

LIFE17 NAT/GR/000514

“Conservation & Management of the Bonelli’s eagle population in the east Mediterranean”
(Acronym: LIFE Bonelli eastMed)

Action D3

Monitoring of project impact on ecosystem functions

Impact Assessment of the LIFE Bonelli eastMed Project on Ecosystem Functions Deliverable of Action D3

Μελέτη Επιπτώσεων του Προγράμματος LIFE Bonelli
eastMed στις οικοσυστημικές λειτουργίες
Παραδοτέο Δράσης D3

Heraklion, April 30, 2025

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Summary in English

The objective of Action D3 is to analyze and evaluate possible modifications on ecosystem services as a consequence of the LIFE Bonelli eastMed project's outcomes.

The study on the "Impact Assessment of the LIFE Bonelli eastMed Project on Ecosystem Functions" was assigned to an External Contractor under a restricted call-for-tenders procedure in September 2024 and the Study was delivered in March 2025.

For the purpose of this study, the quantification of Ecosystem Condition (EC) was made using the national scale assessment for the condition of each ecosystem type (MAES level 2) of Greece (EEA 10km grid cell analysis), within the spatial range of the project sites. In cases of NATURA 2000 sites for which the assessment was not available, a combination of expert opinion and a national database was used. These areas were the following: Notia Mani – GR2540008 & GR2540001, Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni – GR4210003, and Nisos Tilos kai Nisides: Antitilos, Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas – GR4210024. For the NATURA 2000 sites of Cyprus, these data were not available so the EC quantification was not performed.

In order to map and assess Ecosystem Services (ES), MAES common assessment framework has been used and has been organized in a number of practical steps in order to ensure an integrated result. For this ES assessment, the draft version of V5.2 was used. Factors and drivers, including pressures and conservation actions, determining ecosystem services supply in the project area, were taken into account.

Following the methodology approached by the contractor, five (5) main and relevant Ecosystem Types (MAES level 2) were identified in project sites: scrubland; sparsely vegetated land; grassland; woodland; and cropland. Ecosystem types were assessed before LIFE projects' interventions and actions. The Ecosystem Condition (EC) for each relevant ecosystem type identified in the project sites. This procedure has not been completed for the sites in Cyprus as relevant data was lacking. Relevant Ecosystem Services (ES) and ES indicators were chosen. The descriptors of each selected ES code has been rephrased in order to address more adequately the scope of this report.

This study analyzed and evaluated the impact of the actions implemented by LIFE Bonelli eastMed till 31/10/2024 on ecosystem services in project pilot areas in Greece and Cyprus. The evaluation focused on how ecosystem services were or will be modified as a result of the actions outlined in the project.

Specifically, the objective was to assess the changes in the level and trend of ecosystem services after the implementation of these actions. To achieve this, the contractor employed and adapted a version of an approach from Burkhard et al. (2018), specifically designed for the evaluation of ecosystem services. This methodology was developed to assist in decision-making processes and to evaluate

alternative states at the local level, ensuring a comprehensive analysis of the project's effects on ecosystem services within the project sites.

The combined interpretation of the analysis carried out within the elaboration of the Study led to the following assessment of the project's impacts on ecosystem functions and services:

- The LIFE Bonelli eastMed project has had to a positive impact on three key sections of ecosystem services (ES): Provisioning, Regulating & Maintenance, and Cultural.
- No deterioration in ecosystem services can be attributed to the project actions; rather, improvements have been observed.
- As a result of the project's implementation, the coverage of croplands has increased, contributing to greater food availability for wildlife and supporting local agricultural practices.
- The quality and functionality of woodlands-forest ecosystems in Cyprus are expected to improve due to the creation of forest openings, enhancing habitat conditions for various species, including Bonelli's eagle.
- The indicators demonstrate the positive contribution of the LIFE project actions in mitigating two major threats to Bonelli's eagle and other species within the project area: direct mortality and disturbance.

Περίληψη στα Ελληνικά

Στόχος της Δράσης D3 είναι η ανάλυση και αξιολόγηση πιθανών μεταβολών στις οικοσυστημικές υπηρεσίες ως συνέπεια των αποτελεσμάτων του έργου LIFE Bonelli eastMed.

Η μελέτη με τίτλο «Εκτίμηση Επιπτώσεων του Έργου LIFE Bonelli eastMed στις Οικοσυστημικές Λειτουργίες» ανατέθηκε σε Εξωτερικό Ανάδοχο μέσω διαδικασίας πρόσκλησης για υποβολή προσφορών τον Σεπτέμβριο του 2024 και παραδόθηκε τον Μάρτιο του 2025.

Για τους σκοπούς της μελέτης, η ποσοτικοποίηση της Κατάστασης του Οικοσυστήματος (Ecosystem Condition - EC) πραγματοποιήθηκε χρησιμοποιώντας την εθνικής κλίμακας αξιολόγηση για την κατάσταση κάθε τύπου οικοσυστήματος (MAES επίπεδο 2) στην Ελλάδα (ανάλυση πλέγματος ΕΕΑ 10χλμ.), εντός της χωρικής εμβέλειας των πιλοτικών περιοχών του έργου. Σε περιπτώσεις περιοχών NATURA 2000 για τις οποίες δεν υπήρχε διαθέσιμη αξιολόγηση, χρησιμοποιήθηκε συνδυασμός της εθνικής βάσης δεδομένων και των απόψεων/γνώσεων εμπειρογνομόνων. Οι περιοχές αυτές ήταν οι εξής: Νότια Μάνη – GR2540008 & GR2540001, Βόρεια Κάρπαθος και Σαρία και Παράκτια Θαλάσσια Ζώνη – GR4210003, και Νήσος Τήλος και Νησίδες: Αντίτηλος, Πελεκούσα, Γαϊδουρονήσι, Γιακουμή, Άγιος Ανδρέας – GR4210024. Για τις περιοχές NATURA 2000 της Κύπρου δεν υπήρχαν διαθέσιμα τέτοια δεδομένα, συνεπώς δεν πραγματοποιήθηκε ποσοτικοποίηση της Κατάστασης Οικοσυστήματος.

Για τη χαρτογράφηση και αξιολόγηση των Οικοσυστημικών Υπηρεσιών (Ecosystem Services - ES), χρησιμοποιήθηκε το κοινό πλαίσιο αξιολόγησης MAES, το οποίο οργανώθηκε με την εκτέλεση μιας σειράς πρακτικών βημάτων ώστε να διασφαλιστεί ένα ολοκληρωμένο αποτέλεσμα. Για την παρούσα αξιολόγηση Οικοσυστημικών Υπηρεσιών, χρησιμοποιήθηκε η πρόχειρη έκδοση V5.2. Ελήφθησαν υπόψη παράγοντες και εξωτερικές επιδράσεις, συμπεριλαμβανομένων πιέσεων και δράσεων διατήρησης, που επηρεάζουν την προσφορά οικοσυστημικών υπηρεσιών στην περιοχή του έργου.

Σύμφωνα με τη μεθοδολογία που ακολούθησε ο ανάδοχος, εντοπίστηκαν πέντε (5) βασικοί και σχετικοί Τύποι Οικοσυστημάτων (MAES επίπεδο 2) στις περιοχές του έργου: θαμνώδεις εκτάσεις, αραιά καλυμμένες εκτάσεις, χορτολιβαδικές εκτάσεις, δασικές εκτάσεις και γεωργικές εκτάσεις. Οι τύποι οικοσυστημάτων αξιολογήθηκαν πριν τις παρεμβάσεις του έργου LIFE Bonelli eastMed και αναλύθηκε η Κατάσταση Οικοσυστήματος για κάθε σχετικό τύπο οικοσυστήματος στις περιοχές του έργου. Η διαδικασία αυτή δεν ολοκληρώθηκε για τις περιοχές της Κύπρου λόγω έλλειψης σχετικών δεδομένων. Επιλέχθηκαν οι σχετικές Οικοσυστημικές Υπηρεσίες και οι αντίστοιχοι δείκτες τους. Τα περιγραφικά στοιχεία κάθε επιλεγμένου κωδικού Οικοσυστημικών Υπηρεσιών αναδιατυπώθηκαν ώστε να ανταποκρίνονται καλύτερα στο σκοπό της παρούσας εργασίας.

Η μελέτη ανέλυσε και αξιολόγησε τον αντίκτυπο των δράσεων που υλοποιήθηκαν από το έργο LIFE Bonelli eastMed έως τις 31/10/2024, στις οικοσυστημικές υπηρεσίες των πιλοτικών περιοχών του έργου σε Ελλάδα και Κύπρο. Η αξιολόγηση επικεντρώθηκε στο πώς τροποποιήθηκαν ή θα τροποποιηθούν οι οικοσυστημικές υπηρεσίες, ως αποτέλεσμα των παρεμβάσεων που υλοποιήθηκαν από το έργο.

Συγκεκριμένα, ο στόχος ήταν να αξιολογηθούν οι αλλαγές στο επίπεδο και στην τάση εξέλιξης των υπηρεσιών οικοσυστήματος μετά την υλοποίηση αυτών των συγκεκριμένων δράσεων. Για την επίτευξη αυτού του στόχου, ο ανάδοχος υιοθέτησε και προσαρμοσε μια μεθοδολογία βασισμένη στο Burkhard et al. (2018), ειδικά σχεδιασμένη για την αξιολόγηση των οικοσυστημικών υπηρεσιών. Η μεθοδολογία αναπτύχθηκε για να υποστηρίξει διαδικασίες λήψης αποφάσεων και να αξιολογεί εναλλακτικές καταστάσεις σε τοπικό επίπεδο, εξασφαλίζοντας μια ολοκληρωμένη ανάλυση των επιπτώσεων του έργου στις οικοσυστημικές υπηρεσίες των περιοχών παρέμβασης/υλοποίησης.

Η συνδυαστική ερμηνεία των αποτελεσμάτων της ανάλυσης που προέκυψαν κατά την εκπόνηση της Μελέτης οδήγησε στην ακόλουθη αξιολόγηση των επιπτώσεων του έργου στις οικοσυστημικές λειτουργίες και υπηρεσίες:

- Το έργο LIFE Bonelli eastMed είχε θετικό αντίκτυπο σε τρεις βασικές κατηγορίες οικοσυστημικών υπηρεσιών: Προμηθευτικές, Ρύθμισης & Διατήρησης και Πολιτισμικές.
- Δεν παρατηρήθηκε επιδείνωση οικοσυστημικών υπηρεσιών που να αποδίδεται στις δράσεις του έργου· αντίθετα, καταγράφηκαν βελτιώσεις.
- Ως αποτέλεσμα της υλοποίησης του έργου, αυξήθηκε η κάλυψη των καλλιεργούμενων εκτάσεων, συμβάλλοντας θετικά στη διαθεσιμότητα τροφής για την άγρια ζωή και στη στήριξη των τοπικών γεωργικών πρακτικών.
- Η ποιότητα και λειτουργικότητα των δασικών οικοσυστημάτων στην Κύπρο αναμένεται να βελτιωθούν λόγω της δημιουργίας ανοιγμάτων στο δάσος, καθώς αυτά βελτιώνουν τις συνθήκες ενδιαιτήματος για διάφορα είδη, συμπεριλαμβανομένου του Σπιζαετού.
- Οι δείκτες καταδεικνύουν τη θετική συμβολή των δράσεων του έργου LIFE στην αντιμετώπιση δύο σημαντικών απειλών για τον Σπιζαετό και άλλα είδη των πιλοτικών περιοχών του έργου: την άμεση θνησιμότητα και την όχληση.

Impact Assessment of the LIFE Bonelli eastMed Project on Ecosystem Functions

Impact Assessment of the LIFE Bonelli eastMed Project on Ecosystem Functions

Εκπόνηση Μελέτης Επιπτώσεων του Προγράμματος LIFE Bonelli eastMed στις
οικοσυστημικές λειτουργίες

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Herakleion, 21/3/2025

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List of Abbreviations

Abbreviation	Definition
BE	Bonelli's eagle
ES	Ecosystem Service
ET	Ecosystem Type
EC	Ecosystem Condition

1. Introduction

1.1. Aim of the project

LIFE Bonelli eastMed had a 6 years duration and aimed to address - resolve the most critical threats for the Bonelli's eagle populations in Greece and Cyprus and to ensure the long term preservation of a favorable conservation status for the species interconnected local populations. The Bonelli's Eagle is a priority species of the Birds Directive (Annex I), with an International Species Action Plan. As a threatened priority species, its conservation within SPAs and in the wider countryside is among the priorities of the EU Biodiversity Strategy. The same holds for the National Biodiversity Strategy for Greece and the one for Cyprus and the relevant PAFs. As an umbrella top predator species, typical of Mediterranean ecosystems, characterized by large dispersal range, the Bonelli's eagle is an ideal case to apply concerted/ coordinated conservation actions across large geographical areas, involving many countries and stakeholders.

The project actively supported competent nature authorities and key stakeholders to carry out urgent conservation actions, harmonized with the prescriptions of the International Species Action Plan and the published species conservation guidelines, based on the long term Western Europe experience, to build an efficient international conservation umbrella for the species in the 2 project countries as well as in the wider region of Eastern Mediterranean.

The specific project objectives include:

1. Fill current knowledge gaps (especially lack of telemetry data), preventing the spatial assessment of the species mortality causes and local population dynamics
2. Reduce the direct mortality for the species inside breeding SPAs in Greece and Cyprus, acting as regional population sinks
3. Improve the species productivity within SPA breeding sites by foraging habitat management and by reducing human induced disturbance
4. Improve the technical - operational capacity of nature authorities and other stakeholders to effectively manage the species populations
5. Improve the awareness of stakeholders and specific target groups for the sustainable species conservation
6. Plan and implement an effective transferability and replicability strategy for EMBoNET, to further expand the approach to other N2K sites and priority biodiversity of the region

1.2. Purpose of Action D3

The purpose of Action D3 is to analyze and evaluate, from a theoretical point of view, the foreseeable modifications on ecosystem services as a consequence of the expected results of LIFE Bonelli eastMed (LIFE17 NAT/GR/000514).

Through the implementation of concrete conservation actions, restoration and preservation of ecosystem functions can be achieved, enhancing the ecosystem services in the geographical contexts of the interventions. Thus, the purpose of the action D3 is to assess the impact of the projects interventions on the main ecosystem functions and services (hereafter ESS) provided by Natura 2000 Network sites, where the project has been carried out.

More specifically, as Bonelli's eagle is a top predator and is considered an umbrella species in the areas where it is present, it is expected that actions for its conservation and protection also can benefit a lot of other bird species as well and the biodiversity in general. Thus, projects' interventions are expected to lead to restoration and enhancement of the ecological functions in the sites of interventions.

The main limitation associated with this action has to do with the time scale of the project's positive impacts, as they are expected to take on their full scale once the restored habitats and sites are consolidated, and even expand, after years and decades. Thus there is a possibility of underestimation resulting from only assessing in the early years of the projects interventions.

1.3. Target

The main recipients of this evaluation are the coordinating beneficiary of LIFE Bonelli eastMed and the LIFE Unit of the European Commission, as co-financier of the project. Both entities are interested in knowing the modifications theoretically produced on the ecoservices, both in order to evaluate the positive externalities of the project and to have a tool for the public communication of the possible social and environmental benefits of the project.

1.4. Project Area

The project area consists of 24 Natura 2000 sites in Greece (Crete, Cyclades, Dodecanese, Peloponnese, South Attica) and Cyprus, as depicted in the Figure 1-1 and Figure 1-2. The list of all the project sites, SPA and SCA codes, as well as their surface area (ha) is offered in Table 1-1.

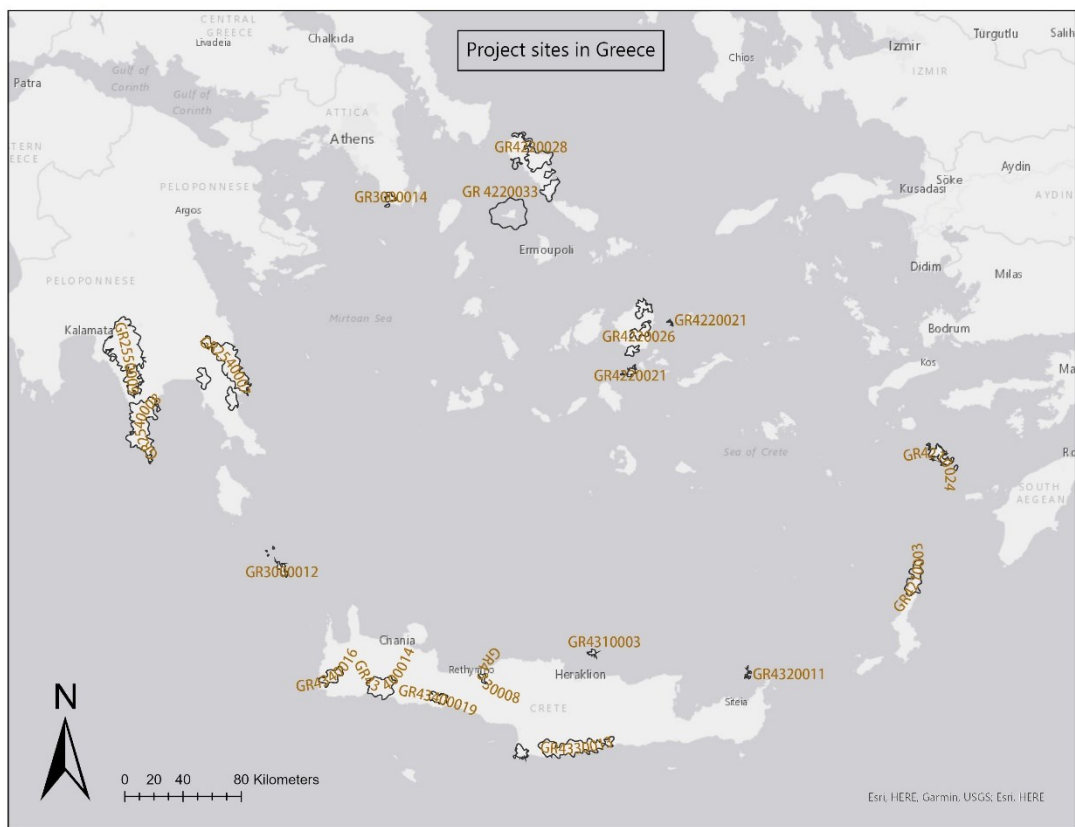


Figure 1-1. Project sites’ boundaries and SPA codes in Greece.

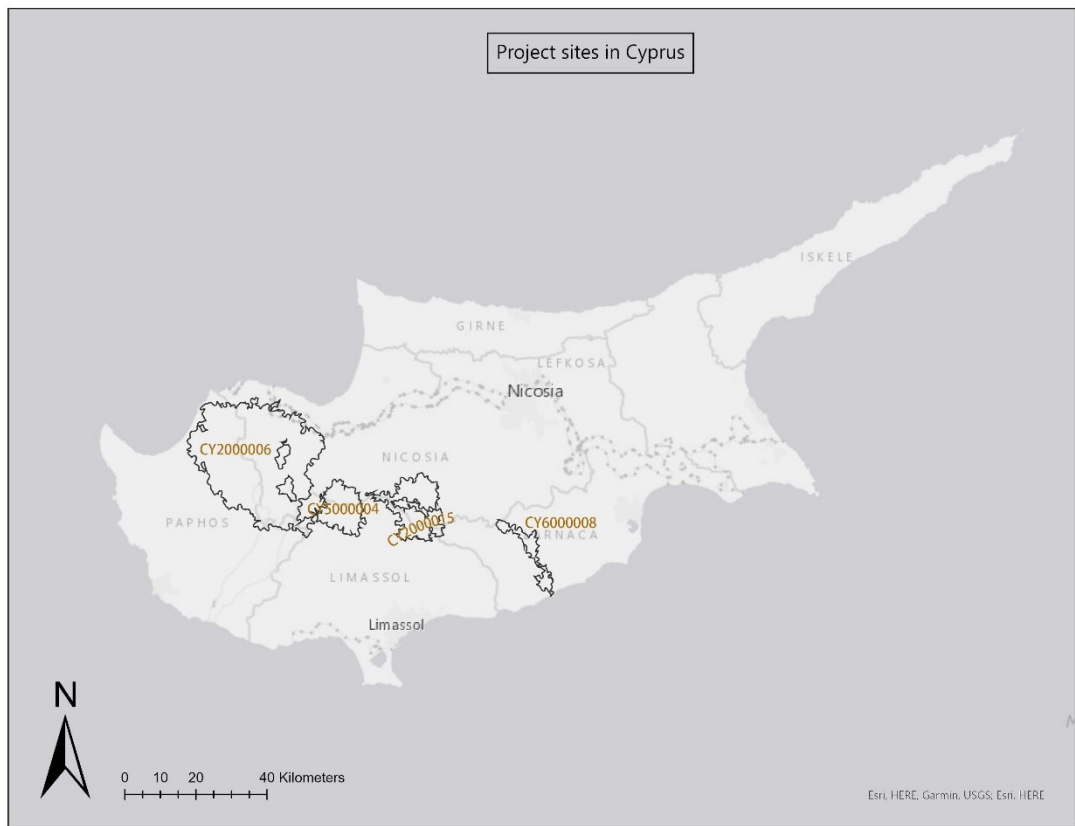


Figure 1-2. Project sites’ boundaries and SPA codes in Cyprus.

Table 1-1. List of project site names, SPA and SCA code, and surface area (ha).

Name of the project site	SPA code	SCA code	Surface area (ha)
Cyprus			
Dasos Pafou	CY2000006		60,225.85
Vounokorfes Madaris - Papoutsas	CY2000015		12,823.78
Ethniko Dasiko Parko Troodous	CY5000004	CY5000004	9,008.79
Potamos Pentaschinos	CY6000008		4,054.97
Greece			
Nisos Gyaros kai Thalassia Zoni	GR4220033	GR4220033	26,114.31
Ori Anatolikis Lakonias	GR2540007	GR2540007	37,566.61
Notia Mani	GR2540008	GR2540001	31,659.31
Oros Taygetos - Lagkada Trypis	GR2550009	GR2550006 & GR2540005	48,785.87
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides	GR3000012	GR3000008	21,010.00
Periochi Legrenon - Nisida Patroklou	GR3000014	GR3000005	2,107.13
Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni	GR4210003	GR4210003	11,297.98
Nisos Tilos Kai Nisides: Antitilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi	GR4210024		6,438.00
Nisos Irakleia, Nisoi Makares, Mikros kai Megalos Avelas, Nisida Venetiko Irakleias	GR4220021	GR4220013	1,986.00
Naxos: Ori Anathematistra, Koronos, Mavrovouni, Zas, Viglatouri	GR4220026		11,948.84
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni	GR4220028		22,036.80
Nisos Dia	GR4310003	GR4310003	1,188.00
Dionysades Nisoi	GR4320011	GR4320006	532.22
Prassano Faragi	GR4330008	GR4330004	1,121.50
Asterousia Ori (Kofinas)	GR4330013	GR4330005	16,173.89
Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi - Koustogerako	GR4340014	GR4340008	54,000.00
Farangi Kallikratis - Argouliono Farngi - Opopedio Manika	GR4340019	GR4340012	4,232.53

Meterizia Agios Dikaioi - Tsounara - Vitsilia Lefkon Oreon	GR4340016		6,875.01
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1.5. Socioeconomic characteristics of the project's sites

This section presents the primary land uses at each project site.

1.5.1. Greece

Crete

Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi – Koustogerako

Main human activities in the area are livestock and farming. Touristic activities in the area are well developed. Recreation is limited to the coastal settlements and in the mountainous part, sports activities such as hiking and canyoning are more widespread but stay mainly in pre-defined routes and the designated paths to the peaks of Lefka Ori mts. Energy production infrastructure such as wind farms and solar panel installations, along with the subsequent energy transport network, are also present in its periphery.

Farangi Kallikratis - Argouliano Farangi - Oropedio Manika

The main human activity is livestock and farming. Other land uses include hunting and tourism (mainly hiking). Infrastructure development in the sector of energy production and energy transfer networks is also present. Touristic activity in the area is represented mainly by hiking and canyoning excursions, in low intensity.

Meterizia Agios Dikaioi - Tsounara - Vitsilia Lefkon Oreon

The main human activity is stock-raising. Low intensity farming also occurs in the area, mainly with the form of olive- groves. Hunting is also being practiced. Tourism in the area is of low intensity and is concentrated mainly near the coastline.

Prassano Faragi

The area consists mainly of public land and secondarily of private land. Stock-raising is the main human activity. Olive- groves consist the main form of low intensity farming. Hunting is also being practiced. Tourism in the area is of low intensity and consists mainly of hikers and canyoners.

Asterousia Ori (Kofinas)

Human activities include arable agriculture, livestock-farming and hunting. Tourism is located mainly at the coastal areas of the site and it is of low-intensity. Mountain sports activities such as rock-climbing and canyoning are also present.

