WWF

REPORT

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BLUE SEEDS

SUSTAINABLE MARINE CONSERVATION

URGENT & POSSIBLE

FOR THE FUTURE OF MEDITERRANEAN SEAGRASS:

ECO-MOORING PROJECT IN KAŞ KEKOVA

PREFACE

Conservation of marine ecosystems and better management of marine resources are vital not only for nature, but also for the people and industries that depend on these resources. While the Mediterranean coast of our country is home to many species such as endangered sea turtles, Mediterranean seal, grouper, and tuna, Kaş-Kekova Special Environmental Protection Area is densely populated by seagrass meadows (*Posidonia oceanica*), known as the lungs of the seas, which form important habitats for sea creatures.

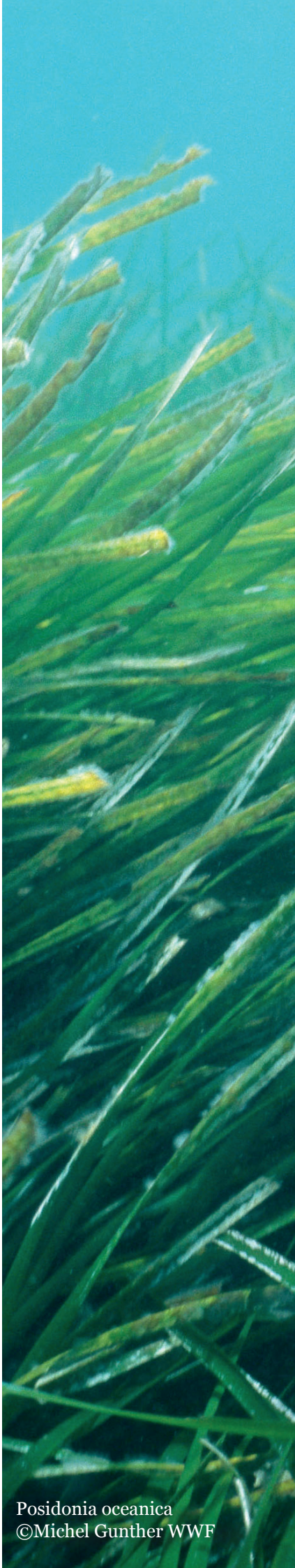
As a result of a series of studies carried out in by WWF the region since 2002, a participatory Marine Protected Area management plan was prepared between 2009-2012 within the borders of Kaş-Kekova Special Environmental Protection Area, which considers the balance of protection and use. Within the scope of this plan, while all scientific researches in Kaş-Kekova region revealed the necessity of creating a buoy system for the protection of seagrass meadows, we carried out buoying and buoy renewal activities in the Kaş-Kekova Region in 2004-2007 and 2010. At the end of this process, in 2014, one of the most important targets in the Kaş-Kekova SEPA Marine Management Plan approved by the Republic of Turkey Ministry of Environment and Urbanization at the time has been determined as "the establishment and operation of a buoy system to prevent anchoring on seagrass meadows" in order to minimize the destruction caused by anchoring on the seabed by placing the Kaş-Kekova SEPA in priority areas and to ensure the protection of seagrass and benthic fauna.

This report was financed by WWF SeaMed, COGITO projects and Mava foundation.

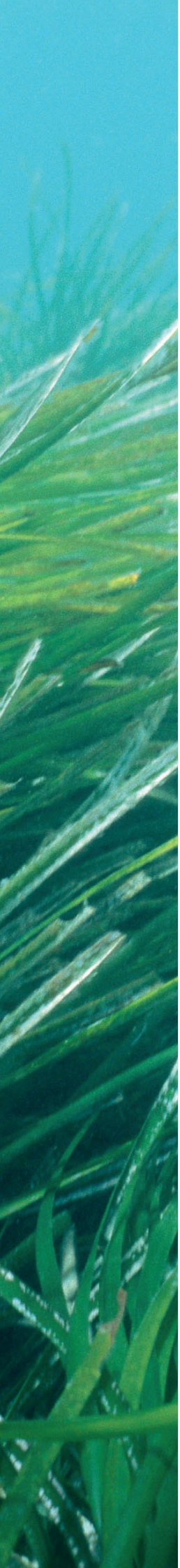
The report is based on the opinions and suggestions received from the stakeholders as a result of the knowledge and experience accumulated based on a series of meetings, interviews, workshops and consultancy services carried out within the scope of all the studies it has carried out to date. WWF aims to contribute to the efforts to prevent the destruction of the seabed caused by the boats operating in the Kaş-Kekova Marine Protected Area. We are working to implement a model that will ensure the financial sustainability of the buoy system and support the conservation activities in the area with the operating model to be developed.

We would like to thank all our stakeholders for their contributions, who shared their knowledge, experience and knowledge in the meetings and interviews that led to the emergence of the report.

WWF-Türkiye



Posidonia oceanica
©Michel Gunther WWF



THE PARTICIPANTS OF BUOY SYSTEM FOR THE KAŞ-KEKOVA SPECIAL ENVIRONMENTAL PROTECTION AREA BUOY SYSTEM WORKSHOP

NAME/SURNAME	ORGANIZATION
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ALİ KAAN TOPUZ	KASAD
ALİYE ERGENDEDEOĞLU	Antalya Metropolitan Municipality/Marine and Coastal Management Branch
BİHTER KAYA	Kaş District Governorate
CEM DEĞİRMENCİLER	Gatemarine
EMRAH MANAP	Ministry of Environment, Urbanization and Climate Change/General Directorate of Conservation of Natural Assets
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SUNA SATIK	Kaş Tourist Information Office
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ABBREVIATIONS

APAL	Agency for Protection and Development of the Littoral (Tunisia)
COGITO	Strengthening the integrated and sustainable management of coastal, island and marine territories and MPAs in the Mediterranean
GEF	Global Environment Facility
GIS	Geographic Information System
HR	Human Resources
IUCN	The International Union for Conservation of Nature
KASAD	Kaş Underwater Society
MPA	Marine Protected Area
NGB	Notre Grand Bleu (Tunisia)
PPP	Public-Private Partnership
SEPA	Specially Environmental Protected Area
SW	South and West
TL	Turkish Lira
UNDP	United Nations Development Programme
VER	Voluntary Emission Reduction

