ECOlogical observing System in the Adriatic Sea: oceanographic observations for biodiversity
Priority Axis 3: Environment and cultural heritage
Specific Objective 3.2: Contribute to protect and restore biodiversity

D4.3.3 Report on the development of a local action plan and upscaling at the basin scale

WP4 – Establishing the Ecological Observing System in the Adriatic Sea (ECOAdS)

A4.3 Integration of ecological observing system with Natura 2000 ecological processes

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Contents

INTRODUCTION

In the framework of work package 4 and the development of case studies, the current activity aims to develop a local action plan and upscaling at basin scale. The report was developed thanks to previous deliverables from different project activities, in particular:

- D3.2.1. Report on the ecological monitoring, conservation strategies and management questions of Natura 2000 marine sites

- D3.3.1 Report on the key oceanographic processes and performance indicators for Natura 2000 marine sites

- D 4.1.1 Report on the characterization of the selected Natura 2000 sites

- D 4.3.1 Review of the knowledge of the ecological processes in the selected Natura 2000 sites

The information of the above-mentioned deliverables was integrated with documents and information for PO DELTA VENETO REGIONAL PARK, which covers the complex territory of the Po River delta, the only delta present in Italy. This site has a high level of complexity due to the dimension of the delta in term of total surface and to the pressures on biodiversity, which have not only local origin but come also from the river basin. As a matter of fact, activity 4.3.1 "Review of the knowledge of the ecological processes in the selected Natura 2000 sites" evidenced, as key ecological processes among others, eutrophication and oligotrophication which depends on the nutrient load that in turn is linked to the whole river basin. In the case of the Po River delta the basin covers almost one quarter of the national territory, it hosts 27% of the Italian population, 37% of the industry, 55% of animal husbandry and 35% of agricultural production. Therefore the local Action Plan must take in consideration, as much as possible,

both the ecological processes and the connection with the other ecosystems, from the upstream freshwater to the surrounding areas and the open sea.

For the purpose of the present report Action Plan (AP) and Management Plan (MP) are considered synonyms.

ACTION PLAN

The PO DELTA VENETO REGIONAL PARK case study covers two Natura 2000 sites: IT3270017 Delta del Po: tratto terminale e delta veneto; IT3270023 Delta del Po.

As a matter of fact the two sites have a large level of overlapping and last but not least Special Protection Area (SPA) are effective part of N2K network according to the Art.3 of Habitats Directive (HD) "*1. A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.*
The Natura 2000 network shall include the special protection areas classified by the Member States pursuant to Directive 79/409/EEC."

For the SPA "IT3270023 Delta del Po" a management plan (MP) was drafted in year 2011, but never formally approved. The experiences gained from drafting the cited MP are used and proposed in the following chapter. The MP was originally drafted for the SPA and not for the SAC "IT3270017 Delta del Po: tratto terminale e delta Veneto" even if the sites share almost all the same habitat and species.

Action Plan or conservation measures?

The deliverable of the project "D3.2.1. Report on the ecological monitoring, conservation strategies and management objectives of Natura 2000 marine sites" analysed the strategies of the different Directives at the basin level "*EU member states assign responsible administrators to achieve and evaluate the conservation purposes of the designated N2K network areas.*
While there is no Adriatic agreement on protection of biodiversity at the basin level, there are multiple initiatives, such as the EU Strategy for the Adriatic-Ionian (EUSAIR, adopted by the Commission on June 2014 and endorsed by the EU Council on October 2014) as a platform for cross-border/international collaboration between Albania, Croatia, Greece, Italy, Montenegro, and Slovenia. "
Furthermore considering the Natura 2000 sites the (HD) Art. 6 states the need of conservation measures and Management Plans:

"*1. For special areas of conservation, Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.*"

The conceptual model developed in the framework of deliverable 3.3.1, reported in Figure **1**, also highlights the double tool conservation measures/management plan.

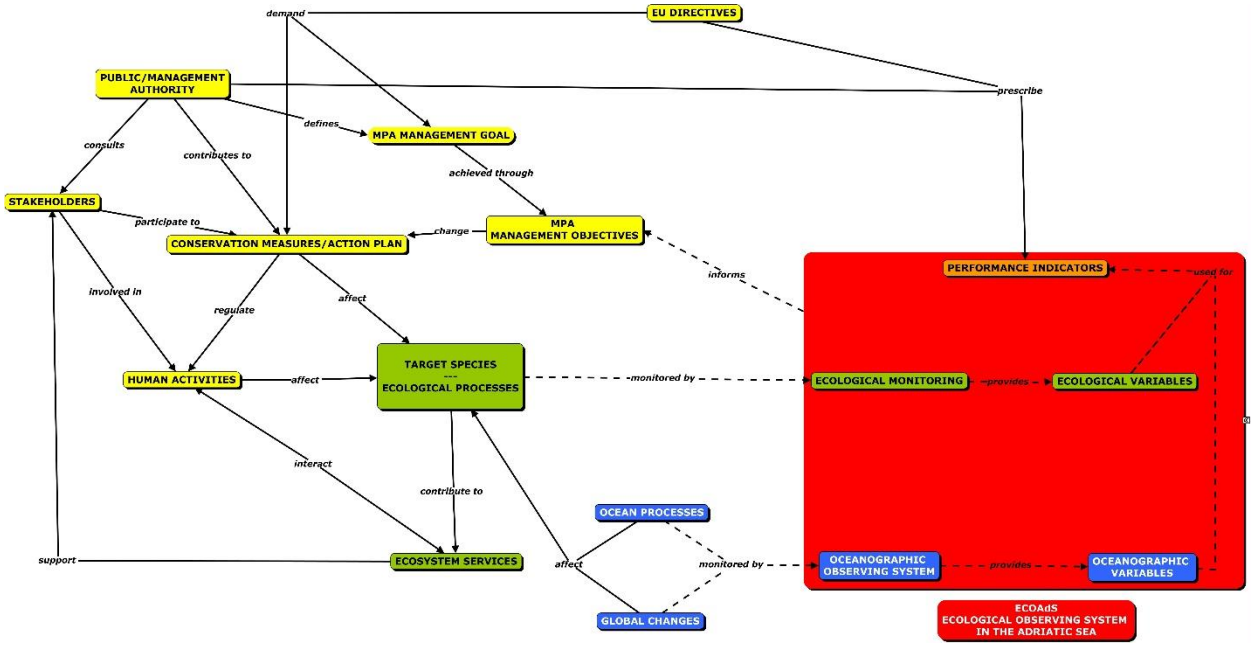

Figure 1: extracted from "D3.3.1 Report on the key oceanographic processes and performance indicators for Natura 2000 marine sites" Generic conceptual model linking ECOAdS with MPA management and EU Directives