Nisos Dia

Main land uses in the area consist of tourism (mainly during summer months), hunting and fishing. The only permanent human presence on the island is a guard.

Dionysades Nisoi

The islands are uninhabited. The site has always been a popular recreation site for locals and the main activities in the area include fishing and sailing. Livestock grazing has been prohibited since 1986. No farming activities are being implemented on the islands.

Peloponnese

Oros Taygetos - Lagkada Trypis

The main human activity in the area is livestock in mid and high altitudes and farming in lower altitudes. Forestry practices are also being implemented at the area. Other land uses include hunting and fishing. Touristic activities are locally common and are mainly concentrated at the coastal zone where the development of touristic facilities is high. Mountain sports activities (mainly rock-climbing, hiking and mountaineering) are recently introduced and currently increasing in the area. Other land uses consist of energy production infrastructures such as wind farms and solar-panel installations and quarries.

Ori Anatolikis Lakonias

The main human activity is livestock and farming. Forestry is also being practiced in the area. Other land uses include hunting and fishing. Touristic activities are mainly concentrated at the coastal zone. Mountain sports' activities (mainly rock-climbing and hiking) were recently introduced in the area and are still under development. Energy production infrastructures such as wind farms and solar-panel installations are present in the western and north part of the site, while several others are waiting for approval by the relevant authorities. Quarrying activity is being practice mainly in the south and southwest part of the project area.

Notia Mani

Main land use is livestock, while farming is represented mainly by olive groves. The population of the area has been reduced severely in the past, resulting in many abandoned settlements and the subsequent cease of traditional agricultural practice that used to take place at the area. As a result the plateaus and semi-mountainous valleys in the area are not cultivated and are mostly used for grazing, resulting to flora degradation, habitat loss and desertification. Hunting and fishing are a common land use. Bee-keeping is another common land use in the area. Tourism is well developed, especially at the western part of the peninsula where tourist facilities are more numerous than the eastern side, but always in close proximity to the coastline. Mountain sports practices in the area include caving, hiking and climbing. The development of energy-production infrastructure is expected to expand further in the next years posing a threat for birds.

Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides

Main activity is livestock breeding, which has led to overgrazing of the natural pasturelands and shrublands. Agricultural practices have diminished during the last years. Touristic activities are not developed at a professional level and hunting is practiced on a regular basis but with low intensity. Bee-keeping and fishing are being practiced at a professional level. Scientific research is a constant human activity in the area, mainly implemented by the Antikythira Bird Observatory ran by Hellenic Ornithological Society.

Attica

Periochi Legrenon - Nisida Patroklou

The area is under severe pressure by human activities. Residential development is very high, the subsequent development of infrastructure such as roads, power lines and other infrastructure has led to a severe land-use change during the last three decades. Illegal buildings and wildfires are also increasing the pressure and lead to habitat loss. Farming and livestock still exist in small scale. Hunting is practiced in large scale, as the area is one of the main migratory routes for birds at national level and one of the most popular hunting destinations for Athenian hunters. Tourism in the area is highly developed, concentrating mainly at the coastline and around Patroklos island.

Aegean

Nisos Gyaros kai Thalassia Zoni

Gyaros is an arid deserted island. Cultivation has been practiced in the past and numerous terraces are found around the hills, nowadays abandoned.

Nisos Irakleia, Nisoi Makares, Mikros kai Megalos Avelas, Nisida Venetiko Irakleias

Low intensity human activities occur in the area including fisheries, livestock breeding and apiculture. Cultivations still occur at the inland part of the islands, mainly cereal cultivations for animal feed.

Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni

Main activities are livestock breeding (sheep, goats and cattle), extensive cultivations (olive grove). Also, bee keeping is a very important land use, with an estimated total of more than 7000 beehives. Touristic activity in the area is present mainly at the coastal areas where the majority of the residential development is concentrated.

Naxos: Ori Anathematistra, Koronos, Mavrovouni, Zas, Viglatouri

The main land use is livestock keeping with over 100,000 sheep and goats and over 7,500 cattle (approx. 40% and 50% of the Cyclades population respectively). Most of the sheep and goats are bred under extensive management and they have always had a crucial role in habitat formation and the conservation of raptors' population. Farming is present mainly in extensive forms of exploitation. Hunting and fishing is also practiced. Bee keeping is commonly found on the island, with approx. 5,500 beehives. Touristic activity is present mainly at the coastal areas where the majority of the residential development is concentrated and at a much smaller scale in the mountainous areas of inland Naxos. In addition, energy production infrastructures (wind farms) are operating within the project area while others are in the stage of approval. Finally, on the island marble quarries are operating.

Dodecanese

Nisos Tilos Kai Nisides: Antitilos, Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda, Nisi Kai Thalassia Periochi

The site includes the island Tilos and 12 surrounding rocky uninhabited islets. Extensive farming, practiced with traditional methods and with the preservation of terraces. Livestock breeding of sheep and goats exist in the islets.

Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni

Livestock and farming are the main land uses and bee-keeping additionally. Touristic activity in the area is present but with low intensity. Hunting is also practiced. The area is located along the migratory route that connects the area with Dionysades islets and NW Crete.

1.5.2. Cyprus

Potamos Pentaschinos

A large part of the site includes natural habitats, of pine forest and other sclerophyllous vegetation as well as transitional bushy and forest habitats. The most important land use is agriculture (most is for cereal, and olive groves, the rest is citrus plantations, and deciduous tree plantations). Also, there is animal farming, mostly goats and sheep and part of the site is open to hunting. The site is also very important for migratory birds and has been declared a migratory bird corridor.

Vounokorfes Madaris – Papoutsas

The main land use is agriculture. Extensive farming is also relatively popular in the area. The area is very popular for hunting and outdoor enthusiasts. It has at least seven hiking paths and regularly hosts outdoor contests, like hiking, mountain running or mountain biking.

Ethniko Dasiko Parko Troodous

There are few human impacts, except those from the abandoned asbestos mine, which is the process of being rehabilitated. The area is the most important mountain resort in Cyprus. There are several summer houses which host people primarily during the summer months, and tourism. Also important land use is recreation (hiking, mountain biking, mountain running), and hunting. Troodos also has ski track and there is skiing in the winter. There is a very small area of agricultural plots, mostly deciduous tree cultivations (almonds, peaches, etc), and there is no animal farming in the SPA. It is a popular hunting area and only 4% is closed to hunting.

Dasos Pafou

The largest percentage of the site is state Forest land and no agriculture or farming by individuals is allowed within it. The only permitted land uses in the forest land are recreation and limited forest activities (cutting of trees for sale as wood) and collection of wild herbs, like thyme, but in very small quantities. The main recreation activities are hiking and mountain biking. Hunting is only allowed periodically in about 8% of the SPA area. A

very small part of the site is agricultural land, made up mainly of vines, citrus trees, olive trees, almond trees, set aside and other types.

1.6. Restoration and conservation actions implemented from LIFE Bonelli eastMed

This section includes project actions relevant to this assessment. The complete list of the project's actions can be found in the Appendix in the Table 6-1. List of the project's actions.

1.6.1. Capacity building

A1.3. Upskilling and operational planning for stakeholder involvement

Stakeholders, as well as volunteer participation, citizen's science and public awareness activities are among the main positive impacts expected for the project from the network mobilisation. Eastern Mediterranean Bonelli's eagle network has established as part of another sub-action, through the up skilling of the members of the Stakeholder, Conservation and Communication Teams on how to integrate a range of actors and effectively engage stakeholders and competent authorities for the establishment of the The project was aiming at the involvement of >100 stakeholders and local volunteers in conservation actions and Natura 2000 management.

1.6.2. Field Surveys

Through this action the baseline information has been updated and new knowledge acquired on the species. The results of the action provided information on areas where monitoring of threats and conservation actions focused. The action was a vital step towards acquiring adequate knowledge that will enable informed decisions for the species conservation in various levels.

A2.1. Surveys on identification of breeding areas and suitability

A2.2. Telemetry surveys for mapping dispersal areas and land use patterns

A3.1. Sensitivity mapping

A3.2. Surveys on species disturbance

A3.3. Surveys on prey consumption and availability

C4. Production of Good Practice Guide and Spatial Planning Tool concerning energy power line and wind farm sitting

1.6.3. Reduction of disturbance

C1.1. Nesting sites surveillance

The aim of this sub-action was to prevent damage or failure to the nests of Bonelli's eagle and also to develop a protocol for the protection of the exposed nests, which will be sustainable and manageable after the project period as well. The sub-action will take place in Cyprus, where the species mostly breeds on trees and the access close to the nest is possible, and Greece.

C1.2. Restriction of road access

The aim of the sub-action was to limit access to dirt roads that are passing close to nests, in order to reduce disturbance and human activities and improve breeding success. The sub-action will take place in Cyprus and Greece.

C1.3. Regulation of climbing activities

The aim of the sub-action was to prepare a tool for informing climbers, hikers and canyoneers of sensitive areas in sites where this kind of activities already exist, in close proximity to nests. The project partners collaborated with climbing federations in Greece as well as in Cyprus.

Furthermore, the establishment of collaboration between HOS and the federations was expected to ensure continuous update with every new route, raptor-friendly route design and expansion of the areas included in the tool in the future. After the end of the project HOS will continue its management and update.

1.6.4. Increase of prey availability, through habitat management

C2.1. Field cultivation with traditional crop varieties

The aim of the sub-action was to increase the prey availability (chukar partridges, rabbits and hares, small game, corvids, rodents and reptiles), at the breeding territories through the cultivation of abandoned terraces and deserted fields within the SPAs. This action was expected to enhance the biodiversity potential of the fields, improve their High Nature Value potential and provide an attractive case study for the implementation of agroenvironment measures for the long term continuation of these interventions.

C2.2. Construction of watering ponds

The aim of the sub-action was to provide fresh water to the main prey species for the Bonelli's eagle, as well as to priority avian species and livestock.

C2.3. Creation of forest openings

The aim of the sub-action is to provide open areas with forbes and annual grasses and high-quality food for prey species.

1.6.5. Reduction of direct mortality, through infrastructural interventions

C3.1. Installation of insulators and markers at power lines

The project area has a widely distributed network of power lines (medium and high voltage) that cross through breeding and foraging areas of the Bonelli's eagle. This Action was aiming at preventing bird's mortality from collision/electrocution in these critical localities. Numerous other species of interest (especially raptors/storks) that breed or migrate through the area are expected to benefit directly from the Action.

C3.2. Intervention in water reservoirs

In order to address the problem of Bonelli's eagle drowning in water reservoirs created for livestock, the project will install in Greece and Cyprus. "Wildlife escape ladders" for water reservoirs on private property were manufactured. The installations consist of built-in expanded metal ramps on all sides coated with industrial paint. It has been proven that the average number of birds drowned per reservoir without ramps/ladders is almost seven fold higher than the ones with ladders installed, thus the action is regarded essential for the Bonelli's eagle survival and wildlife in general.

C3.3. Reduction of secondary poisoning

The aim of the sub-action is to reduce secondary poisoning caused mainly through poisoned bait use in Greece.

In Greece, three Anti-poison Dog Units (APDUs) comprised by one dog each will be formed and operate in Crete. The whole operation consists of a dog, its guide/trainer and an environmental officer (e.g. forestry service staff). The procedure includes the release of the dog in a pre-selected area, allowing it to roam the site without receiving any instruction from the persons present and the poison-bait detection. The Environmental Officer removes the bait/carcass and fills out a relevant protocol.

The APDUs perform patrols along transect lines (up to 10 km long and 200m wide) covering areas of 200-400 ha per day. This means that, theoretically, almost all the project sites in Crete can be inspected in three weeks' time. The implementation of the action and the collection of crime evidence will reduce the feeling of impunity of poison-bait users and discourage them from this illegal activity and increase awareness among

stakeholders. The use of dogs will allow the detection of poisoned baits in the field, not possible to be detected otherwise.

1.6.6. Production of Good Practice Guide and Spatial Planning Tool concerning energy power line and wind farm siting

The Good Practice Guide (GPG) involves protocols and practices for (a) assessing the species conservation problems and threats, (b) treatment of injured or handling dead birds, (c) carrying out baseline surveys for the species population, for identifying, planning and implementing habitat management measures, for carrying out sensitivity mapping for the species conservation in relation to visitor disturbance, planning and operation of power line networks, wind farms and other infrastructures that may increase collision or electrocution risk. Suggestions and recommendations and clear specifications about bird-friendly power lines, pylons and further equipment or retrofitted are included. For collision, it includes suppression of obsolete spans and cross zones with a high risk of collision for birds. Furthermore, the GPG includes recommended minimum nest site distances from built areas or other scattered developments, villages and roads and firebreaks to be used as guideline for new developments.

1.6.7. Planning and implementation of project dissemination

E.1.1. Public awareness campaign

The main goal of the campaign was to increase the popularity of the Bonelli's eagle (BE), the awareness of the threats it faces, to communicate to the public the importance of the Natura 2000 Network for wildlife and its ecosystem services.

This campaign includes open events, presentations and environmental education activities, a mobile wildlife photography exhibition picturing the BE, its habitats and other birdlife of the Eastern Mediterranean as well as information banners. Also, a website providing comprehensive and up-to-date information about the conservation of the BE, the project objectives, actions and results. A newsletter (EL/EN) providing information on project activities and results, social media platforms (Facebook, Twitter, YouTube), media coverage of the project regionally, nationally and internationally across different media channels. Media interest has been developed for the target species, its' threats, project actions and achievements and key socio-economic issues. Also, 10 Signboards (EL/EN) were erected at 5 project sites, providing attractive, robust information accompanied by photos and maps and informative signs in all sites.

E. 1.2. Production of communication material and special publications

A series of communication material has been produced: Project Leaflet, leaflet for climbers and hikers, photo book, stickers, t-shirts and more than 50,000 people have been reached through the dissemination of the communication material.

E.1.3. Engagement of the educational community in the BE conservation

The sub-action involves the design, production and implementation of environmental education material addressed to pupils 9-15 year-old, including educational activities designed for the pupils' acquaintance with the BE life cycle, habitats and importance. Additionally, a comic book (EL:3,000 copies) addressing the BE importance on nature conservation, as well as the means that young generations could use to mitigate its threats, has been disseminated to the pupils participating in educational activities.

Furthermore, two educational workshops have been organized for the dissemination of the material to the educational community, in collaboration with local authorities (e.g. Environmental Education Centres). Open events for children have been organized, including bird watching activities and children workshops, More than 4,000 children participated at the project educational activities.

1.7. Other avifauna species that can be positively affected from the projects interventions

Gypaetus barbatus, Gyps fulvus, Falco eleonora, Falco peregrinus, Falco biarmicus, Buteo rufinus, Aquila chrysaetos, Pernis apivorus, Milvus migrans, Circus aeruginosus, and Aquila penata.

Furthermore, some sites are important for many species of priority during migration or wintering, including *Aquila pomarina, Neophron percnopterus, Aquila heliaca, Milvus milvus, Aquila nipalensis.*

2. Methodology for assessing the impact of the project on ecosystem services

2.1. Introduction

Ecosystems have potential to supply a range of services that are of fundamental importance to human well-being, health, livelihoods, and survival (Costanza et al., 1997; Millennium Ecosystem Assessment (MEA), 2005; TEEB, 2010). Different ways of defining Ecosystem Service (hereafter ES) have been developed so far – they can be described as the benefits that people obtain from ecosystems (MEA, 2005) or as the direct and indirect contributions of ecosystems to human well-being (TEEB, 2010). More recent publications define Ecosystem Services as contributions of ecosystem structure and function (in combination with other inputs) to human well-being (Burkhard et al., 2012; Burkhard B. & Maes J. Eds., 2017).

One of the policy objectives to be achieved by the LIFE projects is to improve the condition of ecosystems that are relevant to their area of intervention so as to increase their capacity to deliver ecosystem services. LIFE projects adopt as a reference the European MAES initiative (Maes et al., 2013) and the Common International Classification of Ecosystem Services (CICES) V5.2 (Haines-Young, 2023) which is a typology for ecosystem services. The EU and its Member States agreed to apply this framework and therefore any result emerging from the assessment of a LIFE project would be consistent with the national and/or EU framework; on the other hand, it offers a coherent and comparable approach across all LIFE projects as well as existing indicators and methodologies.

2.2. MAES analytical framework

To support implementation of the Action 5 of Target 2 of the EU Biodiversity Strategy 2020, European Commission in 2011, has established a working group on 'Mapping and Assessment of Ecosystems and their Services' – MAES, which involves experts of the European Commission, the member states and the research community. The MAES conceptual framework (described in a series of MAES reports¹) links socio-economic systems with ecosystems via the flow of ecosystem services, and through the drivers of change that affect ecosystems either as consequence of using the services or as indirect impacts due to human activities in general (Figure 2-1). This hypothesis has been translated into a structure to guide the ecosystem assessment work as required by Action 5: (i) Mapping of ecosystems; (ii) Defining the condition of the ecosystem; (iii)

¹https://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm

Quantification of the services provided by the ecosystem; and (iv) Compilation of these into an integrated ecosystem assessment.

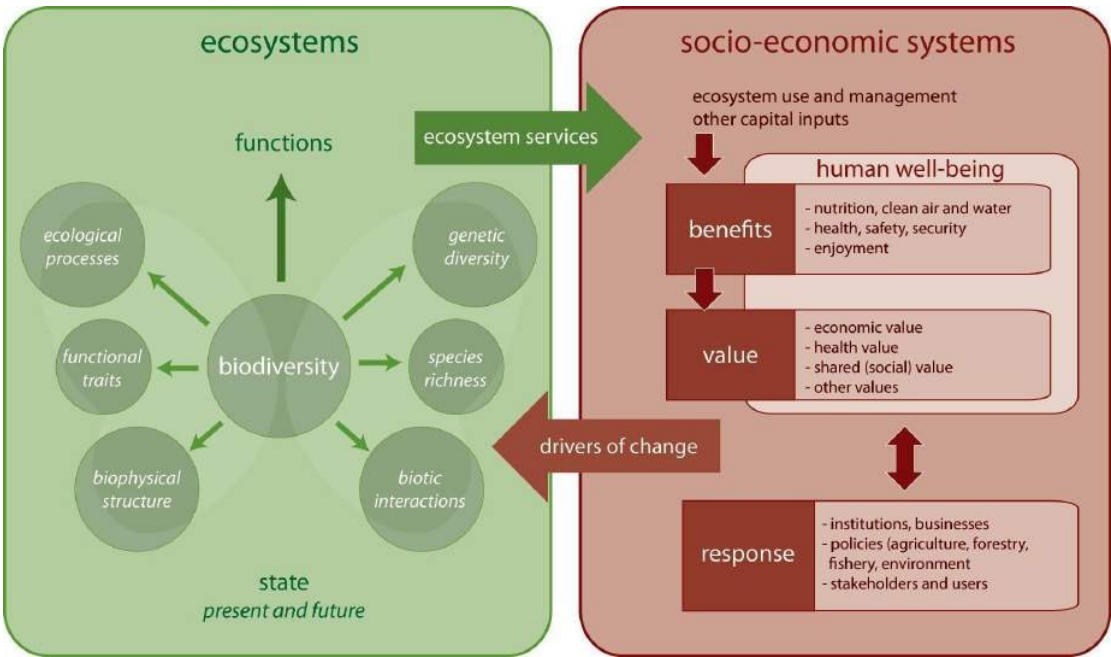


Figure 2-1. Conceptual framework for ecosystem assessment depicting the role of drivers of change (Source: Maes et al., 2016).

2.3. Stepped approach

In order to map and assess ES, MAES common assessment framework has been used and has been organized in a number of practical steps in order to ensure an integrated result. In Figure 2-2 is presented a stepped approach proposed by Burkhard et al. 2018.

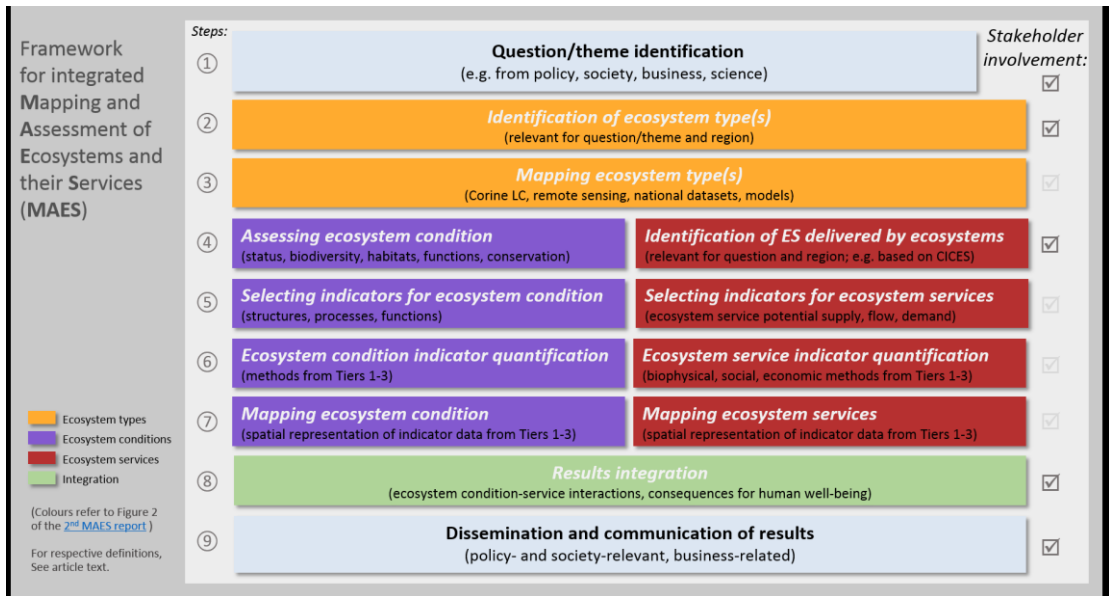


Figure 2-2. Original Framework for integrated Mapping and Assessment of Ecosystems and their Services (MAES). Colours and basic structure refer to Figure 2 of the 2nd MAES report (Maes et al. 2014).

The approach outlined above has been adapted for the purpose of this report in order to assess the impact of the project on the ES.

1. Question and theme identification
2. Identification and mapping of relevant ecosystem types
3. Assessment and mapping of their condition
4. Factors and drivers determining ecosystem services supply in the project area
5. Identification and selection of relevant Ecosystem services
6. Selection of ES indicators
7. ES quantification
8. Results integration

Each step is explained and presented as follows.

2.3.1. Question and theme identification

The main question to be addressed is how project actions influence the ES of the identified ecosystems in the project area. The main ecosystem services on which the project has had or may have effects on a timescale at least ten years, is going to be assessed, trying to quantify the effects in terms of ecosystem services in the context of geographical and temporal interventions.

2.3.2. Identification and mapping of relevant ecosystem types

For the purpose of MAES, 12 aggregated ecosystem types are defined – 7 terrestrial (urban, grassland, cropland, forest and woodland, heathland and shrub, sparsely vegetated land, wetland), 1 freshwater (rivers and lakes) and 4 marine types (marine inlets and transitional waters, coastal, shelf, open ocean).

In order to identify what ecosystem services are supported in this LIFE project, first we identified the MAES ecosystem types that are relevant to the area of intervention. For this purpose we followed the Correspondence between Corine Land Cover classes (2028 version) and ecosystem types, as presented in the Table 2-1. For each ET its coverage in terms to its physical extent (expressed in ha) was calculated.

Table 2-1. Correspondence between Corine Land Cover classes and MAES Level 2 ET.

Ecosystem Types (MAES Level 2)	CORINE Land Cover Classes
Cropland	2.1.1., 2.1.2., 2.1.3., 2.2.1., 2.2.2., 2.2.3., 2.4.1., 2.4.2., 2.4.3., 2.4.4.
Grassland	2.3.1., 3.2.1.
Woodland and forest	3.1.1., 3.1.2., 3.2.4.
Heathland and shrub	3.2.2., 3.2.3
Sparsely vegetated land	3.3.2, 3.3.3, 3.3.4
Wetlands	4.1.1., 4.1.2, 4.2.1, 4.2.2
Urban	1.1.1, 1.3.2, 1.3.3, 1.4.2

2.3.3. Assessment and mapping of ET condition

Ecosystems are characterized in terms of surface or length, condition and trends. For all these parameters, LIFE projects are expected to lead to an improvement in comparison to a baseline situation.

Condition refers to the state or quality of the ecosystems that are expected to deliver ecosystem services. The concept of ecosystem condition is strongly linked to human well-being through ecosystem services. Ecosystems need to be in good condition to provide multiple ecosystem services, which, in turn, deliver benefits and increase well-being. The relation between ecosystem condition and regulating ecosystem services is usually positive (Smith et al., 2017) but can also be a nonlinear relationship. Also, ecosystem condition is used to assess trends and set targets related to the improvement of environmental health.

