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Strategic Environmental Management in Mount Athos under Climate Change - LIFE STEMMA ATHOS

GOUNARIS N.[1], KONTOS K.[1], GALATSIDAS Sp.[2], GEORGIADIS Ch.[1], VLACHAKI D.[1], PAPALAMPROS L.[1]

[1] HOMEOTECH, Environmental Management Company, 102 Egeou Str., P.C. 551 33, Kalamaria Thessaloniki, Greece

[2] Democritus University of Thrace (DUTh), Department of Forestry and Management of the Environment and Natural Resources, 93 Pantazidou Str, 68200 Orestiada, Greece

*corresponding author: Lampros Papalampros
e-mail: lpapalampros@homeotech.gr

Abstract Mount Athos (MA) is a unique cultural and natural heritage site, characterized by high biodiversity, extensive forest cover, and significant historical value. Its ecological integrity is increasingly threatened by climate change (CC) due to factors such as geographic isolation, widespread chestnut monocultures, fragmented forest governance, and limited water resources. With each of the 20 self-governed monasteries managing its own forest independently, the absence of coordinated environmental planning heightens the area's vulnerability to climate-induced risks, particularly wildfires, drought, and pest outbreaks.

This project aims to develop a strategic and integrated environmental management framework for MA, with a dual focus on climate change adaptation and mitigation. Core objectives include reducing susceptibility to CC-related disturbances, enhancing ecosystem resilience, implementing adaptation and carbon sequestration strategies, and modeling the impacts of these practices on wildfire behavior and carbon dynamics. The initiative also seeks to establish long-term institutional mechanisms for environmental governance, tailored to the unique administrative and spiritual context of MA.

By combining scientific planning with local engagement, the project contributes to safeguarding MA's environmental and cultural legacy. Furthermore, it will promote knowledge exchange within the monastic community and across the EU, serving as a model for sustainable management in similarly sensitive and self-governed landscapes.

Keywords: climate change, ecosystem resilience, strategic adaptation plans, Carbon stock, Mount Athos

1. Introduction

The management of the ecosystems in MA is carried out in a fragmented way and lacks CC mitigation and adaptation orientation. Each monastery is a self-governed entity, responsible for the management of its territory. This reality has created the following shortcomings:

- Management plans mainly concern forest exploitation and timber production

- The management of the forests is spatially fragmented, with time gaps between the monasteries.

- The implementation of management is one-dimensional and ignores agricultural land and agroforestry, which can play an important role in CC mitigation and adaptation

LIFE STEMMA ATHOS aims to formulate the general management framework of the Athos peninsula for adaptation to climate change, mitigation of CC-induced threats and the preservation of natural resources, but also the specification of the individual measures required for each Holy Monastery. It will also set the baseline for monitoring and evaluating the impacts of the implementation of pilot measures through the MA CC Observatory that will be established as part of the project.

2. Objectives

The survival of both the monastic community and the preservation of MA's universal value are closely tied to the sustainable management of its forests, as environmental sustainability cannot be considered separately from human and cultural existence. The overall goal of the project is to support the strategic and integrated environmental management in MA, with a focus on CC adaptation and mitigation. The fundamental objectives of LIFE STEMMA ATHOS are to:

1. Reduce vulnerability to CC-related disturbances, particularly wildfires.

2. Enhance ecosystem resilience against CC-related stresses, such as droughts, diseases, and pests.

3. Develop and implement (a) strategic adaptation planning to minimize CC-associated risks and (b) mitigation actions to enhance carbon sequestration

4. Assess and model the effects of adaptation and mitigation management practices on wildfire behavior and carbon fluxes.

5. Establish the foundation for institutionalizing environmental management in MA in response to CC,

safeguarding the overall functionality of this significant cultural and environmental entity while respecting its existing traditions.

6. Share project results and best practices both locally and with other monastic communities and sectors across the EU.

3. Actions and Means Involved

The project aims to establish a strategic and sustainable environmental management framework for MA, focusing on CC adaptation and mitigation. A Strategic Management Plan (SMP) has been developed, incorporating data on infrastructure, environmental, and administrative conditions across individual monasteries, alongside a tailored Action Plan for the partner Monastery of Solan (France). Moreover, a CC Observatory will be established within the 'Chersonisos Athos' N2k site to institutionalize SMP implementation and support long-term environmental governance.

Concrete actions include ecosystem-based interventions in chestnut and pine forests and agroforestry zones, rainwater harvesting for drought and fire resilience, wildfire infrastructure improvements, and the development of a fuel and carbon stock model to assess management effectiveness.

Monitoring actions will assess ecological, C storage, and socio-economic impacts. Communication and dissemination activities will promote best practices and enable knowledge transfer to relevant stakeholders.

4. Quantified expected results and impacts

The expected results of LIFE STEMMA include:

- the implementation of a SMP for CC adaptation and mitigation that integrates environmental, administrative and cultural characteristics of the 20 MA Monasteries

- the establishment and operation of a CC Observatory, being the first institutionalized entity towards pursuing, implementing and monitoring integrated management.

- the reduction of wildfire vulnerability in a pilot area of 343ha, through a) fuel load reduction in aleppo pine and shrubland and b) expansion of agroforestry areas

- the increase of ecosystem resilience and stability in a pilot area of 842ha through pilot management measures (extension of chestnut rotation age, increase of mixed stands, rehabilitation of degraded forest land)

- the enhancement of net carbon removals resulting from sustainable forest and agroforestry management

- a knowledge base of the project's impact, based on models developed to assess the effects of adaptation and mitigation management practices on wildfire behavior and carbon stocks.

- the active engagement of stakeholders from multi-disciplinary sectors and monastic communities across Greece and Europe and increased awareness raising

- a wildfire suppression line through the promotion of agroforestry areas, the construction of 7 alternative innovative rainwater harvesting systems, combined with a well-signed road network

- the introduction of environmental management practices towards CC adaptation and mitigation that respect traditional practices and serve biodiversity and sustainable forest management objectives

- the improvement of N2K habitat types through sustainable management treatments; 9540 (2% from restoration of burnt areas with aleppo pine forests), 9530* (10% from regeneration of black pine forests) and 5350 (2% from treatments pseudomaquis forests)

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