A Commission notice[1] document clarified that the conservation measures are mandatory for habitats and species while the responsible administrators can choose if drafting or not a MP for the sites. The HD leaves open the key question of the choice of a management plan (MP), therefore when should a MP be adopted? The former Italian Ministry of the Environment (now Ministry of Ecological Transition) provided guidelines[2] for logical-decision-making process for choosing the MP. The guidelines suggest a logical process, but they are not statutory for all the case studies and the decision process might also consider local and practical criteria.

[1] Commission notice C(2018) 7621 final, Brussels, 21.11.2018. "Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

[2] Linee guida per la gestione dei siti Natura 2000. Decreto del Ministro dell'Ambiente e della Tutela del Territorio del 3 settembre 2002. (G.U. della Repubblica Italiana n. 224 del 24 settembre 2002)

As a general rule a Management Plan should be drafted and adopted whenever the conservation measures are considered not sufficient to reach, in a reasonable timespan, the conservation objectives. The timespan is a local criterion with a huge range of variation, for instance some habitats might recover in a single season, others need years to be fully restored.

A second point to consider is the practical advantage of a MP, such as introducing not only actions for the conservation of the target habitats and species, but also tools for monitoring and revising the implementation of the management plan and its objectives. Furthermore, MP must take in consideration positive or negative interactions with economic activities of the area of intervention.

In the following chapter it is proposed a structure of the Management Plan which follows the citated guidelines of the Italian Ministry of the Environment. The structure presented below does not replace the guidelines, but is a proposal for upscaling at the basin level taking into account also the experiences gained from the Po Delta Veneto Regional Park in the management of the case study sites.

ACTION PLAN STRUCTURE

The MP must be specifically designed for the sites, as specified by Art. 6 of Habitat Directive *"….appropriate management plans specifically designed for the sites or integrated into other development plans,.."* .

Therefore it is proposed a structure of MP that must be developed considering the local site characteristics, the ecological requirements of the target habitats and species, as well as the territorial and socio-economic context. Only from a deep knowledge framework and analysis arise the management strategies for the site.

The structure is resumed considering the five main sections: Knowledge framework of the site characteristics the Natura 2000 site characteristics; Assessment of the ecological requirements of habitat and species; Conservation objectives; Management strategies; Revision and monitoring of the Action Plan. Each session is mandatory and cannot be skipped since it is somehow preparatory to the next one, but it is expected to vary and to be adapted by scientific knowledge site by site.

Knowledge framework of the site characteristics

This is the first part of the plan in order to build a territorial framework of the site using as much as possible updated information based on scientific publications as well as grey literature such as technical report.

The knowledge framework can be resumed in:

- Physical description of the site

- Biological description of the site

- Socio-economic description of the site

- Description of the architectural and cultural values of the site

- Landscape description

The physical description will include description of the borders of the site and its dimension, regional and local climate, geology and geomorphology, paedogenetic substrate and soil, hydrology.

The biological description regards the habitat and species for which the site has been included inside the Natura 2000 network. This is a critical part, from which can arise a lack of knowledge for the habitat and/or species, in this case can be appropriate to consider a specific monitoring action in order to fill the gap. As a matter of fact an updated knowledge on the habitat and species is the basis for an effective Management Plan. The presence of knowledge gap should be taken in account also in the phase of revision and monitoring of the plan, the gap might shorten the period for its revision. The biological description should include also an habitat map the site, and the distribution of the species present including areas of particular interest such as reproduction, foraging, nursery etc..

The socio-economic description identifies existing or potential factors which might influence positively or negatively the conservation of the habitats and species of the site. The session should include information on the various Authorities having competence on the site, on existing regulation, on the demography of the human population and on the economic activities.

The identification of architectural, archaeological and cultural values areas in the site is necessary in order to identify possible interaction with the conservation of habitat and species since when present usually these kinds of areas have some level of constrain and protection. These levels of constrain and protection must be considered for the management objectives.

The landscape characteristics to consider depends on local legislation the key point is that they might be subjected to specific legislation and constrain with effects on the conservation issue.

Assessment of the ecological requirements of habitat and species

In this chapter the ecological requirements of habitat and species must be analysed and evaluated in comparison with the influence of the biological and socio-economic factors identified in the knowledge framework of the site. In relation to the total number of habitat and species of the site this chapter might be quite long since the ecological requirements involve a variety of conditions as specified by a Commission note on Establishing Conservation Measures (European Commission, Doc. Hab.13-04/05, September 2013):

"*The ecological requirements involve all the ecological needs, including both abiotic and biotic factors, which are deemed necessary to ensure the conservation of the habitat types and species, including their relations with the physical environment (air, water, soil, vegetation, etc.).*"

Indicators should be used in order to assess whether the species and habitats for which the site has been identified are in a favourable state of conservation and which make it possible to evaluate their evolution;

The influence on conservation of habitat and species of biological and/or socio-economical factors identified in the knowledge framework must be analysed. In general term whenever the influence is negative for the conservation a threat is identified.

Conservation objectives

The definition of general and specific objectives arises from the comparison between threats and impact factors arising at a site and, assessment of the ecological needs of habitats and species of the ecological needs of habitats and species of Community interest.

It might be necessary to consider not all the factors with negative influence on conservation but to prioritise these elements in order to conceive conservation objectives. They derive from the identification of critical and degradation phenomena to be eliminated or mitigated, or of dynamics favourable to the conservation of the site to be safeguarded.

During the elaboration of the conservation objectives must be considered also possible conflicting objectives. Each species has some influence on other species and even on habitat the conflicting objectives might appear among the needs of target species or between one animal species and the evolution of plant species. In such a case intervention priorities must be defined on the basis of strategic assessments that respect the site's purposes.

