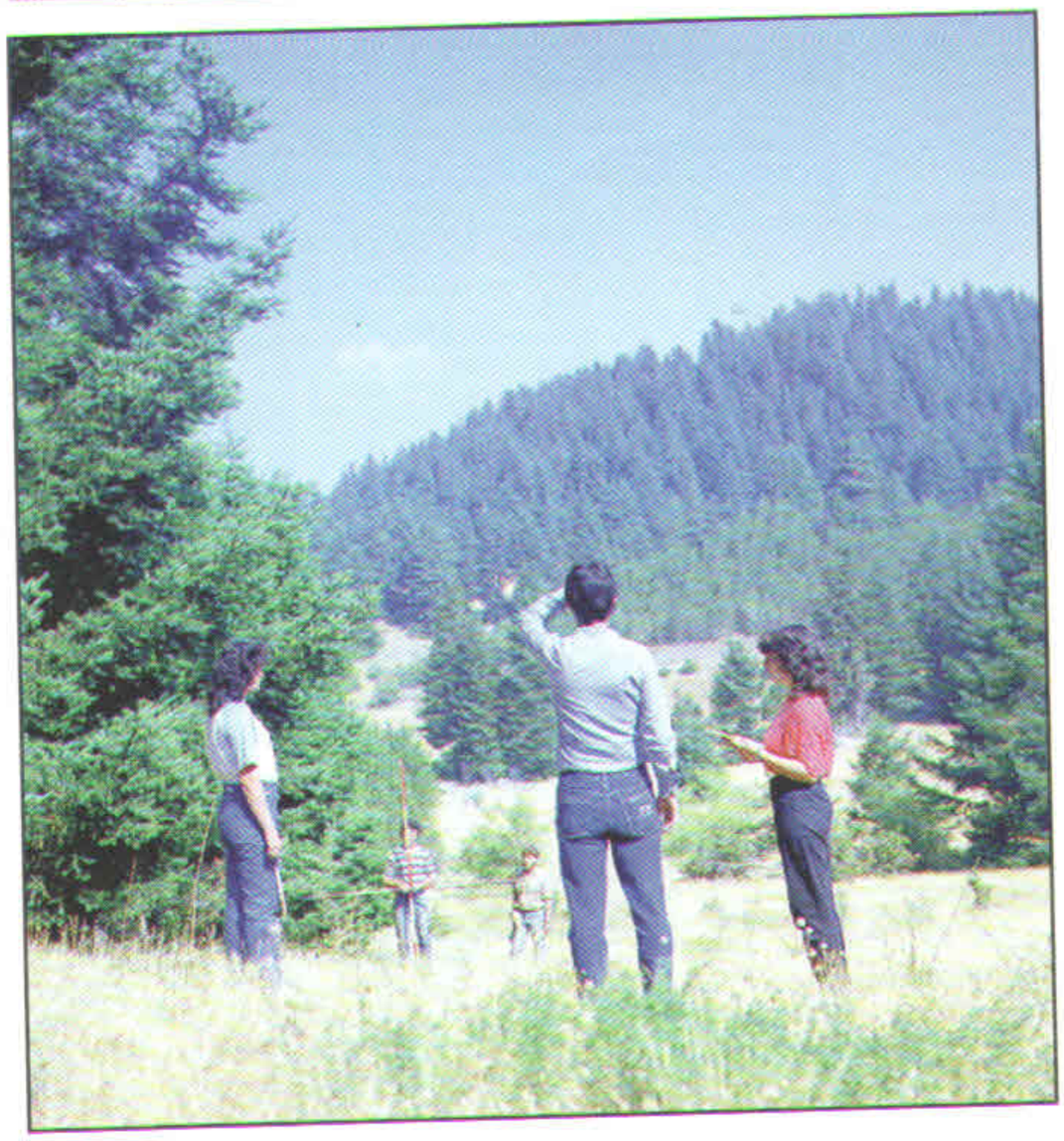
CONIFERS (29)

- *Abies pectinata*
- *Abies concolor*
- *Abies magnifica*
- *Abies equi trojiani*
- *Abies lasiocarpa*
- *Abies bornmuelleriana*
- *Cedrus atlantica*
- *Cedrus brevifolia*
- *Cedrus deodara*
- *Cedrus libani*
- *Cupressus arizonica*
- *Cupressus macrocarpa*
- *Larix decidua*
- *Larix europaea*
- *Libocedrus decurrens*
- *Picea omorica*
- *Pinus insignis*
- *Pinus maritima*
- *Pinus ponderosa*
- *Pinus radiata*
- *Pinus strobus*
- *Pseudotsuga douglasi ή menziessi*
- *Pseudotsuga taxifolia*
- *Sequoia gigantea*
- *Sequoia sempervirens*
- *Sequoiadendron giganteum*
- *Tsuga canadensis*

BROADLEAVED (72)

- *Acer negundo*
- *Acer tataricum*
- *Betula pendula*
- *Calocedrus decurens*
- *Chamaecytisus albus*
- *Chamaecytisus austriacus*
- *Chamaecytisus ciliatus*
- *Chamaecytisus eriocarpus*
- *Chamaecytisus hirsutus*
- *Clematis viticella*
- *Colutea cicilica*
- *Erica carnea*
- *Erica herbacea*
- *Eucalyptus saligna*
- *Eucalyptus cladocalyx*
- *Eucalyptus tereticornis*
- *Eucalyptus camaldulensis*
- *Eucalyptus botryoides*
- *Eucalyptus vinimalis*
- *Eucalyptus prorinqua*
- *Eucalyptus leucoxylon*
- *Eucalyptus gomphocephala*
- *Eucalyptus globulus*
- *Eucalyptus occidentalis*
- *Eucalyptus astrigens*
- *Eucalyptus redunca*
- *Eucalyptus sideroxylon*
- *Eucalyptus diversicolor*
- *Eucalyptus maidenii*
- *Eucalyptus accedens*
- *Eucalyptus melliodora*
- *Eucalyptus punctata*
- *Eucalyptus gardnerii*
- *Eucalyptus gunii*
- *Eucalyptus polyanthemos*
- *Eucalyptus viminalis*
- *Eucalyptus bicostata*
- *Eucalyptus dalrympleana*
- *Pyrus pyraster*
- *Pyrus salvifolia*
- *Quercus borealis*
- *Quercus rubra*
- *Quercus smilax*
- *Quercus suber*
- *Rhamnus catharticus*
- *Ribes alpinum*
- *Robina pseudoacacia*
- *Rosa spinossima*
- *Sambuscus racemosa*
- *Taxodium distichum*
- *Thuja gigantea*
- *Thuja plicata*
- *Tilia parvifolia*
- *Cytisus laburum*
- *Cytisus procumbes*
- *Evonymus europaeus*
- *Evonymus verrucosus*
- *Frangula alnus*
- *Fraxinus holitricha*
- *Fraxinus pallisiae*
- *Liriodedron tulipifera*
- *Malus dimestica*
- *Philirea angustifolia*
- *Pistacia atlantica*
- *Platanus occidentalis*
- *Populus canescens*
- *Euroamerican clones **
- *Populus italica*
- *Populus deltoides*
- *Populus nigra var. Thevestina*

***Hybrids crosses between Populus nigra and P. deltoides**



APPENDIX III

List of threatened plant species

IUCN Red Data Categories:

R : Rare
V : Vulnerable
E : Endangered
I : Indeterminate
nt : Not threatened at present
? : Not sufficiently known the dynamic status of the species population

Abbreviations:

#: Greek Endemic,
**** : Included in one of the B, C, D categories (present).***
A: IUCN Red Data Book categories according to WCMC 1997, PHITOS et al. 1995 ,
B: Protected by the Presidential Decree 67/81,
C: Included in Annex II of the Directive 92/43/EEC,
D: Included in Annex B, Appendix I or II of CITES)

