

Financing for the protection and development of forests and the forest environment in Greece

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Abstract. This paper investigates the contribution of Greek forestry financing to the conservation, protection and restoration of the country's forest ecosystems and the utilization of available financial resources in the formulation of forestry policy. The structure of national financial resources in the forestry sector and their allocation to the country's forestry services for the implementation of corresponding projects are examined. Particular emphasis is placed on the financing of the country's forestry services from national resources of the Public Investment Program. The data are processed with the hierarchical grouping method of multivariate statistics in combination with descriptive statistics. The allocations of funding and their respective absorptions are analysed by clusters. The identification of clusters contributes to the creation of a clearer perception of the problems of the mountainous area and to the assessment of the possibilities of its more rational development, creating the conditions for the selection of alternative solutions. This typological survey of forestry financing is considered important in the context of the effort to correctly capture the needs and possibilities of exploiting financial resources, as well as for the accurate planning and programming of actions in the field of forestry per regional unit.

1 Introduction

Developmental activity is clearly exercised at the expense of environmental protection when the pace of economic growth is rapid. In this case the quality levels of the environment often decrease, because the flow of emissions exceeds the rate of their assimilation by the environment. On the other hand, any environmental degradation burdens the economy in the long term. Policies and markets determine the "environmental price" of economic development and, in the presence of ecological limits, largely determine the reversibility of environmental damage [1].

The evolution of human societies in combination with efforts to enhance economic prosperity may well lead to environmental degradation. Deforestation is a common process throughout human evolution, poses pressure and potentially irreversible environmental risks, despite ecological and modernization processes aiming to limit these risks [2].

Poverty necessitates over-reliance on forests and agricultural products, while overpopulation, which is equally associated with many developing nations, puts additional pressure on forests. The increase in demand for agricultural activities and forest products is orchestrated by the need for economic development and income expansion [3].

Ecological infrastructure supports human well-being directly, providing ecosystem services that cannot be imported, but also services that, through interaction with socio-economic infrastructure, become valuable to humans. Both types of infrastructure are required for human development, but investments in ecological infrastructure are much smaller than those in socioeconomic infrastructure [4].

In the Mediterranean region, many forest types are unproductive or degraded, although they could contribute substantially to the development of local economies. In Greece, 30% of the total area is covered by forests, however their contribution to GDP does almost not exist [5].

Nevertheless, forestry in Greece is a vital sector of production of services and goods and its contribution to the protection and promotion of mountainous and para-forest areas is important. Even though forest funding is very limited. Greece's accession to the European Union and especially its accession to the Community Support Framework has provided funding for various actions that promote the multifunctional role of forests [6].

The multiple ecosystem services of forests can be approached conceptually, distinguishing between supply and demand. Supply refers to the capacity of forests to provide ecosystem services and is related to the characteristics of the forest that is significantly affected by its management, while demand refers to the expectations and needs arising from the beneficiaries of

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the forests, namely the society. Environmental variation, characteristics of organisms, but also economic, political and social changes can affect the provision and value of ecosystem services [7].

The relative importance of ecosystem services does not correspond to their respective contribution to the income of forest owners/managers. Supply services such as those involving timber are by far the most important source of income, while regulatory and cultural services provided by forests account for only 20% of forest owners' income. Given potentially significant trade-offs in forest management related to regulatory and cultural ecosystem services versus timber provision services, the significant mismatch between social demands and potential income from them could result in supply that is insufficient to meet social demands. This requires the development of a system of financial incentives to address the mismatch [8].

Forests can make an important contribution mitigating climate change as carbon sinks. Carbon sequestration in tropical forests is more efficient [9] than in European forests, although they are also a significant carbon sink, especially when wood products used as substitutes for fossil energy-intensive materials are included in the calculations, as they store around 13% of EU greenhouse gas emissions annually [10].

The way in which the adaptation and resilience of forest ecosystems to climate change is sought, depends significantly on the ecosystem services that are sought and targeted by the corresponding forest management methods [11].