Management strategies

The management strategies define concrete actions to implement in order to reach the conservation objectives, it can be resumed into a set of different actions evaluating also the costs and the time needed for the implementation.

The actions to implement can be categorized by the methods of implementation as follows:

- Active interventions
- Regulations
- Incentives
- Monitoring and/or research programmes
- Educational programmes

Active interventions

Active interventions are generally aimed at removing/reducing a disturbing factor or directing a natural dynamic. Such interventions can often have a structural character and the result of the action usually is visible and processable. Quite often the active interventions are necessary for the restoration of the ecosystem or in order to orient the dynamic of natural processes. Anyhow local condition might need a specific frequency of intervention.

Regulations

Regulations are any plan or law that must be applied locally or at a wider scale necessary for the conservation objectives. The regulations must be binding in order to grant the Authority the power to enforce such rules.

Incentives

Incentives, on the contrary of regulations, are not mandatory but they can be used on voluntary basis. Incentives usually are economic with the objective to direct activities, economic, touristic, etc.., in the site useful to reach the conservation target.

Monitoring and/or research programmes

The monitoring and/or research programmes aim to measure the state of conservation of habitats and species, as well as to evaluate the results of the actions of the Management Plan. These programmes also aim to fill in any knowledge gap, the accurate knowledge is necessary to define the management more precisely and to calibrate the strategy identified.

Educational programmes

Educational programmes have the purpose to increase knowledge and to disseminate models of sustainable behaviour as well as to raise awareness among local population. The sustainable behaviour aims to protect the values of the site.

Actions scheme

In order to make the Management Plan as much operational as possible the actions have a common template which has all the elements useful for understanding, implementing and verifying the intervention. The common template is summarized in a simple table suitable for each action category.

Title of the action	
Action type	☐ Active interventions ☐ Regulations ☐ Incentives ☐ Monitoring and/or research programmes ☐ Educational programmes
Code and name of the Natura 2000 site	Code and name of the Natura 2000 site involved in the actions
Territorial Application	Localized to a specific area; involving a whole Natura 2000 site, etc...
Habitat/ Species	Code and scientific name of the target habitat/species involved
Reference map	Specify the database, if any, with spatial georeferenced information
Description of current status	Description of current status of the habitat/species
Monitoring indicators	For instance increase of the area covered by the habitat, increase of the population range, number of people involved into the educational programme, etc...
Action objective	Habitat of the species improvement, Restoration, Restocking, Awareness raising, etc...
Action description	How to
Monitoring the implementation/ progress of the action	How to
Description of expected results	Description of expected results in quantitative and measurable terms
Economic interests involved	Description of economic interests involved
Beneficiaries	If applicable description of beneficiaries, for instance in case of action involving specific economic activities, private areas, areas exploited for economic activities etc..
Authority responsible for implementation	The Authority in charge for the action implementation
Authority responsible for monitoring	The Authority in charge for the action monitoring, not necessarily the same responsible for the implementation
Control frequency	After the 1st year, 2 years, etc…
Penalties	If applicable description of penalties
Action Priority	☐ High ☐ Medium ☐ Low Action priority considering the whole set of actions of the management plan

<table>
<tr><td>Corrective action</td><td>Description of corrective action if the expected results are not achieved during the control</td></tr>
<tr><td>Timetable and costs</td><td>Cost of the actions and timetable for its implementation, add as many as necessary.
<table>
<tr><td>Year</td><td colspan="2">1°</td><td colspan="2">2°</td><td colspan="2">3°</td><td colspan="2">4°</td><td colspan="2">…°</td></tr>
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<tr><td>Policy references and funding</td><td>Description of funding sources identified to implement the action</td></tr>
<tr><td>References and technical annexes</td><td>If applicable description of technical detailed annexes necessary for the implementation of the action</td></tr>
</table>

Revision and monitoring of the Action Plan

The last chapter of the plan is the evaluation and review of the plan itself, the plan general objective is the conservation of natural habitat and species but during the plan implementation the conservation status might change both as result of the actions or for complementary and unforeseen Impact from other sources.

The revision objective is to evaluate the plan implementation and to adapt it to the new situation. The revision must be periodic with a frequency that fits to the time foreseen to achieve the expected results of the actions. Therefore to determine the revision frequency the various timetables of the actions scheme can be compared.

Common indicators for the plan revision are action implementation status (completed, on course, not implemented)), costs respect, achievement of the expected results. The result of the revision is an updated Action Plan with updated conservation objectives and an update set of actions. In consideration of updated scientific information and changes in legislation it might be necessary also to update the chapters on knowledge framework and ecological requirements.

UPSCALING AT THE BASIN SCALE

The N2K case studies, represented in Figure 3, have different dimensions, not all have common species or habitats and even they do not lay in the same biogeographical region represented in Figure 4.

This wide range of conditions could hinder the upscaling of the AP at the basin scale or its application to other sites. But the MP presented in the previous chapters has the aim to implement both Habitats and Bird Directives, therefore it can be applied to any of the case studies. Indeed, the structure of the MP can fit to any N2K sites and even to different species, since it is based on ecological requirements for the target species and habitats. Each local MP must be drafted according to the specific threats occurring in each specific site and last but not least the Commission notice[3] clarifies that the ecological requirements "*…are based on scientific knowledge and can only be defined on a case-by-case basis, according to the natural habitat types in Annex I, the species in Annex II, and the sites which host them. Such knowledge is essential to make it possible to draw up the conservation measures, on a case-by-case basis.*"

As highlighted in D3.5.1 "Long-term strategy and roadmap of the Ecological Observing System in the Adriatic Sea", the proper management plan with the enforcement of the management strategies is the foreseen future for the N2K sites (Figure 2).

[3] Commission notice C(2018) 7621 final, Brussels, 21.11.2018. "Managing Natura 2000 sites The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.