I) Species present in forest environments

Plant taxa	A	B	C	D
AMARYLLIDACEAE				
Galanthus nivalis L.	(R)			
APIACEAE or UMBELLIFERAE				
# Ferulago serpentinica Rech.	(R)			
#Chaerophyllum heldreichii Orph.ex Boiss.	(R)	*		
Ligusticum rhizomaticum	(R)			
BORAGINACEAE				
# Alkanna calliensis Held. ex Boiss.	(R)	*		
# Alkanna pelia (Halacsy) Rech.	(R)	*		
# Nonea cesatiana (Frenzl & Fried.) Greuter & Burdet	(R)			
CISTACEAE				
# Fumana pinatsii Rech.	(R)			
COMPOSITAE or ASTERACEAE				
Artemisia herba-alba Asso	(V)			
Centaurea amplifolia Boiss. & Heldr.	(E)	*		
#Centaurea ebenoides Held. ex. S. Moore	(R)	*		
# Centaurea prespana Rech.	(R)			
# Crepis pawlowski Strid	(R)	*		
# Lamyropsis cynaroides (Lam.) Dittrich.	(nt)			
CRUCIFERAE or BRASSICACEAE				
# Alyssum heldreichii Hausskn.	(R)	*		
CUPRESSACEAE				
Juniperus drupacea Labil.	(V)	*		
ERICACEAE				
Rhododendron luteum Sweet	(R)			
FABACEAE or LEGUMINOSAE				
# Genista sakellariadis Boiss. & Orph.	(R)	*		
# Trifolium dolopicum Held. & Hausskn. Ex Gibelli & Belli	(R)	*		
LILIACEAE				
# Allium heldreichii Boiss.	(R)	*		
Allium olympicum Boiss.	(?)			
Fritillaria bithynica Baker	(R)			
# Fritillaria pelinaea Kamari	(V)			
Lilium rhodopaeum Delip.	(V)	*		
# Ornithogalum exaratum Zahar.	(R)	*		
ORCHIDACEAE				
# Cephalanthera cucullata Boiss. & Held.	(E)	*		
Comperia comperiana (Steven) Ascherson & Graebner	(V)			
Epipogium aphyllum (F.W. Schmidt) Swartz.	(I)			
Epipactis greuteri H. Baumman & Kunkele	(R)			
# Epipactis cretica Kalopissis & Robatsch	(V)			
Epipactis microphylla (Ehrh.)Swartz				
Epipactis atrorubens (Hoffm.)Besser				
# Epipactis olympica Robatsch.				
# Epipactis halacsyi Robatsch.				
Platanthera holmboei H. Lindberg				
Goodyera repens (L.) R.Br.				
PAEONIACEAE				
# Paeonia clusii F.C. Stearn ssp. rhodia (Stearn) Tzan.	(V)	*		

PRIMULACEAE				
# *Cyclamen rhodium R.Gorer*	(?)			
PINACEAE				
Abies alba Miller	(?)			
# *Abies cepahlonica Loudon*	(R)			
Pinus peuce Griseb.	(R)	*		
Pinus sylvestris L.	(?)			
PYROLACEAE				
Orthilia secunda (L.) House	(?)			
RANUNCULACEAE				
Helleborus orientalis Lam.	(R)	*		
ROSACEAE				
Sorbus baldaccii (C. Schneider) Zinserling	(V)			
RUBIACEAE				
# *Asperula muscosa Boiss.& Held.*	(R)			
SANTALACEAE				
# *Thesium vlachorum Alden*	(E)			
SCROPHULARIACEAE				
Lathraea rhodopea Dingler	(R)			
# *Verbascum spathulisepalum Greuter & Rech.*	(I)	*		
VALERIANACEAE				
Valeriana alliariifolia	(R)	*		
VIOLACEAE				
# *Viola oligyrtia Tiniakou*	(V)			

II) Species equally present in forest and open environments

Plant taxa	A	B	C	D
AMARYLLIDACEAE				
# *?Galanthus reginae-olgae Orph.*	(R)			
# *Galanthus reginae-olgae Orph.ssp. vernalis Kamari*	(V)			
APIACEAE				
Aegopodium podagraria L.	(?)			
# *Chaerophyllum heldreichii Orph. ex Boiss.*	(R)	*		
# *Geocaryum parnassicum (Boiss. & Heldr.)Engrstrand*	(nt)			
# *Heracleum orphanidis Boiss.*	(?)			
ARACEAE				
# *Biarum spruneri Boiss.*	(R)			
BORAGINACEAE				
Cynoglossum stamineum Desf.	(V)	*		
# *Onosma erectum Sibth. & Sm. ssp. erectum*	(nt)			
# *Onosma erectum Sibth. & Sm. ssp. malickyi Teppner*	(nt)			
CAPRIFOLIACEAE				
# *Lonicera hellenica Orph. ex Boiss.*	(?)	*		
CARYOPHYLLACEAE				
Silene damboltiana Greuter & Melzhei	(R)			
# *Silene haussknechtii Heldr.& Hausskn.*	(V)	*		
Silene integripetala Bory & Chaub.	(nt)			
Silene schwarzenbergeri Halacsy	(R)			
Silene viridiflora L.	(?)			
COMPOSITAE or ASTERACEAE				
# *Centaurea vlachorum Hartvig*	(V)			
# *Centaurea laureotica Heldr. ex Halacsy*	(R)	*		
# *Crepis guioliana Babcock*	(R)	*		
# *Matricaria tempskyana (Freyn & Sint.) Rauschert*	(nt)			
DATISCACEAE				
Datisca cannabina L.	(V)	*		
DIPSACACEAE				
Knautia magnifica Boiss. & Orph	(nt)	*		
EUPHORBIACEAE				
# *Euphorbia orphanidis Boiss.*	(R)			
FABACEAE or LEGUMINOSAE				
# *Cicer graecum Orph. ex. Boiss*	(R)	*		
# *Ebenus sibthorpii DC.*	(R)	*		
FAGACEAE				
# *Quercus trojana Webb. ssp. euboica (Papaioannou) K.I.Chr.*	(V)	*		
GUTTIFERAE				
# *Hypericum delphicum Boiss. & Heldr.*	(R)			

LABIATAE or LAMIACEAE				
# Scutellaria rupestris Boiss.&Heldr.ssp. parnassica (Boiss.) Greuter & Burdet	(R)	*		
LILIACEAE				
Erythronium dens - canis L.	(R)			
#Fritillaria rhodia Hansen	(R)	*		
ORCHIDACEAE				
Gymnadenia conopsea (L.) R.Br.	(?)			
# Cephalanthera epipactoides Fisch. & C.A. Meyer	(V)	*		
Cypripedium calceolus L.	(?)	*	*	
Serapias ionica E. Nelson ex H. Baumann & Kunkele	(V)			
Epipactis condensata Boiss. Ex D.P. Young				*
# ?Epipactis subclausa Robatsch		*		*
# Ophrys fleischmanii Hayek		*		*
Himantoglossum affine (Boiss.) Schlehter				*
# Himantoglossum samariense C. & A. Alibertis				*
PAEONIACEAE				
# Paeonia parnassica Tzanoud.	(V)		*	
# Paeonia clusii Stern ssp. clusii	(nt)	*		
RANUNCULACEAE				
Adonis cyllenea Boiss., Heldr. & Orph.	(V)			
# Ranunculus subhomophyllus (Halacsy) Vierch.	(R)	*		
Ranunculus reuterianus Boiss.	(R)			
# Consolida tuntasiana (Halacsy) Soo	(R)	*		
ROSACEAE				
# Amelanchier chelmea (Halcsy)Browicz	(R)			
# Cotoneaster parnassicus Boiss.& Heldr.	(R)			
# Crataegus pycnoloba Boiss. & Heldr.	(nt)			
Eriolobus trilobatus (Poiret)M.Roemer	(V)			
RUBIACEAE				
# Galium monachinii Boiss. & Heldr.	(nt)			
SCROPHULARIACEAE				
# Digitalis leucophaea Sm. ssp. Leucophaea	(R)	*		
# Verbascum delphicum Boiss. & Heldr.	(R)	*		
Veronica argutee-serrata Regeland & Schamlh.	(R)			