In times of recession, local fire-vulnerable environments require more effective fire prevention measures, sustainable forest management and regional planning [12].

For essential ecosystem services, negotiations should be done by state governments, as the range of beneficiaries is too broad and because state subsidy solutions run the risk of being deficient in performance or deficient in targeting, resulting in not meeting their purpose [13].

Maintaining evaluative capacity over time requires a corresponding commitment of resources. At the same time, consideration should be given to the need for institutionalized mechanisms for long-term funding of evaluation and monitoring, with a perceived long-term need for these activities [14].

2 Public Investments

2.1 Public investments and their role in the development

Public investment is the most important tool for economic policy and shapes the economic conditions and social provision that bring prosperity to citizens in any country. It is generally accepted that the provision of public investment and the allocation of public resources should respond to local needs and serve the purpose of ensuring equal access to public goods and promoting development potential in all regions [15].

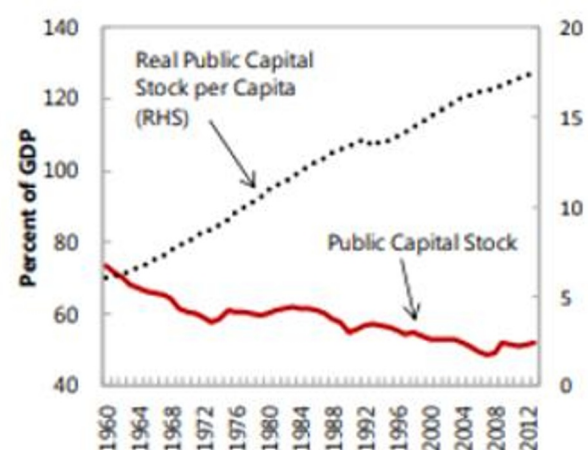
In the economy, public investments are certainly vital services and goods, which could not be obtained with private capital. Forms of investment, which promote long-term growth, are considered to be a prerequisite even for increased private sector investment [16].

Public investment produces short-term, but mostly long-term benefits to the economy as a whole and is therefore difficult to quantify. The main economic benefits arise from infrastructure investments to the extent that they create a sustainable flow of services that are valued by users. Cost analysis of the contribution of infrastructure to development must take into consideration the effects of services that contribute to the improvement of the quality of life and the well-being in general [17]. The most common way to measure public investment is gross fixed capital formation as a percentage of total gross domestic product over a specific period of time, usually the year. In this way, the International Monetary Fund (IMF) calculated for a sample of developed countries that an increase in investment spending by 1% of GDP can increase productivity by about 0,4% in the same year and by 1,5% in the next 4 years [18].

Over the past decade, empirical developed studies analyze macroeconomic conditions that may affect the size of government spending multipliers. The theoretical conclusion that the public investment multiplier is higher (lower) the lower (higher) the initial stock of public capital is, also confirmed by the IMF. Therefore, countries with a low initial stock of public capital (as a percentage of GDP) have significantly higher public investment multipliers than countries with a high initial stock of public capital (Fig.1).

The economic expansion and development of a country depends on the public investments and interventions that the state chooses based on criteria that determine their contribution to the development and prosperity of the country. The evaluation of projects in each sector is deemed necessary because in this way the distribution of available resources is ensured [19].

When properly managed, public investment is a form of public expenditure that enhances growth. Conversely, poor investment choices waste resources, erode public confidence, and potentially hinder growth opportunities.