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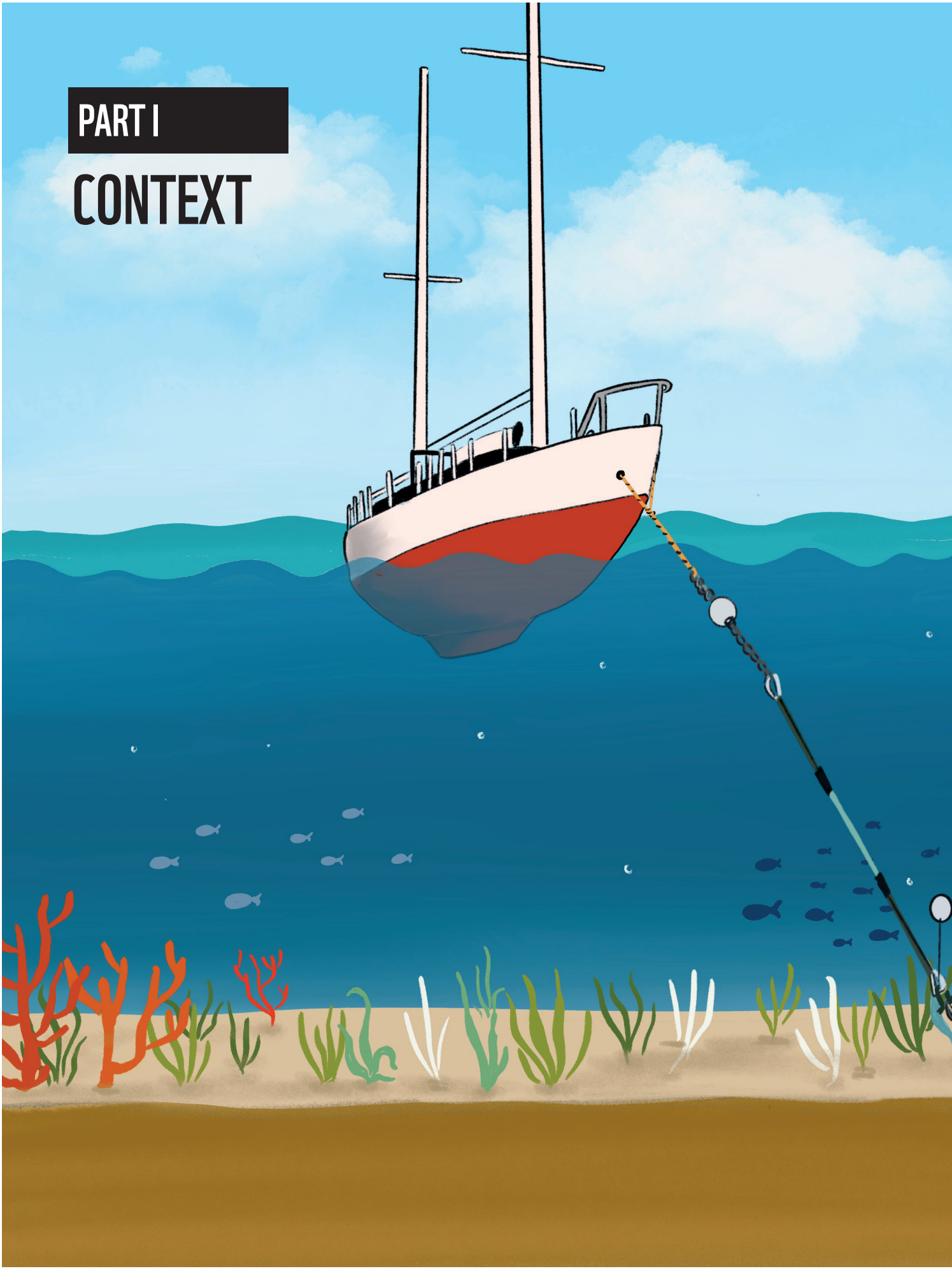
PART I

CONTEXT



ECOSYSTEM SERVICES PROVIDED BY SEAGRASSES

Posidonia oceanica (P. oceanica) is an aquatic plant that only lives in the Mediterranean Sea. Its presence in the region generates a lot of benefits to the human population, in the form of 25 ecosystem services identified in a study in 2015 (Campagne et al., 2015). The economic valuation of the ecosystem services provided by *P. oceanica* shows that this species contributes annually to the global economy between 25.3 million and 45.9 million €/year (Campagne et al., 2015). Among the many ecosystem services provided by *P. oceanica* meadows in the Mediterranean, one can quote:

- Their contribution to wastewater treatment in the Mediterranean is estimated at 60 €/ha/year (in 2014).

- Their contribution to coastal protection against erosion (by reducing the hydrodynamics of waves and current in the meadows, forming banquettes on the beach and stabilizing the shoreline by sediment accumulation) is approximately 160,000 € per protected kilometer.

- By producing, at 10 m depth, more than 14 litres of oxygen per day per m^2, and by being one of the most important nursery grounds for many species, *P. oceanica* meadows directly contribute to fishery resources at an economic value ranging between 27 and 35 €/ha/year.

Among all those ecosystem services provided by *P. oceanica*, there is one that is particularly of importance to the mitigation of climate change: its capacity to store carbon. To put it in other words, seagrasses (which include *P. oceanica*) in general, being highly productive ecosystems, have the ability to remove carbon dioxide from the atmosphere and store it in the seabed (Björk et al., 2008; Boudouresque et al., 2009; Gonzalez-Correa et al., 2007; Pergent et al., 1994). There is no source for these numbers. The known area of Posidonia is about 1.22 million hectares of Posidonia (Telesca, 2015).

However, the rate of decline of *P. oceanica* due to human activities can go up to 5% per year in the Mediterranean. Among the many threats *P. oceanica* is facing across the Mediterranean Sea, boat anchoring impacts on the seafloor is one of the most important (Pharos4MPAs, 2019) (Marbà, 2009, Short et al., 2011). A Previous study showed that on average, one single anchoring can destroy up to 34 shoots (i.e. bundles of leaves that emerge from an underground rhizome) (Francour et al., 1999). To put this figure into context, a healthy *P. oceanica* seagrass meadow contains approximately 500 shoots per m^2 (Francour et al., 1999). Thus, in terms of area damaged per anchoring, it represents an average of 0.067 m^2 per anchoring:

$$\frac{(33{,}5 \text{ shoots damaged})}{(500 \text{ shoots per } m^2)} = 0.067 \text{ m2 damaged}$$

Apart from those figures, one of the main concerns about this threat to *P. oceanica* is that anchoring can not only pull up the meadows but also the roots, preventing regrowth forever.

KAŞ-KEKOVA SEPA CONTEXT

As part of WWF-Turkey's marine biodiversity survey which was initiated in 2002 in the SW territories of Antalya province, the coastline between Patara and Tekirova was investigated and the distribution of marine species protected by national legislation and international conventions was mapped out.

The studies revealed that the coastline between Kaş and Kekova was exceptionally rich in terms of species of conservation importance in accordance with the IUCN criteria. As a result of the analyses of the data collected, the extension of the Kekova Specially Protected Area was proposed to the Repealed Institute for the Protection of Specially Protected Areas to include the important marine areas around Kaş.

As a result of field studies carried out between 2002 and 2006, and with the decision of the Council of Ministers, the boundaries of the Kekova Specially Protected Area has been extended to include the coastline and the islands in the west up to Inceburun of Kaş. The protected area has been renamed as the Kaş-Kekova Specially Protected Area (decision no. 2006/11266, Official Gazette dated 8/11/2006).

Around 1000 marine species have been documented in the Specially Protected Area (SPA) through dives done within marine biodiversity surveys. This is an indicator of the importance of the area in terms of marine biodiversity in the Eastern Mediterranean (Yokeş, 2009).

Endangered species, such as Mediterranean monk seal and sea turtles have established populations in the area and *Pinna nobilis,* a protected mussel species, has populations reaching tens of thousands in waters around Kaş and Kekova (Yokeş, 2007).

WWF-Turkey then focused its efforts on the Kaş-Kekova SPA, due to its richness in terms of species under protection and conducted more in-depth studies on their ecology. The marine biodiversity monitoring activities continued in 2006, 2009, 2010, 2011, 2014 and 2018. The studies, which were carried with the same methodology, in the same periods of the year and by the same team, revealed significant declines in the sighting frequency of many important fish species such as, the dusky grouper, golden grouper, and the common sea-bream. The remarkable decrease in the populations of these species within just 4 years demonstrate the serious pressure on them.

The presence of groupers (dusky grouper and golden grouper), which are at top of the food chain, is an indicator of the health of the marine ecosystem. These flagship species, which are categorized as "endangered" by IUCN are also important for their economic value.

The dusky grouper and the golden grouper, top predators of the food chain of rocky habitats, are at risk in the seas worldwide due to their large size, long life cycle and the long period for reaching reproduction maturity.

The recent studies conducted in Kaş-Kekova area suggest a dramatic decline in the populations of both dusky grouper and golden grouper. Even if their wide geographical range, abundance of juveniles and dispersal of individuals are considered to be the limiting factors of their extinction, over-fishing, easycatch and habitat loss pose serious threats over these species.