III) Species occasionally present in forest environments

Plant taxa	A	B	C	D
APIACEAE or UMBELLIFERAE				
# Eryngium amorginum Rech.	(R)			
ARACEAE				
# Arum idaeum Gand.	(I)			
ARISTOLOCHIACEAE				
Aristolochia hirta L.	(R)			
BERBERIDACEAE				
Bongardia chrysogonum (L.) Griseb.	(E)			
BORAGINACEAE				
# Alkanna sieberi DC.	(R)	*		
# Lithospermum goulandriorum Rech.	(R)	*		
# Onosma euboica Rech.	(R)	*		
# Onosma leptantha Heldr.	(R)	*		
# Rindera graeca (A.DC.) Boiss. & Heldr.	(R)	*		
CARYOPHYLLACEAE				
Minuartia greuteriana Kamari	(R)			
# Silene niederi Heldr. ex Boiss.	(R)	*		
# Silene pentelica Boiss.	(R)	*		
Silene echinospermoides Huber-Mor.	(R)	*		
# Silene oligantha Boiss.& Heldr. ssp. oligantha	(R)			
# Silene pinetorum Boiss.& Heldr.	(R)	*		
COMPOSITAE or ASTERACEAE	(R)			
# Crepis athoa Boiss.	(R)	*		
# Crepis merxmuelleri Kamari & Hartvig	(V)			
# Scorzonera serpentinica Rech.	(R)	*		
CRUCIFERAE or BRASSICACEAE				
# Alyssum fallacinum Hausskn.	(R)	*		
# Aubrieta erubescens Griseb.	(R)	*		
Erysimum rhodium Snogerup	(R)			
Hesperis theophrasti Borbas	(R)			
# Hesperis verroiana Dvorak	(R)			

CYPERACEAE					
# *Carex cretica Gradstein & Kern*	(V)				
EUPHORBIACEAE					
Euphorbia hicrosolymitana Boiss.	(E)				
FABACEAE ή LEGUMINOSAE					
# *Colutea insularis Browicz*	(I)	*			
# *Lathyrus neurolobus Boiss. & Heldr.*	(R)	*			
# *Ononis verae Sirj.*	(R)				
GERANIACEAE					
Biebersteinia orphanidis Boiss.	(E)	*			
GRAMINEAE or POACEAE					
Aegilops umbellatula Zhuk.	(R)				
# GLOBULARIACEAE					
Globularia stygia Boiss.	(V)	*	*		
GRAMINEAE or POACEAE					
Cutandia stenostachya (Boiss.) Stace	(R)				
LABIATAE					
Phlomis bourgaei Boiss.	(R)				
LILIACEAE					
# *Allium guttatum Steven ssp. dilatatum Zahar.*	(R)				
Allium junceum Sm. ssp. junceum	(R)				
Fritillaria carica Rix	(R)				
# *Fritillaria epirotica Turrill ex Rix*	(R)	*			
# *Fritillaria euboica Rix*	(R)	*			
Fritillaria gussichiae (Degen & Dorfler) Rix.	(R)				
Fritillaria rhodocanakis Orph. Ex Baker	(V)	*			
# *?Fritillaria thessala (Boiss.) Kamari ssp. ionica (Halacsy) Kamari*	(?)				
# *Hyacinthella atchleyi (A.K. Jackson & Turrill) Feinbr.*	(R)	*			
Ornithogalum atticum Boiss. & Heldr.	(R)				
ORCHIDACEAE					
Coeloglossum viride (L.) Hartmann					*
Ophrys epirotica (Renz) J.& P. Devillers-Terschuren					*
# *Ophrys aesculapii Renz*	(R)				
# *Ophrys argolica H. Fleischm.*	(V)				
# *Ophrys gottfriediana Renz*	(R)				
Ophrys grammica (B.&E.Willing) J.& P.Devill.-Tersch.					*
Ophrys iricolor Desf.					*
Ophrys israelitica H. Baumman & Kunkele					*
Ophrys levantina Golz & Reinhard					*
Ophrys melena (Renz) Paulus, C.& Gack					*
Ophrys mesaritica Paulus, C.& A. Alibertis					*
Ophrys omegaifera H. Fleischm.					*
Ophrys strausii Fleischm. & Bornm.					*
Ophrys reincholdii Spruner ex Fleischm.					*
Ophrys candica Greuter, Matthas & Risse	(?)				
Orchis provincialis Balbis	(?)				
Orchis purpurea Hudson					*
Orchis militaris L					*
Orchis pallens L	(?)				
Orchis spitzelii Sauter ex Koch	(?)				
Orchis prisca Hautzinger	(V)	*			
Orchis punctulata Steven ex Lindley	(E)				
PAPAVERACEAE					
Corydalis integra Barbey & Mayor	(R)				
PRIMULACEAE					
Soldanella pelia Raus	(V)				
Cyclamen persicum Miller	(V)	*			
ROSACEAE					
X Malosorbus florentina (Zuccagni) Browicz	(V)	*			
RUBIACEAEAE					
# *Asperula baenitzii Heldr.ex Boiss*	(V)	*			
SALICACEAE					
Salix xanthicola K.I. Christensen	(R)				
SCROPHULARIACEAE					
Lesquereuxia syriaca Boiss.	(V)				
Rhinanthus pindicus (Steneek) Soo	(R)	*			
# *Verbascum aphentulium Heldr*	(R)				
Verbascum symes Murb.&Rech.	(R)	*			
ULMACEAE					
# *Zelkova abelicea (Lam.)Boiss.*	(V)	*	*		
VIOLACEAE					
# *Viola athois W. Becker*	(V)	*			
# *Viola cretica Boiss. & Heldr.*	(R)	*			

Abbreviations:

Group A: Widespread losses, rapidly declining populations, many national extinctions, high level concern for their preservation.

Group B: Widespread losses, evidence of steady decline, some national extinctions, medium level concern for their preservation.

Group C: Widespread but scattered populations, few extinctions, lower level concern for their p-reservation.

Group D: Local losses, some extinctions but mainly at edge of geographical range.

The incorporation of Greek mycetes species into one of the mentioned Categories of Vulnerability according to the IUCN Red Data of Endangered Macrofungi in Europe, is noted by the letters A or B or C or D (in parenthesis).