Drivers of change (presented in 3.1.4.) can have a positive (e.g. conservation) or negative (pressures) impact on ecosystem condition. In the case of this project the drivers of change are considered to be the projects actions as well as the pressures existing in the ecosystem types of the project sites.

How to assess EC?

The identification of multiple and concise indicators on ecosystem condition for different ecosystem types is a critical step. The most appropriate method to assess EC is selected on the basis of the capability, resources and needs of the project. Their quantification make use – to the extent possible - of existing data at the appropriate scale and/or on the basis of literature review or even direct measurements. Sites that are representative of a relevant ecosystem type can be used as proxy for the whole project area if no ecosystem maps are available.

In the framework of MAES, an indicator framework for ecosystem condition has been developed. In addition to identifying 6 main classes of pressures, this framework distinguishes between indicators for environmental quality (which express the physical

and chemical quality of ecosystems) and ecosystem attributes (which express the biological quality of ecosystems).

For the purpose of this report the quantification of EC was made using the national scale assessment for the condition of each ecosystem type (MAES level 2) of Greece (EEA 10 km grid cell analysis) derived from Kokkoris et al. (2018), within the spatial range of the project sites. In cases of Natura 2000 sites for which the assessment was not available a combination of expert opinion and a national database was used. These areas were: Notia Mani- GR2540008 and GR2540001, Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni- GR4210003 and Nisos Tilos kai Nisides: Antitilos, Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas- GR4210024. For the Natura 2000 sites of Cyprus these data were not available so the EC quantification was not performed.

2.3.4. Factors and drivers determining ecosystem services supply in the project area

The capacity of an ecosystem to supply ES depends on the state of its structure, processes and functions determined by interactions with socio-economic systems (Maes et al., 2013). A driver is any natural or human-induced factor that directly or indirectly causes a change in ecosystem. A direct driver clearly influences ecosystem processes, where indirect driver influences ecosystem processes through altering one or more direct drivers. Kind of drivers can be: land/sea use and management, and pressures such as land-take, fragmentation, pollution, climate change as well as their impacts on the structure and function of each ecosystem type.

Drivers of change can have a positive (e.g. conservation) or negative (pressures) impact on ecosystem condition. Important direct drivers include climate change, land-use change, invasive species and agro-ecological changes.

The fifth MAES report presents a typology for pressures and ecosystem condition, showing a selection of indicators per ecosystem type to assess the pressures and condition (Maes et al., 2018).

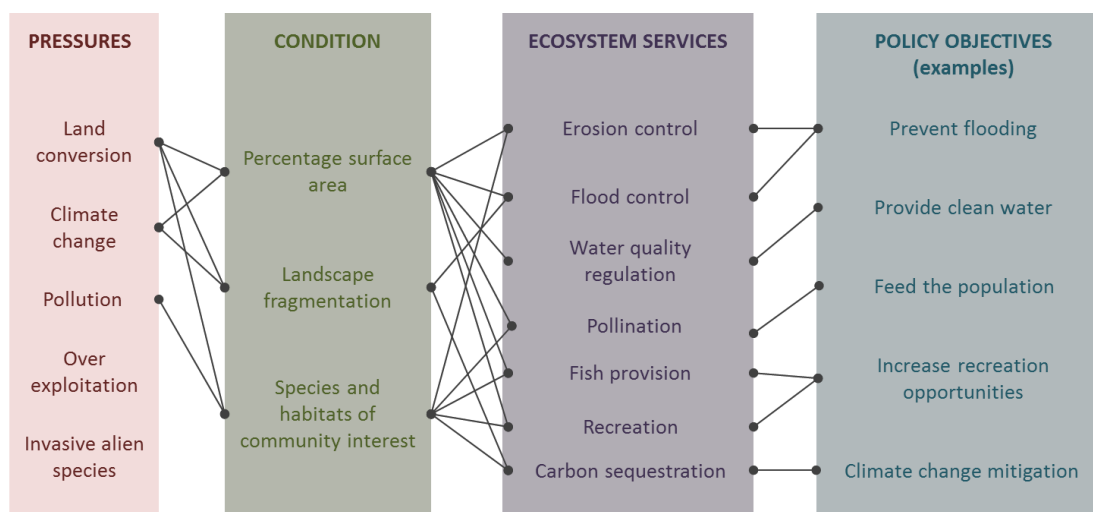


Figure 2-3. Synthesis of the links between pressures, condition and ecosystem services in heathland and shrub, sparsely vegetated land and wetlands (5th MAES report)

2.3.5. Identification and selection of relevant Ecosystem services

At this point, knowing the relevant ecosystem types, a set of relevant ecosystem services can be identified. The MAES framework uses a typology for ecosystem services based on the Common International Classification of Ecosystem Services² (CICES). CICES is based on a five-level hierarchical structure articulated around sections, divisions, groups, classes and class types. Additionally there is a distinction between biotic and abiotic. Sections reflect the three broad groups of services:

- (i) provisioning,
- (ii) regulating & maintenance, and
- (iii) cultural

For this ES assessment the draft version of V5.2 was used. The selection of ES was based on expert knowledge and the availability of data and quantification methods, most of which have been used during or obtained from past and on-going research related to this project.

2.3.6. Selection of ES indicators and ES quantification

At this point follows the identification of significant variables and appropriate indicators to assess the impacts (positive and negative) of the project interventions on the main ES identified. This is the way to assess and map ES and for that there are different methodological approaches, as follows.

Methodologies for the assessment and mapping of ecosystem services

In an attempt to group and classify all the available methodologies for mapping and assessing ecosystem services, three main approaches may be distinguished:

1. Biophysical methods
2. Socio-cultural methods
3. Economic methods
4. Expert-based quantification.

²<https://cices.eu/>

The above approaches (except the economic methods) are presented shortly in the following session. Biophysical methodologies are the most widespread approach to map and assess both the supply and the actual use and demand of ecosystem services. They rely strongly in indicators, proxies and biophysical models. Two main questions have to be addressed:

- a. What do we measure?
- b. How do we measure?

In general, indicators for ecosystem services can be defined for different aspects of this 'flow' from the ecosystems that provide services to the benefits that are captured by people. These range from measures of the structure of the system or particular elements of it (including ecosystem extent and condition), measures of ecosystem process and functions, measures relating to services and measures of use (benefit) and impact (De Groot 1992; Balmford et al., 2008; Tallis and Polasky 2009; De Groot et al. 2010 a, b).

What to measure?

Important element to consider for their selection was if there are any indicators available to measure a given ecosystem service and if there are the means/ capacity/ resources to measure it. A number of indicators are already available at EU level, however, the majority of the ones used, were selected from the project's team in order to be relevant to the project.

How to measure?

First, the choice on how to measure ecosystem services indicators depends on four main criteria:

- the overall purpose of the ecosystem services assessment;
- the availability of data;
- the type of measurement needed to quantify the indicators;
- the resources (human and financial) available.

1. Biophysical methods

Burkhard and Maes (2017) distinguish three general approaches: direct measurements, indirect measurements and ES modelling.

Following Burkhard and Maes (2017), there are:

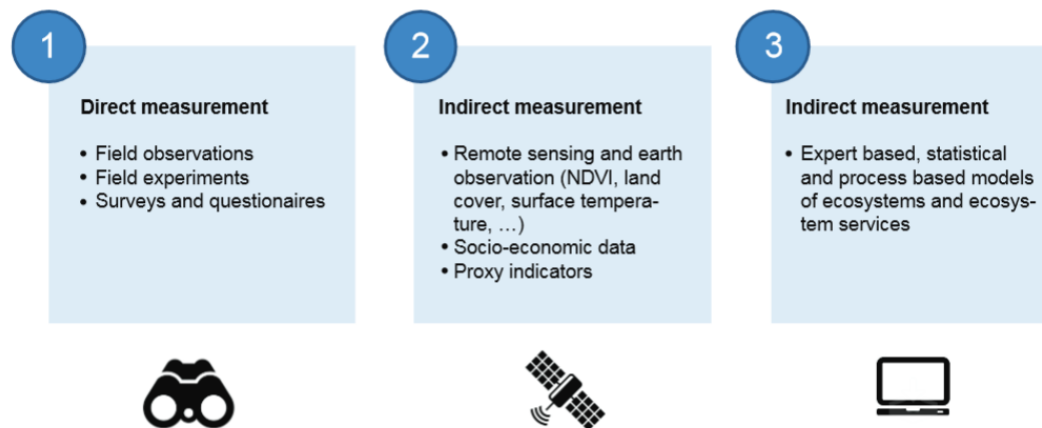


Figure 2-4. 3 main types of measurements needed to quantify the indicators

Direct measurements of ecosystem services

Direct measurements of an ecosystem service indicator are those derived from observations, monitoring surveys or questionnaires. Examples of direct measurements are: measuring the total amount of grass produced in a grassland (biomass production) or counting the total number and number of species of pollinating insects along a transect in a grassland plot (pollination). Direct measurements are the most accurate way of quantification, but require a high amount time and resources.

Indirect measurements of ecosystem services

Indirect measurements also provide a biophysical value, but further interpretations, assumptions or data processing are needed in order to be used as measures of ES. Data collected through remote sensing techniques is a good example of indirect measurements (e.g. vegetation indices or surface temperature). The use of land cover or habitat maps for ES stock and flow assessments can be considered a form of indirect measures. The most common approach is to generate an average value of each ES per land cover type. The ES stock or flow values are averaged from either scientific literature sources or fieldworks. These values can be further linked to land cover units in a map in order to make the analysis spatially explicit.

Ecosystem services modeling

Models are simulations or representation of an ecological system. When direct and indirect data are unavailable, other ecological and socio-economic data and knowledge can be used as surrogate data to estimate the provision and demand of ecosystem services. The advantage of using ES models is that the input data can be modified in order to simulate hypothetical scenarios of land management, land cover change, climate change, etc. in order to predict possible impacts on the provision of ES.

2. Socio-cultural methods

Socio-cultural methods generally aim at assessing human preferences for ecosystem services, leaving aside monetary valuations. Values and perceptions of both demand and supply of ecosystem services are commonly assessed and mapped through a wide array of methods based on eliciting social needs and preferences.

3. Expert-based quantification of ecosystem services

When biophysical or other forms of data are missing, expert assessment are an efficient way to obtain an approximation of ES values about stock, flow and demand. A common technique to quantify the provision of ES in the context of expert-based assessments is the use of relative scores: Experts are asked to value the provision of a certain ES in a relative scoring scale of e.g. 1 to 5.

Important note about the methodological framework that we followed is that the relation between ecosystem condition and regulating ecosystem services is usually positive (Smith et al., 2017). In this context reducing pressures can positively influence ecosystem condition and enhance particular aspects of human wellbeing and policies are actions which directly target ecosystem condition (e.g. nature conservation) can use the concept to demonstrate additional benefits created by implementing conservation measures. In the Figure 2-5 is presented a simplified MAES conceptual model linking ES with drivers of change.

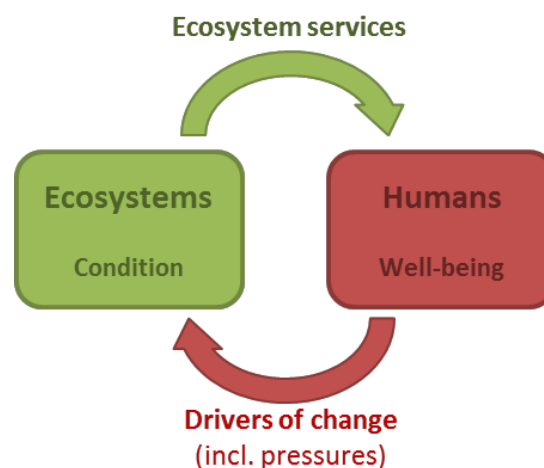


Figure 2-5. Simplified MAES conceptual model based on Grizzetti et al. 2016

Preliminary selection

During the design phase of the project was built the methodological base and the general focus of action D3, thus a first selection of possible indicators was made as presented in the Table 2-2.

Table 2-2. Index of indicators of project's impact on ecosystem services, selected at the design phase of the project.

Ecosystem services			
Division	Group	Class	Indicator
Provisional services			
Nutrition	Biomass	Wild animals and their outputs	Wild game population estimates
Regulating services			
Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats	% of areas included in hunting restriction during bird/hare reproduction periods
Cultural services			
Physical and intellectual interactions with biota, ecosystems and land-/seascapes	Intellectual and representative interactions	Educational	No. of pupils attending environmental education
		Scientific	No. of scientific studies
		Heritage	Total area of land terraces improved
Spiritual, symbolic and other interactions with biota, ecosystems and land-/seascape	Other cultural outputs	Existence	Presence and distribution of Bonelli's eagle and biodiversity

The indicators selected for each ES were measured for each project site, using specific units of measurement. To evaluate the level of each ES, either a relative score or a trend indication was applied, first at the project site level and then for each ET within them. Specifically, the capacity of each habitat to supply ES following projects interventions was assessed and rated.

For the relative scores, ES level were assigned to the relevant indicators based on the 'pressure' parameter information and judgment of research team member using a predefined scale, 1 to 5. '0' represents no relevant ecosystem services supply or demand (Table 2-3). The definition of these numerical values is detailed in the accompanying Table 2-3. Similarly, the categories used to define "Trend" are also provided in the Table 2-4.

Table 2-3. ES level and their definition

ES levels	Levels
0	Unknown
1	Very poor/ bad/ functional
2	Poor/ unfavorable
3	Moderate
4	Good/ favorable
5	Very good/ High

Table 2-4. Classes of "trend" of ES.

Trend
Overall stable
Deterioration
Some deterioration
Improvement/ deterioration in different locations
Some improvement
Improvement

3. RESULTS

In the following pages the results of the stepped approach which was followed, are presented.

3.1. Questions and theme identification

This step was addressed in the section 1.2. presenting the aim of Action D3.

3.2. Identification and mapping of relevant ecosystem types directly influenced by the project

Following the methodology presented in the section 3.1.2. and 3.1.3., 5 main and relevant ET types (MAES level 2) were identified in the project sites: Scrubland, Sparsely vegetated land, Grassland, Woodland and Cropland. Following, in the Figure 3-1, Figure 3-2, Figure 3-3 are presented their spatial distribution within each project site and in the Table 6-3. Main MAES types coverage (ha and % of the total area) , in each project site. In the Appendix, is presented the area in Ha and % that cover each ET.

3.2.1. Greece

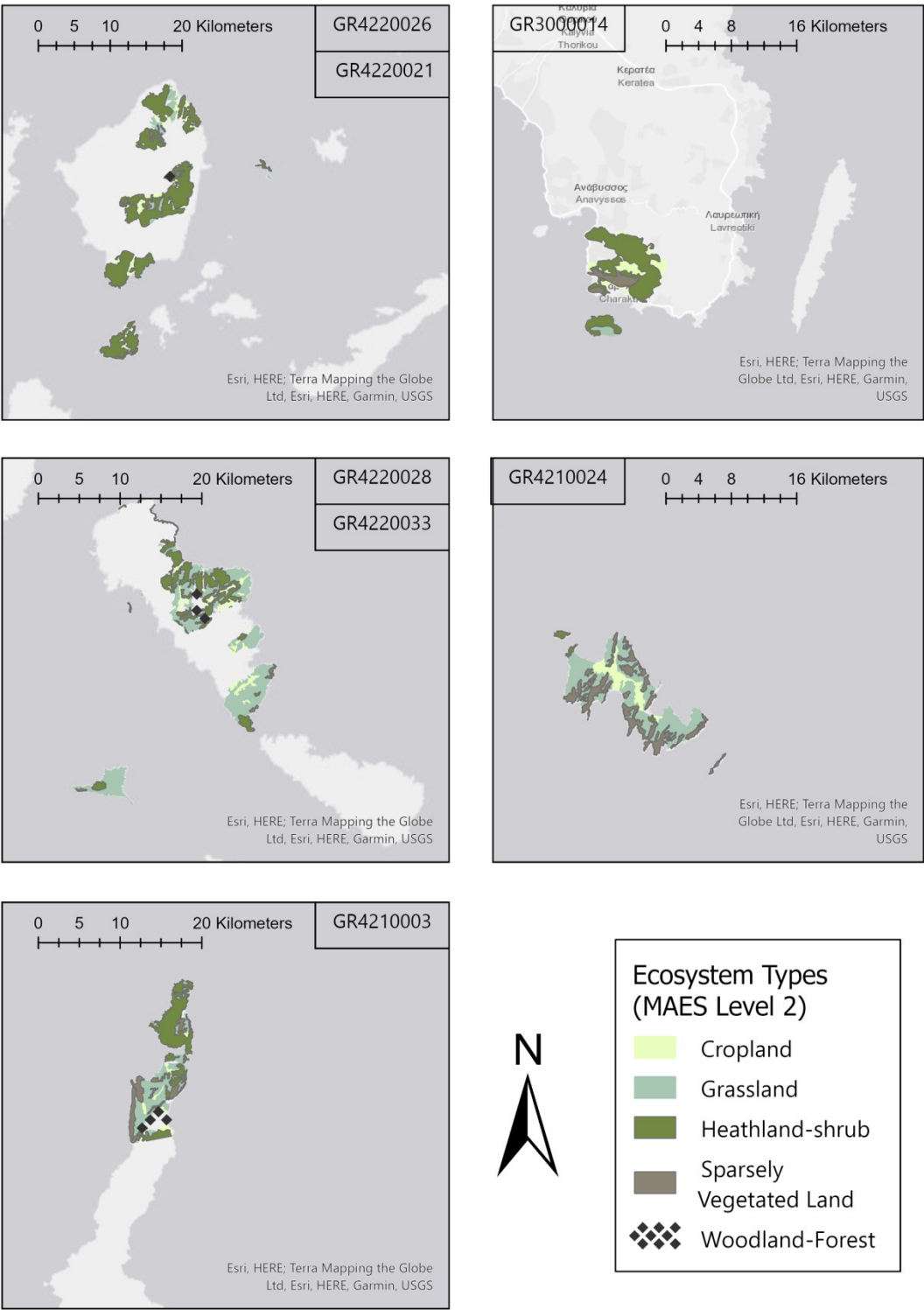


Figure 3-1. Coverage of the 5 main Ecosystem types in the project sites. Each frame depicts different sites.

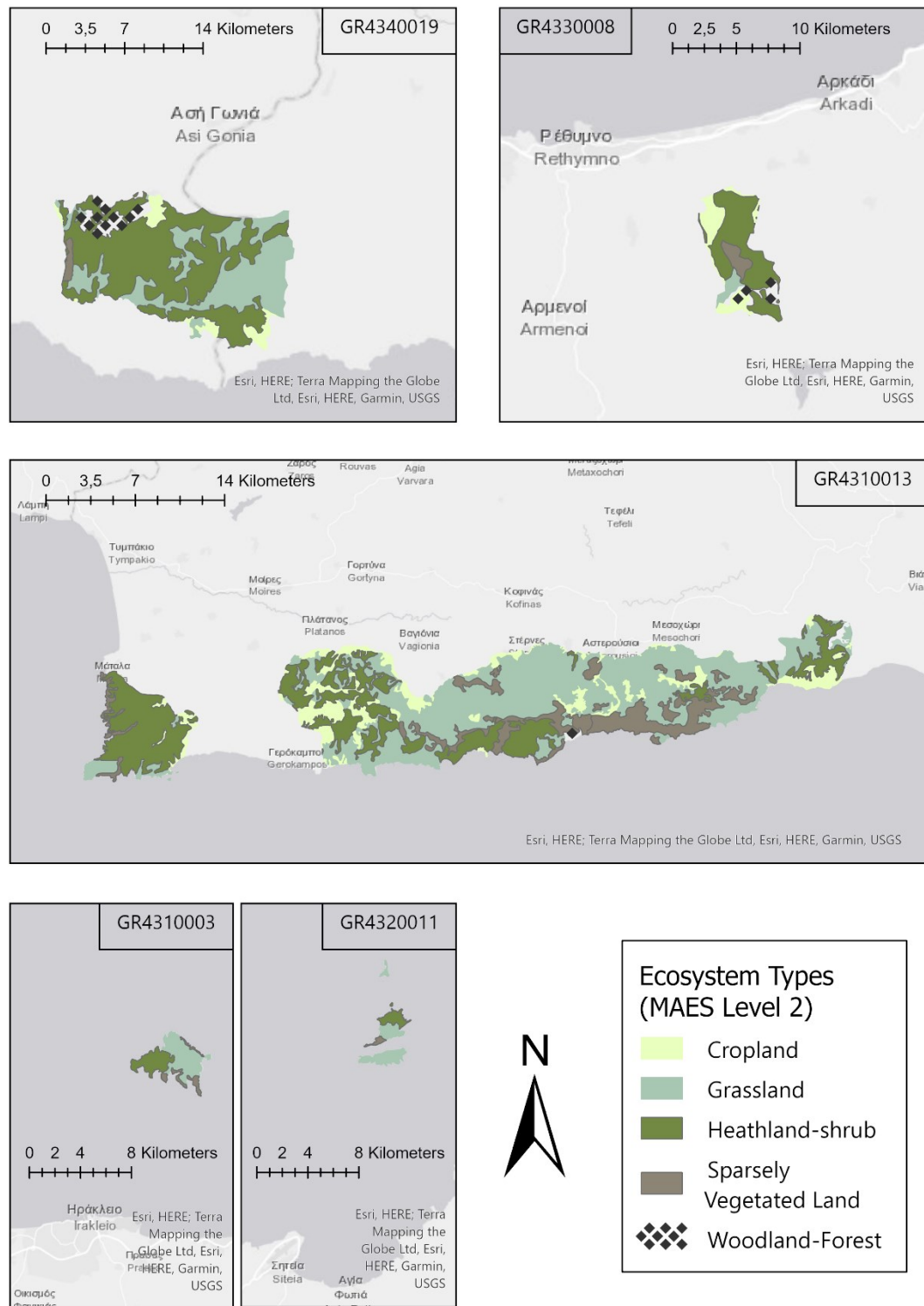


Figure 3-2. Coverage of the 5 main Ecosystem types in the project sites. Each frame depicts different sites.

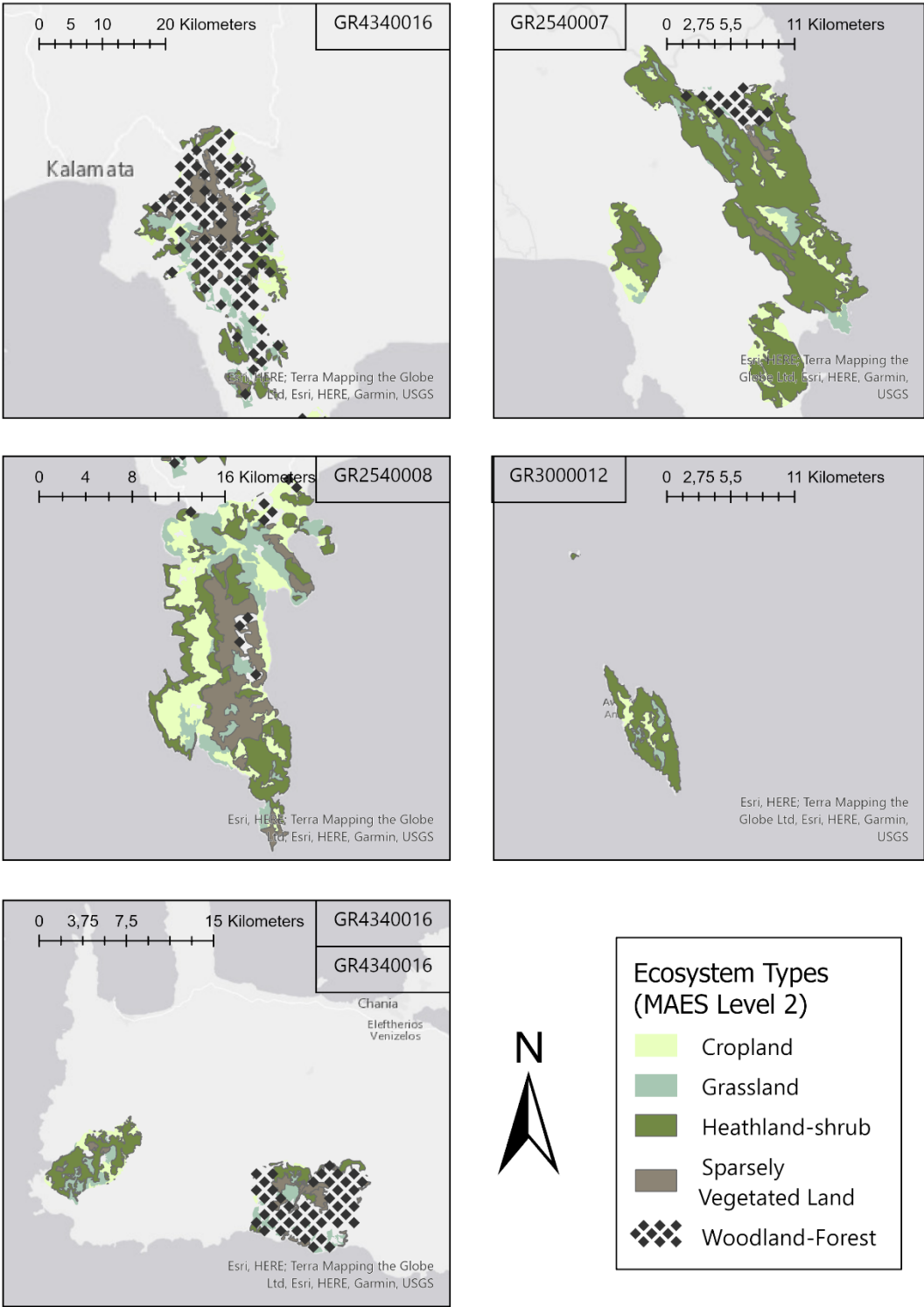


Figure 3-3. Coverage of the 5 main Ecosystem types in the project sites. Each frame depicts different sites.

