

Ecosystems Protection

Greece scale





Co-Evolve4BG

Analysis of Threats and Enabling Factors for Sustainable Tourism at Pilot Scale

Ecosystems protection Greece Scale



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OVERVIEW

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List of abbreviations

Cu	Copper
EMT	Eastern Mediterranean Transient
EU	European Union
IUCN	International Union for the Conservation of Nature
L	Law
NBSAP	National Biodiversity Strategy and Action Plan
OECD	Organisation for Economic Co-operation and Development
Pb	Lead
UNEP	United Nations Environment Programme
Zn	Zinc

Abstract

This report aims to identify the different threats to the marine and coastal ecosystems in Greece and to provide an analysis on existing strategies and measures applied in the country. Greece, due to the intense differences in its geomorphologic landform, hosts many species, some of which are endangered. Thus, a developed network of protected areas has been created in the country, the majority of which belong to the European network Natura 2000. Coastal and marine ecosystems also show great diversity along the Greek coastline, which is the largest in the Mediterranean with an area of about 15,000 km. However, coastal, and marine ecosystems are under pressure and are exposed to a host of risks, focusing mainly on human activities, including climate change and the country's tourism development. Every year, the coastal regions of the country attract millions of tourists, both domestic and foreign. Such a large population can cause environmental damage directly, such as through plastics on the coasts, but also indirectly, for example through the noise caused which can disturb certain noise-sensitive species. Thus, for the protection of ecosystems, the European Union has presented a common strategy, which needs to be implemented by the Member States and the individual objectives of this strategy must have been achieved by 2029. Greece and more specifically, the Ministry of Environment and Energy, analyzed these objectives extensively and created a list of 13 main objectives and additional actions and measures to be implemented, some of which have either been completed or still in progress. Participation of tourism in citizen science projects is also included in these measures which could be beneficial for the coexistence of tourism with marine and coastal ecosystems.

I. Introduction

I.1. Marine & Coastal ecosystems biodiversity in Greece

Greece has the longest coastline in the Mediterranean region, with a length of 15,000 km. It is composed of more than 3,000 islands including the southernmost point Gavdos Island and the easternmost point, Strongyli Island.

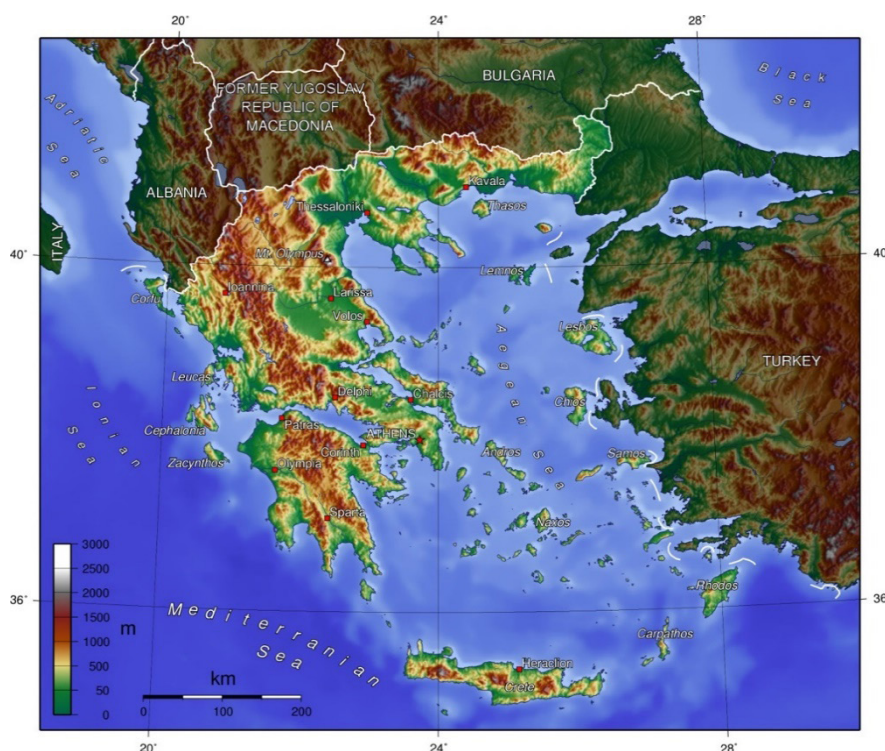


Figure 1. Geographic map of Greece
(https://en.wikipedia.org/wiki/Geography_of_Greece)

Due to the large diversity of microenvironments, the country supports a wide variety of ecosystems with the richest floras and faunas in Europe, including many endemic plants and animals. Coastal and marine ecosystems have high biological, aesthetic, cultural and economic values. According to the National Biodiversity Strategic Action Plan Report of 2002, the following amounts of taxa have been identified in the coastal and marine ecosystems of Greece:

- Macrophytes (in the sea and brackish water): 515 taxa of marine macro-algae and 7 taxa of angiosperms in the sea and brackish water.
- Coastal flora (land): more than 1,500 taxa of land plants.

- Marine mammals: 12 taxa of cetaceans and the Mediterranean monk seal.
- Marine reptiles: 3 taxa of sea turtles, of which only one, namely the *Caretta caretta*, reproduces on the Greek shores.
- Fish: Approximately 450 marine fish species.
- Zoobenthos: more than 2,650 taxa of benthic macrofauna, not including the fauna on the hard substrate of the coast and bathyal zone.