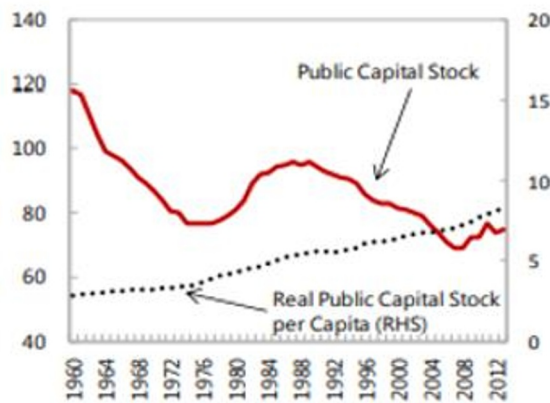


Fig. 1. The course of the public capital stock in relation to its real per capita value in developed and developing countries. (Source: [18], *The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies*)

2.2 The Public Investment Program (PIP) in Greece

The Rio Conference in 1992 is a turning point in the up to then global approach to environmental and development issues. Since then, a global environmental awareness has been developed regarding the prevention and safeguarding of the natural resources of the environment. The EU is leading in this area and implementing forest protection programs by reforming the Structural Funds and adapting them to emerging needs. In 1993, the promotion of economic and social cohesion is very closely linked to the environment, resulting in the introduction of environmental impact assessment as one of the conditions for program funding. In 1994, the newly established Cohesion Fund dedicated almost half of its budget to the four economically weaker member states of the EC (Greece, Spain, Portugal and Ireland), in order to support financially environmental projects and to formulate stricter environmental regulations. These two funds supported environmental investments that reached 1% of GDP in 1999 [20].

In 2019, the investment rate in Greece fell after the sovereign debt crisis and remained one of the lowest in the world. Especially in the field of private investments, Greece ranks last in the EU, which is also due to the low feeling of investment security provided by the country. In 2019, the estimated investment gap ranges from 1,6 to 8% of GDP. Despite all this and compared to the Organization for Economic Cooperation and Development (OECD) country members, Greece is among the countries with the highest percentages of public capital stock and public investments [21].

3 Methodology – data sources

The financing of recurrent actions in forestry is a key tool and ensures the programming of projects and actions that need to be carried out continuously in the context of the protection and management of the country's forests. The total amount of funding available per organization

and per year is determined by the government's fiscal planning and depends each time on the available budget. The data used for this research concern allocations of funding of 13 ongoing projects of the Public Investment Program (PIP) for the forestry sector carried out per region for the time period 2015 – 2021.

To improve the use of the above-mentioned data, projects with common goals have been merged, maintaining the analysis of data by region and year. The merging process created six thematic project categories with codenames, which ensure the funding for requirements concerning the operation of nurseries with the provision of propagating material and reforestation actions (NURS_REFOREST), forest protection actions (FOREST_PROTECT), forest management plans and management actions (SFM_STUDIES), requirements for the project ICP-FOREST and for the implementation of three EU regulations (IMPLEM_EU-REG) and finally for patrols, official transport necessities and travelling expenses (OUTDOOR_EXP).

Furthermore, an analysis was made of the allocation of funding per thematic project category and per region for each year of the 7-year period. The degree of absorption of the resources allocated per project, annually and overall, was also investigated.

For the purpose of the research, the descriptive statistical analysis and the hierarchical method of cluster analysis were applied. As the first is considered useful when the data is available and when there is knowledge on the subject to be analyzed, it is a useful tool for making political decisions contributing to the design and improvement of various strategic systems for the future.

The second method examines the similarity of some variables and creates groups of homogeneous observations, which are considered useful for distinguishing the role played by the harmonization of policy instruments in whole of a country and the convergence towards common goals, in order to ensure fair economic development for all its regional units.

4 Results and discussion

4.1 The main categories of financing

Considering the results of the cluster analysis, it appears within the time period 2015-2021 the maximum funding is directed to the projects which cover fire protection actions, in this case, the thematic project category codenamed FOREST_PROTECT. The regions of Attica, Thessaloniki, Evia, Chalkidiki and Ilia are areas that favor the spread of forest fires because of the topic phytosociological and climatological conditions and therefore present an increased risk rate of forest fires. Other reasons increasing forest fire risk in these regions are also the structure of the spatial distribution of forest ecosystems, the possibility of direct and easy access to them by humans and the rate of exploitation of the wider area by humans in terms of agriculture, tourism, etc.