MYCETES (Basidiomycetes - Ascomycetes - Myxomycetes)

I) Rare and Uncommon fungi of Greece (DIAMANDIS 1993)	**ING (1993)**
Ia) BASIDIOMYCETES	
AGARICACEAE	
Agaricus sylvaticus Schaeff. Ex Secr.	
AMANITACEAE	
Amanita echinocephala (Vitt.) Quel.	
Amanita ovoidea (Bull. Ex Fr.) Quel.	
Amanita phalloides (Vail. Ex Fr.) Secr.	
Amanita solitaria (Bull. Ex Fr.) Secr.	
Amanita virosa Secr. (Rare)	
AURICULARIACEAE	
Auricularia auricula-judae (Bull. ex St. Amans)Berk.	
Auricularia mesdenterica (Dicks.)Pers.	
ENTOLOMATACEAE	
Entoloma sinuatum (Fr.) Kummer	
GOMPHIDIACEAE	
Chroogomphus rutilus (Fr.)Miller	
PAXILLACEAE	
Paxillus involutus (Batsch ex Fr.)Fr.	
RUSSULLACEAE	
Lactarius chrysorrheus Fr.	
Lactarius circellatus Fr.	
Lactarius mitissimus (Fr.)Fr.	
Lactarius pubescens (Fr.ex Krombh.)Fr.	
Lactarius quietus (Fr.)Fr.	
Lactarius rufus (Scop.ex Fr.) Fr.	
Lactarius zonarius (Bull. ex St. Amans)Fr.	
Russula brunneoviolacea Crawsh.	
Russula foetens (Pers. Ex Fr.)Fr.	
Russula heterophylla (Fr.)Fr.	
Russula maculata Quel.et Roz.	
Russula sanguinea (Bull. ex St. Amans)	
Russula turki Bres.	
TRICHOLOMATACEAE	
Clitocybe cyathiformis (Bull.ex Fr.)Kummer	
Clitocybe vibecina (Fr.)Quel.	
Clitocybe rivulosa (Pers. Ex Fr.) Kummer	
Lentinellus ursinus (Fr.)Kuhn. ----------	(C)
Lentinellus vulpinus (Fr.)Kuhn. & Maire ----------	(C)
Leucopaxilus giganteus (Sow. Ex Fr.) Sing	
Omphalotus olearius (D.C. ex Fr.) Singer ----------	(C)
Oudemansiella mucida (Schrad. Ex Fr.)Hohn.	
Tricholoma albobrunneum (Pers. Ex Fr.) Kummer	
Tricholoma argyraceum (Bull. ex St.Amans) Gillet	
Tricholoma atrosquamosum (Chev.) Sacc.	
Tricholoma aurantium (Fr.) Ricken ----------	(B)
Tricholoma caligatum (Viv.) Ricken	
Tricholoma columbetta (Fr.) Kummer	
Tricholoma populinum Lge	
Tricholoma squarrulosum Bres. ----------	(C)
Tricholoma senjuctum (Sow. Ex Fr.) Quel. ----------	(C)
Tricholoma ustaloides Romagn.	
Tricholoma vaccinium (Peers ex Fr.) Kummer	
Xeromphalina campanella (Batsh ex Fr.)Kuhn. et Maire	
Mycena aetites (Fr.)Quel.	
Mycena crocata (Schrad. ex Fr.) Kummer	
Mycena fibula (Bull. ex Fr.) Kuhner	
Mycena filopes (Bull. ex Fr.) Kummer	
Mycena galericulata (Scop. ex Fr.) S.F. Gray	
Mycena galopus (Pers. ex Fr.) Kummer	
Mycena haematopus (Pers. ex Fr.) Kummer	
Mycena inclinata (Fr.)Quel.	
Mycena olida Bres.	
Mycena praecox Vel.	
Marasmius androsaceus (L. ex Fr.) Fr.	
Marasmius epiphyllus (Pers. ex Fr.)Fr.	
Marasmius ramealis (Bull. ex Fr.) Fr.	
Laccaria amethystea (Bull. ex Merat) Murr.	
Laccaria tortilis ((Bolt.) S.F.Gray)Cooke	
Collybia butyracea (Bull. ex Fr.)Kummer	
Collybia cirrhata (Pers.)Kummer	
Collybia confluens (Pers. ex Fr.)Kummer	
Collybia dryophylla (Bull. ex Fr.) Kummer	
Collybia maculata (Alb.&Schw. Ex Fr.)	
Collybia tuberosa (Bull. ex Fr.)Kummer	
Micromphale brassicolens (Romagn.) Orton	
Strobilurus tenacellus (Pers.ex Fr.) Sing.	
Baeospora myosura (Fr. ex Fr.) Spring.	
Panus tigrinus (Bull. ex Fr.) Sing.	
Pleurotus acerosus (Fr.)Konrad & Maubl	
Pleurotus cornucopiae (Paul. ex Pers.) Rolland	
Pleurotus lignatilis(Pers. ex Fr.)Kummer	
Hypsizygus tessulatus (Bull.ex Fr.) Sing	
Lentinus lepideus (Fr.ex Fr.)Fr.	
Calocybe cerina (Pers.ex Fr.)Donk.	
CORTINARIACEAE	
Cortinarius amonoenolens R.Henry	
Cortinarius cinnmomeobadius Hry.	
Cortinarius cinnaamomeus (L.ex Fr.)Fr.	
Cortinarius lepidopus (Cke.)Kuhn. Romagn.	
Cortinarius melinus Britz.	
Cortinarius melliolens Schaeff.	
Cortinarius phoeniceus (Bull.)Maire	
Cortinarius prasinus Fr. ss. Koner.& Maubl.	
Cortinarius salor Fr.	
Cortinarius semisanguineus (Fr.)Gillet	
Cortinarius subfulgens Orton	
Cortinarius traganus (Weinm. ex Fr.)Fr.	
Inocybe eutheles (Berk. & Br.) Quel.	
Inocybe petiginosa (Fr. ex Fr.) Gillet	
Galerina marginata (Fr.)Kuhn.	
Galerina mycenopsis (Fr.)Kuchner	
Gymnopilus penetrans (Fr. ex Fr.)Murr.	
Hebeloma sinapizans (Paulet ex Fr.) Gillet	
CONIOPHORACEAE	
Leucogyrophana pseudomollusca (Parm.)Parm.	