3.2.2. Cyprus

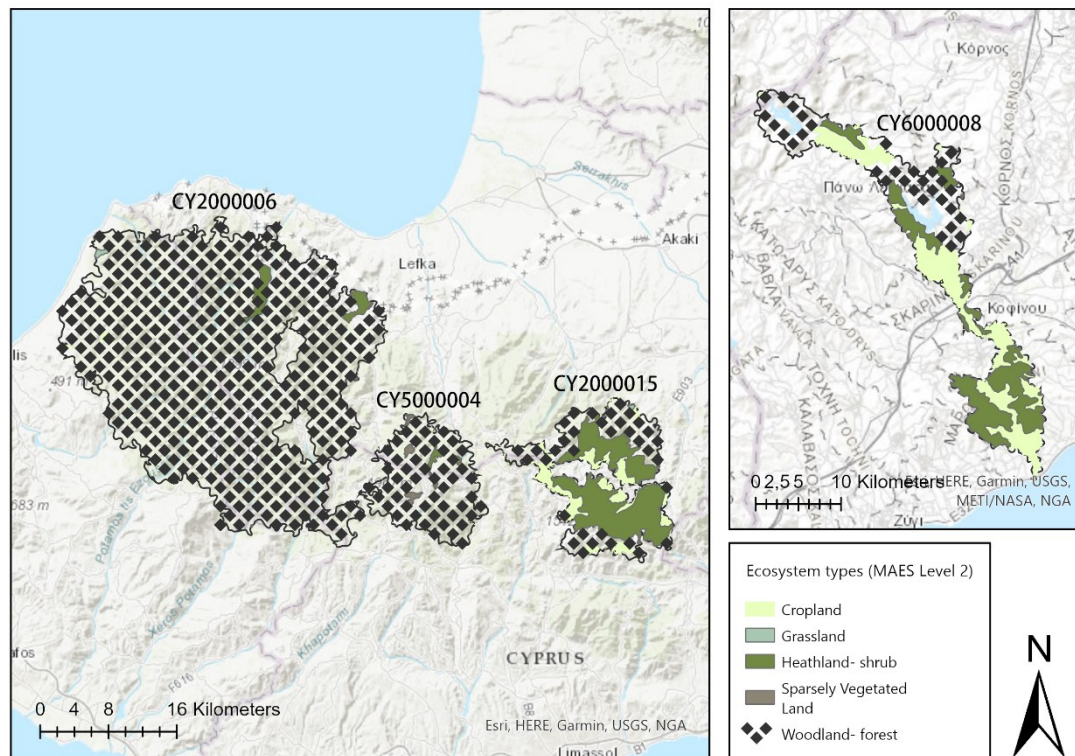


Figure 3-4. Coverage of the 5 main Ecosystem types in the project sites. Each frame depicts different sites.

3.3. Assessment and mapping of ecosystem types' condition

Ecosystem types were assessed before LIFE projects' interventions and actions. Following are presented the Ecosystem condition (EC) for each relevant ecosystem type identified in the project sites. This procedure has not been completed for the sites in Cyprus as relevant data were lacking.

3.3.1. Greece

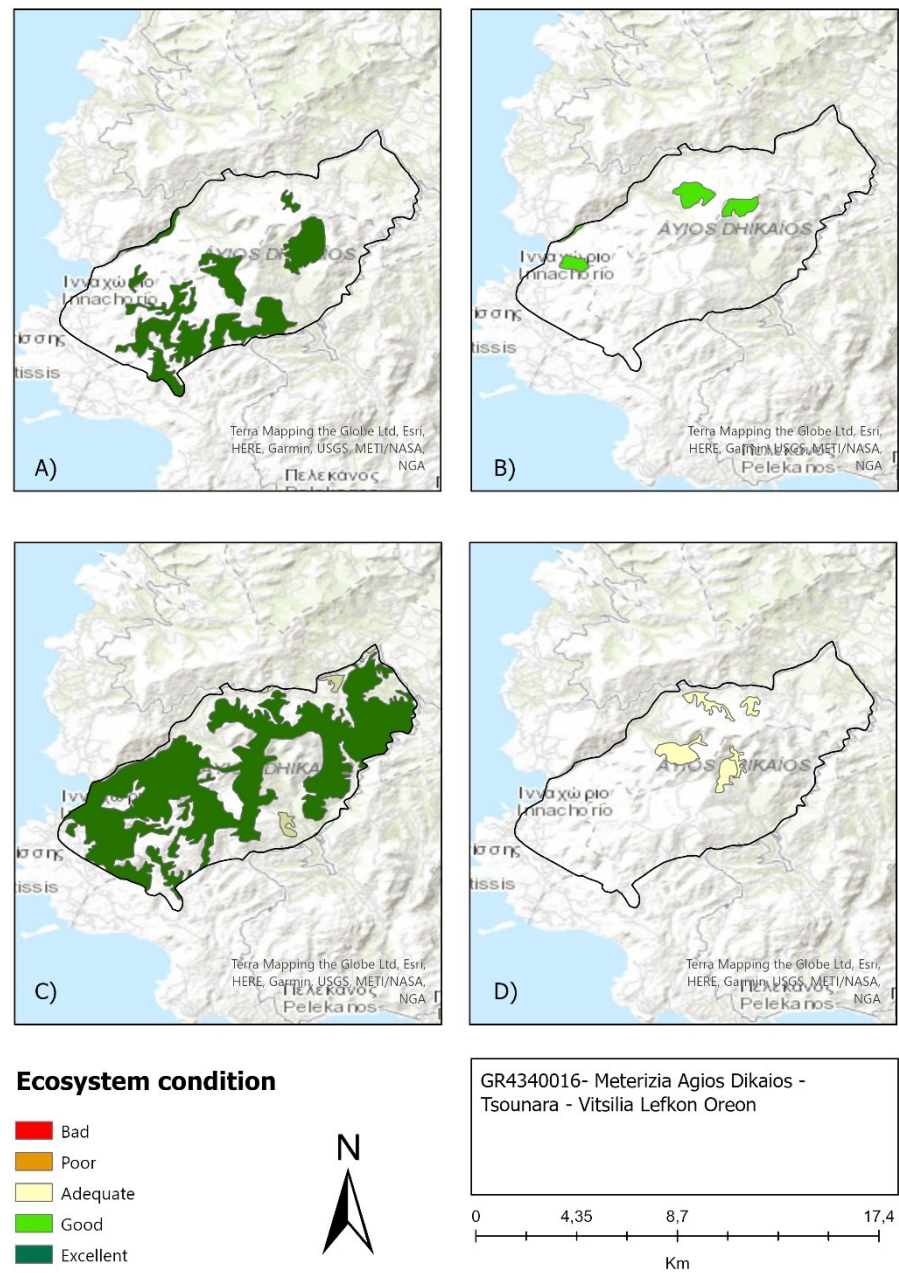


Figure 3-5. EC of GR4340016: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

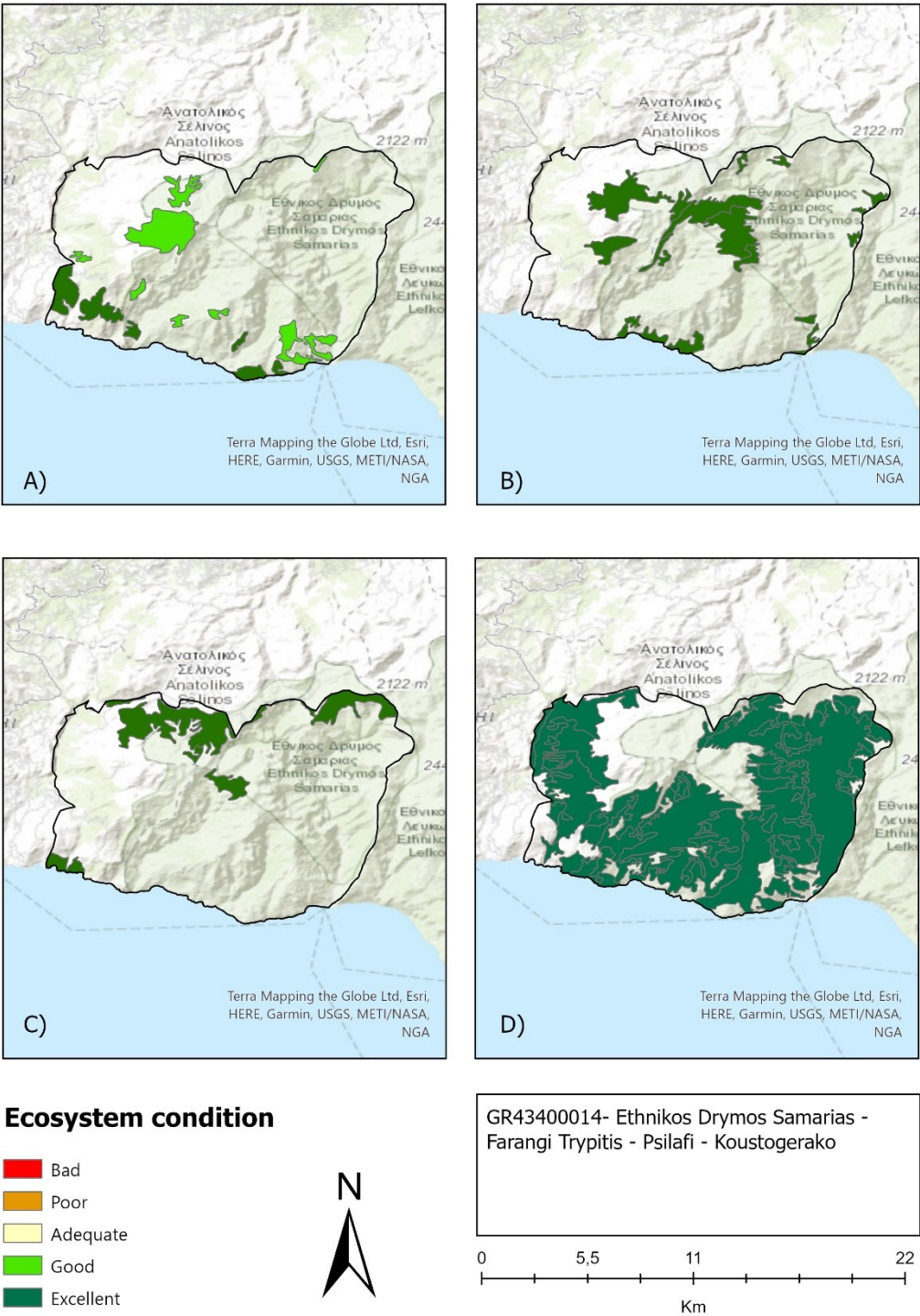


Figure 3-6. EC of GR4340014: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

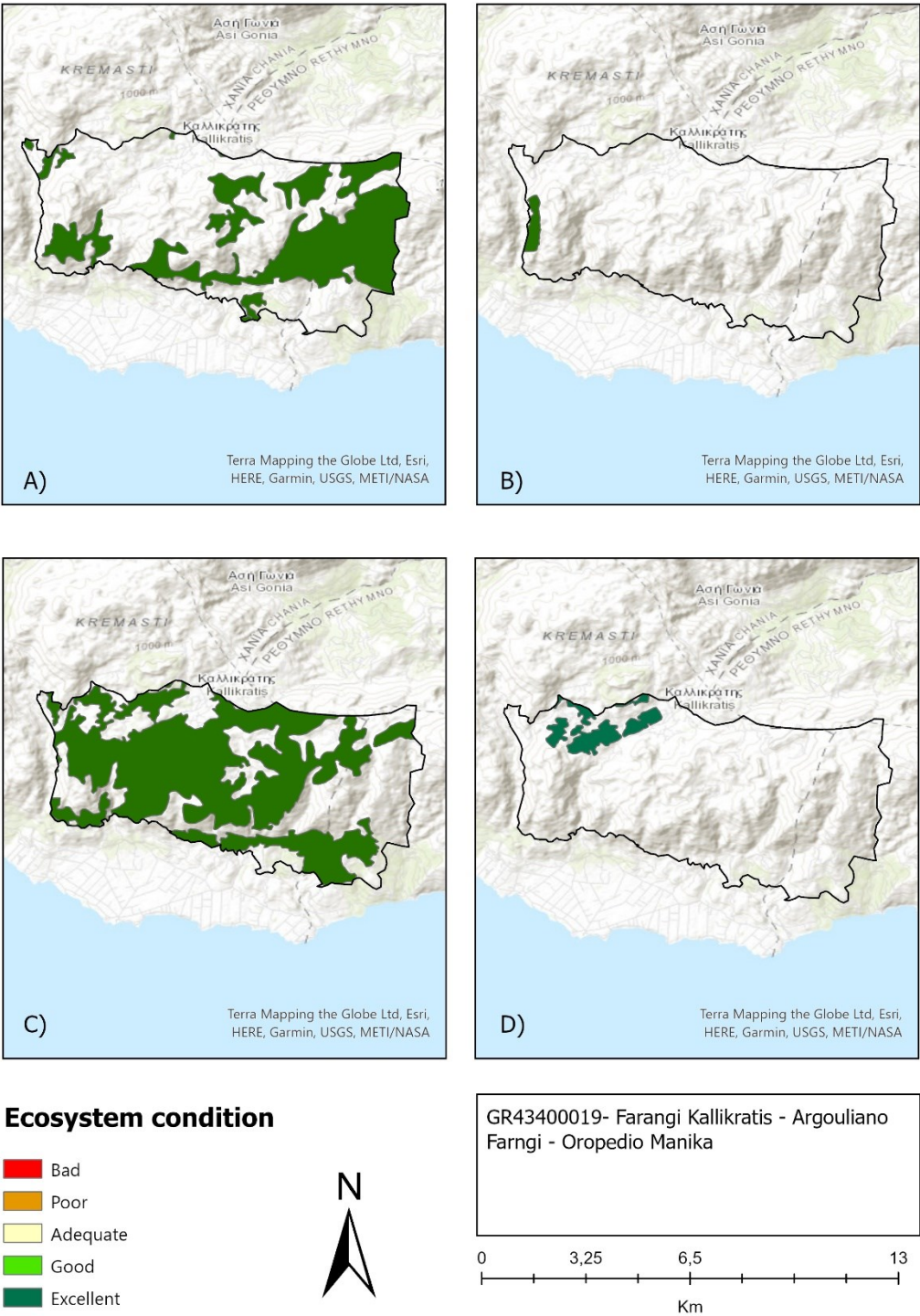


Figure 3-7. EC of GR4340019: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

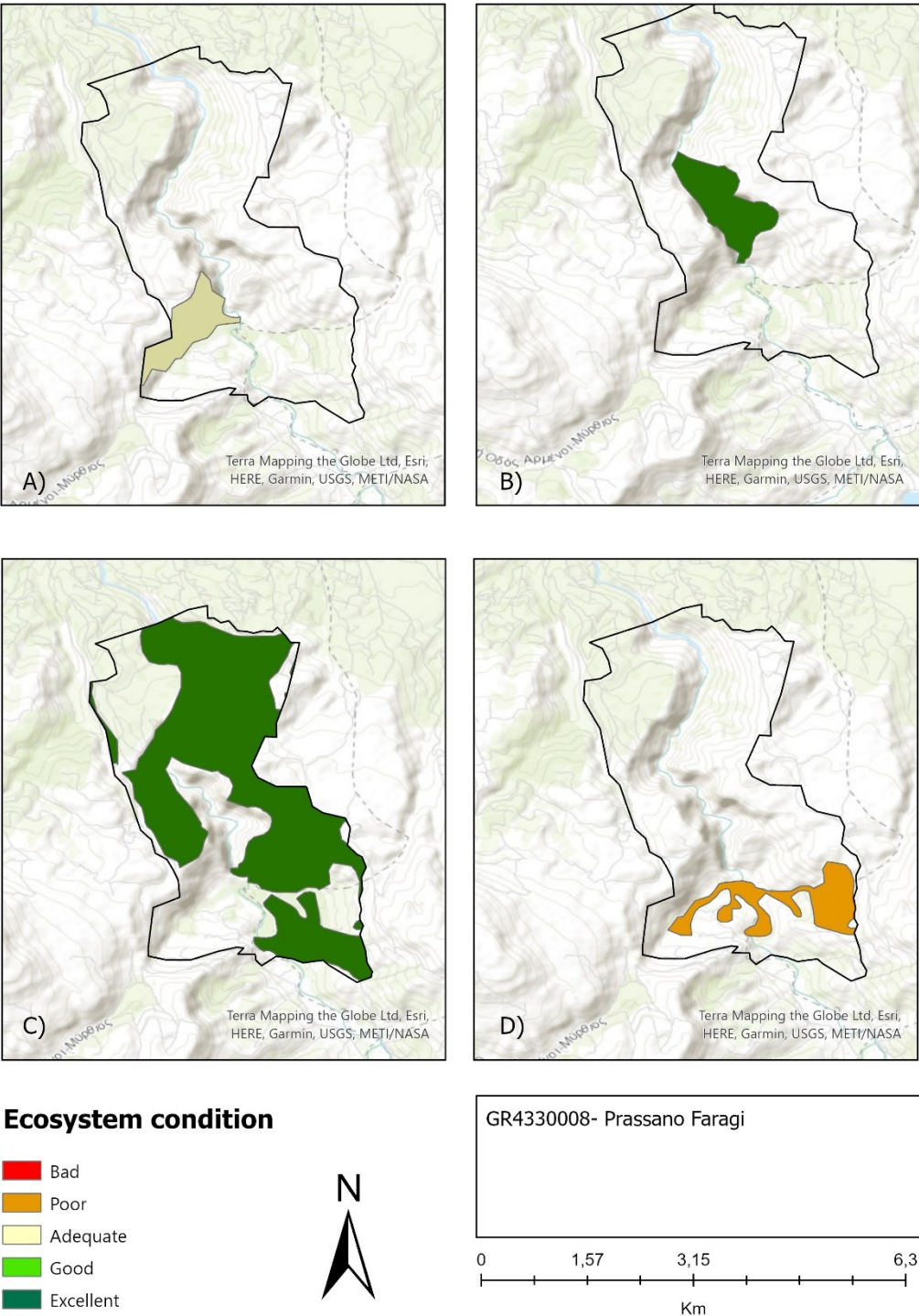


Figure 3-8. EC of GR4330008: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

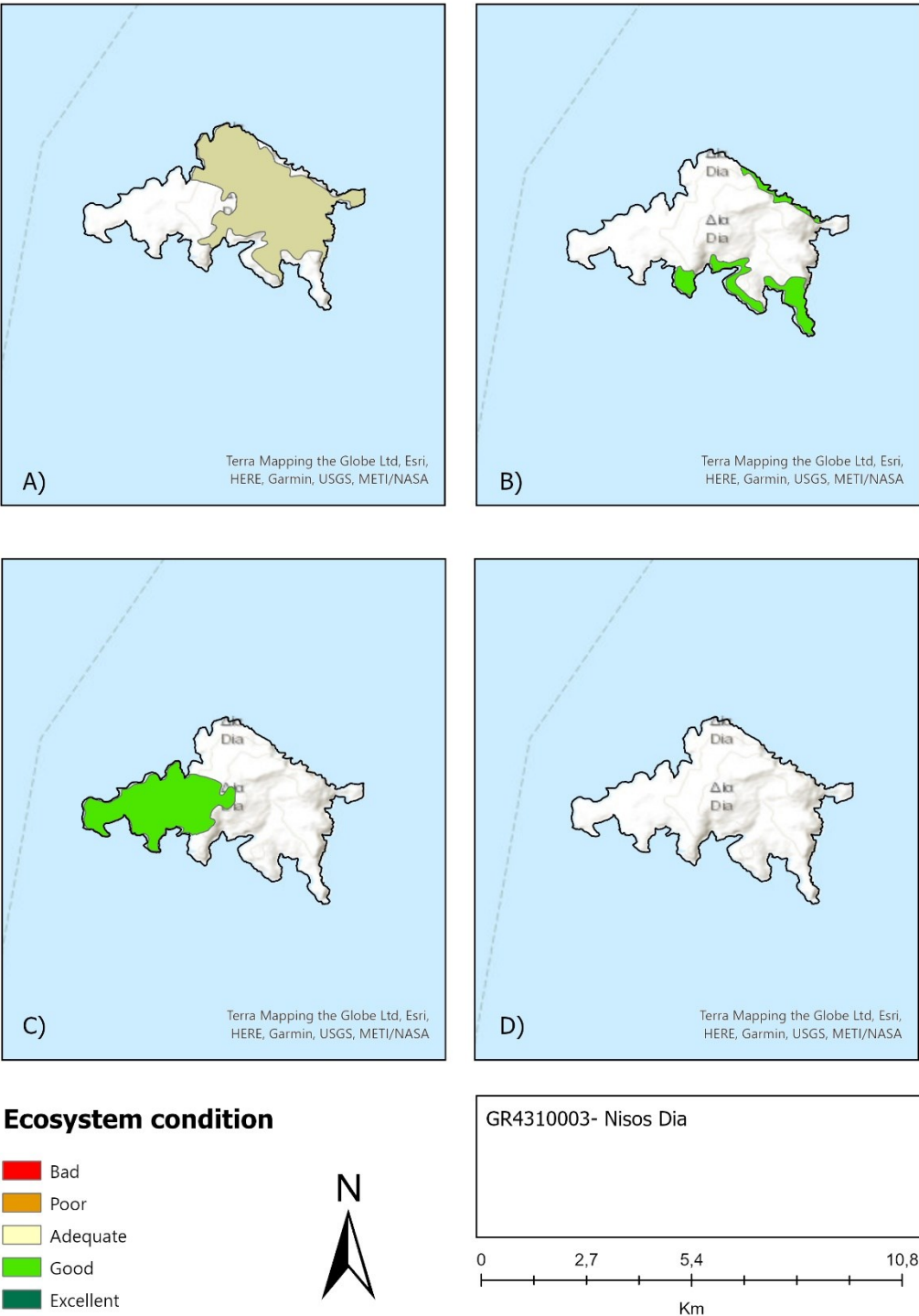


Figure 3-9. EC of GR4310003: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

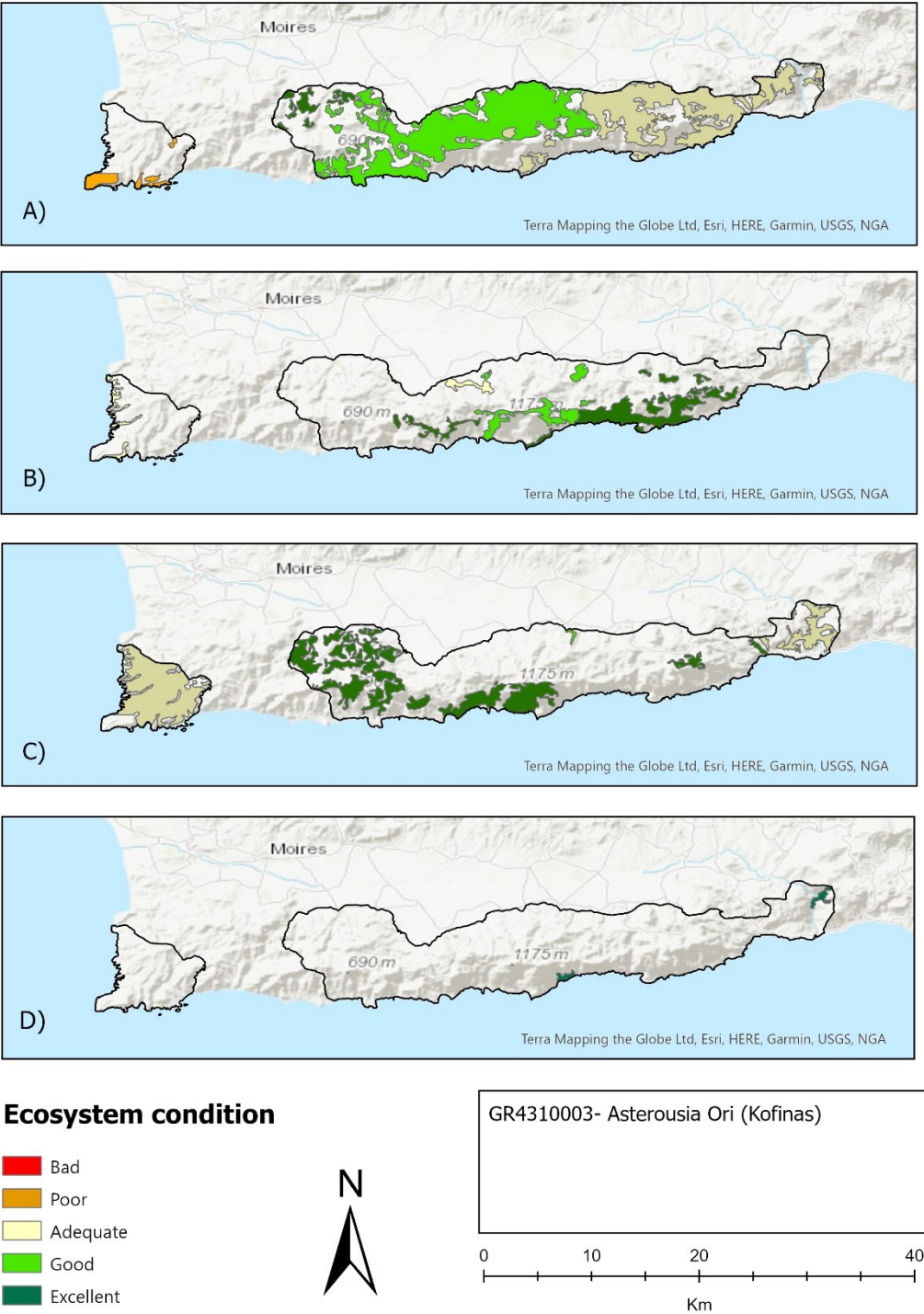


Figure 3-10. EC of GR4310003: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