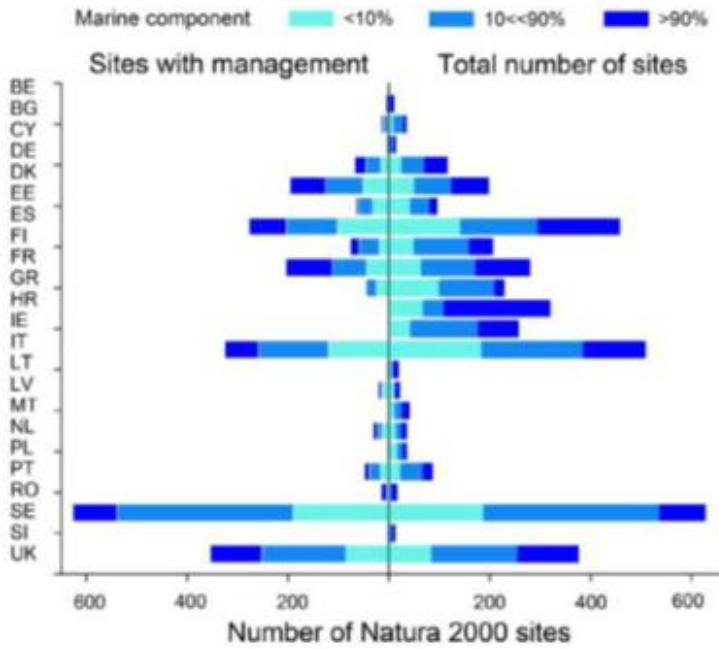

Figure 2. Number of sites of the N2K network with a marine component in each country (after Fraschetti et al., 2018). The number of sites for which a management plan exists and/or official management and conservation measures are applied is also showed. From Deliverable D3.5.1.

Furthermore, the proposed MP introduces not only standard actions for the conservation of the target habitats and species, but also a tool for monitoring and revisioning the implementation of the MP and its objectives.

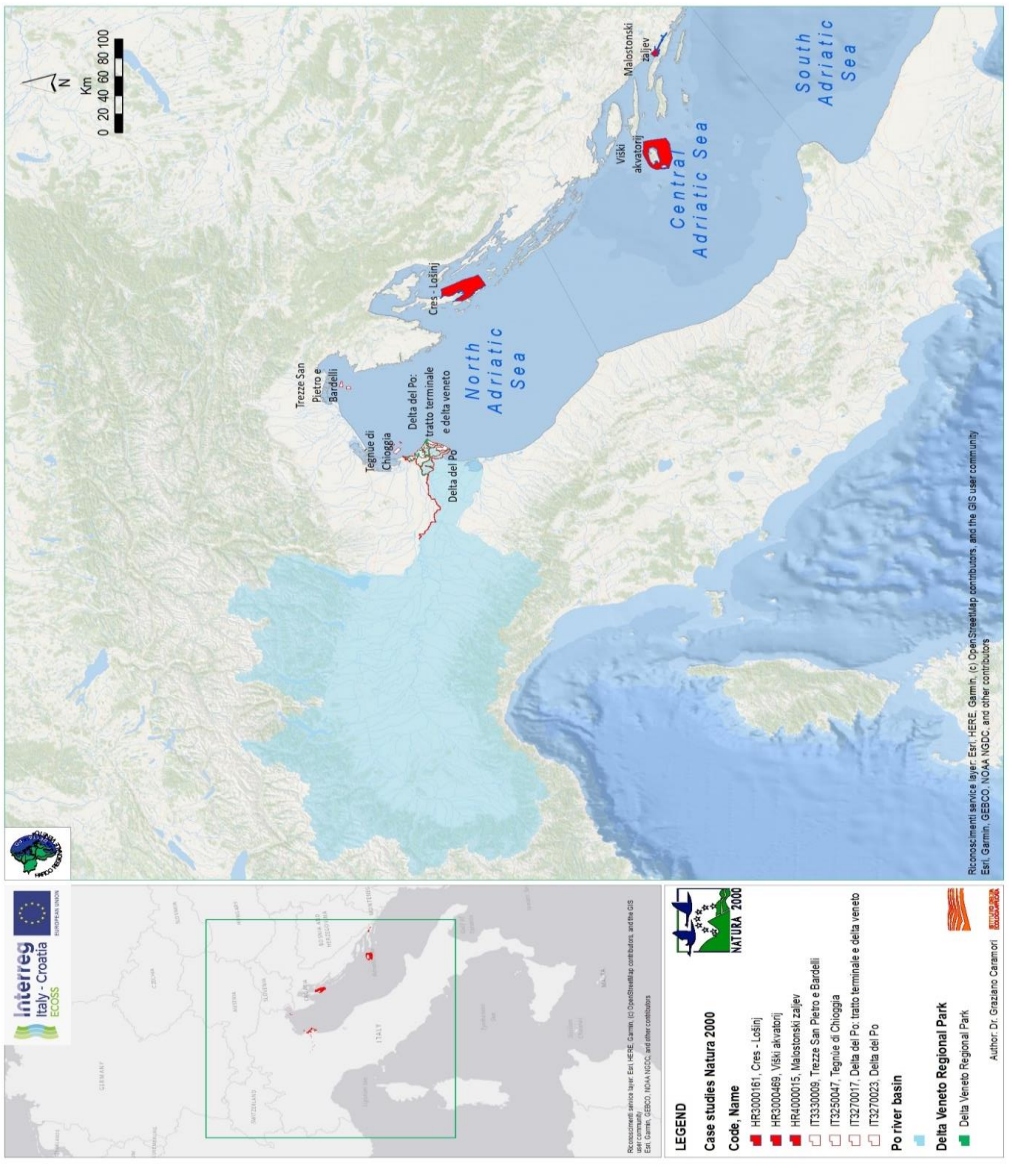

Figure 3: ECOSS Natura 2000 case studies.