I.2. Greek marine & coastal ecosystems protected species

To characterize the area as protected according to the national legislation L.1650/86 and its amendment by L. 3937/2011 and L. 4685/2020, the following criteria should be fulfilled (Greek Ministry of Environment and Energy, 2021):

- The area should be terrestrial, aquatic, marine or mixed, natural, or semi-natural with a recorded presence of natural habitat types and species of international, EU importance and/or Greek interest that need protection and conservation, such as: terrestrial, marine or mixed character National parks, wildlife refuges, protected landscapes and protected natural formations.
- The area must be included in the National Catalog of Areas of the European Ecological Network Natura 2000, because those areas currently designated biodiversity conservation. Law 3044/2002 established 25 Protection Areas, which were added to the two areas that had already been declared protected, based on Laws 1650/1986 and 2742/1999: the National Marine Park of Zakynthos and the National Park of Schinias-Marathon.

In conclusion, there are a total of 1,249 protected areas in Greece, 446 Natura 2000 sites and 90 Sites of Community Importance (Habitat Directive) - as well as 803 sites designated under national laws, so the protected area network in Greece is strongly influenced by Natura 2,000 sites, which make up 50% of the total area covered by protected areas.

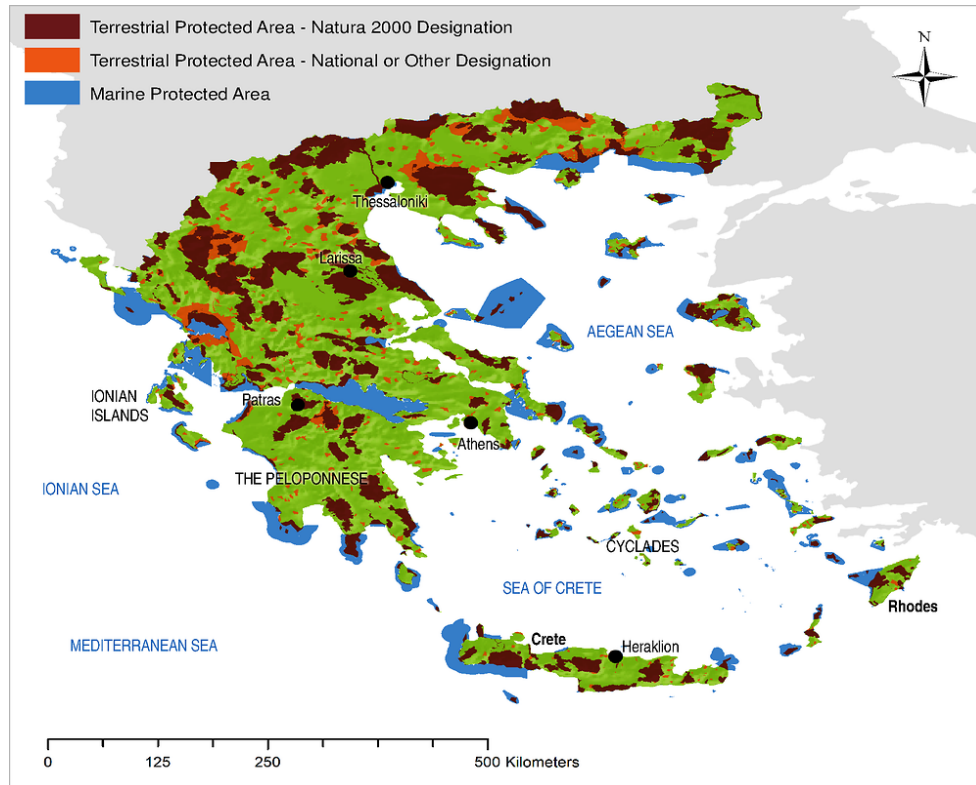


Figure 2. Network of protected areas over Greece
 (UNEP-WCMC and IUCN [2019], The World Database of Protected Areas)

II. Marine and coastal ecosystems threats

The main Marine and coastal pressures come from the impacts of climate change and more specifically from sea level rise, changes in the distribution and intensity of precipitation, flooding and coastal erosion. Pressures from human activities in coastal ecosystems include tourism, population increase and overexploitation of natural resources, especially during summer season (Greek Ministry of Environment and Energy, 2016).

II.1. Climate change impact

It is a fact that environmental changes, including those of marine ecosystems, were linked during the last decades to climate change and variability, with visible impacts on European Seas and coasts. Evidence of climate change impact on the Greek seas are the wide variations in the physical properties of its marine ecosystems. Furthermore, latest tools such as improvement of oceanographic databases, satellite images, advanced models, have allowed better analyses of physical parameters. On the other hand, our knowledge of the biological impacts is well documented. In general, research directly related to climate change impact on Greek marine biodiversity is limited in numbers of specific projects and their spatial coverage (Streftaris and Zenetos, 2009).