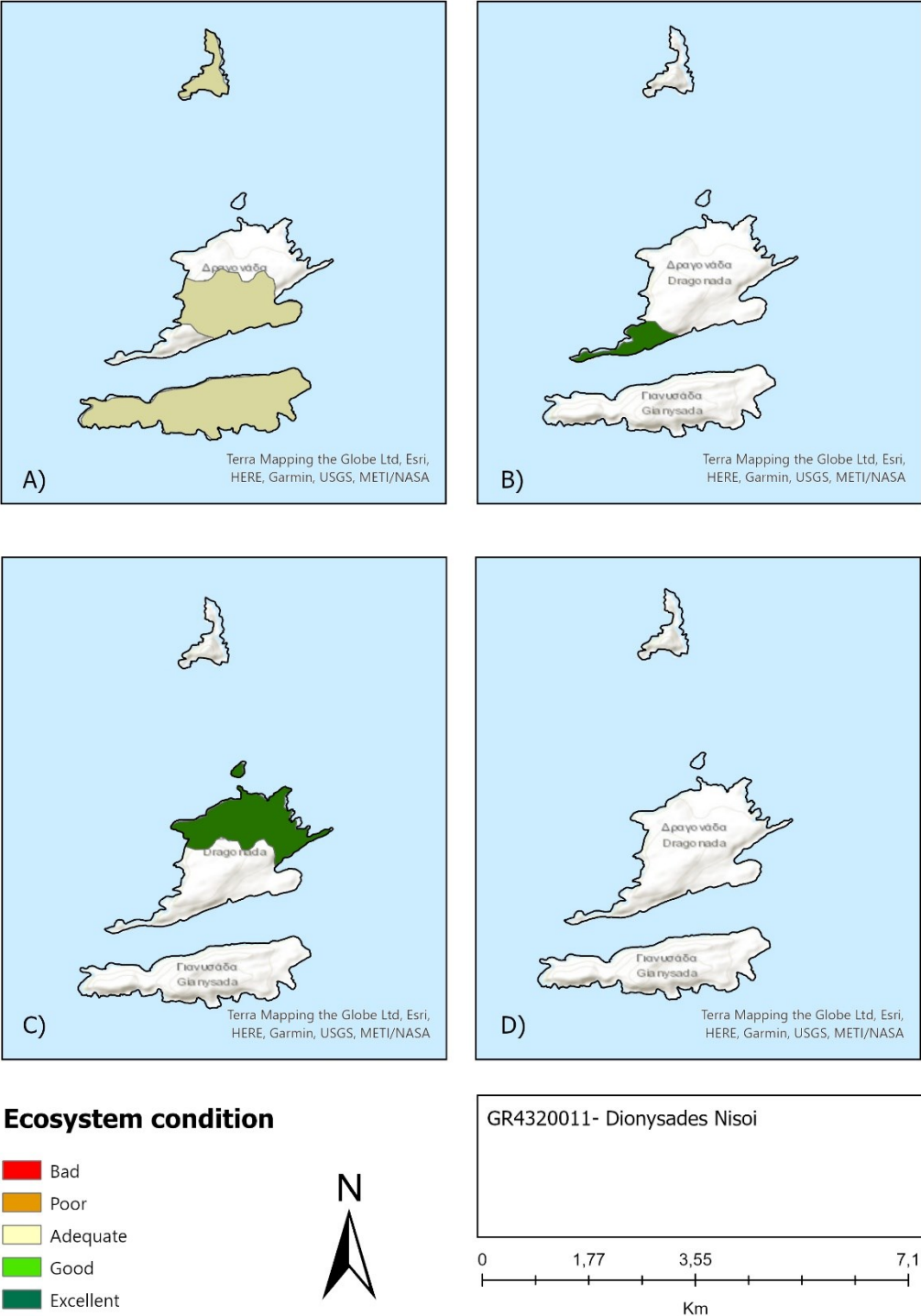


Figure 3-11. EC of GR4320012: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

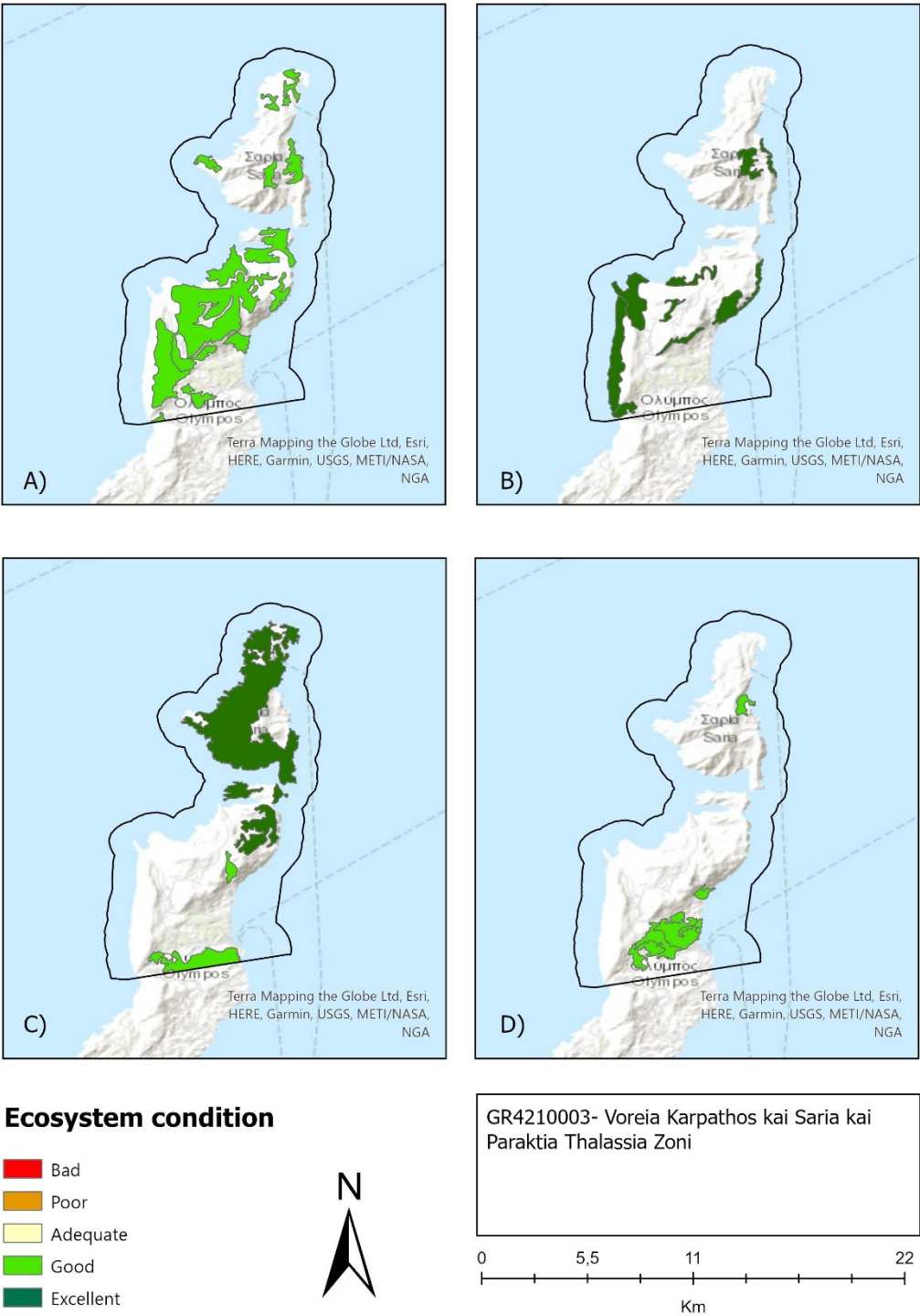


Figure 3-12. EC of GR4210003: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

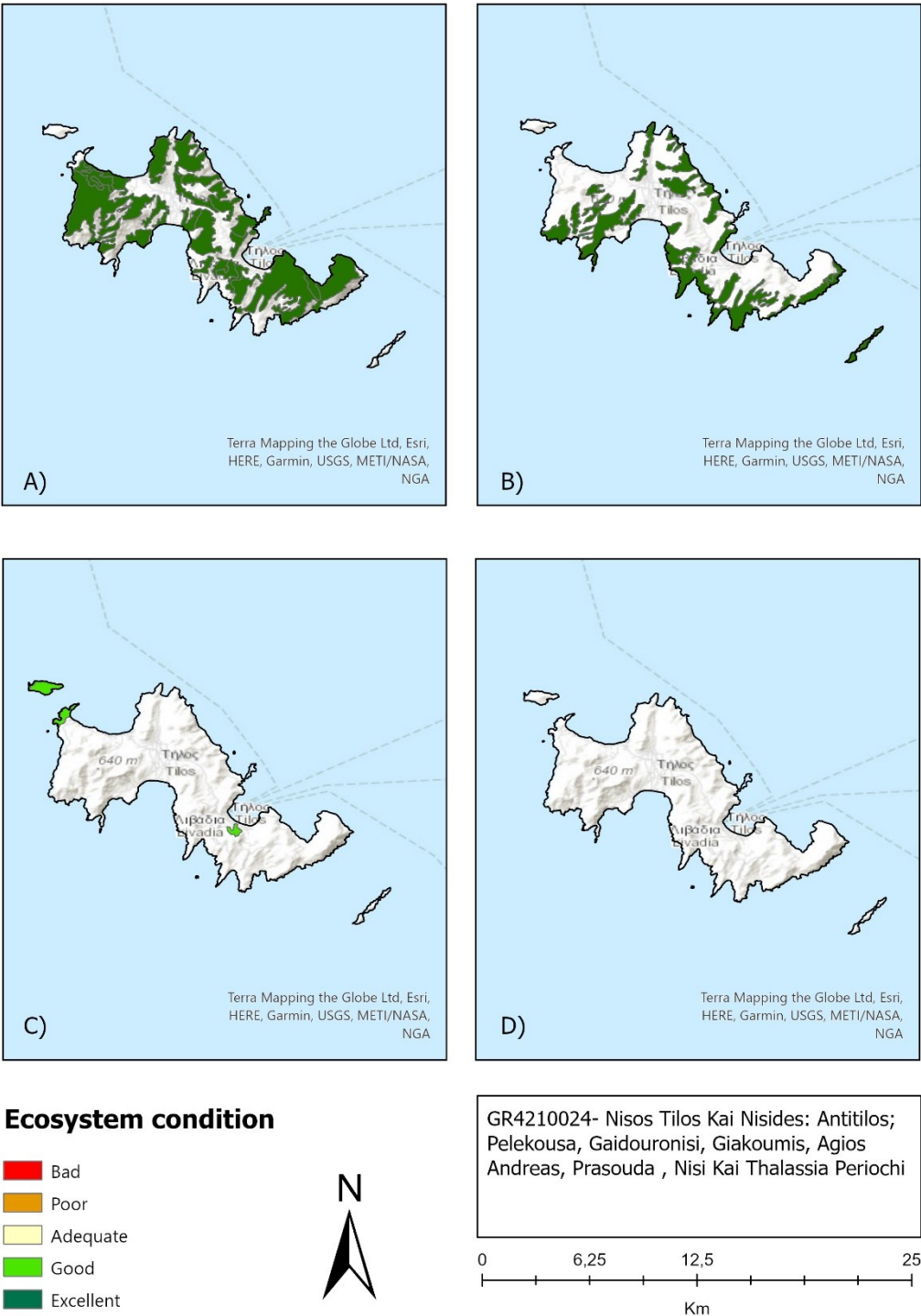


Figure 3-13. EC of GR4210024: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

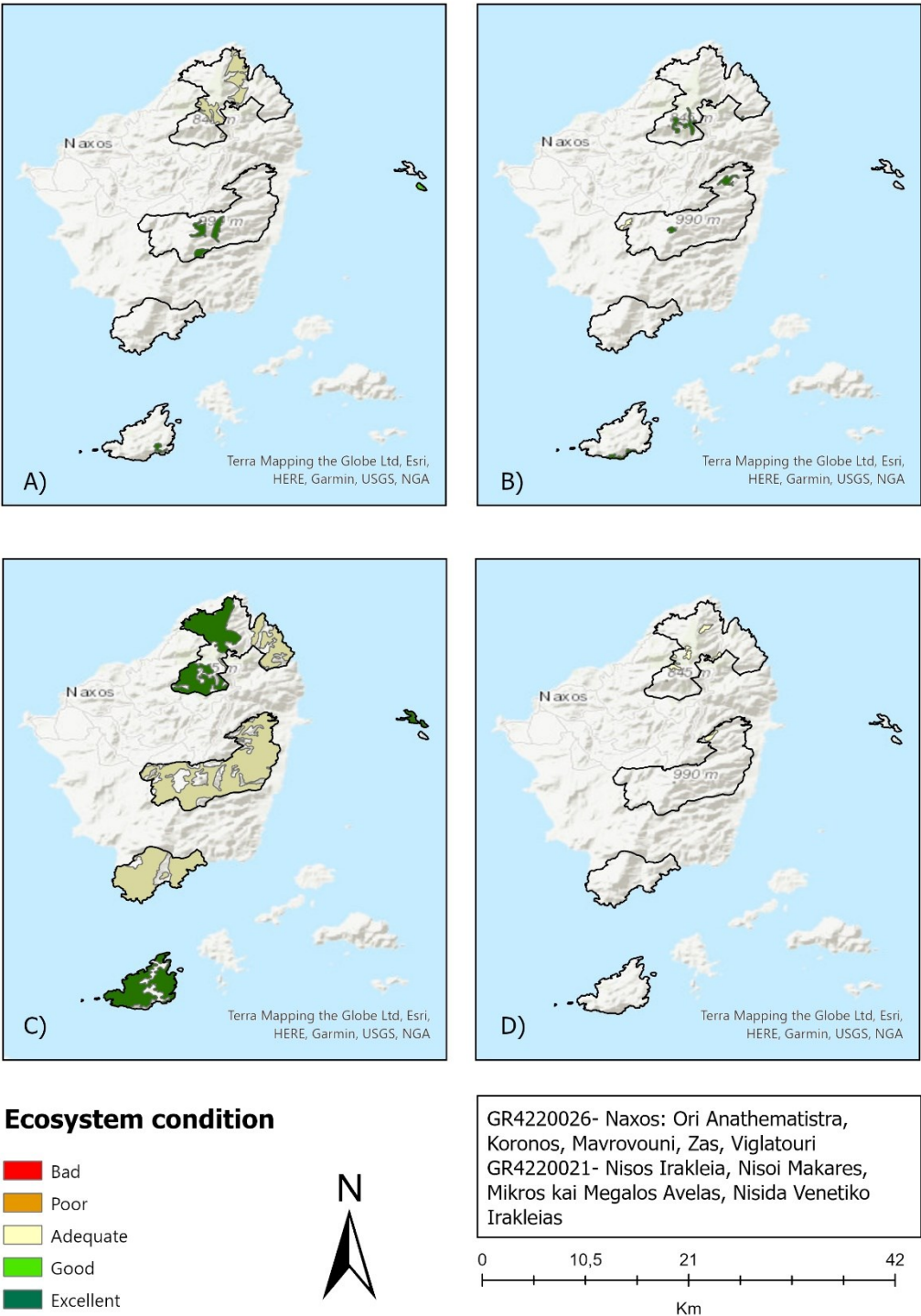


Figure 3-14. EC of GR4220026 and GR4220021: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

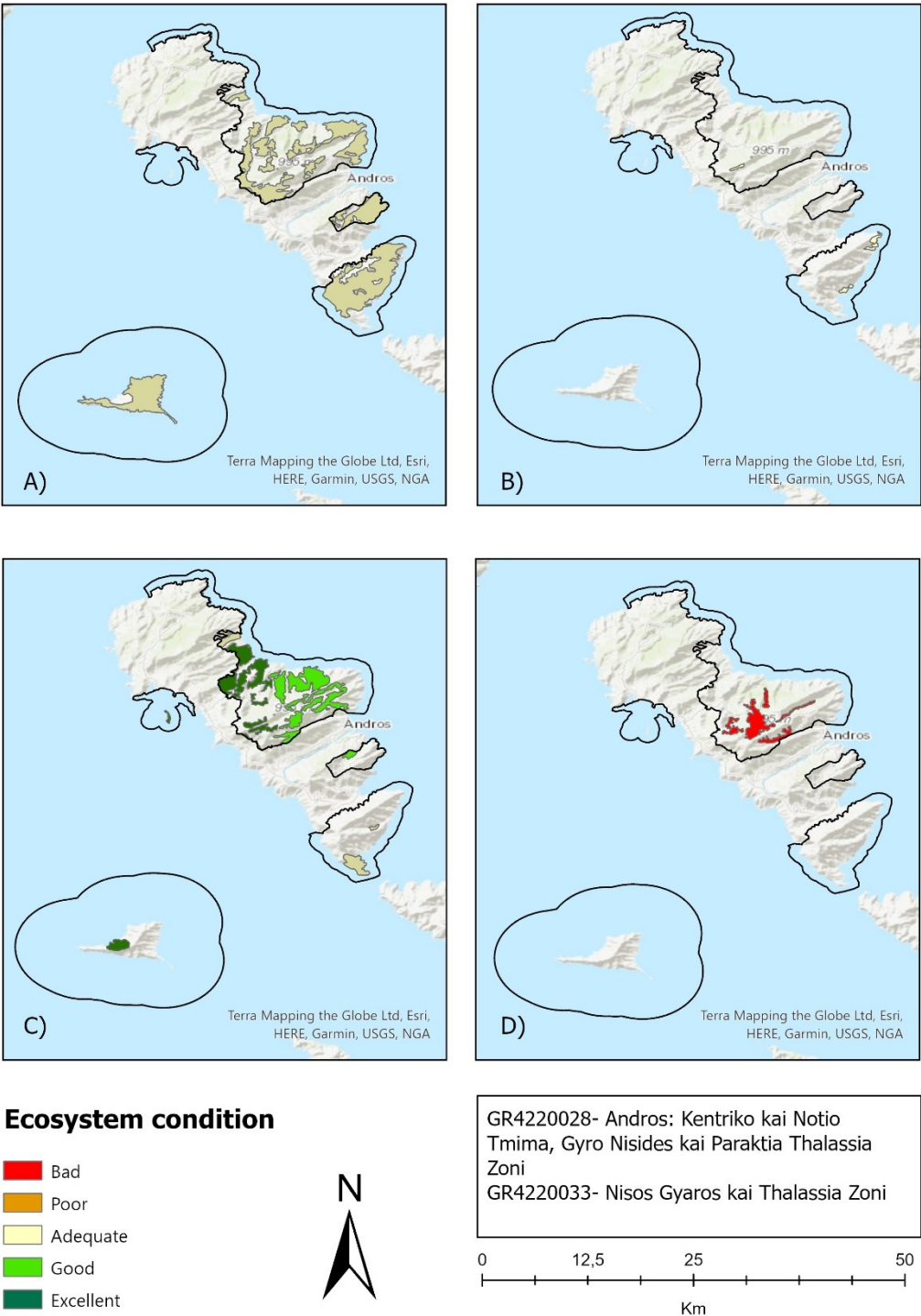


Figure 3-15. EC of GR4220028 and GR4220033: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

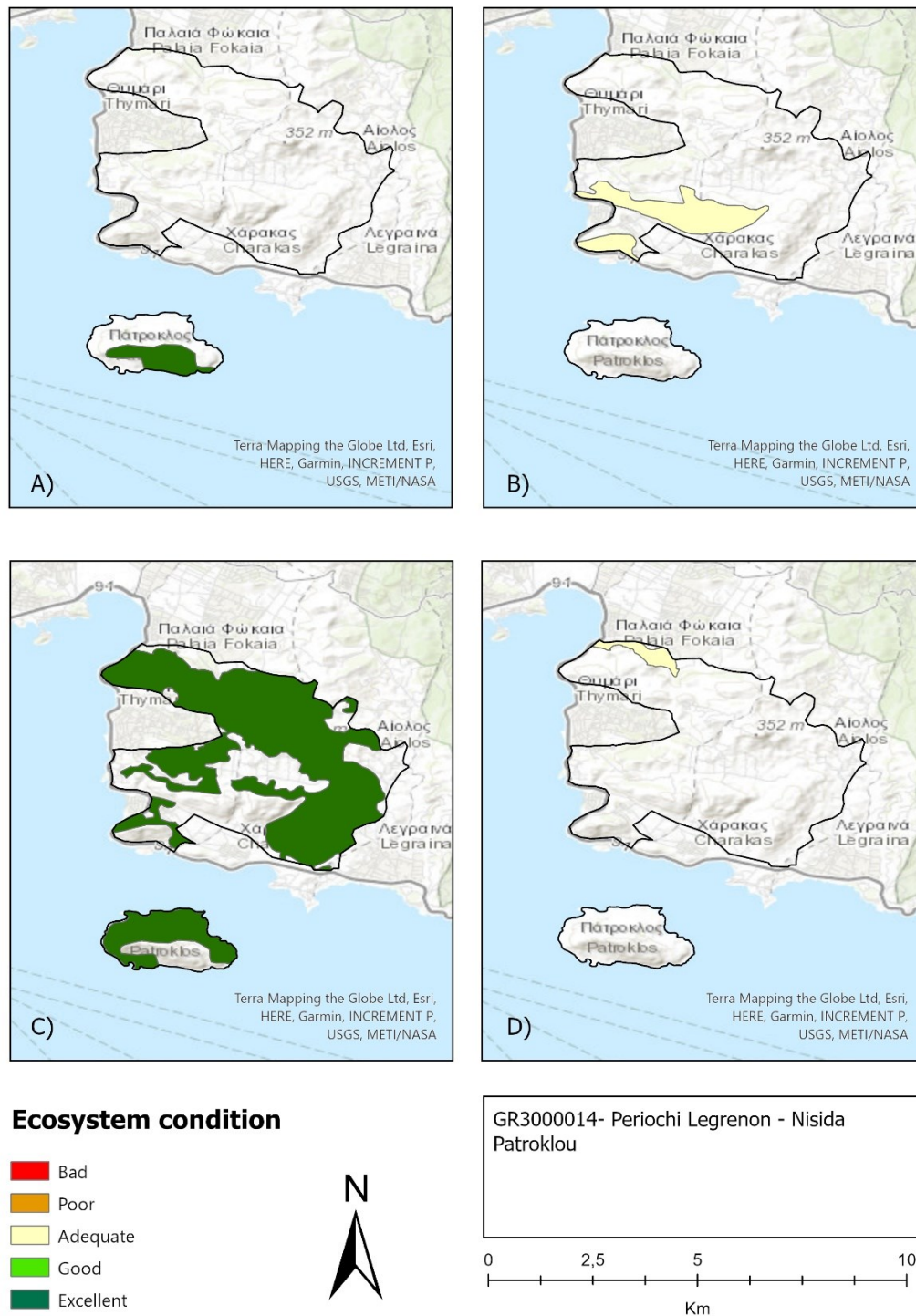


Figure 3-16. EC of GR3000014: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