Dusky Grouper © Linda Pitkin, WWF

The Common Seabream (*Pagrus pagrus*) is recorded as "threatened" on the IUCN Red List but is not included in the communiqué of the Ministry of Food Agriculture and Livestock which regulates fishing in Turkey. Its population in Kaş-Kekova SPA has declined by 95% since 2002. The observation frequency has dropped from 15 to 1 (Yokeş, 2007).

Compared to the other parts of Antalya province, the pressure from industrial and touristic development as well as agricultural pollution is relatively low. Therefore this decline in the population should be due to illegal fishing and/or structural changes in the ecosystem.

Seagrass meadows (*Posidonia oceanica and Cymodocea nodosa*) provide oxygen for marine ecosystems and are an important source of food for herbivorous organisms. The dense carpet of seagrass on the bottom also serves as a nursery for various marine species such as groupers and common seabream. Seagrass beds in sheltered spots host a wider variety of species than those in the open sea.

Posidonia oceanica grows within the depths of 0-40 meters and is estimated to cover an area of 2.5 to 5 million hectares in Mediterranean Basin. It is the most productive of all seagrass species with respect to oxygen production. Seagrass grows very slowly and up to the age of 30 but is continuously damaged by human activities such as anchoring, pollution and coastal development. *P. oceanica* is protected in the entire Mediterranean by international treaties (the Bern and Barcelona Conventions). However, seagrass meadows are intensively used by boats. The only way to prevent the extinction of the sea meadows in near future is to urgently stop anchoring practices and to establish a mooring system in the Kaş-Kekova Marine Protected Area. Installing buoys at certain locations will help protect the sea meadows and benthic life while allowing the boats to operate. A feasibility study has identified over 100 spots where buoys could be installed. WWF-Turkey has initiated the establishment process by placing five buoys at the top priority locations to stop destruction at the benthic area caused by anchoring.

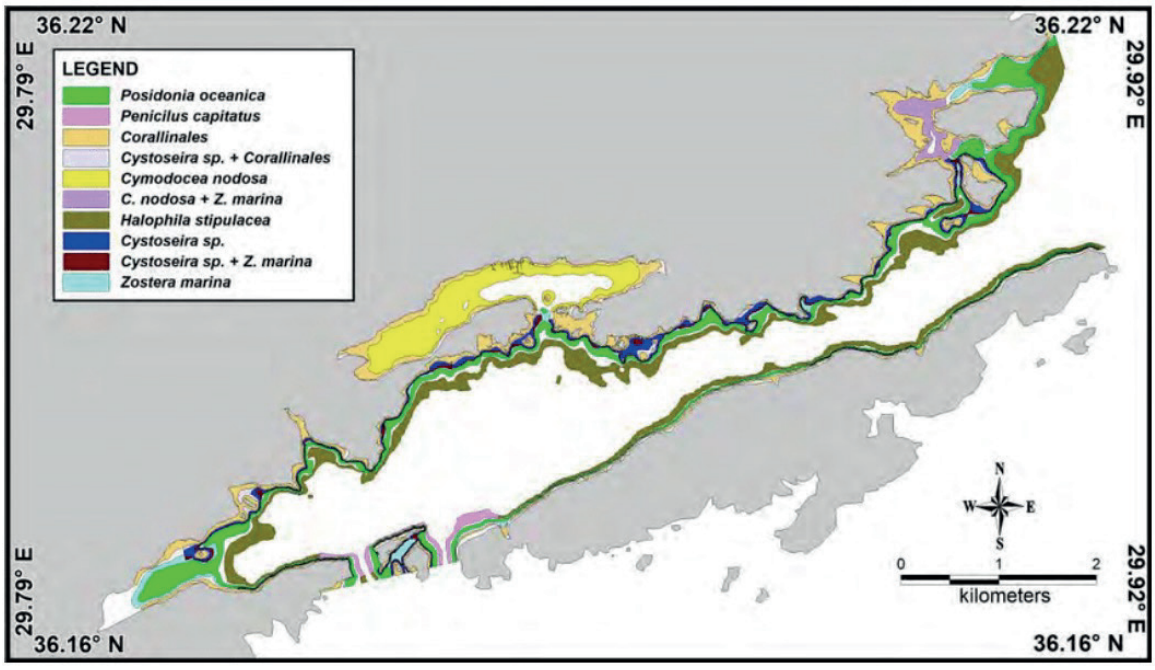


FIGURE 1:
MAPPING OF HABITATS IN THE KEKOVA PART OF THE KAS KEKOVA SEPA.
Source: Akçalı, Barış & Kaboğlu, Gökhan & Bizsel, Kemal & Kavcıoğlu, Remzi & Savaş, Yalçın & Bengil, Fethi & Özaydınlı, Murat & Kayaalp, Janset & Sönmez, Reyhan & Ergün, Güner & Güçlüsoy, Harun. (2019). Habitat mapping in the Marine Protected Areas: Contributions to the management plans in the Foça and Kaş-Kekova Special Environment Protection Areas.

PART II

ECO-MOORINGS IMPLEMENTATION

A technical solution to reduce the anchoring impacts and avoid emissions of CO_2 due to Posidonia destruction is to provide boaters with ecological moorings. Now, most of the existing moorings, although they reduce the impact of anchoring, do not allow for the total preservation of Posidonia meadows as they require the laying of wide supports on the marine substrate. An effective alternative to drastically reduce the impact of boat anchoring is to allow Marine Protected Areas (MPAs) to provide eco-moorings for boaters. These eco-moorings have the particularity of having a small contact surface with the substrate. For example, a study in Port-Cros (vertigo Lab, 2015) showed that using a specific model of eco-mooring (Harmony model) could protect around 450 m^2 of Posidonia meadows, which represents an avoided release of 5.8 to 22.5 tons of CO_2 per year (for a cost of 6,000€ over 10 years).

Thus, this project aims to propose an action plan for the implementation of eco-moorings in the Kas Kekova SEPA to reinforce the conservation of the *Posidonia oceanica* meadows in the area. There are several aspects to be considered for the implementation of such an eco-mooring system in the Kas-Kekova SEPA:

1. A feasibility study presenting all technical aspects to be considered (eco-mooring system, areas of implementation)

2. Financial considerations (investment costs, recurrent costs, sources of funding) including long term considerations such as lifespan of the moorings, management, self-financing, maintenance

3. Governance (managing body, technical partners, financial partners, Public-Private Partnership opportunities)

2.1 FEASIBILITY STUDY

A feasibility study was conducted approximately 10 years ago to assess the possibility of implementing eco-moorings in Kas-Kekova. However, discussions with WWF Turkey showed that there is still a need to assess some local natural features and how they impact the choice of eco-moorings. Only the realization of such a study will allow stakeholders to (i) decide what type of moorings to choose (the same type for all the area, different types to be used based on local natural specificities inside the area, etc.?) and (ii), hence, provide us with a more detailed overview of the related costs.

There are several parameters to consider in a feasibility study here:

- **Geographical parameters:** area of installation/substrate/natural constraints (for installation, maintenance, etc.). A selection of the most suitable areas has already been conducted (see Annex 2), which should be completed by an analysis of the underlying seabed classification given that the type of moorings to be chosen will depend on the substrate in the chosen sites. This section is a prerequisite to determining what type of eco-moorings can be used/not used.

- **Technical parameters:** a draft layout of the ecological mooring installations (depending on the use of areas in relation to boat sizes, etc.) and the assessment of area use and suitable mooring types for the area(s) investigated. The main ecological advantage of eco-moorings compared to classic moorings and direct anchoring is that the anchor line (chain or rope) does not dredge the seafloor. Three main generations of eco-moorings have been developed so far (Pioch and Leocadie, 2017. See Annex 1). The most recent generations allow for a better reduction of impacts on the seafloor when installing the moorings. It is important to bear in mind that the best option should be chosen according to (i) the substrate, (ii) the smallest impact during installation and (iii) the difference of prices that could apply between the generations.

