ACTIONS FOR THE CONSERVATION OF COASTAL DUNES WITH *JUNIPERUS* spp. IN CRETE AND THE SOUTH AEGEAN (GREECE)

LIFE07NAT/GR/000296

Action D.7
Deliverable D.7.2

AFTER-LIFE CONSERVATION PLAN

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"Actions for the conservation of coastal dunes with *Juniperus* spp. in Crete and the South Aegean (Greece)"

- JUNICOAST -

Action D.7: After-LIFE communication and conservation plans

Deliverable D.7.2: After-LIFE conservation plan

Responsible beneficiary: Mediterranean Agronomic Institute of Chania (MAICh)

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Introduction

Coastal dunes with *Juniperus* spp. have been classified as a “**priority habitat**” (code 2250*) by the 92/43 EU Habitat Directive **which means types of habitats in danger of disappearance of which the Community has a particular responsibility for their conservation**. In Greece, they are mostly confined to the South and the West parts of the country especially in the Regions of Crete, the South Aegean and the Peloponnese. They are facing various natural and anthropogenic pressures and are **threatened** mainly by **woodcutting, tourism, forest fires, alien species, restricted natural regeneration of the *Juniperus* species, grazing and browsing, habitat fragmentation, building pressure** and **most importantly lack of public awareness**. Rapid and **uncontrolled tourism growth** in combination with **lack of environmental education and public awareness** is considered one of the most **serious threats** to this priority habitat throughout Greece.

The **aim** of the after-LIFE conservation plan of the JUNICOAST project is to identify and propose conservation and management activities which will be implemented after the end of the project to ensure the long term conservation of coastal dunes with *Juniperus* spp., to secure the sustainability of the concrete conservation actions implemented by the project in Crete and to promote the implementation of similar actions within habitat 2250* on a National Level. To that purpose, several conservation and management activities are expected to be carried at the Cretan Regional level.

Pre-LIFE conservation issues

The aesthetic and economic value of coastal dunes with *Juniperus* spp. in Greece has been widely recognized as they receive ample weight of the tourist industry. However, their **physical** and **ecological functions** have received little attention and until recently, there were **no documented evidence that active conservation or management measures** have been implemented for the protection and restoration of this **priority habitat** in Greece. In view of this, the **Mediterranean Agronomic Institute of Chania**, the **National and Kapodistrian University of Athens** and the **Region of Crete (Forest Directorates of Chania and Lasithi)** implemented a LIFE+ Nature project entitled "Actions for the conservation of coastal dunes with *Juniperus* spp. in Crete and the South Aegean (Greece)", known as JUNICOAST (www.junicoast.gr). The project started on January 2009 and was completed by August 2013.