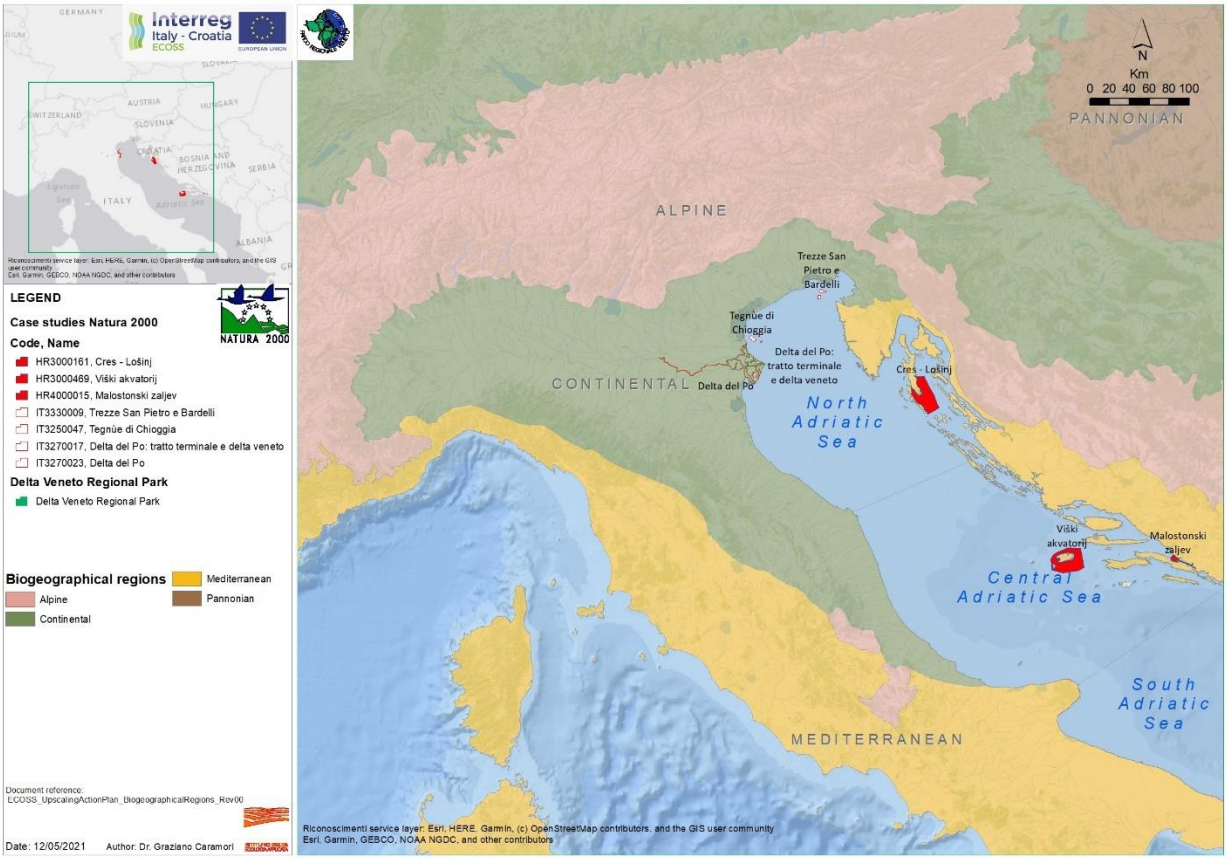

Figure 4: Biogeographical regions and ECOSS case studies.

Case studies upscaling

The deliverable D4.3.1 “Review of the knowledge of the ecological processes in the selected Natura 2000 sites” analysed ecological process and the management objectives of the N2K case studies, which are summarized also in relation to the main species and habitats from Standard Data Form (SDF) in the following table.

Table extracted from D4.3.1 Review of the knowledge of the ecological processes in the selected Natura 2000 sites.

N2K site	Main marine/transitional waters species/habitats from SDF	Standard data form (SDF)	M.P. (Y/N)	Key ecological processes (D4.1.2)	Main management questions (D.4.1.2)	Performance indicators (D4.1.2)
HR3000161 Cres – Lošinj	*Tursiops truncatus*	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HR3000161	N	Not known	- Has the population in the this Natura 2000 site a healthy demographic structure - Are the natural habitats inside this Natura 2000 site efficiently protected - Is the population of T. truncatus increasing outside this Natura 2000 site - Is there sufficient incoming/outgoing genetic flow	- A healthy demographic structure of the T. truncatus population inside the protected area - The monitoring of the spreading of specimen outside the Natura 2000 sites - The monitoring of the genetic variability in the populations (monitoring of the mixing of individuals from population inside and outside the protected area)
HR3000469 Viški akvatorij	*Tursiops truncatus*	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HR3000469	N	Not known		
HR4000015 Malostonski zaljev	1160-Large shallow inlets and bays,1170-Reefs	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=HR4000015	N	Influences from the mainland and open sea; Freswater inputs; Moderate eutrophication, Filtration by organisms	- Is the enforcement of protection measures efficient enough - Are human activities well-managed and ecologically sustainable in the protected areas	- The community structure and composition in large shallow inlets and bay - The presence of a healthy populations of benthic algal floral on the reef

N2K site	Main marine/transitional waters species/habitats from SDF	Standard data form (SDF)	M.P. (Y/N)	Key ecological processes (D4.1.2)	Main management questions (D.4.1.2)	Performance indicators (D4.1.2)
IT3330009 Trezze San Pietro e Bardelli	1110-Sandbanks which are slightly covered by sea water all the time, 1170-Reefs; *Caretta caretta*, *Tursiops truncatus*, *Alosa fallax* (Birds: *Larus melanocephalus*, *Phalacrocorax aristotelis desmarestii*, *Puffinus yelkouan*)	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IT3330009	N	Reproduction and settlement of several benthic, pelagic and demersal species	- Whether the protected area is big enough to achieve the stated goal - If the MPAs constitute a connected network of sites, where long-term resistance and resilience of the communities can be ensured by the dispersal of species - If the enforcement of the protection measures is efficient enough to prevent habitat degradation and biodiversity loss	The community structure and composition, and the presence of a healthy population of two species (Lithophaga lithophaga and Pinna nobilis) from Annex IV, present in both sites, and one species (Phymatolithon calcareum) from Annex V of Habitat (Directive (2009/147/EC)
IT3250047 Tegnùe di Chioggia	1170-Reefs; *Caretta caretta*, *Tursiops truncatus*	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IT3250047	N	Reproduction and settlement of several benthic, pelagic and demersal species		
IT3270017 Delta del Po: tratto terminale e delta veneto	1110-Sandbanks which are slightly covered by sea water all the time, 1130-Estuaries, 1140-Mudflats and sandflats not covered by seawater at low tide, 1150-Coastal lagoons; *Acipenser nacarii, Alosa fallax, Knipowitschia panizzae, Petromyzon marinus, Pomatoschistus canestrinii, Salicornia veneta* (Birds)	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IT3270017	N	Water, sediment and nutrients inputs from the river, water circulation due to the river and from sea tide	- Are Natura2000 sites effectively protecting target abitats and species listed in the Standard Form - Are human activities well-managed and ecologically sustainable in the protected areas	- The community structure with the assessment of the diversity, status and coverage of the different habitats - The Ecological status of water bodies - The assessment of the amount of sustainable food production