Table 1. Documented effects presumably related to climate change in Greek waters (Streftaris and Zenetos, 2009)

Indications	Cause
Expansion of species of tropical affinity originating from the Atlantic	Temperature increase, Shipping
Expansion of tropical- subtropical species from the Indo-Pacific	Temperature and salinity increase
Northern expansion of thermophilous fish	Temperature increase
Mucilage events and Harmful Algal Blooms (HABs)	NAO anomalies, temperature increase
Mass occurrence of scyphomedusae	Climatic variability circulation changes
Zooplankton abundance	Climate change
Changes in biology	Climate change
Molecular changes	Extreme temperatures

Greek marine ecosystem has two main responses to the increased concentration of greenhouse gases: increase in both sea surface temperature and sea-level. In the Eastern Mediterranean during the past two decades (1990-2010), changes in the thermohaline circulation have been observed, known as the Eastern Mediterranean Transient (EMT) (Theocharis *et al.* 1999). In Greek seas such changes have been attributed to a climatic shift over the Aegean Sea and have initiated a series of modifications in the hydrology, dynamics and the water's nutrient distribution (Painter and Tsimplis, 2003).

II.2. Anthropogenic pressures

The coastal zone is a complex ecosystem affected by many factors. In the national report on the coastal zone, four problem categories have been identified, linked to human activities in coastal ecosystems:

- Raising of population
- Human activities in a relatively limited and sensitive space
- Overexploitation of natural resources (*e.g.*, water, energy)
- Failure to make decisions, implement policies and coordinate the competent authorities.

Fisheries and Aquaculture

Despite a significant decrease in the last ten years, Greece has the largest fishing fleet in the European Union. Monitoring and mainstreaming of biodiversity into fisheries is mainly done through laws, to control fishing inputs and methods, including restricted areas for fish juveniles, and banning of drift. Add to the Law's Regulation 1967/2006 for the sustainable exploitation of fishery resources in the Mediterranean Sea, there is an ongoing discussion on the revision of the fishing regulations for the next period. In addition, a specific Greek Law 3937/2011 is dedicated to destructive fishing (*e.g.*, by trawling) over maerl beds and coralligenous habitats (Greek Ministry of Environment, Energy and Climate Change, 2014).

In addition, fishing is restricted during some periods, such as spawning season to protect habitats and marine organisms. More stringent restrictions are applied in protected areas and priority habitats, such as the *Posidonia* meadows, a Natura 2000 site, where operation of aquaculture units is prohibited. However, in Greece, it is a common phenomenon the non-compliance with regulations and restrictions that have been set. As a result, habitat provision and coastal protection are affected (Tsakalou, 2018). Like other sectors, fisheries, and aquaculture in Greece, are governed by European Union policy, namely the Common Fisheries Policy (OECD, 2020). General Target 5 (Table 2) of the National Biodiversity Strategy and Action Plan include revising the regulatory framework for fisheries, based on conservation needs both of species and habitat types, and enhancing the capability of port authorities to control illegal recreational fishing (Greek Ministry of Environment, Energy & Climate Change, 2014).



Figure 3. Bottom trawls, enormous fishing nets that are dragged across the sea floor, clear-cut everything living in their path (<https://europe.oceana.org/en/node/47406>)

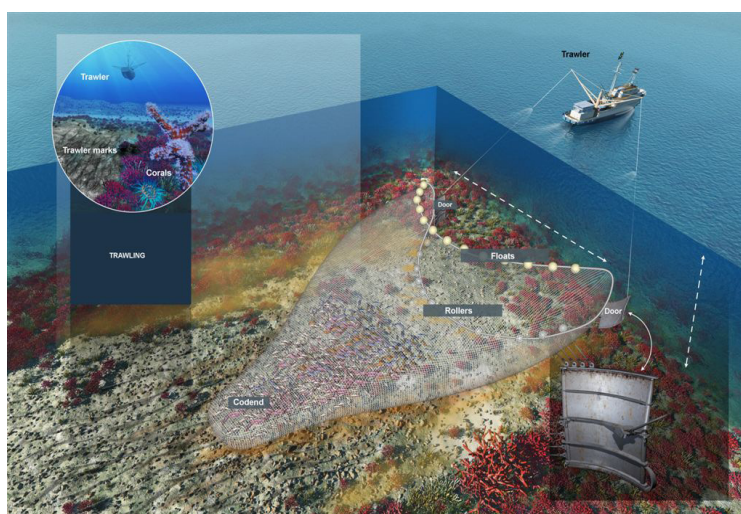


Figure 4. The Fisheries in Greek sea waters are characterized as multispecies and target mainly demersal and pelagic fish stocks (Valavanidis, 2018)

Coast and sea pollution

Greek seas, as part of the Mediterranean Sea, are oligotrophic. However, they have the physical characteristics of semi-closed seas which are more vulnerable to human pressures and anthropogenic pollution. The most important marine pollution involves discharges of ship fuel, untreated discharges of municipal and industrial liquid and solid waste, agricultural and stock farming effluents. According to research, concentrations

of metals, such as Cu, Pb, Zn, are high in many Greek seas, especially in the harbour's sediments. Those metals are part of anthropogenic activities mostly from sewage effluents. In the last decade, improvement of seawater quality was established with the completion of sewage works in many Greek cities (Valavanidis, 2018).