COPRINACEAE	
Coprinus atramentarius (Bull. ex Fr.) Fr.	
Coprinus disseminatus (Pers. ex Fr.)S.F.Gray	
Coprinus leiocephalus Orton	
Coprinus micaceus (Bull. ex Fr.) Fr.	
Coprinus picaceus (Bull. Ex Fr.) S.F.Grey	
Psathyrella marcescibilis (Bridge.)Sing	
Psathyrella multipedata Peck.	
Psathyrella spintrigera (Fr.)Koner. & Maubl.	
CORTICIACEAE	
Peniophora incarnata (Pers. ex Fr.)Karst.	
Phanerochaete velutina (Fr.)Karst.	
Phlebia radiata Fr.	
Phlebia rufa (Fr.)Christ.	
Pulcherricium caeruleum (Pers.)Parm. ----------	(C)
CYPHELLACEAE	
Henningsomyces candidus (Pers. ex Schleich.)O.Kuntze	
HYMENOCHAETACEAE	
Onnia tomentosa (Fr.)Karst. ----------	(B)
NIDULARIACEAE	
Cyathus striatus Huds. ex Pers	
SPHAEROBOLACEAE	
Sphaerobolus stellatus Tode ex Pers.	
STROPHARIACEAE	
Stropharia aeruginosa (Curt. ex Fr.)Quel.	
Pholiota adiposa (Fr.) Kummer	
Pholiota astragallina (Fr.) Sing.	
Pholiota aurivella (Batsh. Ex Fr.) Kummer	
Pholiota flammans (Fr.) Kummer	
Pholiota squarrosa (Mull. Ex Fr.)Kummer	
TREMELLACEAE	
Tremella foliacea Pers. ex Fr.	
Exidia saccharina Alb. et Schw. ex Fr.	
HYGROPHORACEAE	
Hygrogybe strangulata Orton	
Hygrophorus chrysaspis Metr.	
Hygrophorus camarophyllus (Fr.)Dumee ----------	(C)
Hygrophorus cossus (Sow ex Berk.)Fr.	
Hygrophorus dichrous Kuhn. & Romagn.	
Hygrophorus eburneus (Bull. ex Fr.) Fr.	
Hygrophorus hypothejus (Fr. ex Fr.)Fr. ----------	(C)
Hygrophorus marzuolus (Fr.)Bres.----------	(D)
Hygrophorus pudorinus (Fr.)Fr. ----------	(B)
Hygrophorus russula (Fr.) Quel. ----------	(B)
Hygrophoropsis aurantiaca (Wulf. ex Fr.)Maire	
PLUTEACEAE	
Pluteus atromarginatus (Konr.)Kuhn.	
Pluteus cervinus (Schaeff. ex Fr.)Kummer	
BOLBITIACEAE	
Agrocybe cylindracea (DC. Ex Fr.)Maire	
Agrocybe dura (Bolt. ex Fr.) Kummer	
BOLETACEAE	
Boletus appendiculatus Schaeff. ex Fr. ----------	(C)
Boletus erythropus (Fr. ex Fr.)Secr.	
Boletus impolitus Fr. ----------	(B)
Boletus luridus Schaeff.	
Boletus pinicola (Vitt.)Venturi	
Boletus pulverulentus Opat.	
Boletus queletii Schulz. ----------	(B)
Boletus subtomentosus L. ex Fr.	
Boletus versicolor Rostk.	
Suillus luteus (Fr.) S.F.Gray.	
Suillus variegatus (Fr.)O.Kuntze	
CANTHARELLACEAE	
Cantharellus ferruginascens Orton	
Cantharellus lutescens Fr.	
Craterellus cornucopioides (L. ex Fr.)Pers.	
CLAVARIACEAE	
Clavariadelphus fistulosus (Fr.)Corner	
Clavariadelphus junceus (Fr.)Donk.	
Clavariadelphus pistillaris (Fr.)Donk.	
Clavariadelphus truncatus (Quel.)Donk. ----------	(D)
Clavulina cinerea (Fr.)Schroet.	
Clavulina cristata (Fr.)Schroet.	
Clavulina rugosa (Fr.)Schroet.	
Clavulinopsis subtilis (Fr.)Corner	
Ramaria botrytis (Fr.)Rick. ----------	(C)
Ramaria flava (Fr.)Quel.	
Ramaria flavobrunnescens (Akt.)Corner	
Ramaria pallida (Schaeff. ex Schulzer)Ricken	
Ramaria myceliosa (Peck.)Corner	
Sparassis crispa Wulf. ex Fr.	
Thelephora spiculosa (Fr.)Burt.	
Thelephora terrestris (Ehrh.)Fr.	
Typhula erythropus Pers. ex Fr.	
POLYPORACEAE	
Albatrellus cristatus (Pers. ex Fr.) Kotl. & Pouz.	
Albatrellus pes-caprae (Pers. ex Fr.) Pouzar ----------	(D)
Antrodia serialis (Fr.)Donk	
Aurantioporus croceus (Pers. ex Fr.)Murril	
Climacocystis borealis (Fr.)Kotl. & Pouz.	
Fistulina hepatica Schaeff. ex Fr.	
Ganoderma lucidum (Curt. ex Fr.)Karst.	
Gloeophyllum abietinum Fr. ex Fr.	
Hapalopilus nidulans (Fr.)Karst.	
Heterobasidion annosum (Fr.)Bref.	
Meripilus giganteus (Pers. ex Fr.)Karst.	
Phaeolus schweinitzii (Fr.)Pat.	
Phellinus laevigatus (Fr.)Bourd. & Galz.	
Phellinus robustus (Karst.)Bourd. & Galz.	
Phellinus torulosus Pers.	
Polyporus arcularius Batsch. ex Fr.	
Polyporus brumalis Pers. ex Fr.	
Polyporus ciliatus Fr. ex Fr.	
Pycnoporus cinnabarinus (Jacq. ex Fr.)Karst.	
Polyporus lentus Berk.	
Polyporus squamosus Huds ex Fr.	
Inonotus tamaricis (Pat.)Maire	
Rigidoporus ulmarius (Sow. ex Fr.)Gillet	
Tuber aestivum Vitt.	
Tyromyces caesius (Schraed. ex Fr.)Murr.	
Trichaptum fusco-violaceum (Ehrenb. ex Fr.)Ryv.	
Tyromyces stipticus (Pers. ex Fr.)Kotl. & Pouz.	
STEREACEAE	
Stereum gausapatum (Fr.)Fr.	
Stereum ochraceo-flavum (Schw.)Ellis	
Stereum purpureum Fr. ex Fr.	
HYDNACEAE	
Auriscalpium vulgare S.F.Gray	
Hericium coralloides (Scop. ex Fr.)Pers.	
Hericium erinaceus (Fr.) Pers. ----------	(B)
Hydnum repandum Fr.	
Hydnum rufescens Fr.	
THELEPHORACEAE	
Hydnellum aurantiacum (Fr.)Karst. ----------	(B)
Hydnellum ferrugineum (Fr. ex Fr.) Karst. ----------	(A)
Hydnellum scrobiculatum (Fr. ex Secr.)Karst. ---------	(B)
Hydnellum suaveolens (Fr.)Karst.	
Hydnellum caeruleum (Horn ex Pers.)Karst.----------	(B)
Steccherinum ochraceum (Pers. ex Fr.)S.F. Gray	
TREMELLACEAE	
Pseudohydnum gelatinosum (Scop. ex Fr.)Karst.	
CLATHRACEAE	
Clathrus ruber Mich. ex Pers.	
PHALLACEAE	
Mutinus caninus (Pers.)Fr. ----------	(C)
Phallus impudicus Pers.	
GEASTRACEAE	
Geastrum sessile (Sow.)Pouz.	
Geastrum triplex Jungh. ----------	(D)
Myriostoma coliformis (With. ex Pers.)Corda	
LYCOPERDACEAE	
Lycoperdon echinatus Pers. ex Pers.	
Lycoperdon pyriforme Schaeff. ex Pers.	

Ib) ASCOMYCETES	
DERMATIACEAE	
Chlorosplenium aeruginascens (Nyl.)Karst.	
GEOGLOSSACEAE	
Mitrula paludosa Fr.	
HELOTIACEAE	
Bulgaria inquinans Fr.	
HYPOCREACEAE	
Zeus olympius Minter & Diamandis	
HELVELLACEAE	
Discina perlata (Fr.)Fr.	
Gyromitra infula (Schaeff. ex Pers.)Quel.	
Leptopodia elastica (Bull. ex St. Amans)Boud.	
HUMARIACEAE	
Sepultaria sumneriana (Cke)Massee	
STICTIDACEAE	
Vibrissea trunctorum Fr.	
PEZIZACEAE	
Otidea alutacea (Pers.)Massee	
Otidea bufonia (Pers.)Boud.	
Peziza arvernensis Boud.	
Peziza micropus Pers.	
Peziza succosa Berk.	
Sowerbyella imperialis (Peck)Korf.	
SARCOSCYPHACEAE	
Sarcoscypha coccinea (Fr.)Lamb.	
HYPOCREACEAE	
Hypocrea rufa (Pers. ex Fr.)Fr.	
XYLARIACEAE	
Hypoxylon multiforme (Fr.)Fr.	
Hypoxylon serpens (Pers.ex Fr.)Fr.	
Ustulina decusta (Fr.)Petrak	
Xylaria polymorpha (Pers. ex Mer.)Grev.	

Ic) MYXOMYCETES	
TRICHIACEAE	
Arcyria incarnata (Pers.)Pers.	
CERATIOMYXACEAE	
Ceratiomyxa fruticulosa (Mull.)Macbr.	
RETICULARIACEAE	
Reticularia lycoperdon	
Tubifera ferruginosa (Batsch.)Gmelin.	
STEMONITACEAE	
Stemonites axifera (Bull.)Macbr.	
PHYSACACEAE	
Leocarpus fragilis (Dicks.)Rost.	