Project description

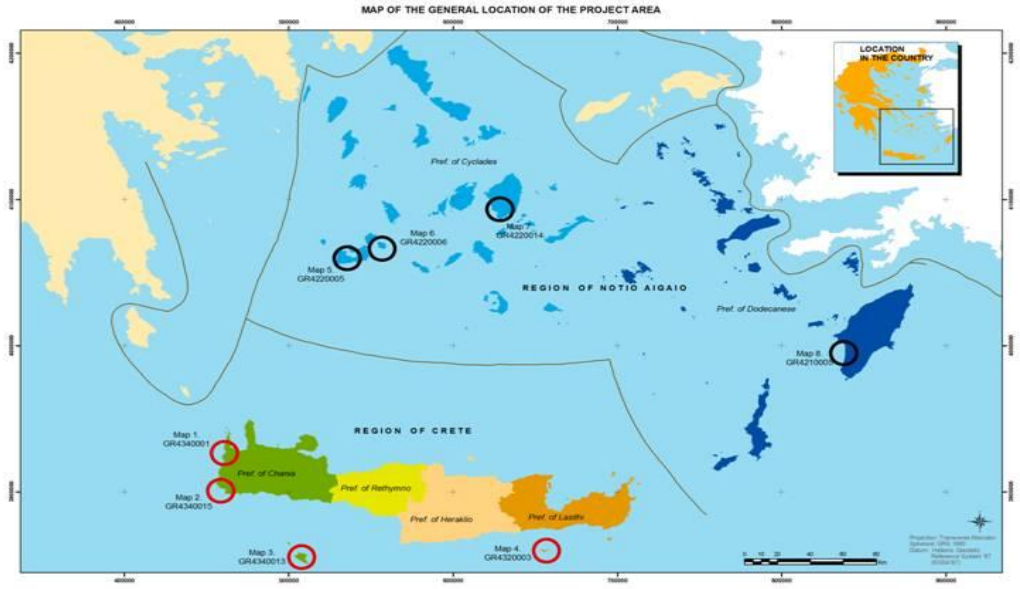
Aim of the project

The **aim** of the JUNICOAST project was to promote and enable the long term conservation of the coastal dunes with *Juniperus* spp. in Greece. The **specific objectives** for achieving this aim were:

- To contribute to the consolidation and dissemination of a knowledge base for the protection, restoration, monitoring and evaluating of coastal dunes with *Juniperus* spp. habitats in Greece,
- To understand, quantify and halt natural and anthropogenic threats that contribute to the long term degradation of the habitat,
- To design and implement concrete conservation and public awareness/dissemination actions for the restoration and the long term protection of the coastal dunes with *Juniperus* spp. and,
- To provide support for better environmental governance in Natura 2000 sites through stakeholder involvement and training.

Project areas

All project areas are Natura 2000 designated coastal dunes with Juniperus spp. (code 2250*) located in Crete (Gavdos, Chrysi, Kedrodasos and Falasarna) and the South Aegean (Milos, Polyegos, Naxos and Rhodes).



Project development

All the actions of the JUNICOAST project were carried out in Natura 2000 designated sites. The activities developed began with a series of **preparatory actions** in Crete that **allowed the consolidation of a national knowledge base** providing insight on the abiotic and biotic factors that influence the habitat structure and quality but also on the effects of anthropogenic pressures.

Preparatory actions:

- Land form and land degradation processes in dune systems
- Dune system plant communities' composition and structure
- Composition and structure of *Juniperus* populations
- Habitat mapping
- Visitor impact assessment
- Stakeholder consultation
- Elaboration of long-term monitoring protocols and selection of indicators
- Elaboration of target habitat protection and restoration specifications
- Determination of the governance structure and legal status

These were followed by **concrete conservation actions** in Crete **targeting the main natural and anthropogenic threats** which put into practice, tested and evaluated actions and methodologies unfamiliar to the Greek habitat's context.

Concrete conservation actions:

- On site habitat demarcation
- Waste removal
- Enhancement of juniper regeneration
- Restoration of the floristic composition and structure of the target habitat
- Dune stabilization through vegetation restoration
- Visitor management intervention and infrastructures
- Design and installation of signs
- Ex situ conservation and propagation of keystone species

Moreover, **information about dune systems, their values, characteristics, functions and dynamics** were incorporated into a **communication strategy to raise public awareness about basic understanding of the nature of dune systems** and their role as a sand reserve for the beach.

The communication strategy was followed by a communication plan that defined a detailed sequence of communication channels and materials and implemented a set of **awareness, education/training** and **networking activities** through which the strategy was put into effect. These activities have been carried out on a National level allowing the promotion of similar concrete conservation and dissemination actions in the South Aegean, disseminate the lessons learnt, promote and provide training of the trialed techniques and methods nationally, as well as raise public awareness ensuring the wider conservation of this priority habitat throughout Greece.

Awareness, education/training and **networking activities:**

- Stakeholder consultation
- Development and implementation of a communication strategy,
- Website development,
- Implementation of an environmental education campaign,

- Training of stakeholders (e.g. forest directorate staff, government officers, etc),
- Production and dissemination of habitat protection and restoration guidelines,
- Dissemination of findings to the scientific community and Layman’s report
- Production of After-LIFE communication and conservation plans
- Design and installation of Signs
- Scientific committee
- Networking with other similar LIFE projects
- Stakeholder committee

Outputs of the project

Outputs by the end of the JUNICOAST project covered two levels: National and Cretan levels.