Marine debris consists of a variety of materials (metal, paper, industrial wood), however, plastic represents 80% of marine debris (UNEP, 2016). Marine plastic pollution on Greek coasts and seas is also highlighted by scientists and policy makers. A public consultation about single-used plastics, carried out by the Ministry of Environment and Energy, had been completed by March 2020 and the draft law applied in public consultation from August to September 2020. In addition, the country is expected to gradually start implementing single-use plastics Directive 2019/904 from the European Union, into its national waste management policy by the beginning of 2021 (Charitou *et al.* 2021). Material such as plastic bags or even small plastic pieces may damage or even kill marine species, such as turtles that are common to swallowing plastic bags thrown into the sea, as they look like jellyfish.



Figure 5. All sea turtle species are at risk from plastic (<https://www.worldwildlife.org/>)

Furthermore, microplastics are a serious pollutant of marine ecosystems as well; they are common on beaches, waters, and sediments from shorelines worldwide, in the open ocean and the deep sea. These pieces of plastic derived from physical or photochemical fragmentation of larger plastic debris, such as bags, clothes, household items, building materials or fishing and aquaculture gear *etc.*

II.3. Tourism development

Another category of pressures on marine ecosystems, linked to tourism and leisure activities, would affect up to 15% of species (Steven and Castley, 2013). The seasonality of tourism in many areas enhances pressure on the environment during summer season, including increased water demand during dry periods, especially on islands. Over-pumping can cause irreversible salinisation of groundwater aquifers. Tourism also contributes significantly to municipal solid waste volumes, which requires greater management efforts for local authorities. Research has found that tourism contributes nearly 20% of the nation's annual gross domestic product (Valavanidis and Vlachogianni, 2012). Commercial shipping, yachting and ferry transport have increased significantly in recent years from Greek ports. The commercial shipping in Greece serves 120 islands, 144 ports and transport around 35-40 million passengers per year. There are 350 coastal shipping routes that serve the Greek islands with their connection to the mainland (Valavanidis, 2018). Organisation for Economic Co-operation and Development (OECD) work on the ocean economy, including coastal and marine tourism, could help Greece harness the benefits of ocean-based industries as well as protect marine ecosystems. Furthermore, excessive development of tourist coastal infrastructure (including large hotels, malls *etc.*) affect coastal areas, by removing large amounts of water, causing soil and water pollution, consuming energy, and altering the landscape. Also, recreational activities like off road vehicle driving in coastal areas (dunes/beaches), the illegal use of speedboats, scuba diving and snorkelling, wind surfing or fishing may damage or destroy natural habitats or disturb sensitive species. It is therefore clear that it is necessary that these activities take place in areas where they have been approved by the competent authority. Finally, the significant increase in population during the tourist season affects marine and coastal ecosystems in multiple ways. One issue is that overcrowded beaches can disturb the flora and fauna that live on beaches and shallow waters. In addition, the increase in population means that the amounts of waste are increasing in coastal areas.

III. Marine and coastal ecosystems strategies and measures

III.1. Greek policies for the protection of the marine environment and the coastal areas

The European Union and the countries surrounding the Mediterranean Sea are part of this Convention, which is implemented through the Mediterranean Action Plan and formulates policies and strategies for the protection of biodiversity and the marine and coastal environment. Recognizing the importance of climate change for the Mediterranean region, in 2008 the countries involved in the Barcelona Convention signed the Protocol on Integrated Coastal Zone Management of the Mediterranean, prioritizing adaptation to climate change. The Marrakesh Declaration, adopted by the Barcelona Convention in November 2009, highlights the need for immediate action to address the serious effects of climate change on ecosystems and resources (Greek Ministry of Environment and Energy, 2009).

Later, in 2011, the European Union presented the “2020 Biodiversity Strategy”, which includes six main objectives.

1. Fully implement the Birds and Habitats Directives.
2. Maintain and restore ecosystems and their services.
3. Increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity.
4. Guarantee the sustainable use of fishery resources and ensure the good ecological status of the marine environment.
5. Combat invasive alien species.
6. Help avert global biodiversity loss.

For this reason, Greece, three years later, introduced The National Biodiversity Strategy and Action Plan (NBSAP) with its 15-year duration from 2014 up to 2029 and has 13 general objectives to be achieved. The general targets correspond to several different sub-targets as illustrated in the Table 2 (Greek Ministry of Environment, Energy & Climate Change, 2014).

Table 2. National Biodiversity Strategy targets
(Greek Ministry of Environment, Energy & Climate Change, 2014)

GENERAL TARGET	SUB-TARGETS
1. Increasing knowledge about the assessment of biodiversity status	1.1 Facilitate access to scientific knowledge (regarding Greek flora and fauna) and fill the gaps in scientific data
	1.2 Facilitate access to information on actions for biodiversity conservation and monitoring, as well as the implementation of the National Strategy.
2. Conservation of national natural capital and ecosystem restoration	2.1 Conservation of species and habitat types in Greek terrestrial and marine ecosystems, to promote the goal of sustainability.
	2.2 Restoration of important species and habitat types.
3. Organization and operation of a National System of Protected Areas and valuation of the benefits derived from their management	3.1 Effective organisation of the administration and management of protected areas and implementing <u>preventive measures in protected areas</u> .
	3.2 Application of exemplary and innovative practices in the productive and tourist sectors based on area management plans for the conservation and <u>management of biodiversity</u> .
	3.3 Design, and possible integration, of ecological corridors of special designation status and their <u>effective management</u> .
4. Conservation of the genetic resources of Greece – Facilitating access to genetic resources – Fair and equitable sharing of the benefits arising from their utilisation	4.1 Ensuring access to scientific records of genetic resources and filling gaps in scientific data.
	4.2 <i>In situ</i> and / or <i>ex situ</i> conservation of Greek genetic resources.
	4.3 Facilitating access to genetic resources and the fair and equitable sharing of benefits arising from the utilisation of genetic resources.
	4.4 Study, prevention, and reduction of the impact of Genetically Modified Organisms on biodiversity