II) Rare and Uncommon fungi present in forests and other ecotypes of Greece (DIAMANDIS 1993)	

IIa) BASIDIOMYCETES	
AGARICACEAE	
Agaricus angustus (Fr.)Quel.	
Lepiota clypeoloaria (Bull. Ex Fr.) Kummer	
Lepiota cristata (A.& S. ex Fr.) Kummer	
Lepiota excoriata (Schaeff. Ex Fr.) Kummer	
BOLBITIACEAE	
Bolbitius vitellinus (Pers. ex Fr.) Fr.	
Conocybe pseudopilosela (Kuhn.)Kuhn. & Romagn.	
LYCOPERDACEAE	
Bovista nigrescens Pers. ex Pers.	
Bovista plumbea Pers. ex Pers.	
RUSSULLACEAE	
Lactarius controversus (Fr.ex Fr.) Fr. ----------	(C)
SCLERODERMATACEAE	
Scleroderma areolatum Ehr.	
Scleroderma bovista Fr.	
Scleroderma geaster Fr.	
Scleroderma verrucosum (Bull.)Pers.	
TRICHOLOMATACEAE	
Clitocybe geotropa (Bull. ex Fr.) Quel.	
Clitocybe olearia (Fr.ex D.C.) Maire	
Lyophyllum connatum (Schum.ex Fr.) Sing.	
Lyophyllum decastes (Fr.ex Fr.)Sing.	
Omphallina ericetorum (Fr.ex Fr.) Quel.	
Omphallina galericolor Romagn.	
CORTINARIACEAE	
Cortinarius multiformis (Fr.)Fr.	
Inocybe perlata (Cke.)Sacc.	
COPRINACEAE	
Coprinus lagopus (Fr.) Fr.	
HYGROPHORACEAE	
Hygrocybe nigrescens (Quell.) Kuhn.	
Hygrophorus coccineus (Fr.)Fr. sensu Rick	
ENTOLOMATACEAE	
Nolanea hirtipes (Schum. ex Fr.) Kummer	
NIDULARIACEAE	
Cyathus olla Batsch. ex Pers.	
Cyathus stercoreus (Schw.)de Toni ----------	(C)
PAXILLACEAE	
Paxillus panuoides (Fr.)Fr.	

IIb) ASCOMYCETES	
HELVELLACEAE	
Helvella lacunosa Afz. ex Fr.	
Paxina acetabulum (L. ex St. Amans)O.Kuntze	
HUMARIACEAE	
Melastiza chateri (W.G. Smith)Boud.	

III) Rare and Uncommon fumgi occasionally present in forests of Greece (DIAMANDIS 1993)	
AGARICACEAE	
Agaricus bernardii (Quel) Sacc.	
Lepiota rhacodes var. hortensis Pilat	
Cystolepiota adulterina (Moell.) Bon.	
CLAVARIACEAE	
Clavaria acuta Fr.	
LYCOPERDACEAE	
Langermannia gigantea (Batsch. ex Pers.)Rostkov.	
Lycoperdon excipuliformis Schaeff. ex Pers.	
Lycoperdon spadiceum Pers.	
POLYPORACEAE	
Phellinus tuberculosus (Baumg.) Niemela	
TRICHOLOMATACEAE	
Omphallina griseopallida (Desm.)Quel.	
Omphallina postii (Fr.) Sing.	
Mycena acicula (Schaeff. ex Fr.)Kummer	
COPRINACEAE	
Coprinus congregatus (Bull. ex St. Amans) Fr.	
Coprinus niveus (Pers.ex Fr.) Fr.	
Coprinus plicatilis (W.Curtis ex Fr.)Fr.	
Coprinus radians (Desm.) Fr.	
Coprinus velox God. ex Lge	
Psathyrella candolleana (Fr.) Maire	
Psathyrella prona (Fr.) Gillet	
Panaeolus rickenii Chora	
Panaeolus sphinctrinus (Fr.) Quel.	
STROPHARIACEAE	
Psilocybe coprophyla (Bull. ex Fr.)Kummer	
Psilocybe crobullus (Fr.)Kuhn & Romagn.	
HYGROPHORACEAE	
Hygrocybe nivea (Scop.) Fr.	

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Source:
Dr P. Dimopoulos, Section of Botany, Biology Department, University of Athens.

APPENDIX IV

List of threatened vertebrate species

Red Data Book Categories of Greece:

R:	Rare
V:	Vulnerable
E:	Endangered
I:	Indeterminate
K:	Insufficiently known
E1:	Immediate danger
E2:	Non-Immediate danger

Species present in forest environments	
A1 Mammals	
Rhinolophus euryale	E
Eptesicus serotinus	E
Myotis daubentoni	E
Myotis myotis	E
Myotis mystacinus	E
Myotis nattereri	E
Nyctalus lasiopterus	E
Nyctalus leisleri	E
Nyctalus noctula	E
Pipistrellus nathusii	E
Plecotus auritus	E
Plecotus austriacus	E
Ursus arctos	E
Felis silvestris	E
Lynx lynx	(E)
Cervus elaphus	E
Myotis blythi	V
Glis glis	(V)
Canis lupus	V
Capreolus capreolus	V
Dama dama	V
Rhinolophus ferrumquinum	V
Rhinolophus hiposideros	V
Myotis bechsteini	R
Barbastella barbastellus	R
Dryomys nitedula	R
Sciurus vulgaris	
Muscardinus avellanarius	
Clethrionomys glareolus	
Martes martes	
Sus scrofa	
A2 Birds	
Ciconia nigra	E2
Tetrao urogallus	R
Aegolius funereus	R
Picus canus	R
Dendrocopos leucotos	R
Picoides tridactylus	R
Turdus torquatus	R
Bonasa bonasia	I
Accipiter gentilis	
Tetrao tetrix	
Bubo bubo	
Glaucidium passerinum	
Strix aluco	
Jynx torquilla	
Picus viridis	
Dryocopus martius	
Dendrocopos major	
Dendrocopos syriacus	
Dendrocopos medius	
Dendrocopos minor	
Turdus viscivorus	
Phylloscopus bonnelli	
Phylloscopus sibilatrix	
Regulus regulus	
Regulus ignicapillus	
Aegithalos caudatus	
Parus palustris	
Parus ater	
Sitta europaea	
Certhia familiaris	
Nucifraga caryocatactes	
Loxia curvirostra	
Pyrrhula pyrrhula	
Coccothraustes coccothraustes	

Species equally present in forest and open environments	
A1 Mammals	
Pipistellus pipistrellus	E
Pipistrellus savii	E
Vespertilio murinus	E
Cricetulus migratorius	E
Sciurus anomalus	V
Pipistrellus kuhli	V
Meles meles	(V)
Crocidura lasia	R
Nycteris thebaica	R
Talpa caeca	R
Talpa europaea	R
Talpa romana	R
Neomys anomalus	R
Vormela peregusna	R
Erinaceus concolor	
Crocidura leuucodon	
Crocidura russula	
Crocidura suaveolens	
Neomys fodiens	
Sorex minutus	
Sorex araneus	
Lepus europaeus	
Apodemus mystacinus	
Apodemus sylvaticus	
Apodemus flavicollis	
Vulpes vulpes	
Mustela nivalis	
Mustala putorius	
Martes foina	
A2 Birds	
Haliaeetus albicilla	E1
Aegypius monachus	E1
Aquila heliaca	E1

Aquila clanga	E2
Aquila pomarina	V
Aquila chrysaetos	V
Hieraaetus pennatus	V
Falco biarmicus	V
Columba oenas	R
Clamator glandarius	R
Ficedula semitorquata	R
Falco cherrug	I
Pernis apivorus	
Milvus milvus	
Circaetus gallicus	
Accipiter nisus	
Accipiter brevipes	
Buteo buteo	
Falco subbuteo	
Scolopax rusticola	
Columba palumbus	
Streptopelia turtur	
Cutulus canorus	
Otus scops	
Athene noctua	
Asio otus	
Troglodytes troglodytes	