Outputs at the National level:

The **preparatory actions** in Crete allowed the consolidation of a **National** knowledge base providing insights on:

- The **geomorphology** of coastal dunes in Crete
- The dune system **plant communities and *Juniperus* population** composition and structure
- The **effect of anthropogenic threats** on the habitat’s ecological conditions
- **Effective conservation and monitoring methods** through the elaboration of habitat protection and restoration guidelines and monitoring protocols.

Moreover, the **public awareness and dissemination actions** and more specifically, the **National communication strategy** allowed the promotion of concrete conservation and dissemination actions in the South Aegean, disseminated the lessons learnt in Crete, promoted and provided training of the trialed techniques and methods nationally, as well as raised public awareness ensuring the wider conservation of this priority habitat throughout Greece.

Outputs at the Cretan level:

The main outputs in Crete were the improved conservation status of the habitats and halting of threats through a series of actions which resulted in the following:

- 239.31 ha of coastal dunes with *Juniperus* spp. have been mapped, demarcated, cleaned and protected; of which 11.48 ha are in Kedrodasos-Elafonisi, 2.76 ha in Falasarana, 16.52 ha in Sarakiniko-Gavdos, 25.54 ha in Agios Ioannis-Gavdos, 98.55 in Lavrakas-Gavdos and 87.46 ha on Chrysi Island.

122 wooden sticks for habitat demarcation have been installed in Gavdos, 15 in Falasarna, 29 in Kedrodasos-Elafonisi and 161 on Chrysi Island.

- Enhanced regeneration of the *Juniperus* species in all Cretan habitats

96 juvenile *Juniperus macrocarpa* plants were replanted and fenced at Cretan sites (21 in Sarakiniko-Gavdos of which 14 have survived, 41 in Agios Ioannis-Gavdos of which 25 have survived and 34 in Kedrodasos-Elafonisi of which 14 have survived),

12 naturally established juveniles of *Juniperus macrocarpa* were fenced (6 in Sarakiniko-Gavdos and 6 in Kedrodasos-Elafonisi),

150 juvenile *Juniperus macrocarpa* plants and 60 female individuals are growing in the nursery of MAICh for future planting if needed.

- Restoration of the floristic composition and structure of the target habitat

45 *Pancratium maritimum* individuals have been planted and fenced in kedrodasos-Elafonisi of which 21 have survived,

44 C*entaurea pumilio* individuals have been planted and fenced in kedrodasos-Elafonisi of which 19 have survived,

184 invasive species (*Pinus brutia*) have been eliminated from Cretan sites (57 from Sarakiniko-Gavdos, 30 from Agios Ioannis-Gavdos, 57 from Lavrakas-Gavdos, 19 from Chrysi-East and 21 from Chrysi-West),

The invasive species *Carpobrotus edulis* have been eliminated from 2 localities in Chrysi-East.

- *In situ* and *ex situ* conservation of *Juniperus* and habitat keystone species

36 keystone[1] and 80 indicator*[2]* species have been identified at all Cretan sites. Seeds from *Juniperus macrocarpa* and all keystone species have been collected, cleaned and stored at the seed bank of MAICh.

- Primary/front dune zone restoration where needed

14 units of sand trapping fences (200m length in total) were installed at the North beach of the East site of Chrysi Island.

- Minimization of threats and negative impacts on all habitats

340 m of wooden boardwalks have been constructed and installed (120 m in Sarakiniko-Gavdos and 220 m in Chrysi-East),

65 directional wooden sticks have been installed for the main trails delineation in Gavdos (Agios Ioannis and Lavrakas), 40 in Chrysi Island and 8 directional metal sticks for the E4 path in Kedrodasos-Elafonisi,

10 wooden Rubbish bins have been installed at the main beach in Sarakiniko-Gavdos,

15 four-wheeled Plastic Rubbish Bins have been installed in Gavdos, 6 in Kedrodasos-Elafonisi and 2 in Falasarna,

2 wooden tables with wooden benches have been installed within the habitat in Sarakiniko-Gavdos,

3 wooden benches have been installed within the habitat in Kedrodasos-Elafonisi and 2 on Chrysi Island.