5. Enhancing the synergies among the main sectoral policies for the conservation of biodiversity. Establishing incentives.	5.1 Effective integration of biodiversity conservation at all levels of spatial planning.
	5.2 Minimise impacts of large infrastructure projects.
	5.3 Ensure the compatibility of residential and industrial development activities (including conventional energy production) with biodiversity conservation.
	5.4 Ensure the compatibility of tourist activities with biodiversity conservation.
	5.5 Ensure the compatibility of agricultural, fisheries, and forestry activities with biodiversity conservation.
	5.6 Ensure the compatibility of energy production activities and infrastructure (including renewable energy) with biodiversity conservation.
	5.7 Ensure the compatibility of mining activities with biodiversity conservation.
	5.8 Ensure the compatibility of other activities (like hunting, collection of plants or animals) with biodiversity conservation.
6. Conservation of landscape diversity	6.1 Finalization of the integration of the landscape diversity conservation policy into all sectoral policies.
	6.2 Maintaining the diversity of the landscape both inside and outside of protected areas.
	6.3 Conservation of unique landscapes.
7. Prevention and minimisation of the impacts of climate change on biodiversity	7.1 Study the effects of climate change on biodiversity and ecosystem functions.
	7.2 Take action so that the components of biodiversity will be able to adapt to climate change.
	7.3 Reduce the impacts of actions established to address climate change on biodiversity.
	7.4 Enhance the role of forests in mitigating the effects of climate change.
8. Protection of biodiversity from invasive alien species	8.1 Prevention, early detection, and controlling the introduction and spread of invasive species.
	8.2 Taking action to restore the impacts of invasive alien species on biodiversity.

9. Enhancing international cooperation for biodiversity conservation	9.1 Substantially enhancing the effectiveness of international, regional and transnational cooperation for the conservation of biodiversity and ecosystem services.
	9.2 Enhancing transboundary cooperation for biodiversity conservation.
10. Upgrade the quality and efficiency of public administration on biodiversity conservation	10.1 Improving public administration in organisational matters, scientific matters, and decision-making processes for the effective implementation of biodiversity policies, measures and legislation.
	10.2 Ensuring adequate funding for biodiversity conservation.
11. Integration of biodiversity conservation in the value system of societies	11.1 Integrating biodiversity issues in formal and non-formal education and the promotion of the value of biodiversity.
	11.2 Promoting environmental awareness in biodiversity conservation.
12. Citizen participation in biodiversity conservation	12.1 Establishment of cooperation among citizens, scientists and public administration in the decision-making process and monitoring of its implementation
	12.2 Promoting the accountability of companies in the context of biodiversity conservation.
13. Appreciation of ecosystem services and the promotion of the value of Greek biodiversity	13.1 Valuation of ecosystem functions and services in social and economic terms.
	13.2 Valorisation of biodiversity and the services provided by biodiversity and ecosystems
	13.3 Promotion, establishment, and maintenance of natural green infrastructure.

Most recently, in 2019, The European Union enacted the 2030 biodiversity strategy which is a comprehensive, ambitious, and long-term plan to protect nature and help reverse the degradation of ecosystems. The strategy aims to put Europe's biodiversity on a path to recovery by 2030 and contains specific actions and commitments:

1. Establish an expanded European network of protected areas on land and at sea,
2. Launch a European nature restoration plan by the end of 2021,
3. Introducing measures to enable the necessary transformative change,
4. Introducing measures to tackle the global biodiversity challenge.

Greece is processing the plan, to follow the biodiversity strategy for 2030. Currently, a public consultation has started to protect nature and ecosystems according to the above specific actions and commitments.

III.2. Protective measures & actions

III.2.1. Greek National Targets

To achieve the 13 General Targets of the [Table 2](#), there are some specific actions that need to be applied in Greece. The goal of these targets is to ensure biodiversity and at the same time, to open the horizons for sustainable tourism, with respect for the environment, the different species and the natural attractions of the country. This target has considered key pressures, ecosystem threats and the ability of competent authorities to make decisions. Additionally, National targets aim to the simultaneous protection of the environment and the sustainability of tourism. The actions are presented below, as presented by the Greek Ministry of Environment and Energy.

1. Increasing knowledge about the assessment of biodiversity status by:

- Creation of the biodiversity database of Greece for flora, fauna and habitat types and interface with existing or new related databases.
- Mapping the distribution of species and habitats in detailed geographical maps. That action has already been completed by the competent body, under the supervision of the Greek Ministry of Environment and Energy.
- Enhancing and contributing to the organisation and preservation of museum collections of representative samples of all species of Greek flora and fauna in natural history museums and other relevant collections throughout Greece.
- Establishment and organisation of monitoring and evaluation of the implementation of the strategy, using monitoring indicators, in collaboration with other relevant Ministries.
- Continuous updating, upgrading and expansion of the National Database for Hydrological and Meteorological Information and interface with spatial biodiversity databases.
- Support for applied research on conservation management of species and habitat types.