- **GIS mapping work:** GIS mapping is usually necessary (this work must, in particular, make it possible to begin to tighten the potential areas for the installation of moorings). Regarding the establishment of the mooring system in Kaş-Kekova, WWF Turkey has already developed a feasibility study in which a total of 160 concrete vaulted buoys in 23 points of the MPA are deemed necessary in order to ensure the effective conservation of the Posidonia seagrass meadows and marine biodiversity. Furthermore, WWF has prepared the technical Terms of Reference for the execution of the mooring system. On the other hand, it has been a long time since the first feasibility report was prepared, the technology and the foreseen cost of this system have changed significantly. During the previous project implementation period of WWF-TR, a consultation process was conducted together with the Kaş Underwater Society as part of the Kaş-Kekova MPA Local Working Group. The efforts searching for funds and implementing partners for the mooring buoy system and the request by the harbour administration, the locations of the mooring system were revised and the number was reduced to 89.

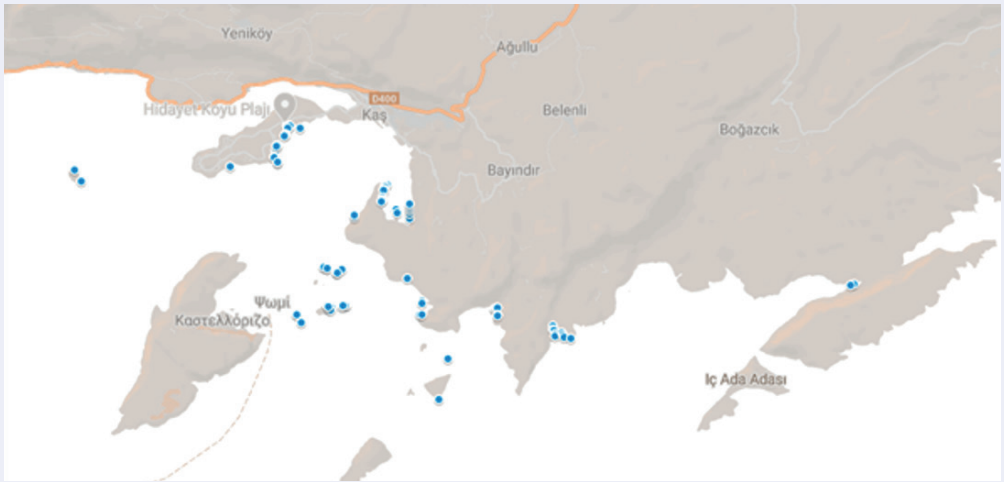
- **Practical parameters:** once the type of moorings and their locations have been chosen and identified on a map, it is necessary to complete this work with a first assessment of both the financial needs and the potential legal and/or political constraints (for example, the legal implications for a potential PPP – see section Governance below).

LOCALIZATION OF FUTURE MOORINGS IN THE KAS-KEKOVA SEPA

Locations of the moorings can be categorized into 3, based on nautical distances from the Kaş Harbour.

MAIN AREAS OF LOCATION	SUB-CATEGORY
20 min. range from the harbour	a. Limanağzı Fener b. Hidayet Plajı and Stone Age c. Guvercin Islanda d. Neptune e. Çapa Banko
30 min range from the harbour	f. Gurmenli Island g. Pina and Heybeli Islands h. Besmi and Flying Fish i. Canyon j. Kovanlı Island k. Coban Bay, Big Cave and Tunnel
45 min range from the harbour	l. 13 Banko and Sarı Ot m. Ufak Dere Bay n. İnonu Bay o. Aperlai Bay

Coordinates of each of the 89 buoys can be seen in **annex 1.**



MAP 1
MAP OF LOCATIONS FOR MOORINGS, KAS KEKOVA SEPA AREA

2.2 FINANCIAL CONSIDERATIONS

In order to develop a sound business plan for this project, several questions need to be addressed. The information to consider in the business plan for the implementation of eco-moorings is introduced in the table below.

2.2.1 MAIN ASPECTS TO CONSIDER

TABLE 1:
LIST OF INFORMATION TO CONSIDER FOR ASSESSING NECESSARY BUDGET

CATEGORY	ISSUES TO BE ADDRESSED	ACTIONS TO ADDRESS THOSE ISSUES OR ANSWERS TO THOSE QUESTIONS
STUDY	• Do you have all prerequisite scientific and technical information (see part on eco-mooring system above) to start the process of eco-mooring purchasing? • If not, what is the missing information and what levers do you need to work on to get this information in the shortest possible time?	1. Reviewing past work done regarding this theme in the Kas Kekova SEPA 2. Reviewing past work done regarding this theme in other MPAs/marine sites in Turkey 3. Listing all missing information based on your review to identify what still needs to be identified 4. Organising exchanges with experts and product providers
MATERIAL	• What kind of eco-mooring system do you favor according to (i) the natural constraints and (ii) your main objective? • How much eco-mooring do you need? • Do local/national competences for the purchase of eco-moorings exist?	5. Studies above should give you the understanding of the best type of eco-mooring to implement 6. The number of eco-moorings to implement has already already identified, as well as the location of each moorings (see below) 7. Exchanges with experts and product providers within the studies above should provide you with a clear understanding of the local/national competences on the matter
IMPLEMENTATION	• Do you need additional material (for the preparation of the substrate to receive the moorings, renting a boat for implementation, etc.)? • Can your eco-mooring provider also realize the implementation (overall budget included in a full quote)? • If not (for example if the provider is not Turkey-based), what kind of company do you need to implement them (big boat rental, professional divers, etc.)?	8. Clear terms of references should be written to list all prerequisites for the provider 9. The quotes provided by the different candidates should be clear about how they are planning to deliver, from material provision to the implementation on site

MAINTENANCE	• Do you let the eco-moorings on site all year long, or only during the high season? • If only on-site during the high season, how do you take them out and put them back in the water annually? Where do you store them? • What parts do you need to maintain? How often do you need to maintain the eco-moorings? • Is the maintenance frequency the same whether you leave them annually or remove them at the end of the high season? • Are there any local company(ies) able to provide such services on a regular basis?	10. A planning document anticipating the long-term management and addressing those questions should be realized prior to the implementation
HUMAN RESOURCES	• Permanent staff: do you need to have dedicated staff to manage the eco-moorings? On what information do you base your choice of having or not having permanent staff (time required for the control, reporting to investors, etc.)? The idea here is to be able to estimate how much time/per-year will be required for the running of the eco-mooring field based on all available information, and to estimate, in terms of full-time equivalent, your HR needs for that. • Once you assessed the human needs, where do they come from? Do you have to develop a structure to run it (because at this stage there is an operational management unit of the MPA), or do you have partners to whom you can delegate these activities? • Seasonal staff: if permanent staff is not required, do you need seasonal staff? For what (maintenance, surveillance, management, installation, etc)? Do you need to hire or subcontract?	

Regarding the points related to the study, points 1 to 3 have already been addressed. Discussions with experts have already been started during the workshop in December 2020, but some additional meetings should be organized. These discussions should provide final information related to (i) the substrate of the chosen sites, (ii) the type of moorings best suited for the site and (iii) assessing the national competencies on the matter.

Once those final points have been assessed, Terms of Reference to identify the provider can be drafted. This work should be done in parallel with the identification of potential sources of funding and the development of the management structure. Please refer to figure 3 to understand the full approach for implementing next steps leading to the implementation of eco-moorings.

Posidonia oceanica © Michel Gunther

2.2.2 EXAMPLES OF BUDGETS FROM SIMILAR CASE STUDIES

The figures provided below are extrapolated from other Mediterranean contexts and will have to be refined by answering the questions in the table above.