- Increased public awareness in relation to coastal dunes with *Juniperus* spp.

16 information signs have been installed within the boundaries of all Cretan sites (4 in Kedrodasos-Elafonisi, 2 in Falasarna, 2 in Srakiniko-Gavdos, 2 in Agios Ioannis-Gavdos, 3 in Lavrakas-Gavdos and 3 on Chrysi Island)

[1] **Keystone species:** Species that can occur at any trophic level and plays a critical role in maintaining a community because it has profound and far reaching effects in the web of interactions and its removal would lead to significant changes (just like the removal of the keystone of an arch).

[2] **Indicator species:** Species whose presence is directly related to a particular quality in its environment at a given location

15 notice boards have been installed at strategic points outside the boundaries of the sites (relevant municipalities and ferry boats connecting Crete with Gavdos and Chrysi islands).

Current situation - SWOT analysis

	INTERNAL		
POSITIVE	**STRENGHTS**[1] 1. The project deliverables and especially the "habitat protection and restoration guidelines" provide "best practices techniques" for the protection and restoration of the habitat and they can be also used as "reference" studies and techniques for other sites in Greece. 2. The mapping of the habitats exact boundaries of each site, provide a powerful tool for the effective protection of the habitat. 3. The existing National and European legislation is considered sufficient. 4. The stakeholders' consultation provided a participatory approach in determining the restoration specifications of the studied sites and ensures the long term sustainability of the project outcomes. 5. The applied communication strategy and the constructed infrastructures had positive response. 6. The proposal itself could be used as an example for other such initiatives. 7. The project consortium provides a thorough monitoring and evaluation of the results and an immediate reaction to unexpected issues.	**WEAKNESSES**[2] 1. The Governance structure and the fragmentation of responsibilities result into ineffective habitat protection. 2.Inability of full law implementation 3. The economic crisis and the lack of public investment in the environmental sector 4. Difficult access to some remote sites on islands	NEGATIVE
	1. key stakeholders aware of the importance of nature conservation as a development factor 2. Increased participation of stakeholders 3. Appropriate funding through the LIFE programme. **OPPORTUNITIES**[3]	1. Lack of public awareness mainly regarding the main goal of the Natura 2000 network. 2. Expansion of the impact of climate change on *Juniperus* populations and/or on other keystone species. 3. Increase number of campers due to the present economic crisis **THREATS**[4]	
	EXTERNAL		

[1] **Strengths** (i.e. those attributes of the project, the project team, and the site (s) that have aided or can aid in achieving the project's objectives).
[2] **Weaknesses** (i.e. those attributes of the project, the project team and the site(s) that have harmed or can harm the project's potential to achieve its objectives).
[3] **Opportunities** i.e. external conditions that might be helpful in achieving the project's objectives).
[4] **Threats** (i.e. external conditions that might be harmful to achieving the project's objectives).

After-LIFE conservation activities

Future conservation activity	Degree of importance	Responsible	Possible source of funding	Budget/Comments
Update and maintenance of the knowledge base on coastal dunes with *Juniperus* spp.	Important	MAICh NKUA	Own resources	-
Maintenance of all installed infrastructures	Necessary	Forest Directorates, Municipalities, MAICh	Own resources	15.600 €
Littering removal	Necessary	Municipalities	Own resources	Cooperation with volunteers
***In-situ* and *Ex-situ* conservation of *Juniperus* and other keystone species**	Necessary	MAICh	Own resources	2.000 €
Monitoring program regarding plant species, threats and other ecological parameters	Necessary	MAICh NKUA	Own resources	1500 €
Basic wardening and fire protection activities	Crucial	Forest Directorates	Own resources	-
Cooperation between various authorities	Crucial	All	Own resources	-
Implementation of the after-LIFE communication plan	Crucial	MAICh	Own resources	-