N2K site	Main marine/transitional waters species/habitats from SDF	Standard data form (SDF)	M.P. (Y/N)	Key ecological processes (D4.1.2)	Main management questions (D.4.1.2)	Performance indicators (D4.1.2)
IT3270023 Delta del Po	1110-Sandbanks which are slightly covered by sea water all the time, 1130-Estuaries, 1140-Mudflats and sandflats not covered by seawater at low tide, 1150-Coastal lagoons; *Acipenser nacarii, Alosa fallax, Knipowitschia panizzae, Petromyzon marinus, Pomatoschistus canestrinii*, *Salicornia veneta* (Birds)	http://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=IT3270023	N	Water, sediment and nutrients inputs from the river, water circulation due to the river and from sea tide		/

Using the data review of the table extracted from D4.3.1, it is possible to suppose action categories to fill in the management strategies of a future AP. We highlight that it is necessary the full analysis of the AP in order to draft management strategies, therefore the following upscaling has the value of hypothesis and cannot be applied without a full analysis of each site.

In the following chapter we report possible application of the Action categories considering the main management objectives arose from the deliverable D4.3.1 “Review of the knowledge of the ecological processes in the selected Natura 2000 sites”. Therefore, this must be considered a simple preliminary and theoretical study.

Cres-Lošinj (HR3000161) - Viški akvatorij (HR3000469)

At both N2Ksites *Tursiops truncatus* is considered the main species of interest and with the same management objectives. The performance indicators chosen are:

- A healthy demographic structure of the *T. truncatus* population inside the protected area

- The monitoring of the spreading of specimen outside the Natura 2000 sites

- The monitoring of the genetic variability in the populations (monitoring of the mixing of individuals from population inside and outside the protected area)

These performance indicators could be part of actions of different categories

Performance indicator	Possible Action category
- A healthy demographic structure of the *T. truncatus* population inside the protected area	Active interventions Monitoring and/or research programmes Educational programmes
The monitoring of the spreading of specimen outside the Natura 2000 sites	Monitoring and/or research programmes Educational programmes
The monitoring of the genetic variability in the populations	Monitoring and/or research programmes

Malostonski zaljev (HR4000015)

For this site the habitat target are 1160-Large shallow inlets and bays, 1170-Reefs. The performance indicators chosen are:

Performance indicator	Possible Action category
- The community structure and composition in large shallow inlets and bay	Monitoring and/or research programmes (Habitat map)
- The presence of a healthy populations of benthic algal floral on the reef	Monitoring and/or research programmes

Trezze San Pietro e Bardelli (IT3330009) - Tegnùe di Chioggia (IT3250047)

These two sites share the habitat and species target 1170-Reefs; *Caretta caretta*, *Tursiops truncatus,* and also share the performance indicators chosen.

The community structure and composition, and the presence of a healthy population of two species (*Lithophaga lithophaga* and *Pinna nobilis*) from Annex IV, present in both sites, and one species (*Phymatolithon calcareum*) from Annex V of Habitat (Directive (2009/147/EC)

Performance indicator	Possible Action category
The community structure and composition, and the presence of a healthy population of two species (*Lithophaga lithophaga* and Pinna nobilis) from Annex IV, present in both sites, and one species (*Phymatolithon calcareum*) from Annex V of Habitat (Directive (2009/147/EC)	Monitoring and/or research programmes (Habitat map)

LOCAL ACTION PLAN PO DELTA VENETO REGIONAL PARK

The management plan of the SPA "IT3270023 Delta del Po" foresaw a cycle of evaluation and revision in order to be adapted to the changing local conditions, both due to the results of management and to changes independent from the plan itself.

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Figure 5: Piano di gestione precedente e non approvato che copre solo il sito Natura 2000 IT3270023 Delta del Po.

The MP included specific objectives related to the conservation of species and habitats, each of them had a priority level according to the scale: High; Medium; Low. The Management Plan identified 34 actions, divided into:

14 Active interventions;

4 Regulations;

4 Incentives;

9 Monitoring and/or research programmes;

3 Educational programmes.

The type of actions is the same described in the AP structure, anyhow the number of actions per type and the total number of each action in the plan are specific to the site addressed.

The plan was originally designed with a timeframe of 5 years, which was considered necessary for the implementation of the different actions. An important chapter of the plan is the evaluation and revision: since the general objective of the plan is the conservation of habitats and species, both the evaluation, after 3 years, and the complete revision, at the end of the 5 years have been included. The scheme below is extracted from chapter 8 of the plan and summarizes the evaluation and revision.

anno / Fase	1°	2°	3°	4°	5°	
Valutazione del Piano				X	X	X
Revisione del Piano					X	X

Figure 6: time schedule of the mid-term evaluation and review of the entire management plan of the SPA "IT3270023 Delta del Po", (extracted from the original plan, in Italian) .

Revision of Management Plan of Delta del Po (IT3270023)

As already stated the plan was not formally approved, so the three-year mid-term evaluation was not carried out. However, given the implementation of some projects, a review of the plan can be envisaged using the set of indicators for the actions.

In the following table the 34 actions of the plan, divided by type, are resumed. Each action scheme was represented by letters and progressive numbers. The initials letters represent the action type: GA - Active interventions; RE - Regulations; IN - Incentives; MR - Monitoring and/or research programmes; PD - Educational programmes.