The first question to address when realizing a business plan for such activity is: what are the similar past experiences one can get inspiration from? In general, one should draw inspiration from the results/failures/ success of other contexts. In this case, it is important to draw attention to 3 different sets of information:

- The Gocek case study (see Box 1 below)
- The BlueSeeds study in Malta (see box 2 below)
- A previous study was done in Kas Kekova. Based on a previous feasibility assessment conducted in 2015 by an underwater engineering company namely DerinSu, the total budget based on 154 moorings was estimated to be around 3.126.000TL, including the costs of feasibility research, construction of buoys and implementation processes. Costs for mooring management have not been budgeted so far

EXPERIENCE FEEDBACK, GÖCEK

The project of "Strengthening the Marine and Coastal Protected Areas System of Turkey" is being carried out by the Ministry of Environment and Urbanization General Directorate for Protection of Natural Assets with the partnership of the Ministry of Forestry and Water Affairs General Directorate of Nature Conservation and National Parks and the General Directorate of Fisheries and Aquaculture Representation of Food, Agriculture and Livestock Ministry; with the implementing partnership of United Nations Development Program (UNDP Turkey) and with the financial support of the Global Environment Facility (GEF).

Because of an intense activity area for boats and yachts, 97 buoys were established in Göcek and Dalaman Bays in 2010 to prevent boat and yacht's anchors from causing damage to the seafloor by the Ministry of Environment and Urbanization. In the time since buoys were established, it has been decided that designing the buoys to provide a more effective and efficient service will be more important when implementing the aim of studies undertaken for the protection of the area. To do this, the first idea to come to mind was to try to find out the answers of whether the buoys can be operated for a certain fee charged to the yachts and boats visiting the bays.

In connection with the operation of the buoys, a number of interviews were done with representatives of the public sector (Harbormaster, Environment Directorate, etc.), Mayors, representatives of the Chamber of Maritime Commerce and operators of private yacht clubs and marinas who are providing similar types of services in the sector, and officials of environmental organizations.

Unfortunately, an operational model/body for the administration of the buoy mooring system was not able to form (surveillance, maintenance) and in time it became unusable. Mostly because of the inadequate capacity, the system became inactive.

EXAMPLE FROM THE MALTA BUSINESS PLAN

Financially speaking, the implementation of eco-moorings is usually includes two main steps: the investment phase and the management/maintenance phase.

Investment phase:

- A study was realized by BlueSeeds in Malta in 2019-2020, within the scope of a project for the implementation of 50 eco-moorings. Figures provided by members of the Malta Environmental Resources Authority during the practical business planning training **for the purchase of eco-moorings is the following:** 1.160,00€ per mooring. In our case, it would represent a total investment cost for purchase of **92.800,00€ for 80 moorings**

- The cost of installation is based on a UK study, and is estimated at 550,00 £ per mooring. It represent, in our case, an investment cost for installation of 44.000,00£ **for 80 moorings** (using a barge)

- The figures will have to be refined once the type of eco-mooring to be used is selected, and the seller is identified – nationally or internationally

Once eco-moorings are successfully implemented, their maintenance on a regular basis is a key element to consider. As it can also be an important part of the management budget, it is important to assess the future maintenance needs and their costs prior to the implementation of the buoys. A recent guide published in France by the Ministry of ecological transition estimated a total annual cost of 66,000€ for a 200-mooring area (https://mer.gouv.fr/sites/default/files/2020-12/Guide_zone_mouillage_equipements_legers_0.pdf). A 2017 UK study estimated the cost of annual maintenance per mooring, considering an inland maintenance scenario (see table 2 below).

TABLE 2: COSTS OF MOORING MAINTENANCE, SOURCE: AMEC FOSTER WHEELER ENVIRONMENT, 2017

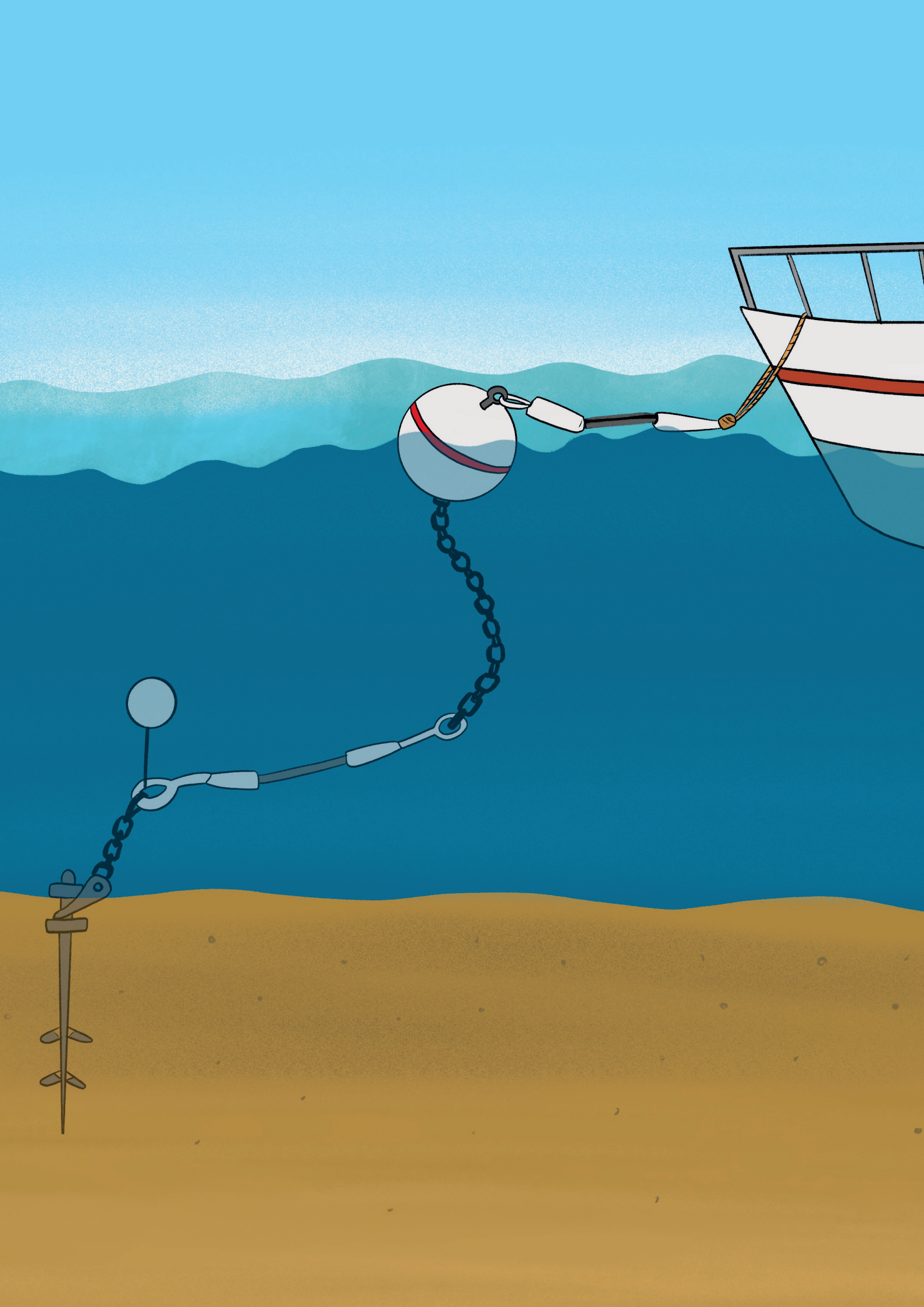
EVENT	COST PER EVENT (£) (FOR 1 MOORING)	FREQUENCY OF EVENTS
Annual maintenance (detach from anchor block by divers)	613	Annually
Annual maintenance (reattach to anchor block by divers)	613	Annually
Annual maintenance (onshore pressure wash)	20	Annually
Total per mooring	1.246	Annually
Total for 80 moorings	99.680	Annually

To ease the process of drafting a business plan, previous similar studies on the topic are used. Especially, a work on the business planification for conservation measures' implementation in all Maltese MPAs is introduced in box 2 below. This work, with the Environmental Resources Authority, allowed BlueSeeds to develop a business plan for the implementation of 50 eco-moorings.