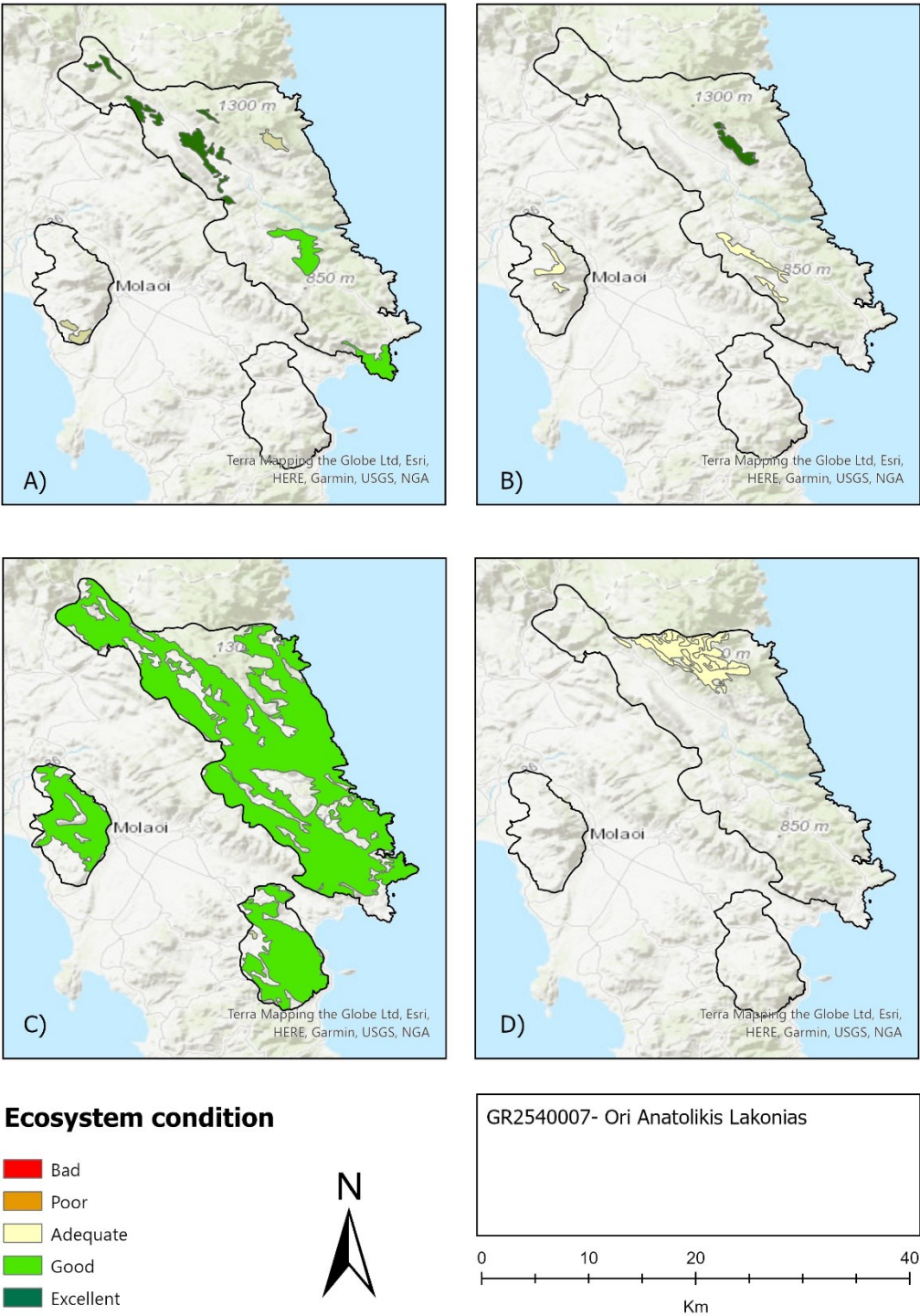


Figure 3-17. EC of GR2540007: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

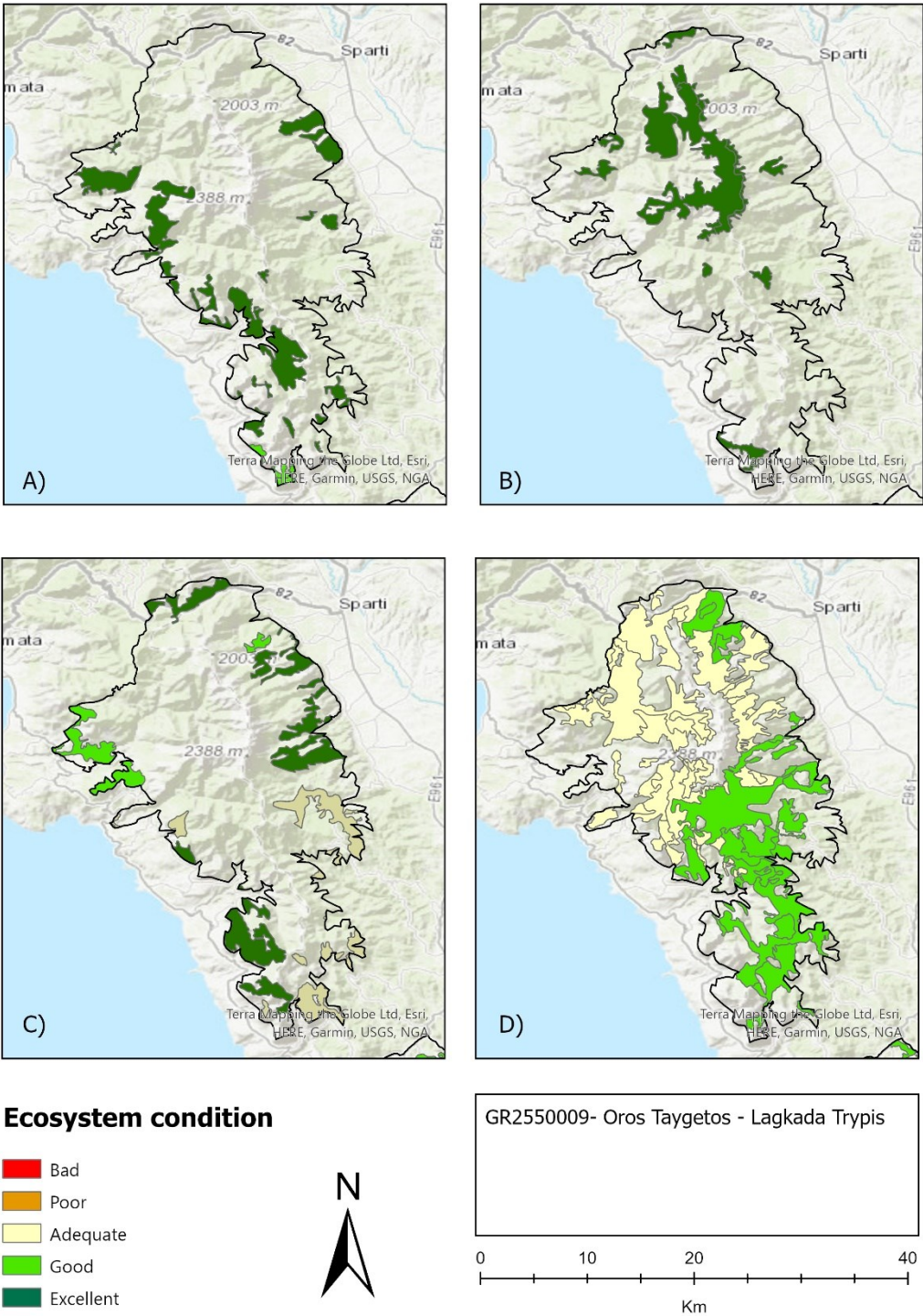


Figure 3-18. EC of GR2550009: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

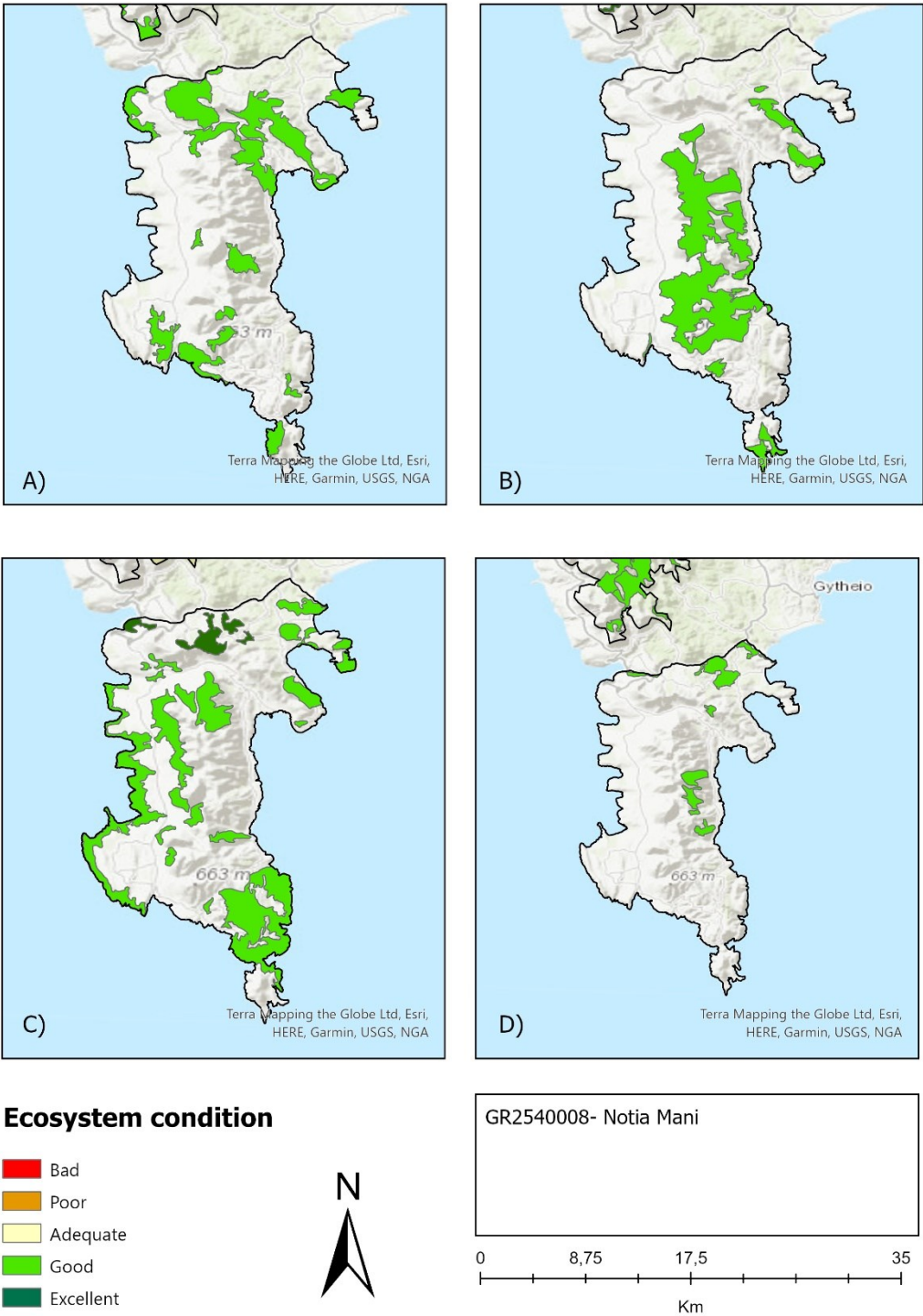


Figure 3-19. EC of GR2540008: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

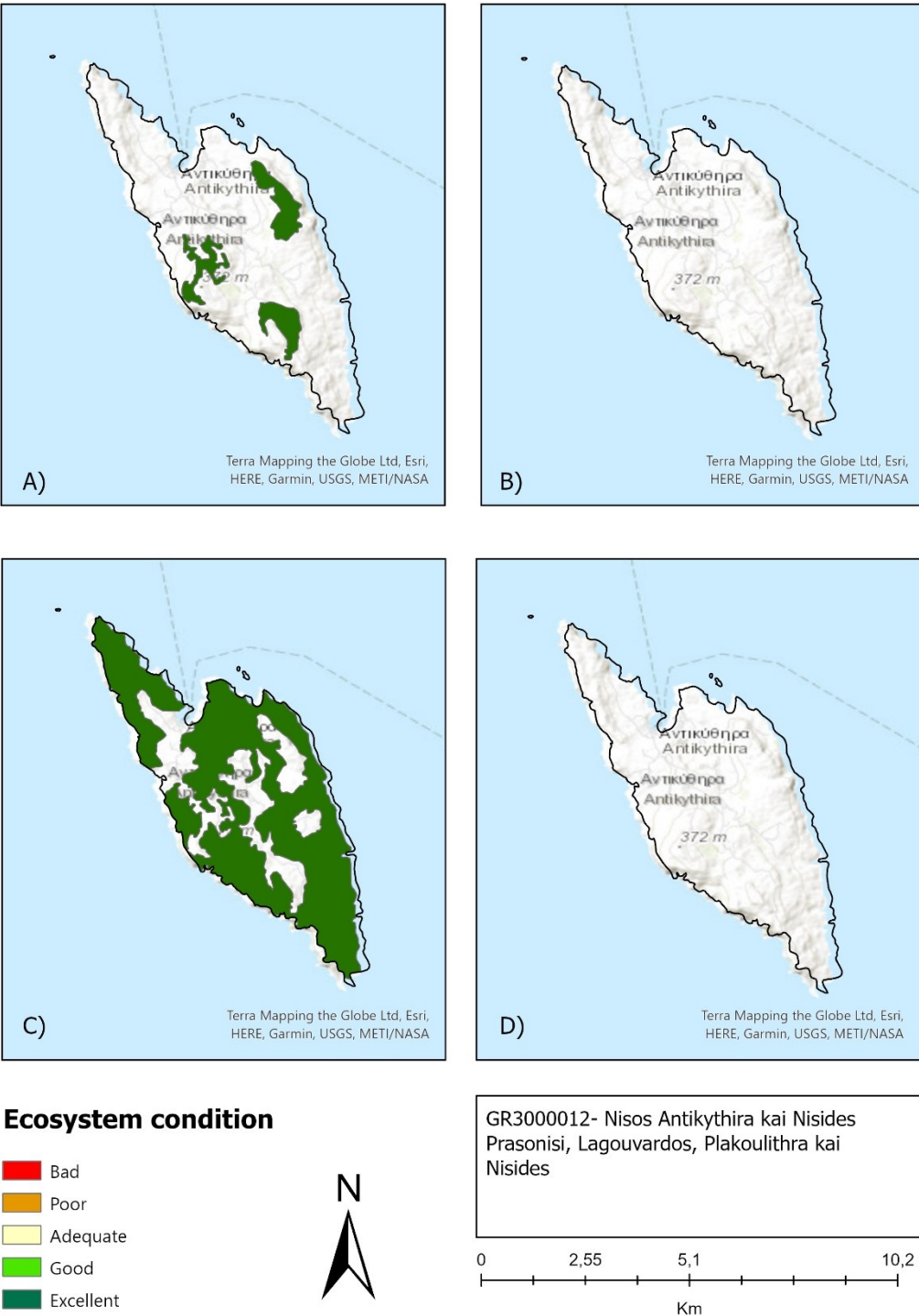


Figure 3-20. EC of GR3000012: A) Grassland, B) Sparsely vegetated land, C) Heathland and shrub, D) Woodland and forest

3.4. Factors and drivers determining ecosystem services supply in the project area

As explained in the section 2.3.4., drivers of change, including pressures and conservation actions are related and regulate ES supply of the ET. Below are presented the main factors and drivers of change influencing ecosystem types, their condition and their potential of ES supply, in our project area.

Human-induced wildlife mortality

Wildlife, particularly bird species, faces significant threats from human activities. Electrocution by energy structures, collisions with power network infrastructure, and wind turbines are among the leading causes of direct bird mortality. The illegal use of poison baits targeting mammalian species such as weasels (*Mustela nivalis*) and beech martens (*Martes foina*), as well as stray dogs, contributes to an increasing number of poisoned animals entering the food chain. Additional pressures include shooting and drowning in water structures. Proposed wind farm developments are expected to exacerbate these threats in certain ecosystem types.

Human disturbance

Human activities also contribute to wildlife disturbance through various mechanisms:

- Increased human presence: Direct disturbances due to habitat degradation and a dense road network in some areas.
- Hunting pressure: Reduced food availability for birds of prey, particularly species that rely on Chukar Partridges, Wild Pigeons, and Brown Hares.
- Incompatible land use: Housing developments, tourism expansion, settlement growth, and recreational activities (e.g., hiking, climbing) near breeding sites.
- Infrastructure development: Construction of roads and quarrying activities.

Land abandonment and habitat degradation

Land abandonment is another significant factor, leading to:

- A decline in prey availability for predatory species.
- Degradation of foraging habitats due to the cessation of traditional agricultural practices.
- Overgrazing, scarcity of freshwater, wildfires, and desertification, all of which negatively impact ecosystem integrity.

Knowledge gaps and management challenges

A lack of scientific data, particularly telemetry information, hinders the spatial assessment of mortality causes and population dynamics for endangered bird species such as the BE. Additional challenges include:

- Limited technical and operational capacity of nature conservation authorities and stakeholders.
- Poor coordination among relevant parties (e.g., conservation services, electricity grid companies, hunter associations) to implement effective conservation measures within breeding territories and key dispersal areas.
- Low awareness among stakeholders and target groups regarding species conservation needs.

Insufficient conservation framework

The current conservation measures, including those under the Natura 2000 Special Protection Areas (SPAs) network, provide insufficient protection for species like the BE. The large dispersal ranges of these birds and the lack of international coordination among East Mediterranean countries expose them to risks beyond protected areas, often crossing national borders and continents.

These pressures result in:

1. Uncertain long-term preservation of a favorable conservation status for Bearded Eagles (BEs) and other interconnected local populations of birds of prey.
2. Increased mortality rates among birds of prey, particularly juvenile individuals.
3. Reduced productivity, further compromising population viability.
4. An inadequate conservation framework, unable to effectively address these challenges.

3.5. Selection of relevant Ecosystem services and ES indicators

This section presents the ES most relevant to the project, along with the indicators chosen for their quantification and assessment. The descriptors of each selected ES code has been rephrased in order to address more adequately the subject of this report. A summary of the ES classes, their descriptors and indicators used are presented in the Table 6-4 in the Appendix. The selected indicators are derived from the project's actions, with many of them representing quantifiable outcomes of those actions. In cases where the quantification was not possible, a trend of their outcome was expressed based on the expert opinion of the project scientists. Also, the majority of the indicators selected rely on the biophysical methods using direct or indirect measurements.

As the Bonelli's eagle is an umbrella species for wildlife the preservation and improvement of biodiversity in general is also expected. These improved ecosystem services are expected to affect the local society's subjective well-being. The primary

ecosystem services expected to benefit from the implementation of the project are outlined below.

3.5.1. Provisioning services

1.1.1.1: Field cultivations of traditional varieties

Indicator: Field cultivations of traditional plants (ha)

The selection of this indicator was based on the rational that is easy indicator to obtain and the fact that cultivations can sustain a good population status of prey. In order to achieve the increase of prey availability for the BE, 131.65 ha of fields have been cultivated with traditional crop varieties in 8 Natura 2000 sites.

Table 3-1.Total area (ha) of field cultivations in each Natura 2000 site (Action C.2.1)

Natura 2000 site name	Site code	Field cultivations (ha)
Asterousia Ori (Kofinas)	GR4330013	62.54
Dionysades Nisoi	GR4320011	25.40
Farangi Kallikratis - Argouliano Farngi - Opopedio Manika	GR4340019	16.22
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides	GR3000012	4.52
Prassano Faragi	GR4330008	17.15
Nisos Dia	GR4310003	5.00
Ori Anatolikis Lakonias	GR2540007	0.26
Periochi Legrenon - Nisida Patroklou	GR3000014	0.56
Potamos Pentaschinos	CY6000008	4.05
Vounokorfes Madaris - Papoutsas	CY2000015	4.75
Dasos Pafou	CY2000006	5.38

3.5.2. Regulation and maintenance services

The descriptors outlined below present a different aspect of the ES Class "Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)".

2.3.2.3.: Increase of forage species populations (Chukar partridges, rabbits and hares, rodents, lizards)

Indicator: Field cultivations of traditional plants (ha)

One of the key conservation activities of the project was increasing prey availability for the BE through habitat management. This included cultivating fields with traditional crop varieties as a targeted sub-action to achieve this goal. This indicator has been quantified in the Table 3-16.

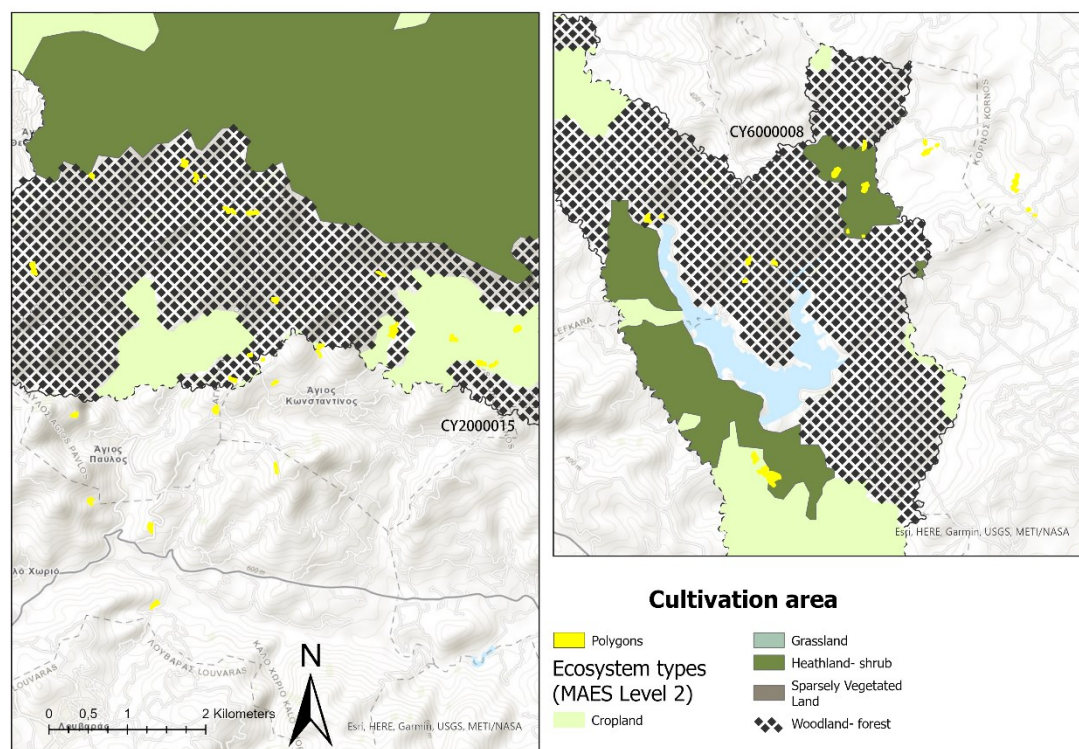


Figure 3-21. Cultivations areas in two project sites in Cyprus. The coverage of these cultivations is reported in the table 3-1.

2.3.2.3: Maintenance of favorable conservation status of the Bonelli's eagle

Indicator: Bonelli's eagle productivity

All the conservation actions of the program (C1.1, C1.2, C1.3, C2.1, C2.2, C2.3, C3.1, C3.2, C3.3) are facilitating this service. These actions include: the construction of watering ponds, the creation of forest and shrubland openings, as well as the regulation of hunting activities. The territories of the Bonelli's eagles that have been managed in mainland or inhabited islands are expected to act as game stock recovery areas. This indicator was calculated as follows: $\text{Productivity} = \frac{\text{N. of egg laying pairs}}{\text{N. territories (including unknown \& abandoned)}}$ comparing the values derived from species monitoring activities and surveys from 2019 and 2023.

2.3.2.3: Maintaining wildlife fauna

This service derives from multiple actions as explained below and thus multiple indicators have been used for its quantification.

Indicator: Anti-poison Dog Units (APDUs) operation (Total Detections)

Three Anti-poison Dog Units (APDUs) allowed the detection of poisoned baits in the field, not possible to be detected otherwise. The three units were expected to improve the poison detection capacity of the existing 2 APDUs on Crete. The available data about the APDUs operation come from Heraklion region thus the benefits derived from their operation are relevant only to GR4310003.

Table 3-2. Operation of APDU in Heraklion Prefecture.

	Total Detections	Positive Detections	No of Poisoned Baits	No of Dead animals
2020	3	2	4	2
2021	5	3	5	5
2022	28	13	22	20
2023	32	14	48	8
2024	55	31	153	40
TOTAL	123	63	232	75

Indicator: Number of insulated pylons and marked power lines

In order to mitigate electrocution and collision on power lines of Bonelli's eagles pylons were insulated and power lines were marked. This action was critical for the survival of the BE in the project countries, as it is one of the main threats for the species, and also critically important for other large birds, especially raptors/storks, along the Eastern Mediterranean flyway.