The thematic project category for the management of forest ecosystems (SFM_SUDIES) includes mainly the preparation of silvicultural management studies with the

aim of their sustainable management and protection, the cultivation processes of all kinds in order to maintain their plant health, as well as work in the context of their multifunctional role, as defined by modern requirements. Additionally, every type of forestry study which intends a) to develop game hunting and game management and to protect wild animals and their habitats, but also b) to implement forest projects related to the protection, management and development of forest ecosystems, is included. In this category, funding stood out mainly for the regions of Evros, Drama, Xanthi, Chalkidiki, Evia and Ioannina, namely areas with productive forests, rich biodiversity and special interest in forest recreation.

Funding for the cultivation and operation of public forest nurseries lies in the seed collection and management of seed producing gardens and stands. In this way good quality forest propagating material is ensured which is intended for the production of planting material used in reforestation actions, usually in burned or degraded forest areas and in watersheds, for retention of soils and for limitation of erosion and flooding phenomena. For these purposes, funding through the thematic project category NURS_REFOREST is focused in the regions of Thessaloniki, Rhodopi and Attica, where all three Directorates of Reforestation belong with multiple activities in this area. The Center for Processing, Control and Certification of Forest Propagation Material located in Attica is the pillar of this process, as it works scientifically, coordinating all these actions.

The ICP – FOREST project, implemented by the Forest Research Institution in collaboration with the forest services, shows the most stable funding and absorption over time. The results of this program are important for the calculation of the state of forests through measurements that take place in sample areas throughout the country. Its continuous and stable funding is necessary, in order to obtain data on the ecological value of forests and the course of their health at National and European level, as the program is implemented in the countries of the European Union.

The needs, arising from the incorporation into national law of the 2 EU timber regulations, FLEGT and EUTR, and the obligation to implement them for the protection of forests on a global scale, led to the selection of funding for the thematic project category codenamed IMPLEMENT_EU-REG. The main funding is directed to the central forest service of the Hellenic Ministry of Environment and Energy, the responsible authority for coordinating the regional forestry services, regularly informing the European Commission on issues related to trafficking of illegally logged timber and creating appropriate and necessary tools (e.g. digital applications) for better monitoring the trade of timber, both, within the country and/or from third countries in the EU.

The forestry services in the regions of Attica, Thessaloniki, Evia and the regions of northeastern Greece were the main recipients of funding for undertaking patrols in the context of control exercises, but also for official travelling (OUTDOOR_EXP). The available appropriations of this project, however, disclosed the lowest absorption in the seven years period, with a rate

that reached an average of 45%, due to the available staff, infrastructure and means.

4.2 Absorption degree of resources per region

Three groups of regions were the outcome of the cluster analysis on this section (Table 1).

Table 1. Results of cluster analysis depending the absorption of resources per region

N° of groups	N° of regions	% of regions	Regions
1	27	52,7	Etoloakarnania, Arkadia, Viotia, Drama, Dodekanisa, Evros, Evia, Evritania, Ilia, Imathia, Heraklion, Thessaloniki, Karditsa, Kilkis, Lasithi, Messinia, Magnisia, Pella, Pieria, Rodopi, Serres, Trikala, Fthiotida, Fokida, Chalkidiki, Chania, Chios
2	16	33,6	Arta, Attica, Achaia, Zakynthos, Ioannina, Kavala, Kastoria, Kozani, Kyklades, Lakonia, Larisa, Lesvos, Xanthi, Preveza, Florina
3	8	15,7	Argolida, Grevena, Thesprotia, Corfu, Kefalonia, Lefkada, Rethymno, Samos
	51	100,0	

The first group contains almost half of all regions that show a relatively high level of funding absorption, ranging from 70% to 80%. Lasithi, Chania, Fokida, Evia and Imathia are in the lead out of the total of 27 regions of this particular category with an absorption rate of funding over 80%, regardless of the height of funding.

About one third of the total funding recipients per region is placed in the second group where an instability is observed regarding the absorption of funding in the long term. The second group includes the majority of the regions of Epirus, as well as Attica, which in proportion to the rest of the country's regions, is superior in terms of population and forest services per area.