The Kaş Port Authority (Kaş Liman Başkanlığı) seems to be the solely responsible institution for placing any object onto the sea-surface and without its permission, the buoy systems can't implement in Kaş-Kekova MPA (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=16726&MevzuatTur=7&MevzuatTertip=5). Considering the status of the area as Specially Environment Protected Area, the General Directorate for the Protection of Natural Assets (GDPNA) is the secondary institution which can forbid anchoring within Kaş-Kekova MPA and force boats, yachts and other marine vehicles to use the buoy system.

The Ministry of Transport and Infrastructure is one of the main institutions in charge of the implementation of eco-moorings. The moorings have to be included within the maritime maps as anchorage moorings, otherwise, the moorings will be considered to be just signal buoys and boats will not be allowed to tie up on the buoys.

The local governorship can take measures regarding moorings, but usually at a smaller scale. For example, recently with the initiative of the former governor and the collaboration and contribution of local stakeholders and WWF-Turkey, 150m long chain and 7 mooring buoys were implemented within the harbor for boats to tie (to avoid the use of anchors) while resting in the harbor, 1 mooring buoy right by the Coast Guard as a docking-station and most importantly of all 10 mooring buoys were implemented at the priority areas within Kas-Kekova MPA. However, as this was a local initiative, the buoys are considered as signal moorings, not as anchorage moorings.



2.2.3 DONORS & FINANCING MECHANISMS

All those costs come from previous studies realized by BlueSeeds. It will be important to address all the questions in Table 1 in order to refine the budget data. In parallel to the identification of all costs, it is important to identify potential investors, donors and financing mechanisms in positions to fund those costs. In order to identify the best-suited investors/donors/financing mechanisms to involve, there are several questions to address.

TABLE 3: QUESTIONS TO BE ADDRESSED REGARDING IDENTIFICATION OF FINANCING

CATEGORY	QUESTIONS TO ADDRESS	ACTIONS TO BE TAKEN TO ADDRESS THOSE ISSUES
ORIGIN OF THE FUND AND COSTS TO BE COVERED	• Do you want/need the investment and the recurrent costs to be covered by the same source of funding? • In many cases, funding from donors/ investors/philanthropists is focused on investment costs and does not cover recurrent costs • It is important to think whether you need a long-term involvement from your first financial partner(s), or if you can use other sources for the maintenance. It is probably the central question when it comes to financing this type of project, in order to avoid spending time and energy on installing mooring that will not last due to the lack of maintenance	a. Preparing a sound and sustainable business plan based on information collected from the feasibility study will be required to understand all your needs
PUBLIC SOURCES	• Regarding the public sources of funding currently existing in the area (for marine conservation activities, for environmental activities, and other sectors' subsidies), what are the best available public sources to mobilize in your opinion? • How do you answer the same question at the national level? How can you use WWF Turkey channels to reach out those public sources of funding?	b. Experiences and networks from past projects, as well as close work with public authorities, should help you list the best options for the current project. Discussions with stakeholders involved in a similar case study in Gocek already started during the workshop in December 2020 and should be continued.
PRIVATE SOURCES	• The same questions for public sources also apply here. • Do you have any ideas/constrains in terms of blended finance?	

FINANCING MECHANISMS	• Apart from financing sources (i.e. those that are referred to an entity, a structure, loaning or granting you the realization of your project), it is important to think about financing alternatives. Those alternatives can either be a good complement to those "classic" sources, or allow you to address long-term financing issues. • Two solutions arise that could be of interest for the business model and need to be discussed. The first one is the payment for mooring booking, which can be seen as a self-financing mechanism. One of the main aspects to consider in your business plan is the recurrent cost of maintaining your moorings over time. When it comes to covering your maintenance costs, one of the main questions you have to ask yourself is wether or not you are willing to implement a self-financing mechanism which is based on the implementation of a mooring fee for boat users. • Example of online booking application for moorings are under testing in the Mediterranean (e.g. BlueMooring.org), lesson learned should be taken into account for a future ecomooring in Kaş-Kekova MPA.	c. You have to keep in mind that the implementation of a self-financing mechanism comes with cost. The most important one is related to the fee collection system. Using a human collecting system, by going from boat to boat to collect the fee, could prove to be expensive. The use of a booking app could be an option to reduce management costs. Discussions have already started with BlueSeeds on that topic with stakeholders involved in a similar case study in Gocek. Keeping in touch regarding the development of such approach in another area in Turkey should allow the future governance body to assess if this approach is relevant for the Kas kekova context. d. The timeframe of implementation of a self-financing mechanism also needs to be assessed depending on your short-term objectives: do you want to implement it directly after the implementation of eco-moorings (users have to pay since the beginning, keeping in mind that it could be an obstacle), or do you want to first let the moorings free of charge (so that users, who are not used to using moorings instead of anchoring, can get used to it prior to charging them? e. Regarding the self-financing approach, which is more linked to the covering of recurrent costs, two aspects are to be considered: • From the future governance body prospective, are the stakeholders ready to develop such approach? • From the users prospective, you have to assess their willingness-to-pay, in order to determine if (i) people are willing to pay for moorings and (ii) to what extent they would be willing to pay. This can be done through a willingness-to-pay survey.
	• Blue carbon approach	f. This approach is quite innovative and linked to the investment phase. Robust scientific data on Posidonia carbon storage capacity and anchoring impact on Posidonia in the area need to be thoroughly assessed. g. This kind of mechanism can be complicated to design. However, the topic of blue carbon market is currently trending, and opportunities should arise.

A precise budget can be drafted only once all technical aspects have been thoroughly discussed with experts (see above). Based on this budget, the most suited type of investment partners can be identified. In parallel, governance issues have to be addressed to reassure potential investors by showing them the project have been designed on a long-term basis.

BOX 4

THE POTENTIAL OF A BLUE CARBON APPROACH TO FINANCE IMPLEMENTATION AND MAINTENANCE OF ECO-MOORINGS

What is blue carbon and carbon offsetting?

It is a financing mechanism by which an entity substitutes, partially or totally, a reduction of its own greenhouse gas emissions for an equivalent amount of carbon credits by purchasing them from a third party.

The compensation consists of measuring the greenhouse gas emissions generated by an activity (transport, heating, etc.) then, after having attempt to reduce these emissions, financing a project to reduce greenhouse gas emissions or avoid future degradation and emissions (a project to protect *Posidonia oceanica* through eco-mooring installation could fit in that category) which will reduce, in another place, the same volume of greenhouse gases.

The principle is that a given amount of CO2 emitted in one location can be "offset" by reducing or sequestering an equivalent amount of CO2 in another location.

Carbon market in Turkey

According to the European Bank for Reconstruction and Development (EBRF) and the website Turkish carbon market (http://turkishcarbonmarket.com/), "Turkey plays a prominent role in the global voluntary carbon market. The voluntary carbon market relates to transactions in carbon credits that fall outside the compliance schemes created under the Kyoto Protocol. Demand for carbon credits in this market is driven largely by companies that pursue voluntary greenhouse gas emissions targets and intend to demonstrate climate leadership within the industry. Turkey represents the largest seller of voluntary carbon credits in Europe. Over the period 2007 – 2015, Turkey offset around 35 million tons of CO2e valued at over US$ 200 million. This is equivalent to approximately 70 per cent of the total market volume in Europe to date. In 2015, Turkey was responsible for around half of all primary transactions in Europe, amounting to 3.1 million tonnes of CO2e. This made Turkey the fourth-largest supplier of voluntary carbon offsets globally after the United States, India and Indonesia, on par with other large players including Kenya and Brazil. Despite high transaction volumes, however, the total value of these transactions declined from US$ 18.6 million in 2013 to US$ 4.3 million in 2015 due to a decline in the price of carbon in recent years. The majority of Turkey's voluntary carbon transactions were derived from sales of VERs generated by wind, hydro, and landfill methane projects."