The number of insulated pylons and marked power lines were calculated and from that it is estimated that the number of dead birds will reduce in the future, thus contributing positively to the ES "Maintaining wildlife bird fauna".

Table 3-3. Number of insulated pylons in each site of interventions.

Natura 2000 site name	Site code	No Insulated pylons
Asterousia Ori (Kofinas)	GR4330013	18
Prassano Faragi	GR4330008	6
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni	GR4220028	5

Notia Mani	GR2540008	27
Nisos Tilos kai Nisides: Antitilos, Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas,	GR4210024	5
Ethniko Dasiko Parko Troodous	CY5000004	11

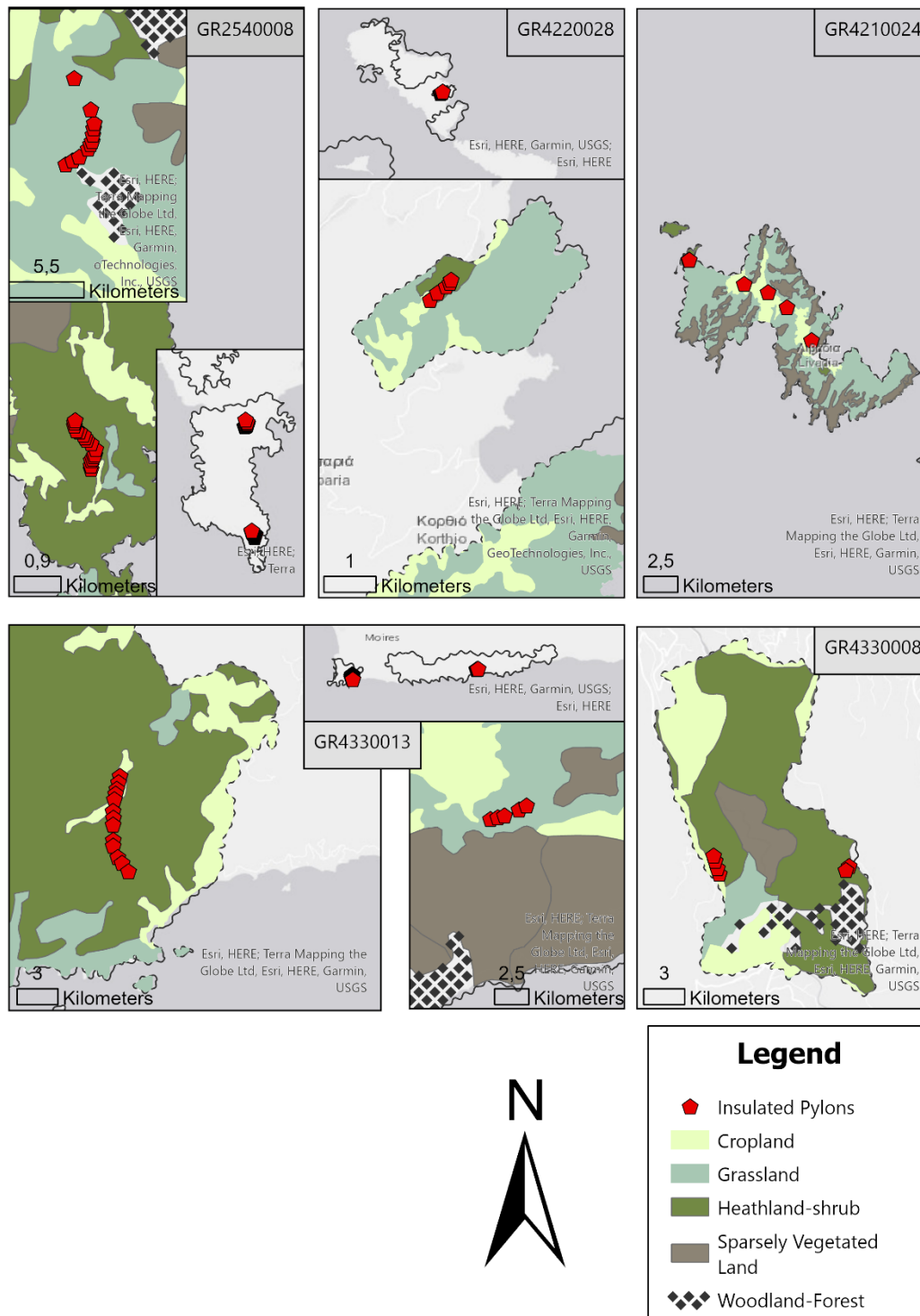


Figure 3-22. Position of insulated pylons in project sites in Greece

Indicator: Number of wildlife escape ladders

It has been proven that the average number of birds drowned per reservoir without ramps/ladders is almost seven fold higher than the ones with ladders installed, thus the construction of “Wildlife escape ladders” benefited Bonelli’s eagle survival and wildlife in general, reducing the number of drowning animals.

Table 3-4. Number of escape ladders in each site of intervention.

Natura 2000 site name	Site code	Number of escape ladders	Remarks
Ori Anatolikis Lakonias	GR2540007	4	
Oros Taygetos - Lagkada Trypis	GR2550009	2	in proximity to the site
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni	GR4220028	2	in proximity to the site
Naxos: Ori Anathemastira, Koronos, Mavrovouni, Zas, Viglatouri	GR4220026	4	in proximity to the site
Nisos Tilos Kai Nisides: Anttilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi	GR4210024	4	
Asterousia Ori (Kofinas)	GR4310003	5	
Prassano Faragi	GR4330008	1	
Farangi Kallikratis - Argouliano Farngi - Oropedio Manika	GR4340019	1	in proximity to the site

Indicator: Number of constructed/ restored watering structures

The aim of the sub-action was to provide fresh water to the main prey species for the BE through the production of watering structures. From this action many avian species; livestock are estimated to be benefited.

Table 3-5. Number of constructed/ restored watering structures in each site of intervention.

Natura 2000 site name	Site code	Number of constructed/ restored watering structures
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides	GR3000012	3

Nisos Tilos Kai Nisides: Anttilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi	GR4210024	2
Dionysades Nisoi	GR4320011	1
Prassano Faragi	GR4330008	2
Asterousia Ori (Kofinas)	GR4310003	23
Farangi Kallikratis - Argoulano Farangi - Oropedio Manika	GR4340019	4

3.5.3. Cultural

3.1.1.2: Birds of prey as attraction to birdwatchers

Indicator: Number of birdwatchers

The practice of bird watching is often a direct indicator of a well-preserved and ecologically balanced bird population within protected areas. Thus, protecting and preserving critical habitats that support diverse bird species, offering suitable conditions for nesting, feeding, and migration, conserving high species diversity, stable populations, and the presence of indicator or flagship species like BE—attracts birdwatchers and nature enthusiasts. As the actions of the program aimed at reducing disturbance or mortality incidents, it is expected that bird community has been benefited thus more birdwatchers are attracted. Though, for this assessment it is not possible to count the number of people visiting the project Natura 2000 sites for bird watching, so only a positive trend is expected after the program's end.

3.2.1.1.: Scientific research

Indicator: Number of scientific publications

Through the publication of reports, peer-reviewed articles, and open-access data, this project contributes to the global body of knowledge. Also, the workshops, seminars hosted as part of this project further disseminate findings, encouraging academic discourse and collaboration. The list of the scientific publications and the conference presentations are in the Appendix part "Scientific publications".

Other: Public awareness about endangered species conservation

This Ecosystem service is offered through projects public awareness campaign. Environmental education fosters a deeper understanding of the interconnectedness of ecosystems and human well-being, encouraging participants to adopt conservation-friendly behaviors. Also, educated communities are more likely to support conservation

initiatives, advocate for policies protecting ecosystems, and engage in sustainable practices. Two indicators are used to assess this ES.

Indicator: Number of people reached

Number of people reached through Mass Media, Social Media, Newsletters' release, website operation, Web tool for climbers, public presentations, exhibitions, festivals and more. More detailed are presented below:

1. More than 1,500,000 people have been informed about the project and Bonelli's eagle through: media publications, social media, newsletters, etc.
2. The website had more than 45.000 visitors.
3. Visitors to the online climbing tool have been around 2,900 and at least another 1,000 have been informed at climbing festivals and special presentations at their clubs or elsewhere.
4. Over 10,000 people (general public) have been informed through presentations or distribution of information materials at open events, workshops, festivals, exhibitions etc. in both countries (Greece & Cyprus).

Indicator: Number of pupils reached

During the project duration environmental education programs and material has been produced thus 4,000 students/teachers have been informed so far throughout Greece and Cyprus (either through presentations in schools, special seminars for environmental education teachers, or have received the educational material).

3.6. ES quantification

The quantification of ecosystem services was based on their level or trend following the project interventions at the project sites. For the Greek sites, both the level and trend were assessed, while for the Cyprus sites, only the trend was evaluated. This was due to the unavailability reference data on ecosystem conditions.

3.6.1. Greece

Table 3-6. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for Peloponeese area and each GR seperately

Peloponnese							
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Bonelli's eagle productivity	0.14	0.22	All	2	3	Improvement/ deterioration in different locations	All
Ori Anatolikos Lakonias			GR2540007				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of wildlife escape ladders	0	4	C3.2	3	3	Overall stable	Heathland-Shrub
Field cultivations of traditional plants (ha)	NA	0.26	C.2.1	2	2	Some improvement	Cropland
Notia Mani			GR2540008				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	27	C3.1	3	4	Some improvement	Grassland, Heathland-Shrub

Oros Taygetos - Lagkada Trypis			GR2550009				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of wildlife escape ladders	0	2	C3.2	3	3	Overall stable	NA
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides			GR3000012				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Field cultivations of traditional plants (ha)	NA	4.52	C.2.1	2	3	Some improvement	Cropland
Number of constructed/ restored watering structures	NA	3	C2.2	2	3	Overall stable	Heathland-Shrub

Table 3-7. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for Attica region.

Attica							
Periochi Legrenon - Nisida Patroklou			GR3000014				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of constructed/ restored watering structures	NA	2	C2.2	3	3	Overall stable	Heathland-Shrub
Bonelli's eagle productivity	0.5	1	All	3	4	Improvement	All
Field cultivations of traditional plants (ha)	NA	0.56	C.2.1	3	3	Overall stable	Heathland-Shrub

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Table 3-8. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for Dodecanese region and each GR separately

Dodecanese							
Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni			GR4210003				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Nisos Tilos Kai Nisides: Anttilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi			GR4210024				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	5	C3.1	2	3	Some improvement	Cropland
Number of cunstructed/ restored watering structures	NA	2	C2.2	2	3	Some improvement	Cropland
Number of wildlife escape ladders	0	4	C3.2	2	3	Some improvement	Cropland

Table 3-9. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for Aegean region and each GR separately

Aegean							
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Bonelli's eagle productivity	0.33	0.54	All	2	3	Some improvement	All

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Nisos Irakleia, Nisoi Makares, Mikros kai Megalos Avelas, Nisida Venetiko Irakleias			GR4220021				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Naxos: Ori Anathematistra, Koronos, Mavrovouni, Zas, Viglatouri			GR4220026				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of wildlife escape ladders	0	4	C3.2	2	3	Some improvement	NA
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni			GR4220028				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	5	C3.1	2	3	Some improvement	Grassland
Number of wildlife escape ladders	0	2	C3.2	2	3	Some improvement	NA
Nisos Gyaros kai Thalassia Zoni			GR4220033				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET

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Table 3-10. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for Crete region and each GR separately

Crete							
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Bonelli's eagle productivity	0.5	0.67	All	3	4	Improvement	All
Nisos Dia			GR4310003				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Field cultivations of traditional plants (ha)	NA	5	C.2.1	3	4	Improvement	Heathland-Shrub
Dionysades Nisoi			GR4320011				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	1	C3.1	2	3	Overall stable	Grassland
Field cultivations of traditional plants (ha)	NA	25.4	C.2.1	2	4	Improvement	Grassland
Prassano Faragi			GR4330008				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	6	C3.1	3	3	Overall stable	Heathland-Shrub
Number of cunstructed/ restored watering structures	NA	2	C2.2	2	2	Overall stable	Cropland

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Number of wildlife escape ladders	0	1	C3.2	2	2	Overall stable	Cropland
Field cultivations of traditional plants (ha)	NA	17.15	C.2.1	2	3	Some improvement	Cropland
Asterousia Ori (Kofinas)			GR4330013				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Anti-poison Dog Units (APDUs) operation (Total detections)	3	55	C3.3	3	4	Some improvement	ALL
Number of insulated pylons and marked power lines	0	18	C3.1	3	4	Some improvement	Heathland-Shrub
Number of cunstructed/ restored watering structures	NA	23	C2.2	3	4	Some improvement	Heathland-Shrub
Number of wildlife escape ladders	0	5	C3.2	3	4	Some improvement	Heathland-Shrub
Field cultivations of traditional plants (ha)	NA	62.54	C.2.1	3	4	Improvement	Heathland-Shrub, Grassland
Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi - Koustogerako			GR4340014				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Farangi Kallikratis - Argouliano Farngi - Oropedio Manika			GR4340019				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	0	4	C3.1	3	4	Some improvement	NA

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Number of wildlife escape ladders	0	2	C3.2	3	4	Some improvement	NA
Field cultivations of traditional plants (ha)	NA	16.22	C.2.1	3	4	Improvement	Heathland-Shrub, Grassland
Meterizia Agios Dikaio - Tsounara - Vitsilia Lefkon Oreon			GR4340016				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET

3.6.2. Cyprus

Table 3-11. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for the GR in Cyprus

Cyprus							
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Bonelli's eagle productivity	0.39	0.3	All	NA	2	Some deterioration	All
Dasos Pafou			CY2000006				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of wildlife escape ladders	NA	6	C3.2.	NA	3	Some improvement	Woodland-Forest

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Area of forest openings (ha)	NA	6.76	C2.3.	NA	4	Improvement	Woodland-Forest
Field cultivations of traditional plants (ha)	NA	5.38	C.2.1	NA	2	Some improvement	Woodland-Forest
Vounokorfes Madaris - Papoutsas			CY2000015				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of wildlife escape ladders	NA	3	C3.2.	NA	3	Some improvement	Woodland-Forest
Field cultivations of traditional plants (ha)	NA	4.75	C.2.1	NA	2	Some improvement	Woodland-Forest
Ethniko Dasiko Parko Troodous			CY5000004				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	NA	11	C3.1	NA	3	Some improvement	All
Number of wildlife escape ladders	NA	4	C3.2.	NA	3	Some improvement	Woodland-Forest
Potamos Pentaschinos			CY6000008				
Indicator (measurment unit)	Baseline value or trend	After LIFE	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of insulated pylons/ marked power lines	NA	26	C3.1	NA	3	Improvement	Heathland-Shrubs
Field cultivations of traditional plants (ha)	NA	4.05	C.2.1	NA	3	Some improvement	Heathland-Shrubs

3.6.3. All sites of interventions

Table 3-12. Assessment of a) ES Indicators, b) the contribution of each action to the relevant ES's level and trend and c) reference of the most associated ET. Presentation for all sites of interventions within Natura 2000 sites spatial range.

ALL sites							
Indicator (measurment unit)	Baseline value or trend	After LIFE interventions	Action	ES level (before)	ES level (after)	ES trend (after the interventions)	Most associated ET
Number of birdwatchers	NA	NA	ALL	4	4	Overall stable	All
Number of people reached	x	1,559,000.00	E1.1, E1.2	2	3	Improvement	All
Number of pupils reached	x	4,000	E.1.3	2	3	Improvement	All
Number of scientific publications	x	6	ALL	2	4	Improvement	All
Number of stakeholders and volunteers involved in conservation actions	NA	100	A1.3	2	3	Some improvement	All

4. Summary and result discussion

This report aims to analyze and evaluate the impact of the actions implemented under the LIFE Bonelli eastMed project (LIFE17 NAT/GR/000514) on ecosystem services (ES) in the project areas (Natura 2000 sites) in Greece and Cyprus. The evaluation focuses on how ecosystem services will be modified as a result of the actions outlined in the LIFE Bonelli eastMed project. Specifically, the objective was to assess the changes in the level and trend of ecosystem services after the implementation of these actions, as presented in the corresponding Table 4-1.

To achieve this, we employed and adapted a version of an approach from Burkhard et al., (2018), specifically designed for the evaluation of ecosystem services. This methodology was developed to assist in decision-making processes and to evaluate alternative states at the local level, ensuring a comprehensive analysis of the project's effects on the ecosystem services within the project sites.

Table 4-1. Summary of Ecosystem services identified and their quantification and trend in each project site.

ES code	ES Description	Site of intervention	ES level (before)	ES level (after)	ES trend (after the interventions)
1.1.1.1	Field cultivations of traditional varieties	GR4330013	3	4	Improvement
		GR4320011	2	4	Improvement
		GR4340019	3	4	Improvement
		GR4330008	2	3	Some improvement
		GR4310003	3	4	Improvement
		GR2540007	2	2	Some improvement
		GR3000012	2	3	Some improvement
		GR3000014	3	3	Overall stable
		CY2000006	NA	2	Some improvement
		CY2000015	NA	2	Some improvement
		CY6000008	NA	3	Some improvement
2.3.2.3	Increase of forage species populations (chukar partridges, rabbits and hares, rodents, lizards)	GR4330013	3	4	Improvement
		GR4320011	2	4	Improvement
		GR4340019	3	4	Improvement
		GR4330008	2	3	Some improvement
		GR4310003	3	4	Improvement
		GR2540007	2	2	Some improvement

2.3.2.3	Maintenance of favorable conservation status of the Bonelli's eagle	GR3000012	2	3	Some improvement
		GR3000014	3	3	Overall stable
		CY2000006	NA	3	Improvement
		CY2000015	NA	2	Some improvement
		CY6000008	NA	3	Some improvement
	Maintaining wildlife fauna	ALL	2	3	Improvement/ deterioration in different locations
	Maintaining wildlife fauna	GR3000014	3	3	Overall stable
		GR4310003	3	3	Overall stable
		GR2540007	3	3	Overall stable
		GR2550009	3	3	Overall stable
		GR4330013	3	4	Some improvement
		GR4320011	2	3	Overall stable
		GR4330008	2	2	Overall stable
		GR4340019	3	4	Some improvement
		GR4220028	2	3	Some improvement
		GR4220026	2	3	Some improvement
		GR2540008	3	4	Some improvement
		GR4210024	2	3	Some improvement
		GR3000012	2	3	Overall stable
		CY5000004	NA	3	Some improvement
		CY2000006	NA	3	Some improvement
		CY2000015	NA	3	Some improvement
		CY6000008	NA	3	Improvement
3.2.1.1	Scientific research	ALL	2	4	Improvement
3.1.1.2	Birds of prey as attraction to birdwatchers	ALL	4	4	Overall stable
Other	Public awareness about endangered species conservation	ALL	2	3	Some improvement

In the project area, we have identified and presented the relationship between the pressures (factors and drivers of change), the actions taken to mitigate these pressures, and the indicators used to measure the impact of these actions on the ecosystem types and their capacity to supply ecosystem services (ES). The combined interpretation of Table 6-4, Table 4-1, Table 3-6, Table 3-7, Table 3-8,

Table 3-9,

Table 3-10, Table 3-11 and Table 3-12 allows for a first assessment of the impacts of the project on the functions and services provided by the project.

4.1. Provisioning Services

1.1.1.1 – Cultivated terrestrial plants (including fungi, algae) grown for nutritional purposes

The LIFE Bonelli eastMed project has made important contributions to provisioning services through the cultivation of traditional plant varieties. By restoring traditional agricultural practices and cultivating plants for nutritional purposes, the project not only strengthens local ecosystems but also promotes sustainable land use and food production. Furthermore, these field cultivations of native and traditional plant species, measured in hectares (ha), support local biodiversity and provide essential food sources for wildlife, including the Bonelli's eagle and other species in the ecosystem, contributing to the improvement of ES- 2.3.2.3 which is outlined below.

4.2. Regulation and maintenance services

Regulatory services are represented from 2.3.2.3- Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection), which will be favored in several ways, though the proposed system of indicators can only quantify three specific aspects of this service, which are outlined below.

This regulatory service is closely tied to several critical pressures that affect the ecosystem and the species of concern, including: Human-Induced Wildlife Mortality, Human Disturbance, Land Abandonment and Habitat Degradation, Knowledge Gaps and Management Challenges and Insufficient Conservation Framework.

Descriptors

"Increase of forage species populations (Chukar partridges, rabbits and hares, rodents, lizards)" which has been measured through the indicators:

- Field cultivations of traditional plants (ha)
- Area of forest openings (ha)

"Maintenance of favorable conservation status of the Bonelli's eagle" measured through Bonelli's eagle productivity.

The overall status of this indicator showed improvements or deteriorations (Table 4-2) in different project areas. It has shown some deterioration in Cyprus and different levels of improvement were assessed in Crete, Aegean, Attica, Peloponnese regions. Furthermore, the status of this indicator is also linked to the N. of active territories (territories with BE present) as shown to Table 4-2. This variability is largely due to the differing levels of intensity of pressures and threats across sites, such as in Cyprus where a deterioration of this indicator has been assessed.

Table 4-2. Presentation of ES descriptor "Maintenance of favorable conservation status of the Bonelli's eagle".

ES code	ES Description	ES level (before)	ES level (after)	ES (after interventions)	trend the	Most asociated ET
2.3.2.3	Maintenance of favorable conservation status of the Bonelli's eagle	2	3	Improvement/ deterioration in different locations		All

Table 4-3. N. of active territories (territories with BE present) during the period 2019-2024.

Year	Regions	N. of active territories (territories with BE present)
2019	Crete	4
	Cyprus	18
	Aegean	16
	Attica	1
	Peloponnese	3
2023	Crete	2
	Cyprus	19
	Aegean	11
	Attica	1
	Peloponnese	2

Also, the project has successfully addressed land abandonment and habitat degradation, particularly through field cultivation of traditional plants (ha) in most of the project sites. This has led to a significant improvement in both Provisioning Services (e.g., Cultivated terrestrial plants grown for nutritional purposes - ES code 1.1.1.1), as already presented and Regulation & Maintenance services, particularly in maintaining or regulating nursery populations and habitats, including gene pool protection (ES code 2.3.2.3) by providing habitat to fauna such as chukar partridges, rabbits and hares, small

game, corvids, rodents and reptiles. Furthermore this action contributed by enhancing the biodiversity potential of the fields and improving their High Nature Value potential. Indirectly, these efforts have also contributed to the Maintenance of favorable conservation status for Bonelli's eagle (ES code 2.3.2.3), enhancing the overall conservation outlook for the species.

Additionally, this descriptor is linked with Human Disturbance acting as pressure to the species of concern. However, there was no specific indicator identified and used to directly assess the mitigation of human disturbance pressures on ecosystem service (ES) provision. However, one of the project actions, the regulation of climbing activities (C1.3. action), is expected to contribute indirectly to reducing this pressure on Bonelli's eagle habitats, ultimately supporting the preservation of the species. For instance, 2,900 people have visited the online climbing tool and at least another 1,000 have been informed at climbing festivals and special presentations at their clubs or elsewhere.

Furthermore, while knowledge gaps and management challenges were addressed during the project, the relevant actions contributed more indirectly to the Maintenance of favorable conservation status of Bonelli's eagle (ES code 2.3.2.3). Nonetheless, these efforts have helped support the broader conservation goals, particularly regarding Bonelli's eagle populations. And finally, an insufficient conservation framework was identified before the project implementation, yet no specific indicator was created to assess the impact of actions aimed at addressing this challenge. Further efforts may be needed to strengthen the conservation framework to better assess and enhance future project outcomes.

"Maintaining wildlife fauna" which has been measured through

- Anti-poison Dog Units (APDUs) operation
- Number of insulated pylons/ marked power lines
- Number of constructed/ restored watering structures
- Number of wildlife escape ladders

Human-induced wildlife mortality is a significant threat to Bonelli's eagle populations in Greece, with key factors including electrocution from energy infrastructure, collisions with power lines and wind turbines, and poisoning from illegal bait targeting mammals like weasels and martens, as well as stray dogs. For instance, in Cyprus island (in and out of the project sites, has been reported six poisoning issues, and one of them was reported into a project site during the period 2019-2024 (Navarrete et al., 2024).

Additionally, shooting and drowning in water structures further exacerbate these risks. 70 Individuals were recovered dead during the period 2019-2024 (Navarrete et al., 2024) as shown to the Table 4-4.

Table 4-4. Number of deaths recorded per year. (Navarrete et al., 2024).