Prunella modularis	
Prunella collaris	
Erithacus rubecula	
Luscinia megarhynchos	
Turdus merula	
Turdus pilaris	
Turdus philomelos	
Turdus iliacus	
Sylvia cantillans	
Sylvia curruca	
Sylvia atricapilla	
Phylloscopus collybita	
Muscicapa striata	
Ficedula parva	
Ficedula albicollis	
Ficedula hypoleuca	
Parus lugubris	
Parus caeruleus	
Parus major	
Certhia brachydactyla	
Garrulus glandarius	
Fringilla coelebs	
Carduelis spinus	

Species occasionally present in forest environments	
Columba livia	
Tyto alba	
Caprimulgus europaeus	
Upupa epops	
Lullula arborea	
Anthus trivialis	
Cercotrichas gelactotes	
Hippolais pallida	
Hippolais olivetorum	
Sylvia melanocephala	
Sylvia hortensis	
Sylvia borin	
Phylloscopus trochilus	
Serinus serinus	
Carduelis chloris	
Carduelis carduelis	
Emberiza hortulana	

A1 Mammals	
Myotis emarginatus	E
Capra aegagrus	E
Canis aureus	V
Lutra lutra	V
Rupicapra rupicapra	R
Microtus nivalis	
Apodemus agrarius	
A2 Birds	
Milvus migrans	E1
Phasianus colchicus	V
Coracias garrulus	V
Buteo rufinus	R
Falco peregrinus	K
Buteo lagopus	
Falco tinnunculus	
Falco eleonorae	
Alectoris graeca	

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Source:

Dr A. Sfouggaris, University of Thessaly,

Department of Agriculture, Plant and Animal Production

APPENDIX V

List of threatened invertebrate species

Documentation of threats:

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- B. Presidential Decree 67/1981.
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- D. IUCN Conservation Monitoring Centre 1996. - 1996 IUCN Red List of Threatened Animals.
- E. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973.
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I, II, III, IV, V: Corresponding Appendices -(Appendices- for Directives, Conventions)

I, II, III, IV, V: Corresponding Appendices -(Appendices- for Directives, Conventions)

Categories of threats:

E: Endangered species
V: Vulnerable species
R: Rare species
I: Indeterminate status of species
K: Insufficiently known
Rev: Threatened, but under revision by IUCN
CR: Critically endangered species
EN: Endangered species
VU: Vulnerable species
LR: Low Risk
DD: Insufficiently known
NE: Species Not Evaluated

*: Priority species for E.U.

I. Species present in forest environments

	A	B	C	D	E	F	G	H	I	J	K	L	M
MOLLUSCA													
ARACHNIDA													
ORTHOPTERA													
ODONATA													
TRICHOPTERA													
NEUROPTERA													
MANTOIDEA													
LEPIDOPTERA													
Agrodiaetus (=Neolysandra) coelestinus													V
Agrodiaetus damon													R
Agrodiaetus nephohiptamenos													V
Apatura iris		+				+			+				
Apatura metis	IV		II			+			+		E		
Boloria (=Brenthis) graeca		+											
Boloria (=Brenthis) pales		+											
Brenthis hecate						+			+				
Carcharodus flocciferus													R
Clossiana dia		+											R
Coenonympha leander		+											V
Coenonympha orientalis (=gardetta)													V
Coenonympha rhodopensis													V
Colias aurorina		+											
Colias balcanica (=caucasica)						+							V
Colias phicomone		+											
Cyaniris helena		+											
Elphinstonia charlonia						+			+				V
Erebia cassioides		+											
Erebia euryale													V
Erebia ligea		+											V
Erebia melas		+											
Erebia oeme													V
Erebia triaria		+											
Eriogaster catax	II/IV		II	DD		+	E		+	+	E		
Eumedonia eumedon													R
Euphydryas (=Hypodryas) aurinia	II		II			+			+				V
Euphydryas cynthia		+											
Heodes (=Lycaena) alciphron													R
Kirinia klimene													E
Kretania psylorita		+										+	V
Lasiomatta petropolitana													R
Lysandra philippi													V

Maculinea alcon				LR		+			+		V		V
Maculinea arion	IV		II	LR		+			+		V		R
Melanargia russiae		+											V
Neptis sappho						+			+				E
Parnassius apollo		+	II	VU	II	+			+		R		R
Parnassius mnemosyne	IV	+	II			+			+		Rev		
Polyommatus eros (=menelaos)		+											V
Pseudochazara cingovskii													V
Pseudochazara mamurra (=graeca)		+											
Pyrgus alveus													R
Pyrgus cinarae		+											V
Spialia (=Pyrgus) phlomidis		+											R
Strymonidia (=Fixsenia) pruni		+											R
Strymonidia (=Satyrium) w-album													V
Thecla betulae													V
Thersamonia thetis		+											E
Turanana panagaea		+				+			+				E
Vacciniina optilete		+				+							
COLEOPTERA													
Aesalus scarabaeoides								+	+				
Agrilus ater								+					
Ampedus cardinalis								+					
Ampedus nigerrimus								+					
Buprestis haemorrhoidalis								+					
Buprestis octoguttata								+					
Buprestis splendens	II/IV		II	VU		+	E	+	+	+	E		
Cerambyx cerdo	II/IV		II	VU		+	E	+	+	+	E		
Chalcophora mariana								+					
Chrysomela gypsophilae		+											
Dicerca aenea								+					
Dicerca alni								+					
Dicerca herbsti								+					
Dicerca moesta								+					
Eupotosia koenigi								+					
Eurythyrea austriaca								+					
Eurythyrea quercus								+					
Gnorimus octopunctatus								+					
Kisanthobia ariasi								+					
Lampra festiva								+					
Lucanus cervus	II		III						+				
Morimus funereus	II			VU		+	E	+	+	+	E		
Necydalis ulmi								+					
Oxypleurus nodieri								+		+			
Prinobius scutellaris								+					
Rhamnusium bicolor								+					
Rhopalopus insubricus								+	+	+			
Rhysodes sulcatus								+	+	+			
Rosalia alpina	*II/IV	+	II	VU		+	E		+	+	E		
HYMENOPTERA													

Formica lugubris				LR		+	V		+		V		
Formica pratensis				LR		+	V		+		V		
Formica rufa				LR		+	V		+		V		
DIPTERA														
Ctenophora elegans								+						
Ctenophora festiva								+	+	+				
Ctenophora ornata								+						
Milesia semiluctifera								+						

II. **Species equally present in forest and open environments**

	A	B	C	D	E	F	G	H	I	J	K	L	M
MOLLUSCA													
Acicula hausdorfi				DD									
Codringtonia acarnanica				LR									
Codringtonia codringtonia				LR									
Helix godetiana		+		LR								+	
Helix pomatia	V		III			+	V		+		R		
Platyla peloponnesica				DD									
Vallonia enniensis				DD									
Zonites spp.		+											
ARACHNIDA													
Eresus niger									+				
Macrothele cretica				DD					+		I		
ORTHOPTERA													
Dolichopoda cassagnaui		+										+	
Dolichopoda graeca		+										+	
Dolichopoda hussoni		+										+	
Dolichopoda insignis		+										+	
Dolichopoda naxia		+										+	
Dolichopoda patrizii		+										+	
Dolichopoda petrochilosi		+										+	
Dolichopoda remyi		+										+	
Dolichopoda thasosensis		+										+	
Dolichopoda unicolor		+										+	
Dolichopoda vandeli		+											
ODONATA													
Anax imperator		+											
Boyeria irene						+			+				+
Coenagrion ornatum									+				+
Cordulegaster charpentieri													+