Kaş © Okyanus Aşkın

How to use a blue carbon approach for eco-mooring implementation?

BlueSeeds is currently working on building on a methodology to estimate blue carbon preserved by the installation of ecological moorings. Thanks to the first results of a Vertigo Lab study conducted in Port-Cros, France in 2016 and the estimated price of the carbon ton that resulted from the implementation of this methodology (too high to be considered as an opportunity for only voluntary carbon market), BlueSeeds proposed through a Blue Natural Capital Funding Facility call to develop an innovative approach to finance the conservation of the Posidonia meadows. This approach seeks to combine different types of funding and reshape the entire business model of MPA eco-mooring installation: an investment mechanism based on blue carbon credits to purchase eco-moorings for MPAs and prevent the loss of Posidonia meadows from boat anchoring, sustainable self-financing mechanisms to ensure running costs of eco-mooring fields (through the development of blue businesses around the eco-moorings and a mooring booking application for boaters).

The use of blue carbon credits to finance the purchase of eco-moorings could be a path to explore, even though the marine blue carbon market is still at the moment less developed than the terrestrial carbon market (especially those based on REDD projects). This approach for *Posidonia oceanica* conservation through the financing of eco-moorings by a blue carbon approach will require a feasibility study: (i) projections on the loss of meadows according to two scenarios (a business-as-usual scenario, a scenario with eco-moorings), to estimate the quantity of avoided emissions and the amount on the carbon market, (ii) design of the blue carbon framework (methodology to be used, credits registration process in a voluntary market, etc. (iii) development of the sustainable business model to manage the moorings field. This approach would require more time for the implementation of the eco-moorings, which may not be compatible with the WWF timeline.

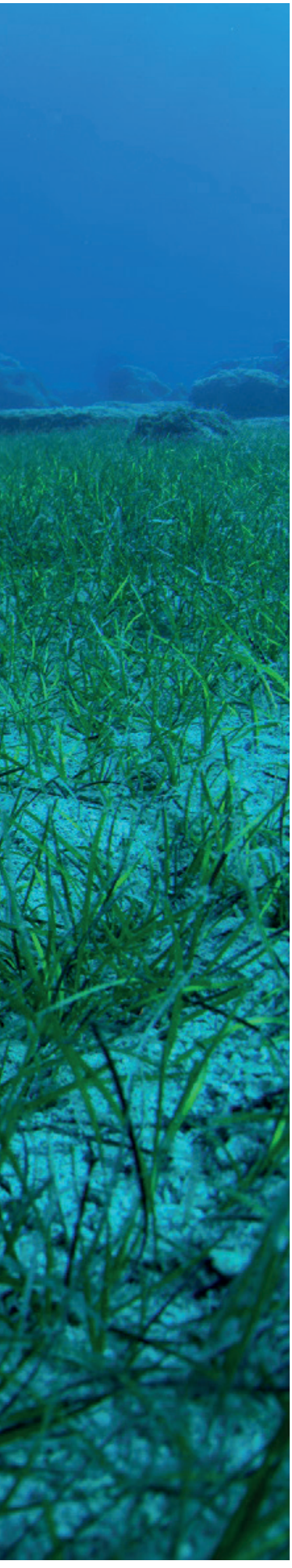
Stage of the process

Blue carbon could be in the future considered as a good investing opportunity, as a co-funding inside a wider financing strategy. At the moment, the methodological processes, the implementation of sound blue carbon financing mechanism in the Mediterranean Sea and in Turkey are at a too early stage to consider it as a relevant opportunity. It is important however to keep this approach in mind in the long term as there has been recently a growing interest from different international stakeholders on the topic.

PART III

GOVERNANCE

Pinna nobilis, Kas © Tahsin Ceylan



Knowing who is going to handle the overall management of the eco-moorings (implementation but also long term running) is a central point for the success of such an approach. As the project will occur within a protected area, there are bound to be restrictions. At this time, there are no on-site management units, so it is most probable that there will be a need to delegate the management to a third party:

- Who will be this third party? To answer this primordial question, it is necessary to organize further stakeholders' meetings. This work has started during the workshop in December and should be followed by additional meetings in 2021 to define the stakeholders to be involved and the roles of everyone.
- What role for the municipality or the governorate? Once again, an official presentation of the project to the governorate and the municipality should be realized to assess their willingness to be involved.
- Which private stakeholders can be involved, and at what stage of the development? Does the Tourism association have the capacity/willingness to manage it? What about diving clubs or the Kas Marina?

LIST OF STAKEHOLDERS TO INVOLVE
Governorship of Antalya The Province Directorate of Environment and Urbanization, Department for the Conservation of Natural Assets (Coordination)
The Province Directorate of Culture and Tourism
The Province Directorate of Transportation, Maritime and Communications
Coast Guard Command (Antalya)
The Ministry of Transportation, Maritime and Communications (Kaş Harbor Authority)
The West Mediterranean Development Agency
The Antalya Metropolitan Municipality
The Demre Municipality
The Kaş Municipality
The Kaş District Directorate of Food, Agriculture and Livestock
The Demre District Directorate of Food, Agriculture and Livestock
The Kaş Tourism Information Office
The Kaş Fishery Cooperative
The Kaş Underwater Society
The Kaş Tourism & Promotion Society
WWF Turkey
The Antalya Branch of Chamber of Shipping
The Kaş Setur Marina Administration
Kaş Port Authority
AKD
KASAD
Gatemarine Company

TABLE 4: LIST OF POTENTIAL STAKEHOLDERS TO BE INVOLVED

Kaş - Kekova Özel Çevre Koruma Bölgesi © Murat Draman

3.1 NATURE OF THE PARTNERS INVOLVED

If the Kas marina (or any other private stakeholder) is involved in the management, then it could be relevant or necessary to develop a Public-Private Partnership.

Since conservation issues cannot be addressed separately from socio-economic issues at the local level, innovative forms of financing must also take into account all the stakeholders of the site to be conserved. This requires the development of an integrated management model for protected areas aimed at the sustainability of biodiversity and the integration of environmentally friendly human activities. Public-Private Partnership is one of the solutions envisaged to fill this financing gap while integrating all stakeholders in the management (Braye N., 2017; Lopez y Sira Jimenez, 2006).

Definiton

There is currently no consensus on a formal definition of PPPs, either internationally or nationally, but rather, depend on the context, a set of legal tools available to establish a partnership between public and private entities. Some common definitions include the following:

- Forms of cooperation between public authorities and the business community aimed at ensuring the financing, construction, renovation, management or maintenance of an infrastructure or the provision of a service (European Commission, Green Paper on PPPs, 2004)
- Arrangements, usually medium-term, between the public and private sectors whereby certain services that are the responsibility of the public sector are administered by the private sector, (World Bank).

Objectives

More specifically, in the context of an operational application for protected area management, this type of partnership responds to different management, governance and conservation objectives, such as :

- Optimization of the costs of management/ functioning of the protected area, through the development of an additional financing mechanism or the reduction of costs (transferred from the public manager to the private operator).