Characteristic for the third group was the limited funding absorption, recorded in eight regions corresponding 15,7%. The Ionian Islands, Thesprotia and Rethymnon, which are exceptions for the geographical regions of Epirus and Crete respectively, show a high participation. On the contrary, Grevena faces a particularly low absorption rate of around 18%, creating particular interest for further analysis as a region with a rich forest environment.

Overall, in the forest services of northern Greece were recorded the highest absorption of the allocated resources. On the other hand, for the continental regions of Epirus and Western Macedonia, as well as for the Ionian Islands the available resources were used less, with an average of 10,4%.

Concerning Peloponnese, with the exception of Messinia and Ilia with an absorption of over 80%, the remaining regions managed to utilize funding, on average, around 50% of the available resources for projects and works in their forest ecosystems, while Arcadia is the better example and Argolida the worst.

The forestry services of Crete, with the exception of Rethymnon, highlight every year important work in the implementation of forestry projects through the PIP.

Finally, among the regions of Thessaly and Central Greece, Larissa lags significantly with an absorption rate that does not exceed 40%, while the other regions fluctuate at a very satisfactory level.

4.3 Absorption degree of resources per project

The degree of absorption of funding per project of the Public Investment Program (PIP) was also investigated. The ICP - FOREST project had the best performance in the seven-year period under review, with most projects following with an absorption rate from 55% to 72%. The integrated projects of 2019 as well as the projects that covers expenses for patrols, official travelling etc. had the lowest use of funding. The total absorption of funding per project from 2015 to 2021 was estimated at an average of 65%.

4.4 General results for the PIP projects

The PIP is one of the most useful financial tools for the forestry sector. The ongoing projects which are included in the collective decision of this program covered over time a significant range of recurrent actions performed by the country's forest services. The resources allocated per year were limited compared to the available resources of co-financed programs, but on the other hand more easily accessible, as the administrative procedures are simpler and already known to the staff of the beneficiary services, contrary to those applied to the co-financed programs.

It was also found that the duration of the economic crisis did not particularly affect the availability of PIP resources for forestry projects. The actual difference in the fluctuation of available credits between the thematic project categories was the payment limit. As the national part of the PIP is part of the state budget and depends on its amount, the allocated funding to each institution is formed accordingly to the spending limits of this budget.

Furthermore, in 2019 two new projects regarding the protection of forest ecosystems and inhabited areas near forests and forest lands were included in the PIP, with a relatively high budget and a three-year time frame. The fact that the forest services have not still exploit these resources to the desired extent, raises questions about their design and inclusion conditions.

4.5 Discussion

The financing of forestry, with the ability to absorb funds, demonstrates a heterogeneity over time and may need specialized financial procedures, due to the

particular nature of the forest sector. Additionally, an alertness for constantly adjusting the height of financial resources due to unpredictable and extreme environmental and climatic developments is required.

In future, an interactive forest economy approach is considered important where the costs and benefits can operate in a compensatory manner. Therefore, an establishment of a technical economic management is proposed, with key elements the relationship among cost and benefit, the degree of efficiency and the selection of investments with multiple socio-economic criteria. The above mentioned may boost the forestry sector and contribute to the country's economy attributing to the maximum benefit of the protection and maintenance of healthy forests.

5 Conclusions

The results of the analysis, related both to the amount of funding regarding the degree of its absorption, highlighted cases of good operation and satisfactory utilization of the financial resources provided, as well as malfunctions faced by the forestry service during the reviewed period.

Reasons to which this two-way picture can be attributed include: a) the task of the forestry services with additional obligations beyond the direct and permanent tasks in the context of the management and protection of forest ecosystems, b) the particularly complex nature of the forestry projects implemented mainly in semi-mountainous and mountainous areas of the country which are completely dependent on the time of year and the prevailing weather conditions, and c) the existing personnel which is actively employed in the forestry services.

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