Cordulegaster heros						+			+				+
Cordulegaster insignis													+
Epallage fatima													+
Gomphus schneiderii													+
Gomphus vulgatissimus						+			+				+
Hemianax ephippiger		+											
Lindenia tetraphylla	II/IV		II			+			+	+			+
Ophiogomphus cecilia	II/IV		II			+	E		+	+	E		+
Orthetrum chrysostigma													+
Platycnemis pennipes													+
Pyrrhosoma nymphula													+
Somatochlora flavomaculata						+							+
Stylurus (=Gomphus) flavipes	IV		II				E		+		I		+
Sympetrum depressiusculum									+				+
Trithemis festiva													+
TRICHOPTERA													
Adicella dionisos									+	+			
Ceraclea riparia									+	+			
Ernodes articularis									+	+			
Rhyacophila polonica									+	+			
Tinodes megalopompos									+	+			
Tinodes pallidulus									+	+			
Tinodes peteressli									+	+			
Wormaldia subnigra									+	+			
NEUROPTERA													
Distoleon tetragrammicus									+		K		
Libelloides macaronius									+		K		
Myrmeleon formicarius									+		K		
MANTOIDEA													
Bolivaria brachyptera									+		V		
Empusa fasciata									+		V		
LEPIDOPTERA													
Agrodiaetus iphigenia													E
Agrodiaetus nonacriensis (=iphigenia)													E
Anthocharis gruneri		+											
Apatura ilia		+				+			+				R
Callimorpha (=Euplagia) quadripunctaria	*II								+				
Charaxes jasius		+											
Colias hyale (=alfacariensis)		+											
Erebia ottomana		+		NE					+		R		
Erynnis marloyi													R
Everes alcetas													R
Everes decoloratus													R
Freyeria trochylus		+											R

Gegenes nostrodamus													R
Gonepteryx rhamni		+											
Hamearis lucina													R
Heliothis nubigera katerinae		+											
Hipparchia aristaeus		+											
Iolana iolas													R
Leptidea duponcheli		+											
Lycaeides argyrognomon									+		Rev		R
Lycaena dispar	II/IV		II	LR		+	E		+	+	E		E
Melitaea arduina													V
Muschampia (=Syrichtus) tessellum		+		NE		+			+		K		V
Nymphalis xanthomelas													E
Papilio alexanor	IV	+	II			+			+		Rev		R
Philotes bavius		+							+				E
Pieris ergane		+				+			+				
Pieris krueperi		+											R
Plebejus pylaon (=sephirus)						+			+				R
Polyommatus eroides													R
Proserpinus proserpina	IV		II	DD		+	V		+		V		
Pseudochazara amymone													E
Saturnia pyri									+		E		
Scolitantides orion						+			+				R
Thymelicus hamza		+											
Zerynthia polyxena	IV	+	II			+			+		Rev		
COLEOPTERA													
Calosoma sycophanta						+	V		+		V		
Carabus intricatus (=arcadicus)				LR		+	V	+	+		V		
Cardiophorus anticus								+					
Cardiophorus gramineus								+					
Cetonischema aeruginosa								+					
Elater ferrugineus								+					
Lampyris noctiluca		+											
Onthophagus furcatus									+				
Osmoderma eremita	*II/IV		II	VU		+	E	+	+		E		
Raiboscelis azureus		+											+
Temnorhynchus baal								+					
Trichius sexualis													
HYMENOPTERA													
Anergates atratulus				VU									
Camponotus aethiops									+		I		
Camponotus dalmaticus									+		I		
Camponotus fallax									+		I		
Epimyrma adlerzi				VU									
Epimyrma kraussei				VU									
Epimyrma ravouxi				VU					+		R		
Formicoxenus nitidulus				VU									
Liometopum microcephalum									+		R		
Myrmoxenus gordiagini				VU									

Polyergus rufescens									+		I		
Strongylognathus silvestrii				VU									
DIPTERA													

III. Species occasionally present in forest environments

	A	B	C	D	E	F	G	H	I	J	K	L	M
MOLLUSCA													
ARACHNIDA													
ORTHOPTERA													
ODONATA													
TRICHOPTERA													
NEUROPTERA													
MANTOIDEA													
LEPIDOPTERA													
Agrodiaetus admetus		+											
Agrodiaetus ripartii		+											
Allancastria (=Zerynthia) cerysii		+				+			+				R
Anthocharis damone		+											R
Archon apollinus		+		LR		+			+		R		V
Borbo borbonica						+			+				V
Everes argiades													R
Heodes (=Lycaena) ottomanus													E
Hyles hippophaes	IV		II	DD		+	V		+		V		
Pontia chloridice		+				+			+				V
Thersamonia thersamon													R
Zezeeria knysa		+											V
COLEOPTERA													
HYMENOPTERA													
DIPTERA													

Source: Dr S. Sfendourakis, Zoological Museum, Department of Biology, University of Athens

APPENDIX VI

Categories of organised forest recreational areas (Douros 1997)

- **Outdoors recreational areas** are forest areas organised to host more than one forest recreational activity, i.e. wandering areas, picnic areas, playgrounds, Environmental Educational and Awareness Centres, refreshment rooms etc.
- **Picnic areas** are areas organised mainly to serve visitors that wish to have a meal outdoors and remain in the forest for a few hours during daytime.
- **Vantage areas** are areas especially shaped to enable the passer-by or visitor to enjoy the view.
- **Car parking areas** are small areas usually along roads, organised to enable passer-by or visitor to stop to rest, drink water, enjoy the view etc.
- **Playgrounds** are isolated areas organised to facilitate children play.
- **Other areas.** It includes organised camping areas, forest environmental settlements, recreational areas equipped with potable water foundations etc.

List of journals and newspapers with forest and environmental content

a) **Journals**

AGRICULTURAL RESEARCH AND TECHNOLOGY. National Agricultural Research Foundation.
AZIMUTH. Mountain and Sea Friends
AMPHIBIUS. Goulandris Natural History Museum, Greek Biotope Wetland Centre
COMPULSARY LANDINGS. Greek Centre of Nursing Wild Animals and Birds
"ARCHELON". Sea Turtle Protection Club
M.S.P.S BULLETIN. Mediterranean Seal Protection Society
MEDITERRANEAN S.O.S. NETWORK
INFORMATION BULLETIN OF THE HELLENIC SOCIETY. Hellenic Society for the Protection of the Environment and the Cultural Inheritance.
SEAL STORIES. Mediterranean Seal Protection Society.
NEW ECOLOGY: International Institute of Environmental Research
OMEN. Hellenic Ornithological Society
GREENPEACE: Environmental Protection NGO
NATIONAL GEOGRAPHIC MAGAZINE OF GREECE
OXYGEN
"GEORAMA" - EXPERIMENT. Published in Athens
SMALL BEAR. ARKTOUROS
THE FRIENDS OF THE MUSEUM. Goulandris Natural History Museum
ENVIRONMENTAL EDUCATION. Greek Society for Environmental Awareness and Education
FORESTRY PROBLEMS: Greek Foresters' Society
EAR (OF CEREALS). Ecological Movement of Elefsina
ECOTOPE. Published in Thessaloniki
"PRIVATE MADE PUBLIC". Ecological Movement of Thessaloniki
PANDA. World Wild Fund for Nature (WWF - HELLAS)
"GEOTECHNICAL AWARENESS". Geotechnical Chamber of Greece
NATURE. Hellenic Society for the Protection of Nature
MOUNTAIN TOPS. Greek Mountaineering Club of Acharnae

b) **Newspapers**

LOOK-OUT. Ecological Movement of the island Samos
"BYRONIAN VIBRATIONS". Byronian Cultural Club
OAK STAND. Forest Group of Friends and Ecologists of the Prefecture of Phthiotida
EVRO-ECO-LOGIC. Ecological Society of the Prefecture of Evros
ENVIRONMENTAL CORFU. Environmental Protection Club of the Prefecture of Corfu
"EN AETHRIA". Ecological Movement of Patra
"HYMETTUS". Environmental, Ecological and Cultural Club of Papagou "HYMETTUS"
MYCONIAN. Published on the island of Myconos
"FUROGATOS". Ecological Initiative of Chania.

APPENDIX VII

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