2. Conservation of national natural capital and ecosystem restoration by:

- Creating a national list of important flora and fauna species and other groups of organisms, as well as of natural habitat types, including the endemic species.
- Mapping the ranges of species and habitat types with priority to the species of Community interest.
- Conducting a review of the status of marine waters, definition of good environmental status, establishment of environmental targets and relevant indicators, establishment, and implementation of a monitoring programme.
- Applying horizontal management and recovery actions for species and habitat types in Greece, taking into consideration the adaptation to climate change (e.g., creation of infrastructure inside protected areas for the protection of seagrass beds).

3. Organisation and operation of a National System of Protected Areas and enhancement of the benefits from their management:
 - Designation as protected any area that meets the necessary criteria.
 - Assessment of the status of ecosystems and the services they provide.
 - Creation of a database with all available information about the boundaries of protected areas, the delineation of zones established in them, the conservation terms, the ecological and conservation management status of all protected areas.
 - Management of maritime traffic and fisheries, according to the findings of the assessment of the maritime traffic and fisheries effects on protected areas.
 - Development of a system for remote sensing monitoring of terrestrial protected areas of the 'Natura 2000' network.
 - Developing a framework for the implementation of compensatory measures, as provided for in Article 6 (4) of Directive 92/43/EEC (setting standards, criteria, conditions, and competent service for implementation of compensatory measures).
 - Ensuring the development and implementation of a priority actions framework for funding the areas of the 'Natura 2000' network.
 - Identifying the species whose conservation requires the definition and delineation of ecological corridors and protected areas – Securing the establishment of the ecological corridors as a tool that enhances the coherence of the National System of Protected Areas.
4. Conservation of the genetic resources of Greece – Facilitating access to genetic resources – Fair and equitable sharing of the benefits arising from their utilisation:
 - Ensuring continuous recording, evaluation, and characterisation of genetic resources, with direct or long-term economic interest – Completion of the National List of cultivars and breeds.
 - Ensuring the maintenance and enhancement of the operation of seed and germplasm banks.
 - Develop a national database for the storage of characteristic species and specific genomic sequences, which will be available for comparison with other species outside Greece and could be used as a measure of the uniqueness and genetic diversity of species.
 - Preparation and implementation of a national plan for the conservation of genetic resources.
 - Establishing a National Gene Bank, that incorporates specific categories, to develop a system of unified management of genetic material.
 - Developing national regulatory licensing framework for access to genetic resources and fair and equitable sharing of the benefits arising from their use.
 - Developing and implementing an action plan for biosafety issues.

5. Enhancing the synergies among the main sectoral policies for the conservation of biodiversity – Establishing incentives:

- Review for ensuring the conservation of biodiversity and appropriate adjustment of standards drafting Environmental Impact Assessments and the Strategic Environmental Impact Assessments with the selection of appropriate measurable indicators.
- Developing a framework for the implementation of compensatory measures to mitigate the negative environmental impacts of infrastructure projects.
- Promoting and evaluating green infrastructures and avoiding habitat fragmentation.
- Implementing measures to prevent and combat industrial pollution (installation and operation of clean technology and environmental restoration).
- Achieving completion of management plans for environmental risks and hazards in the marine environment.
- Ensuring the conservation of biodiversity in the development of ecotourism and agrotourism.
- Promoting specialised actions for supporting green infrastructure and tourism services.
- Establishing a framework, as a priority in protected areas, for infrastructure development, tourism actions and activities, in compliance with the conservation of biodiversity and in collaboration with the Ministry of Culture in the case of shared responsibilities.
- Defining indicators for monitoring the impact of tourism on natural resources and infrastructure (water, effluent, waste, land, parking areas, etc.).
- Creating fisheries protected areas or implementing the provisions of the Fisheries Regulations.
- Recording and assessing the state of fish species stocks.
- Recording seagrass beds and coral formations in Greek marine environments, to protect them from fishing.
- Codifying and updating of legislation regulating fishing activities.
- Revising the regulatory framework concerning fishing and fisheries based on the conservation needs of species and habitat types.
- Establishing a monitoring system using biodiversity indicators per activity sector.
- Ensuring the development of a strategic programme for the assessment of cumulative impacts and establishment of indicators for monitoring the operation of renewable-energy plans impacts on vulnerable species and habitat types.
- Enhancing harbour authority's abilities to control illegal recreational fisheries.