Detailed objectives	Action scheme
Promoting natural evolution in potential holm oak forests	**GA-1**
Introduction of tree species more resistant to salinity and aridity in willow forests	**GA-2**
Combating the spread of the allochthonous invasive *Sicyos angulatus* in willow forests	**GA-3**
Enlargement of habitat 1320: Spartina swards (Spartinion maritimae) through the construction of new salt marshes with material from the excavation of sublagoon channels	**GA-4**
Containment/eradication of the allochthonous species *Sylvilagus floridanus*.	**GA-5**
Containment/eradication of the allochthonous species *Myocastor coypus*	**GA-6**
Maintenance of the officiosity of the lagoon inlets and sublagoon channels.	**GA-7**
Conservation and extension of freshwater habitats for *Emys orbicularis* and *Pelobates fuscus insubricus*	**GA-8**
Maintenance of breeding colonies of colonial arboreal Ciconiformes	**GA-9**
Creation of nesting bumps for Charadriformes	**GA-10**
Restoration/increase of phragmites and cladium thickets	**GA-11**
Creation of multi-purpose freshwater basins	**GA-12**
Reduction of anthropogenic disturbance at Cà Mello and Bacucco	**GA-13**
Ex situ conservation of *Kosteletzkia pentacarpos*	**GA-14**
Enhancement of the naturalness of poplar cultivation areas	**RE-1**
Protection of the habitats and species present in the brackish lagoons by maintaining the traditional extensive fish farming in lagoons.	**RE-2**
Reduction of anthropic disturbance Nesting sites of arboreal Ciconiformes; Charadriformes	**RE-3**
Implementation of a protection and intervention plan in case of spillage of oily substances and/or hydrocarbons or other pollutants	**RE-4**

Detailed objectives	Action scheme
Incentivization of sustainable management of rice fields	**IN-1**
Incentivization the creation of lowland forests on river branches	**IN-2**
Incentivization organic farming practices, hedges and tree belts	**IN-3**
Incentivization for the provision of nest boxes for nocturnal and diurnal birds of prey	**IN-4**
Monitoring the impact of power lines on birdlife	**MR-1**
Monitoring environmental contaminants: colonial water birds	**MR-2**
Mapping macrophytic communities in lagoon areas	**MR-3**
Monitoring of highly dynamic and variable geometry habitats: 1210 Annual vegetation of drift lines; 2110 Embryonic shifting dunes	**MR-4**
Hunting monitoring	**MR-5**
Waterbirds nesting monitoring	**MR-6**
Experimental containment and monitoring of the invasive allochthonous *Oenothera biennis/stucchi* in mobile and fixed coastal dune habitats with herbaceous vegetation	**MR-7**
Floristic mapping of the Po Delta area of Veneto, with particular attention to valuable species and invasive allochthonous species.	**MR-8**
Phytosociology cartography of riparian woody vegetation	**MR-9**
Involvement of school students	**PD-1**
Increasing the sensitivity of local communities	**PD-2**
Reduction of predation by ichthyophagous birds and impact on non-target species	**PD-3**

In the table below the plan's actions are evaluated. Some actions have been implemented in different steps, due to different Programmes, therefore the evaluation is limited due to gaps in the data availability.

Action	Implementation status	Timetable respect	Costs respect	Achieved Results
GA-1	no	-	-	-
GA-2	no	-	-	-
GA-3	no	-	-	-
GA-4	no	-	-	-
GA-5	no	-	-	-
GA-6	no	-	-	-
GA-7	partially	no	-	partially
GA-8	yes	no	-	yes
GA-9	no	-	-	-
GA-10	partially	-	-	partially
GA-11	no	-	-	-
GA-12	no	-	-	-
GA-13	yes	-	-	-
GA-14	no	-	-	-
RE-1	no	-	-	-
RE-2	no	-	-	-
RE-3	no	-	-	-
RE-4	partially	no	-	partially
IN-1	no	-	-	-
IN-2	no	-	-	-
IN-3	no	-	-	-
IN-4	no	-	-	-
MR-1	no	-	-	-
MR-2	no	-	-	-
MR-3	no	-	-	-
MR-4	yes	no	no	yes
MR-5	no	-	-	-
MR-6	partially	-	-	partially

MR-7	no	-	-	-
MR-8	no	-	-	-
MR-9	no	-	-	-
PD-1	partially	-	-	partially
PD-2	partially	-	-	partially
PD-3	no	-	-	-

Besides the evaluation by action the habitat map of the site has been updated on year 2017, therefore it is possible a comparison with some of the original objective dealing with habitats improvement. For instance the action GA-4 foreseen the increase of habitat 1320 Spartina swards (*Spartinion maritimae*) through the realization of new islets with sediments from dredging of underwater channel inside the lagoons. From the comparison of the habitat maps of the year 2009 and 2017 actually the result is a reduction of the area covered by the habitat 1320.

On the contrary for the action MR-4 Monitoring of highly dynamic and variable geometry habitats: 1210 Annual vegetation of drift lines; 2110 Embryonic shifting dunes the comparison of the maps highlight an increase of habitat 2110 almost of twofold for the year 2017 corresponding to 98,890 m^2, on respect of the year 2009 in which the habitat occupied 58,628 m^2. The increase is calculated excluding the case of habitat mosaic. The habitat 1210 results decreased respect to the habitat map of the year 2009.

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The concise quantifications reported above are preliminary and not complete, for example they do not evaluate any interpretative changes in the habitats that have occurred between one review and the following one. However, for habitat 2110 Embryonic shifting dunes, the increase could be linked to the dynamism of the delta and in part linked to a resumption of sedimentary deposit at least in the northern part of the delta, as documented by a 2018[4].

In other lagoons of the Po river delta, the dynamism has been exploited as a positive element with a NBS (Nature Based Solution) technology in the recent LIFE AGREE[5]. project. The NBS in this case was a low-cost and non-invasive technology in which the sediments deposit has been regulated in order not to close the tidal exchanges with the lagoons but rather to favor the growth of new habitats After only two years from the use of the NBS technology and the construction of this structure, 138,825 m^3 of sediments were deposited, the removal of these sediments with a dredge would have cost € 527,535 (€ 3.8 / mc), in comparison of an installation cost of the NBS of € 280,000.

A new management plan should cover the two N2K sites, as well as the new marine site proposed in August 2020 IT3270025 (Figure 7) in addition to migratory species such as *Acipenser naccarii* (Adriatic sturgeon) and *Alosa fallax* (Alosa) both anadromous, which well represent the need for connection between the different N2K sites.

