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# Contribution of forests and forestry to the mitigation of greenhouse effects in Greece

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In Greece, there is no official inventory for the activity Land Use, Land-Use Change and Forestry. The national forest inventory was completed in 1992. Using the data of this inventory, the carbon store of woody biomass of Greece has been estimated by FAO-TBFRA(2000) as 52.04 Mt C, of which 46.36 Mt C is above stump biomass and 8.67 Mt C is stump and root biomass. The four highest priority mitigation options in the forestry sector in Greece are afforestation and reforestation; forest management improvements; protection of existing forests from forest fires and human pressure and substitution of fossil fuels with sustainably produced biofuel.
**Keywords.** Forest inventory, mitigation measures, Greece.

## 1. INTRODUCTION

In the Second National Communication (NC2) to UNFCCC (1997) Greece reported that for the activity area Land-Use Change and Forestry, there are no sufficient official inventory data to account for $CO_2$ sinks. The national forest inventory of Greece started in 1963 and completed in 1992. About 60% of the land was inventoried from 1963 to 1967, the rest during the period 1975–1985 and the complete inventory was presented in 1992 (Hellenic Republic, 1992).

Using the data of this inventory, the carbon store of woody biomass for Greece has been estimated by UN–ECE;FAO (2000) as 52.04 Mt C, of which 46.36 Mt C is above stump biomass and 8.67 Mt C is stump and root biomass (Reference year 1992). These figures equal to 12.6 Mt C·ha$^{-1}$ for above stump biomass. The carbon balance of woody biomass on forest and other wooded land has been estimated at 0.43 Mt C·y$^{-1}$ (net annual increment 1.32 Mt C·y$^{-1}$ – annual fellings and natural losses 0.89 Mt C·y$^{-1}$). This figure is very rough and does not include releases from burning, emissions and removals from soil, land use change, etc.

An overview of the emissions of the greenhouse gases for the years 1990 to 1995 is presented in **table 1**.

**Table 1.** Greenhouse and other gases emissions (in Kt) for the period 1990–1995.

| | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** |
|---|---|---|---|---|---|---|
| **Carbon dioxide** | **84,575** | **84,303** | **86,429** | **86,946** | **89,005** | **90,492** |
| Energy | 76,834 | 76,642 | 78,722 | 79,015 | 81,289 | 82,426 |
| Industrial Processes | 7,398 | 7,315 | 7,358 | 7,581 | 7,364 | 7,713 |
| Waste | 343 | 346 | 349 | 350 | 352 | 353 |
| **Methane** | **443.027** | **443.985** | **444.544** | **447.597** | **456.628** | **455.608** |
| Agriculture | 272.795 | 272.201 | 270.071 | 271.833 | 278.236 | 275.988 |
| Waste | 111.696 | 112.662 | 113.492 | 114.106 | 114.674 | 114.936 |
| Energy | 58.536 | 59.122 | 60.981 | 61.658 | 63.718 | 64.684 |
| **Nitrous oxide** | **17.286** | **16.827** | **16.893** | **16.602** | **16.685** | **16.884** |
| Agriculture | 8.392 | 8.438 | 8.442 | 8.341 | 8.378 | 8.333 |
| Energy | 6.594 | 6.493 | 6.468 | 6.378 | 6.476 | 6.591 |
| Industrial Processes | 2.300 | 1.896 | 1.983 | 1.883 | 1.831 | 1.960 |
| **Carbon monoxide** | **1,280.010** | **1,359.601** | **1,359.124** | **1,391.640** | **1,427.042** | **1,447.921** |
| **Nitrogen oxides** | **344.081** | **358.113** | **360.989** | **358.940** | **367.436** | **372.603** |
| **NMVOCs** | **262.693** | **274.424** | **288.363** | **303.201** | **331.970** | **338.536** |

Source: (Hellenic Republic, 1992)

## 2. WORKING GROUP 1 RELATED ACTIVITIES (Inventory of C sinks and sources)

Greece has not made an inventory of C pools and changes in C pools in forests, so the aim of Greek participants to COST E21 will be to understand the existing methodologies and their uncertainties in order to be able to compile a national report.

## 3. WORKING GROUP 2 RELATED ACTIVITIES (Analysis of forest management practices)

The four highest priority mitigation options in the forestry sector of Greece are:
- afforestation, reforestation;
- forest management improvements;
- protection of existing forests from forest fires and human pressure;
- substitution of fossil fuels with sustainably produced biofuel.

Below are given the relevant portions from the greek NC2 to UNFCCC:

*"...Although no significant progress is discernible in this very important sector, a number of structural changes and improvements in the Forestry Service have been put in place which are necessary for the implementation of the reforestation programme. Actions to be carried out comprise of:*
- *reforestation with coniferous and deciduous species, giving priority to species resistant to forest fires;*
- *construction and improvement of forest roads;*
- *construction of small-size works in mountainous areas facilitating access to forests;*
- *construction and improvement of buildings used by the Forestry Service for the inspection of forest fires...".*

*"...Regarding the reinforcement of the Forest Resource Control Programme (i.e. the control of forest fires), the implementation of this measure is in progress and it is expected that the trend observed during the last years (i.e. every 3–4 years, forest fires are more than triple the annual average), resulting in a significant loss of forest land will be altered...".*

The average reforestation rate in Greece was reported to be 4,000 $ha \cdot y^{-1}$ for the last 30 years. There are 48 mainly small size state forest nursery with an annual mean production of 16 million seedlings. In the forest management area there is tendency to manage forests for multiple uses, protection of existing semi-natural forests and restoration of degraded wooded lands. Forest fires constitute the main threat to the forests of Greece followed by drought, pests, diseases and land use change. The annual consumption of fuelwood has decreased from 3.75 Mt in 1960 to 1.25 Mt in 1997 due to the use of other fuels. The causes of deforestation range from clearing of forest land for agriculture, mineral extraction, road construction, urban development and hydro-reservoirs to degradation of forests for fuel wood and destructive forest fires.

The major problems for the implementation of mitigation actions in the forestry sector in Greece include:
- unclear land tenure;
- pressures on land available for mitigation activities and existing incentives to clear land for agricultural and livestock production;
- risk of drought, fire, and pests; illegal logging activities;
- inadequate data collection and methods for monitoring and verification of carbon flows.

## 4. PERSPECTIVES AND RESEARCH NEEDS

The Greek government has been committed to the following actions for the mitigation of greenhouse gases, as stated in the NC2 to UNFCCC:
- acceleration of reforestation (36 M€);
- the forest resource control programme (104 M€);
- soil protection (130 M€);
- promotion of biofuel production (25 M€).

More specifically the following two research activities have been foreseen: Study of the rational use of forest resources (150 M€) and The role of forests and agriculture in the $CO_2$ balance (15 M€). The progress of these actions has been slow and the research activities have not been funded until now.

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