Degree of importance: Crucial>Necessary>Important

After-LIFE conservation actions

Implemented conservation actions	Future activities	Responsible	Site	Estimated budget
Habitat demarcation	Maintenance of habitat demarcation infrastructure (wooden sticks/LIFE and Natura 2000 logos). Painting wooden sticks or replacement in case of damage	Forest Directorate of Chania or Minicipality of Gavdos	Gavdos (Sarakiniko, Agios Ioannis, Lavrakas)	2.000 €
		Forest Directorate of Chania or Minicipality of Kantanou-Selinou	Kedrodasos	500 €
		Forest Directorate of Chania or Minicipality of Kissamos	Falasarna	200 €
		Forest Directorate of Lasithi or Minicipality of Ierapetra	Chrysi	3.000 €
Waste removal	Waste removal from the habitat and regular cleaning of the rubbish bins during summer season	Municipality of Gavdos in cooperation with volunteers	Gavdos (Sarakiniko, Agios Ioannis, Lavrakas)	-
		Municipality of Kantanou-Selinou in cooperation with volunteers	Kedrodasos	-
		Municipality of Kissamos in cooperation with volunteers	Falasarna	-
		Municipality of Ierapetra in cooperation with volunteers	Chrysi	-
Fenced naturally established *Juniperus* juveniles	Maintenance of fences	NKUA or Forest Directorate of Chania	Gavdos (Sarakiniko)	800 €
			Kedrodasos	400 €

Implemented conservation actions	Future activities	Responsible	Site	Estimated budget
Elimination of invasive species	Monitoring and evaluation	NKUA	Gavdos (Sarakiniko, Agios Ioannis, Lavrakas)	1.000 €
		NKUA	Chrysi	500 €
Boardwalks	Maintenance of boardwalks (painting and replacement in case of damage)	Forest Directorate of Chania	Gavdos (Sarakiniko)	1.500 €
		Forest Directorate of Lasithi	Chrysi-East	2.000 €
Path delineation	Maintenance of path delineation infrastructure (wooden sticks/LIFE and Natura 2000 logos). Painting wooden sticks or replacement in case of damage	Forest Directorate of Chania or Minicipality of Gavdos	Gavdos (Agios Ioannis, Lavrakas)	1.000 €
		Forest Directorate of Chania or Minicipality of Kantanou-Selinou	Kedrodasos	200 €
		Forest Directorate of Lasithi or Minicipality of Ierapetra	Chrysi	800 €
Rubbish bins	Maintenance and cleaning of rubbish bins	Municipality of Gavdos	Gavdos (Sarakiniko)	200 €
Wooden tables and benches	Maintenance	Forest Directorate of Chania	Gavdos (Sarakiniko)	400 €
		Forest Directorate of Chania	Kedrodasos	200 €
		Forest Directorate of Lasithi	Chrysi	400 €
Sand trapping fences	Maintenance of sand trapping fences and planting with keystone species	Forest Directorate of Lasithi	Chrysi	500 €

Implemented conservation actions	Future activities	Responsible	Site	Estimated budget
Information Signs	Maintenance of information signs (painting and replacement in case of damage)	MAICh	All Cretan sites	1.500 €
***Ex-situ* conservation of *Juniperus* and other keystone species**	Collection, storage and propagation of *Juniperus macrocarpa* and other keystone species	MAICh	All Cretan sites	1.000 €
	Maintenance of propagated seedlings and cuttings of *Juniperus macrocarpa* and other keystone species transferred to the nursery of the Forest Directorate of Chania	Forest Directorate of Chania	All Cretan sites	1.000 €
			TOTAL	**19.100** €

Conclusions

The AFTER-LIFE conservation plan was presented at the final event of the project that was held on August 27, 2013 at the conference center of MAICh. This is the final version of the plan after receiving feedbacks, comments and corrections proposed by the relevant stakeholders (Forest Directorates of Chania/Lasithi and Municipalities of Gavdos, Kantanou-Selinou, Kissamos and Ierapetra).

The main conclusion of the event was that for the fulfillment of the aim and the objectives of Junicoast, efforts made should not stop at the end of the project, but should continue in the future. In this spirit, there was a verbal agreement and commitment between all stakeholders to continue the established cooperation, the actions carried out and the maintenance of all installed project infrastructures.