6. Conservation of landscape diversity by:
 - Implementing a landscape policy at national and regional level.
 - Maintaining the functions of the landscape regarding biodiversity conservation.
 - Recording the unique landscapes possessing high biodiversity values in areas of palaeontological importance.
7. Prevention and minimisation of the impacts of climate change on biodiversity by:
 - Carrying out research on the impact of climate change on species, habitats, and ecosystem functions.
 - Definition of areas at risk regarding the intensity of the effects of climate change, assessment of habitat types and species threatened by climate change and their future range due to climate change.
8. Protection of biodiversity from invasive alien species by:
 - Establishing an institutional framework for detecting, preventing entry, controlling, or eradicating invasive species, for the restoration of impacted ecosystems.
 - Recording invasive species observed through the country in a database.
 - Exploring and recording their mechanisms of entry and monitoring their spread and impacts.
 - Implement national programmes for public information/ awareness and training of staff of relevant agencies on alien and invasive species.
9. Enhancing international cooperation for biodiversity conservation by:
 - Promoting the implementation of relevant international conventions, regulations, and agreements.
 - Designing international technology transfer programmes (to and from Greece).
 - Creating new partnerships and establishing support for new transboundary parks in cooperation with neighbouring countries.
 - Formulating cross-border programmes for species conservation.
10. Upgrading the quality and efficiency of public administration on biodiversity conservation:
 - Improvement of the necessary horizontal inter-administrative cooperation between sectors of environmental policy (biodiversity, forests, waters, coastal areas, rural areas, etc.).
 - Updating and codifying the legislation related to biodiversity.
 - Securing national funds for biodiversity conservation through the 'Green Fund' – Supporting the operation of the national 'Natura 2000' committee.
 - Utilisation of Community funding opportunities for biodiversity conservation.

11. Integration of biodiversity conservation into the value system of society by:

- Teaching biodiversity issues and ecosystem protection at all levels of education – training of teachers on biodiversity and its evolution. Also, strengthening Environmental Education Centres.
- Making better use of management bodies of protected areas and environmental NGOs in environmental education programmes for biodiversity.
- Providing education for focus groups of productive sectors (farmers, animal breeders, fishermen, *etc.*).
- Ensuring the creation and development of special open access portal in the Ministry of Environment and Energy where information on the conservation and management status of Greek biodiversity will be available (according to the provisions of Law 3937/2011).
- Providing guides for identification of habitat types and species for community (by the Greek Ministry of Environment and Energy) and made them available online.
- Encouraging citizen participation in actions of biodiversity conservation.
- Promoting actions by companies for biodiversity conservation.

12. Citizen participation in biodiversity conservation by:

- Defining the role of educational and research institutes, of scientific organisations and of environmental NGOs as stakeholders.
- Strengthening business activity to develop products and services designed to conserve natural resources, recycle materials, and reduce emissions of hazardous and non- hazardous substances into the environment throughout the life of the products.
- Encouraging low environmental disturbance activities with significant beneficial effects on biodiversity and discouraging activities with negative impacts when planning and funding of investment projects by companies.
- Map the direct and indirect impact of any company's activities on biodiversity, applying as a best practice the «Life Cycle» approach including recording the relative footprint of any company's supply chain, in wherever possible.

13. Appreciation of ecosystem services and the promotion of the value of Greek biodiversity by:

- Promoting the value of biodiversity and of the socio-economic benefits of conservation.
- Creating a national system of incentives for the creation and maintenance of “natural green infrastructure”.
- Completion of inscription, designation, and institutionalization of biodiversity management of islets (parks, streams, hills, lakes, rivers, wetlands, coastlines) within the urban fabric.

III.2.2. Applied measures and tools

Greek Government has already applied some of the above measures, to face the relevant threats to ecosystems, in the last decade, with the financial assistance of the European Union. Also, the National Programme for the Environment assisted by regional activities dealt with water quality and pollution in coastal areas. Additionally, the program *LIFE-Nature* for coastal areas was involved with many projects for management of environmental problems (Valavanidis, 2018). Program *LIFE* contributes to the sustainable development and achievement of the goals and objectives of the Europe 2020 strategy. Finally, under the supervision of the Ministry of Environment and Energy, online tools (visualization via maps) have been designed, which include either dataset with the boundaries of 244 Special Conservation Areas (Habitats Directive 92/43) or 202 Special Protection Areas (Birds Directive 2009/147) (Greek Ministry of Environment and Energy, 2021).