Project area	Deaths					
	2019	2020	2021	2022	2023	2024
Attica and Peloponnese	1	0	1	4	0	0
Aegean	4	1	1	7	8	5
Crete	1	1	4	9	2	0
Cyprus	4	3	8	6	1	0



Figure 4-1. Bonelli's eagle found dead by illegal shooting in Crete. (Navarrete et al., 2024) Bonelli's eagle found dead by illegal shooting in Crete. (Navarrete et al., 2024)

The LIFE Bonelli eastMed project has implemented a range of actions to address the key threats to Bonelli's eagle, as outlined in the previous sections. These efforts have led to a notable improvement in the ecosystem services (ES) associated with the conservation of its habitats. In most of the Natura 2000 sites, a clear to moderate improvement in these ES is expected. However, some sites are projected to maintain a stable trend, reflecting the varying intensity of threats and pressures across different areas. Key outcomes from these actions include:

- Increased populations of forage species such as chukar partridges, rabbits, hares, rodents, and lizards.
- Maintenance of a favorable conservation status for Bonelli's eagle populations.
- Overall improvement in wildlife fauna management.
- The operation of Anti-Poison Dog Units (APDUs) in sites such as Asterousia Ori and eastern Crete has been crucial in detecting and preventing poisoning

incidents, as shown in the project data (Figure 4-2. Map of the discoveries from the APDUs during 2019-2024 (end of June) in Crete and Rhodes. (Navarrete et al., 2024)

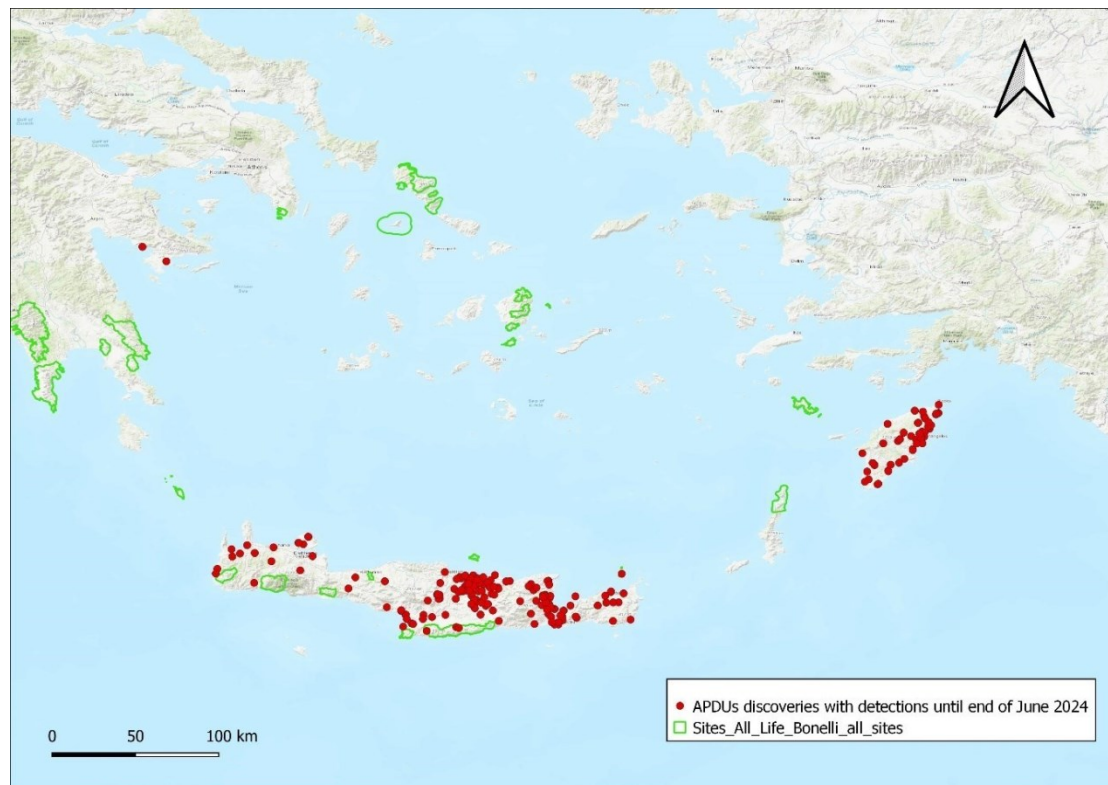


Figure 4-2. Map of the discoveries from the APDUs during 2019-2024 (end of June) in Crete and Rhodes. (Navarrete et al., 2024)

4.3. Cultural services

The LIFE Bonelli eastMed project actions, including E.1.1 Public awareness campaign, E.1.2 Production of communication material and special publications, and E.1.3 Engagement of the educational community in Bonelli's eagle conservation, have made a positive contribution to improving public awareness about endangered species conservation. This ecosystem service (ES) was measured through the following indicators:

- Number of people reached
- Number of pupils reached
- Number of stakeholders and volunteers involved in conservation actions

A key outcome of the project is the significant increase in public awareness surrounding the conservation of endangered species, especially Bonelli's eagle. Through outreach efforts, educational campaigns, and the distribution of informative materials, the project has successfully engaged a wide audience, leading to a greater understanding and support for the conservation of Bonelli's eagle and other endangered species. As a result, this has enhanced the cultural service related to species conservation awareness.

Furthermore, the conservation efforts surrounding Bonelli's eagle have also served as an educational tool. The project has worked diligently to raise public awareness about the importance of preserving endangered species. Through outreach programs, informational campaigns, and community engagement, local populations have gained a deeper understanding of the role Bonelli's eagle plays in the ecosystem, the challenges it faces, and the significance of protecting its habitat. These efforts contribute to a broader environmental consciousness, inspiring future generations to become more involved in conservation actions.

In addition to public awareness, the project has contributed to the scientific investigation and the creation of traditional ecological knowledge related to the conservation of Bonelli's eagle. This has been measured through the following indicator:

- Number of scientific publications

Scientific research has played a crucial role in understanding the species' behavior, habitat needs, and conservation requirements. The publication of research findings has expanded knowledge about Bonelli's eagle and its ecosystem, while also promoting the integration of traditional ecological knowledge into modern conservation efforts. This research supports continued improvement in conservation strategies and helps inform policy decisions for future projects.

Basic Conclusions:

- The LIFE Bonelli eastMed project has had a positive impact on three key sections of ecosystem services (ES): Provisioning, Regulation & Maintenance, and Cultural.
- The ES were assessed in terms of their levels and trends over the duration of the project.
- No deterioration in ecosystem services can be attributed to the project actions; rather, improvements have been observed.
- As a result of the project's implementation, the coverage of croplands has increased, contributing to greater food availability for wildlife and supporting local agricultural practices.
- The quality and functionality of woodlands-forest ecosystems in Cyprus are expected to improve due to the creation of forest openings, enhancing habitat conditions for various species, including Bonelli's eagle.
- The indicators demonstrate the positive contribution of the LIFE project actions in mitigating two major threats to Bonelli's eagle and other species within the project area: direct mortality and disturbance.

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6. APPENTIX

Table 6-1. List of the project's actions.

A. Preparatory actions, elaboration of management plans and/or of action plans
A.1 Upskilling and operational planning
A.2 Surveying of species breeding and dispersal areas
A.3 Surveying species threats at breeding and dispersal areas
A.4 Elaboration of the Replicability and Transferability Plan
B. Purchase/lease of land and/or compensation payments for use rights
C. Conservation actions
C.1 Reduction of disturbance
C.2 Increase of prey availability, through habitat management
C.3 Reduction of direct mortality, through infrastructural interventions
C.4 Production of Good Practice Guide and Spatial Planning Tool concerning energy power line and wind farm siting
C.5 Establishment of Eastern Mediterranean Bonelli's Eagle Network (EMBONet)
D. Monitoring of the impact of the project actions (obligatory)
D.1 Monitoring of project impact
D.2 Monitoring of socioeconomic project impact
D.3 Monitoring of project impact on ecosystem functions
E. Public awareness and dissemination of results (obligatory)
E.1 Planning and implementation of project dissemination
E.2 Implementation of Replicability and Transferability Plan
F. Project management (obligatory)
F.1 Project management and coordination
F.2 Planning for After-LIFE
F.3 Monitoring of project progress
F.4 Compilation of information for indicator tables

List of scientific publications derived from the project actions

Anagnostopoulou, A., Damianakis, K., Kardamaki, A., Kasinis, N., Kasinos, N., Baxevani, P., Papazoglou, K., Tsiopelas, N., Chatzistyllis, Ch. (Editors, Probonas, M., Baxevani, P.) (2022) *Good practice guide for the management of threats affecting the viability of the Bonelli's eagle Aquila fasciata (Gr & En)*. Natural History Museum of Crete-UoC (pp.160)

Kardamaki, A., Georgopoulou, E., Anagnostopoulou, A., Kontogeorgos, G., Xirouchakis, S. (2022). When necessary data are missing: Evaluating a threat collection protocol for the Bonelli's eagle *Aquila fasciata* on Crete (Greece). *Alauda*, 90(4), 63-69.

Kassinis, N. , Hadjistyllis, H. & Mayrose, A. (2022) Population status and conservation of the Bonelli's Eagle *Aquila fasciata* in Cyprus. *Alauda* 90 (4), 2022: 69-78

Kassinis, N., Panagiotis Konstantinou, P., Hadjistyllis, H. & Andreas Lysandrou A.YSANDROU (2022) ABSTRACT.– Causes of mortality for Bonelli's Eagle in Cyprus, 1996-2021: Spatial and temporal patterns. *Alauda* 90 (4), 2022: 79-83

Solanou, M., Trypidaki, E., Georgopoulou, E., Damianakis, K., Kardamaki, A., Xirouchakis, S. (2022) Selection of Nesting Habitat and Insular Niche Separation of Two Sympatric *Aquila* Species. *Diversity*, 14(12), 1136

Xirouchakis S., Damianakis K., Kardamaki A., Anagnostopoulou A. (2023) Dispersal Movements and Hot Spot Areas of Juvenile Bonelli's Eagles on the Island of Crete, Greece. *Raptors Conservation*, 2, 76-77

Oral Presentations in Congresses

Anagnostopoulou, A., Kardamaki, A., Damianakis, K., Tsiopelas, N., Dimalexis, A., Sidiropoulos, L., Tsiakiris, R., Xirouchakis, S. (2022) Impact assessment study of wind energy infrastructure spatial planning on large birds of prey of Greece: the case of the Bonelli's Eagle (*Aquila fasciata*) on the Aegean archipelago, western Peloponnese and Crete -Oral presentation-. *15th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions, 12-15 October 2022, Mytilini, Greece.*

Anagnostopoulou, A., Kardamaki, A., Damianakis, K., Tsiopelas, N., Dimalexis, A., Sidiropoulos, L., Tsiakiris, R., Xirouchakis, S. (2021) Impact assessment study of wind energy infrastructure spatial planning on large birds of prey of Greece- Sensitivity mapping methodological approach" -Oral presentation-. *10th HELECOS Conference, On line, October 14-17 2021, Ioannina, Greece.*

Kardamaki, A., Tsiopelas, N., Hadjistyllis, H., Damianakis, K., Sidiropoulos, L., Kassinis, N., Navarrete, E., Anagnostopoulou, A., Dimalexis, A., Xirouchakis, S. (2022) Population status of the Bonelli's eagle (*Aquila fasciata*) in Greece & Cyprus -Oral presentation-. *15th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions, 12-15 October 2022, Mytilini, Greece.*

Tsiopelas, N., Evangelidis, A., Kardamaki, A., Damianakis, K., Anagnostopoulou, A., Sidiropoulos, L., Navarrete, E., Dimalexis, A., Mayrose, A., Xirouchakis, S. (2022) Dispersal movements of juvenile Bonelli's eagles (*Aquila fasciata*) from Greece. Preliminary results as revealed from satellite telemetry (poster presentation). *15th International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions. Mytilini, 12-15 October 2022.*

Poster presented in Congresses

Anagnostopoulou, A., Georgopoulou, E., Kontogeorgos, G., Kardamaki, A., Damianakis, K., Xirouchakis, S. (2021) Using species distribution modelling to reveal potential nesting sites of Bonelli's eagle on the island of Crete -Poster presentation-. *Symposium Aigle de Bonelli, Montpellier, 23-24 Sept 2021, France.*

Table 6-2. MAES types coverage (ha and % of the total area) in each project site, including the Marine, Urban and Rivers/ lakes types.

Natura 2000 site	Code	Area	MAES type 2								SUM
			Cropland	Grassland	Heathland/ shrub	Marine	Rivers/ Lakes	Sparsely Vegetated Land	Urban	Woodland/ Forest	
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni	GR4220028	Ha	1771.69	7504.20	4431.54			229.61	35.27	1045.13	15017.44
		%	11.80	49.97	29.51	0.00	0.00	1.53	0.23	6.96	100.00
Asterousia Ori (Kofinas)	GR4330013	Ha	3525.42	13535.63	7708.20			3521.90	5.15	169.64	28465.95
		%	12.38	47.55	27.08	0.00	0.00	12.37	0.02	0.60	100.00
Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni	GR4210003	Ha	349.15	2079.74	2203.95			932.36		517.33	6082.53
		%	5.74	34.19	36.23	0.00	0.00	15.33	0.00	8.51	100.00
Dionysades Nisoi	GR4320011	Ha		355.51	123.18			29.42			508.11
		%	0.00	69.97	24.24	0.00	0.00	5.79	0.00	0.00	100.00
Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi - Koustogerako	GR4340014	Ha	115.78	1425.52	1274.54			1647.83		9524.02	13987.70
		%	0.83	10.19	9.11	0.00	0.00	11.78	0.00	68.09	100.00
Meterizia Agios Dikaios - Tsounara - Vitsilia Lefkon Oreon	GR4340016	Ha	1200.65	1331.30	3790.72		32.45	231.98		293.15	6880.25
		Ha	17.45	19.35	55.10	0.00	0.47	3.37	0.00	4.26	100.00
Naxos: Ori Anathematistra, Koronos, Mavrovouni, Zas, Viglatouri	GR4220026	%	1717.93	1096.74	8543.57			323.77		230.95	11912.95
		Ha	14.42	9.21	71.72	0.00	0.00	2.72	0.00	1.94	100.00
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides	GR3000012	%	275.08	194.18	1413.65						1882.91
		Ha	14.61	10.31	75.08	0.00	0.00	0.00	0.00	0.00	100.00
Nisos Gyaros kai Thalassia Zoni	GR 4220033	%		1546.87	207.49			44.28			1798.65
		Ha	0.00	86.00	11.54	0.00	0.00	2.46	0.00	0.00	100.00

Nisos Dia	GR4310003	%		637.26	347.32			143.17			1127.75
		Ha	0.00	56.51	30.80	0.00	0.00	12.70	0.00	0.00	100.00
Nisos Irakleia, Nisoi Makares, Mikros kai Megalos Avelas, Nisida Venetiko Irakleias	GR4220021	%	178.63	74.45	1554.34			68.74	31.58		1907.74
		Ha	9.36	3.90	81.48	0.00	0.00	3.60	1.66	0.00	100.00
Nisos Tilos Kai Nisides: Antitilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi	GR4210024	Ha	694.97	3436.46	140.59			1895.77	36.03		6203.82
		%	11.20	55.39	2.27	0.00	0.00	30.56	0.58	0.00	100.00
Notia Mani	GR2540008	Ha	9657.13	5539.77	8222.92			6475.64	157.22	1387.30	31439.98
		%	30.72	17.62	26.15	0.00	0.00	20.60	0.50	4.41	100.00
Ori Anatolikis Lakonias	GR2540007	Ha	5195.88	2632.18	26326.92			1039.50	102.75	2186.67	37483.90
		%	13.86	7.02	70.24	0.00	0.00	2.77	0.27	5.83	100.00
Oros Taygetos - Lagkada Trypis	GR2550009	Ha	2794.81	5879.24	9000.65			6046.96		25079.31	48800.99
		%	5.73	12.05	18.44	0.00	0.00	12.39	0.00	51.39	100.00
Periochi Legrenon - Nisida Patroklou	GR3000014	Ha	350.28	84.43	1362.14	35972.08		220.47	42.78	41.30	38073.48
		%	0.92	0.22	3.58	94.48	0.00	0.58	0.11	0.11	100.00
Prassano Faragi	GR4330008	Ha	250.81	64.27	629.83			86.49	2.93	87.98	1122.32
		%	22.35	5.73	56.12	0.00	0.00	7.71	0.26	7.84	100.00
Farangi Kallikratis - Argouliano Farngi - Opopedio Manika	GR4340019	Ha	236.24	1409.17	2354.93			48.01		187.48	4235.83
		%	5.58	33.27	55.60	0.00	0.00	1.13	0.00	4.43	100.00

Table 6-3. Main MAES types coverage (ha and % of the total area) , in each project site.

Natura 2000 site	Code	Area	MAES type 2					SUM
			Cropland	Grassland	Heathland/ shrub	Sparsely Vegetated Land	Woodland/ Forest	
Andros: Kentriko kai Notio Tmima, Gyro Nisides kai Paraktia Thalassia Zoni	GR4220028	Ha	1771.69	7504.20	4431.54	229.61	1045.13	15017.44
		%	11.80	49.97	29.51	1.53	6.96	99.77
Asterousia Ori (Kofinas)	GR4330013	Ha	3525.42	13535.63	7708.20	3521.90	169.64	28465.95
		%	12.38	47.55	27.08	12.37	0.60	100.00
Voreia Karpathos kai Saria kai Paraktia Thalassia Zoni	GR4210003	Ha	349.15	2079.74	2203.95	932.36	517.33	6082.53
		%	5.74	34.19	36.23	15.33	8.51	100.00
Dionysades Nisoi	GR4320011	Ha		355.51	123.18	29.42		508.11
		%	0.00	69.97	24.24	5.79	0.00	100.00
Ethnikos Drymos Samarias - Farangi Trypitis - Psilafi - Koustogerako	GR4340014	Ha	115.78	1425.52	1274.54	1647.83	9524.02	13987.70
		%	0.83	10.19	9.11	11.78	68.09	100.00
Meterizia Agios Dikaioi - Tsounara - Vitsilia Lefkon Oreon	GR4340016	Ha	1200.65	1331.30	3790.72	231.98	293.15	6880.25
		Ha	17.45	19.35	55.10	3.37	4.26	100.00
Naxos: Ori Anathematistra, Koronos, Mavrovouni, Zas, Viglatouri	GR4220026	%	1717.93	1096.74	8543.57	323.77	230.95	11912.95
		Ha	14.42	9.21	71.72	2.72	1.94	100.00
Nisos Antikythira kai Nisides Prasonisi, Lagouvardos, Plakoulithra kai Nisides	GR3000012	%	275.08	194.18	1413.65			1882.91
		Ha	14.61	10.31	75.08	0.00	0.00	100.00
Nisos Gyaros kai Thalassia Zoni	GR 4220033	%		1546.87	207.49	44.28		1798.65
		Ha	0.00	86.00	11.54	2.46	0.00	100.00
Nisos Dia	GR4310003	%		637.26	347.32	143.17		1127.75

		Ha	0.00	56.51	30.80	12.70	0.00	100.00
Nisos Irakleia, Nisoi Makares, Mikros kai Megalos Avelas, Nisida Venetiko Irakleias	GR4220021	%	178.63	74.45	1554.34	68.74		1907.74
		Ha	9.36	3.90	81.48	3.60	0.00	100.00
Nisos Tilos Kai Nisides: Antitilos; Pelekousa, Gaidouronisi, Giakoumis, Agios Andreas, Prasouda , Nisi Kai Thalassia Periochi	GR4210024	Ha	694.97	3436.46	140.59	1895.77		6203.82
		%	11.20	55.39	2.27	30.56	0.00	100.00
Notia Mani	GR2540008	Ha	9657.13	5539.77	8222.92	6475.64	1387.30	31439.98
		%	30.72	17.62	26.15	20.60	4.41	100.00
Ori Anatolikos Lakonias	GR2540007	Ha	5195.88	2632.18	26326.92	1039.50	2186.67	37483.90
		%	13.86	7.02	70.24	2.77	5.83	100.00
Oros Taygetos - Lagkada Trypis	GR2550009	Ha	2794.81	5879.24	9000.65	6046.96	25079.31	48800.99
		%	5.73	12.05	18.44	12.39	51.39	100.00
Periochi Legrenon - Nisida Patroklou	GR3000014	Ha	350.28	84.43	1362.14	220.47	41.30	38073.48
		%	0.92	0.22	3.58	0.58	0.11	100.00
Prassano Faragi	GR4330008	Ha	250.81	64.27	629.83	86.49	87.98	1122.32
		%	22.35	5.73	56.12	7.71	7.84	100.00
Farangi Kallikratis - Argouliano Farangi - Opopedio Manika	GR4340019	Ha	236.24	1409.17	2354.93	48.01	187.48	4235.83
		%	5.58	33.27	55.60	1.13	4.43	100.00

Table 6-4. List of identified ES, their indicators, unit measures, relevant actions and sites of interventions

Section	Division	Group	Class	Code	Descriptor of ES, EC or pressure	Indicator	Unit of measure	Method	Action	Site of intervention
Provisioning (Biotic/Biophysical)	Biomass	Cultivated terrestrial plants for nutrition, materials or energy	Cultivated terrestrial plants (including fungi, algae) grown for nutritional purposes	1.1.1.1	Field cultivations of traditional varieties	Field cultivations of traditional plants (ha)	Ha	Direct	C2.1	GR4330013, GR4320011, GR4340019, GR3000012, GR4330008, GR4310003, GR2540007, GR3000014, CY2000006, CY2000015, CY6000008
Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Increase of forage species populations (chukar partridges, rabbits and hares, rodents, lizards)	Field cultivations of traditional plants (ha)	Ha	Indirect	C2.1	GR4330013, GR4320011, GR4340019, GR3000012, GR4330008, GR4310003, GR2540007, GR3000014, CY2000006, CY2000015, CY6000008

Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Increase of forage species populations (chukar partridges, rabbits and hares, rodents, lizards)	Area of forest openings (ha)	Ha	Direct	C2.3	CY2000006
Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Maintenance of favorable conservation status of the Bonelli's eagle	Bonelli's eagle productivity	N. of egg laying pairs / N. territories (including unknown & abandoned)	Direct	C1.1, C1.2, C1.3, C2.1, C2.2, C2.3, C3.1, C3.2, C3.3	ALL
Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Maintaining wildlife fauna	Anti-poison Dog Units (APDUs) operation	No of patrols	Direct	C3.3	Applicable only for GR4310003

Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Maintaining wildlife fauna	Number of insulated pylons/ marked power lines	No of insulated pylons and marked power lines	Indirect	C3.1	GR4330013, GR4330008, GR4220028, GR2540008, GR4210024, CY5000004, CY6000008
Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Maintaining wildlife fauna	Number of constructed/ restored watering structures	No of constructed/ restored watering structures	Indirect	C2.2	GR3000012, GR4210024, GR4320011, GR4330008, GR4310003, GR4340019, GR3000014
Regulation & Maintenance (Biotic/Biophysical)	Regulation of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Maintaining or regulating nursery populations and habitats or breeding grounds (Includes gene pool protection)	2.3.2.3	Maintaining wildlife fauna	Number of wildlife escape ladders	No of wildlife escape ladders	Indirect	C3.2.	GR2540007, GR2550009, GR4220028, GR4220026, GR4210024, GR4310003, GR4330008, GR4340019, CY2000006, CY2000015

Cultural (Biotic/Biophysical)	Physical and experiential interactions with natural environment	Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting, i.e. broadly recreational activities	Elements of living systems that enable activities promoting health, recuperation or enjoyment through passive or observational interactions	3.1.1.2	Birds of prey as attraction to birdwatchers	Number of birdwatchers	Number of birdwatchers	Indirect	C1.1, C1.2, C1.3, C2.1, C2.2, C2.3, C3.1, C3.2, C3.3	ALL
Cultural (Biotic/Biophysical)	Intellectual and representative interactions with natural environment	Direct, in-situ and outdoor interactions with living systems that depend on presence in the environmental setting	Elements of living systems that enable scientific investigation or the creation of traditional ecological knowledge	3.2.1.1	Scientific research	Number of scientific publications	No of scientific publications	Direct	A2.1, A2.1, A3.1, A3.2, A3.3, C.4	ALL

Cultural (Biotic/Biophysical)	Other characteristics of living systems that have cultural significance	Other	Other		Public awareness about endangered species conservation	Number of people reached	Number of people reached through Mass Media, Social Media, Newsletters' release, website operation, Web tool for climbers, public presentations, exhibitions, festivals	Direct	E1.1, E1.2	ALL
Cultural (Biotic/Biophysical)	Other characteristics of living systems that have cultural significance	Other	Other		Public awareness about endangered species conservation	Number of pupils reached	Number of pupils participated in environmental education programmes and material	Direct	E1.3	ALL
Cultural (Biotic/Biophysical)	Other characteristics of living systems that have cultural significance	Other	Other		Public awareness about endangered species conservation	Number of stakeholders and volunteers involved in conservation actions	Number of stakeholders and volunteers involved in conservation actions	Direct	E1.3	ALL