[4] Ninfo, A., Ciavola, P. & Billi, P. The Po Delta is restarting progradation: geomorphological evolution based on a 47-years Earth Observation dataset. *Sci Rep* **8,** 3457 (2018). https://doi.org/10.1038/s41598-018-21928-3

[5] G. Caramori, M. Pellizzari Graziano Caramori, 2020. Azione d6 monitoraggio del ripristino delle funzioni ecosistemiche. Report Tecnico. LIFE AGREE. https://lifeagree.eu/wp-content/uploads/2021/01/Azione-D6-Monitoraggio-del-ripristino-delle-funzioni-ecosistemiche_Rev09.pdf

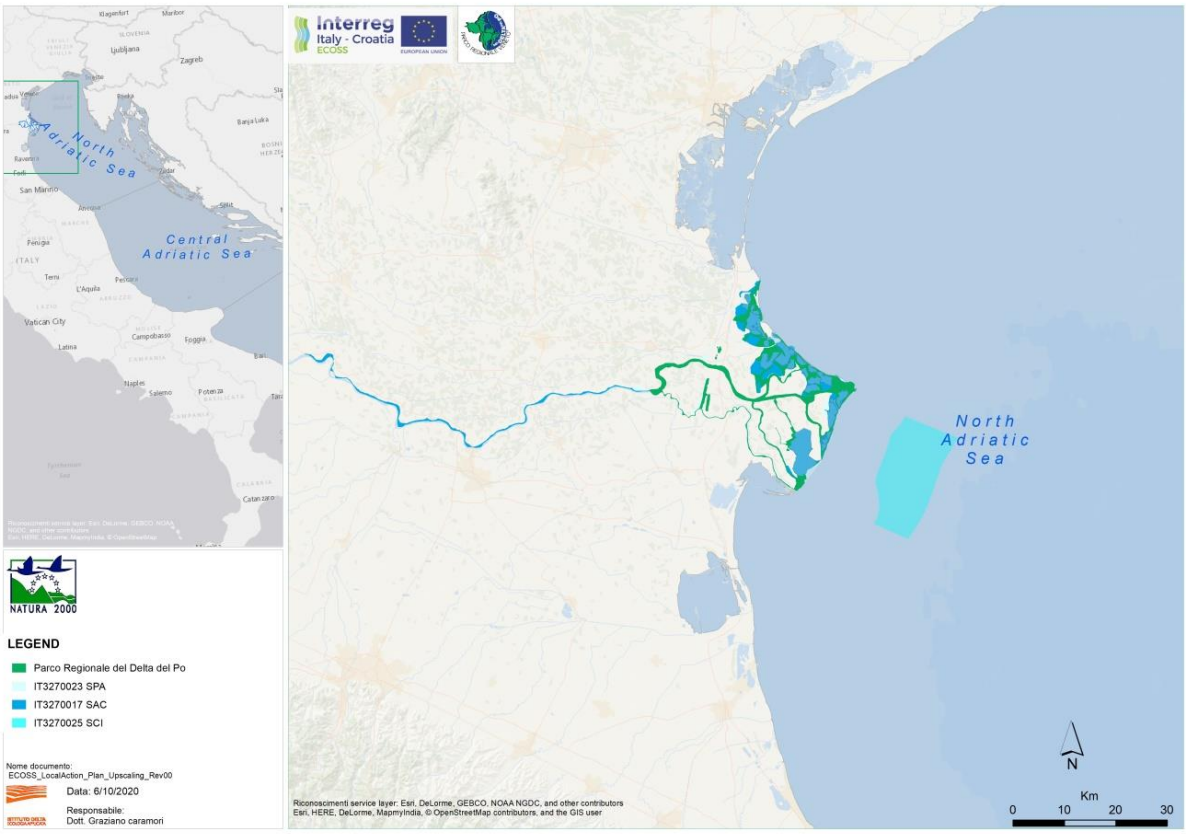

Figure 7: spatial relation among IT3270017 Delta del Po: tratto terminale e delta veneto; IT3270023 Delta del Po and the new marine site IT3270025 proposed on August 2020.

The management strategy therefore can be summarized in

1) Adaptive management according to the delta dynamism;

2) Use of new technologies based on NBS;

3) Involvement of economic activities that depend on local resources;

4) Positive synergies among conservation and Green Deal.

The first two points have been already described. Point 3) resumes what was already highlighted in the first version of the MP whose approach envisaged the involvement of private individuals as regards both the private properties inside the site and the activities external to the site, but which can positively influence the presence of habitats and species

As regards point 4), the delta is particularly suitable for integrating the "Farm to fork[6]" strategy with the conservation needs, in particular of Art. 12 Habitats Directive for species in Annex IV, whose conservation does not take place only within the boundaries of the N2K network. This could mobilize and direct funding in a positive synergy between economic activities and conservation objectives.

CONCLUSION

The present report analysed previous deliverables that have been complemented with further studies and available documents from the Po Delta Veneto Regional Park in order to upscale Action Plan at basin scale.

This deliverable provides a general structure for Action Plan for the N2K sites selected as case studies in the ECOSS project in compliance with Art. 6 of Habitats Directive. Preliminary suggestions have been provided for the upscaling in the N2K sites selected as case studies for the project ECOSS. Anyway we highlight that it is necessary the full analysis of the Action Plan in order to draft management strategies, therefore the upscaling cannot be applied without a full analysis of each site. A detailed chapter dedicated to the Delta Po Management Plan revision suggests specific strategies.

[6] https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_it

The delta is a quite rare environment in the Adriatic Sea as well as in the whole Mediterranean, anyhow the indications we provide such as the use of new technologies based on NBS, the involvement of economic activities that depend on local resources and the positive synergies among conservation and Green Deal, might be applied also to other N2K case studies.

Finally, we wish to emphasize one strategic element to take in consideration: the involvement of professional fishermen, who can play a crucial role for the conservation objectives and they must be involved directly into any active management. For the direct involvement of fishermen is suggested the case study of LIFE AGREE [7]which proved to be effective, in which professional fishermen were directly involved since the early phases and participated actively to some of the conservation actions with specific and adequate funding. As a matter of fact, conservation is not the isolation or closure of limited areas, but involves a change of the use of different resources of the ecosystems.

[7] https://lifeagree.eu/wp-content/uploads/2021/07/LIFE_AGREE-Final-Report.pdf

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