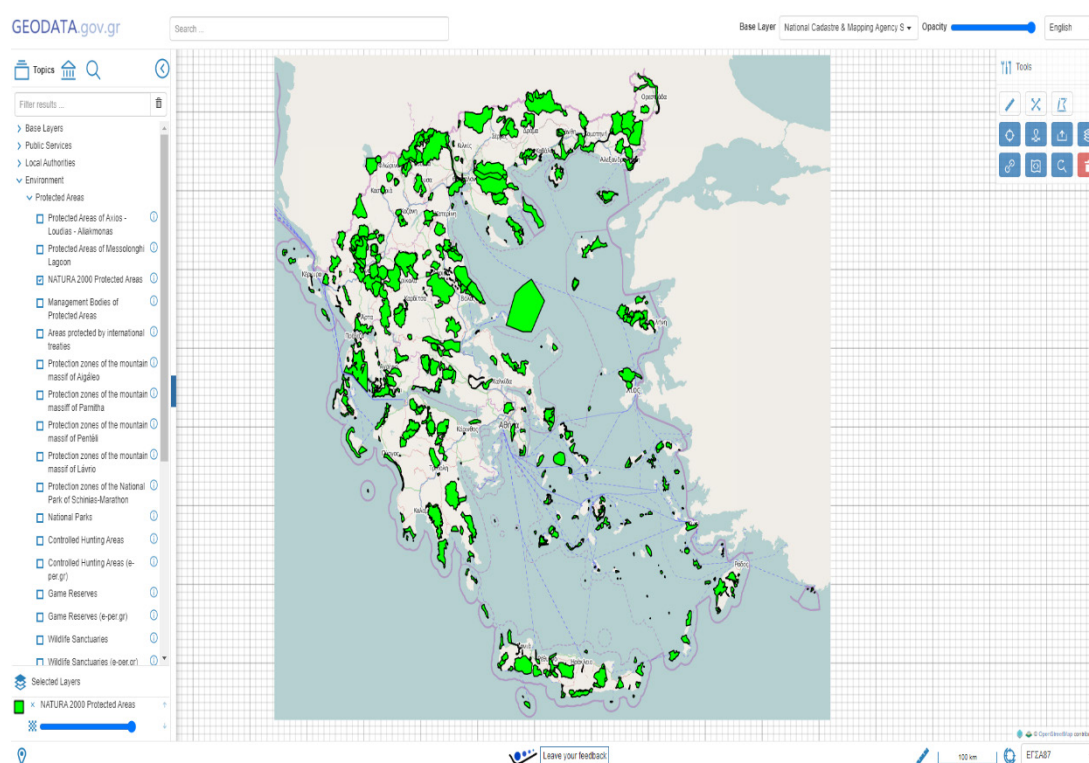


Figure 8. Tool for mapping NATURA 2000 areas in Greece (Greek Ministry of Environment and Energy)

III.3. Tourism supports marine & coastal ecosystem management practices.

The NBSAP includes several actions to achieve sub-target 5.4 on the compatibility of tourist activities with biodiversity conservation. Key actions include developing ecotourism and agro tourism, establishing frameworks for infrastructure development, especially in protected areas, and defining monitoring indicators.

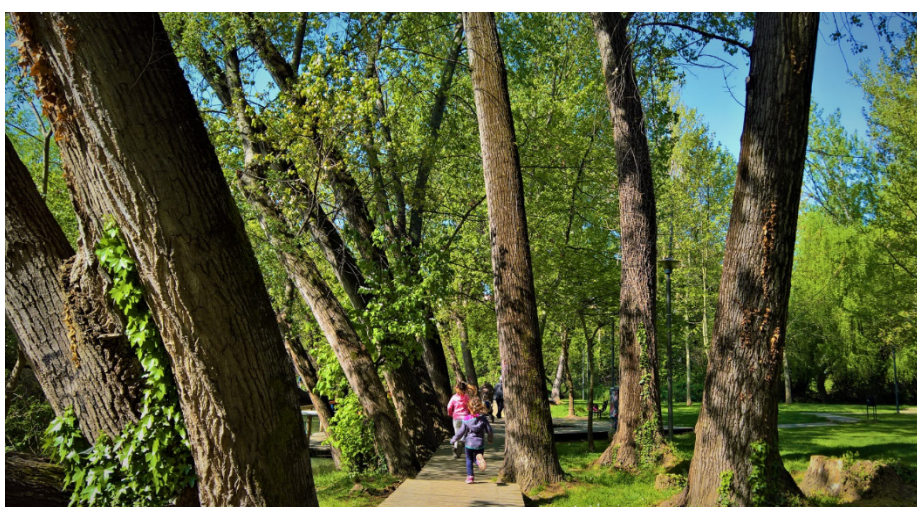


Figure 9. Greek ecotourism (mamakita.gr)

The Green Tourism Initiative, run by the Ministry of Tourism, aims to improve performance among micro, small and medium-sized tourism enterprises. Through this program, tourism businesses are financially supported to improve their resources and energy efficiency and encouraged to promote the environmentally sound characteristics of destinations (Government of Greece, 2018). To date, however, Greece's position in relation to this initiative and national objective is unclear. The development of the National Maritime Spatial Strategy in 2020, along with the updated Spatial Planning Framework for Tourism, could lead to more effective management of coastal and marine areas (OECD, 2020).

In July 2019, the Greek Minister of Tourism presented the new tourism strategy in the parliament. It has five pillars, including one on social and environmental sensitivity. In addition, ad hoc initiatives sponsored by the EU and the European Bank for Reconstruction and Development aim to reduce pressures from tourism, notably through diversifying destinations and combating over tourism (Aristeidou, 2019).

IV. Conclusions

Greece has the longest coastline in Mediterranean region, and it is estimated that 57% of the country's population live in coastal areas (Polyzos *et al.* 2019). Additionally, most tourism activities take place in coastal areas and that is a key pressure on ecosystems. The main threats for marine and coastal ecosystems are the climate change, fisheries, pollution, especially plastic litter, coastal infrastructure, tourism development and other anthropogenic pressures, such as population increase, overexploitation of natural resources, failure of decision-making process and policy implementation as well. The above pressures can cause damage to marine and coastal ecosystem as well as exacerbate species extinction.

To protect the environment, including protected areas and vulnerable species, The European Union enacted the Biodiversity Strategy in 2014, with the aim that all targets resulting from this strategy will be achieved by 2029. The Greek government has addressed a list of 13 general objectives that the country must achieve by 2029. To achieve them, the Greek Ministry of Environment and Energy suggested some specific actions to be applied and some tools that need to be developed, such as mapping protected areas Natura 2000. The fact that some tools have already been created, as well as some actions started to be implemented, is promising for ecosystems protection, especially coastal and marine ones. In addition, implementing these measures paves the way for the sustainable development of tourism in coastal areas, while reducing the pressures that this development exerts on ecosystems.

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