- Outsourcing of the sources of financing and the necessary technical resources, by relying on the financial capacities and skills of the private sector for natural resource management.
- Support for governance, through the development or strengthening of participatory management between the public manager and the private partner.
- Involvement of local populations (Blue Plan, 2017) in the partnership so as to meet environmental challenges while promoting local socio-economic development. The PPP project may, in particular, result from an activity directly carried out by local populations, or have an indirect impact through employment, training or the development of related activities. This makes it possible, in particular, to set up alternative channels of income for the local population
- Upgrading of existing infrastructures that may have been abandoned or that are currently not developed. The PPP can then allow a certain economic revival at the local level while anchoring environmental conservation issues in the territory.

Nature of the partners involved

The form of the PPP chosen depends on various parameters, including the nature of the partners involved:

- On the public side, the designated person responsible for the management of the HA may be more or less centralized (government authority or territorial community) and autonomous (departmental directorate, departmental corporation or autonomous agency).
- On the private side, the situation can be very different depending on whether the private party is commercial or non-commercial (association or company) and whether it is local or international.

The legal aspects to consider for the implementation of such PPP depend on the national jurisdiction. Regarding this issue, two main sources should be used:

- https://bpp.worldbank.org/en/data/exploreeconomies/turkey/2018#1
- International PPP Platform Turkiye (Pekintas Plaza Kat: 9 Buyukdere Cad. No: 32, 34394-00 Mecidiyekoy-Istanbul, Tel: +90(212) 211 66 11 - Fax: +90(212) 211 55 75, Email: ppp@GroupLaw.com.tr & info@ppp.org.tr)
- Two pdf sent in the same email of this note (named “PPP Reference Guide” and “Turkey PPP”). The participation of a private stakeholder in such a scheme is correlated with financial terms. In other words, if some form of income cannot be generated in one way or another through the eco-mooring activity, it will be complicated to find someone to get involved.

CHRONOLOGY OF THE IMPLEMENTATION PROCESS

1 Project's Selection — PP. 25-26
2 Identification of project holder and type of PPP to be used
3 PPP preparation and feasibility — PP. 35-40
4 Conclusion of contract — P. 41
5 Contract content and signature — PP. 42-45

Option 1:
Development of ecoturism activities already carried out by a private partner (Notre Grand Bleu) on the spot

Too early stage

Preliminary internal discussions required

NOT DEVELOPED

MAIN INFORMATION

* The two private stakeholders support APAL all along the process
* Necessity of transparency and regular feedback to the local advisory committee

Facilitated method of procurement without recourse to competitive bidding

Law n° 2008-23, 1ST April 2008: concessions

Law n° 2014-1039, 13Th March 2014: public markets

QUESTIONS TO ASK YOURSELF

Which project leader?

2 OPTIONS considered

PP. 28-30

Notre Grand Bleu

Tourism Operators

APAL

PP. 32-33

Concession

Partnership Aggrement

What preliminary documents?

* Feasibility study
* Description sheet with comparative analysis report
* Financial impact assestments study

What are the private partner options?

* NGB with subcontractors
* Tourist service providers
* Hybrid partner made up of NGB and service providers (civil society, commercial, etc.)

Option 2:
Ecotourism upgrading of the current tourism offer (services and infrastructures) with the introduction of an eco-tax

Advanced discussions

3 stakeholders directly concerned all agree on the principle

What kind of PPP?

FIGURE 2: ROADMAP FOR THE IMPLEMENTATION OF A PPP IN THE DOMAIN OF MARINE CONSERVATION, KURIAT ISLANDS EXAMPLE. SOURCE: PLAN BLEU 2018.

CONCLUSION

This document is a starting point in the process of approaching potential investors to implement eco-moorings in the Kaş-Kekova SEPA. Some information, especially technical, on which important steps of the implementation process depend, are still necessary to complete this work. This document provides in figure 3 below and through tables 1 and 3 above clear indications on the missing information required to finalize the process of implementation

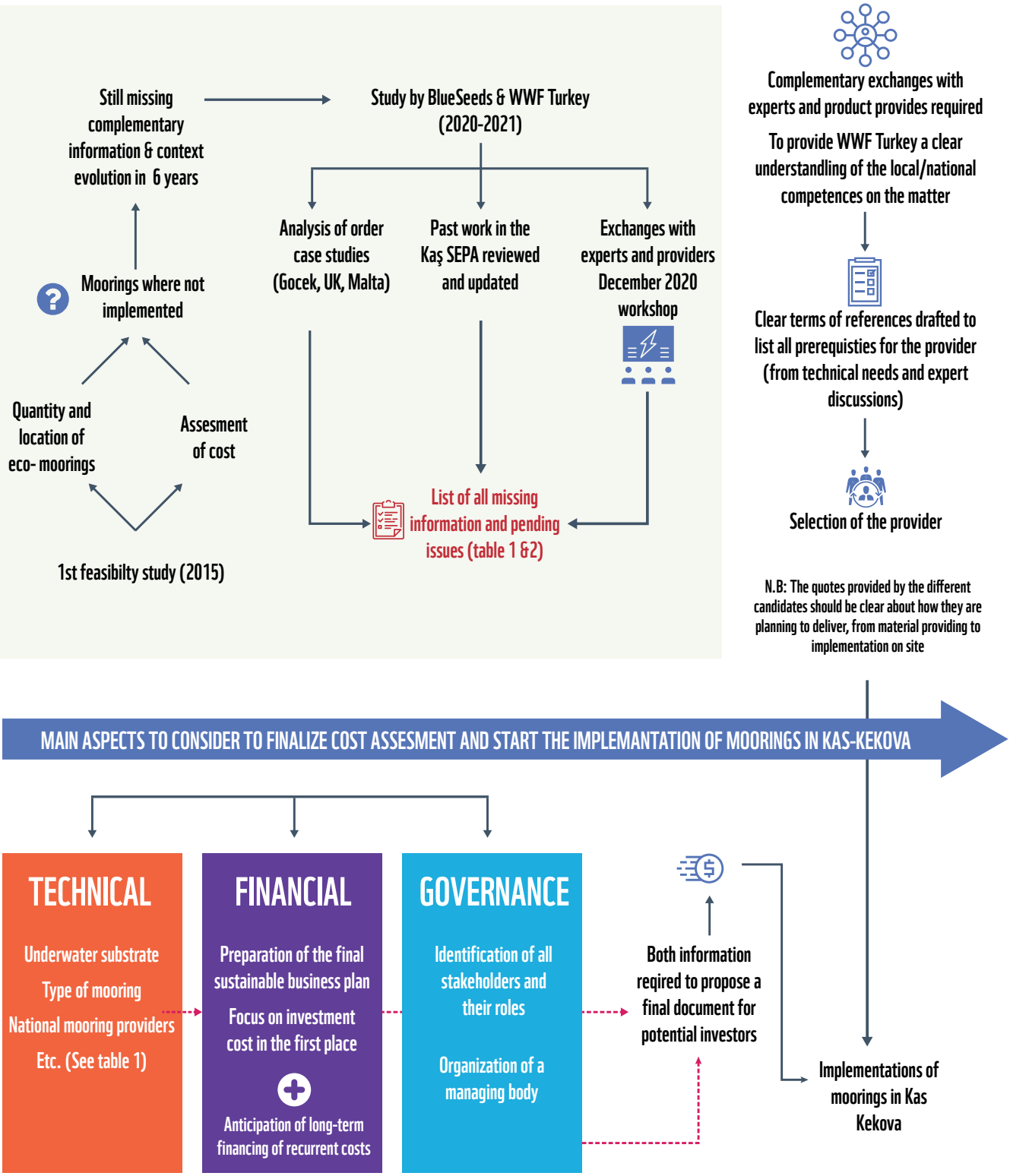


FIGURE 3: SUMMARY DIAGRAM OF THE MAIN STEPS IN THE IMPLEMENTATION PROCESS

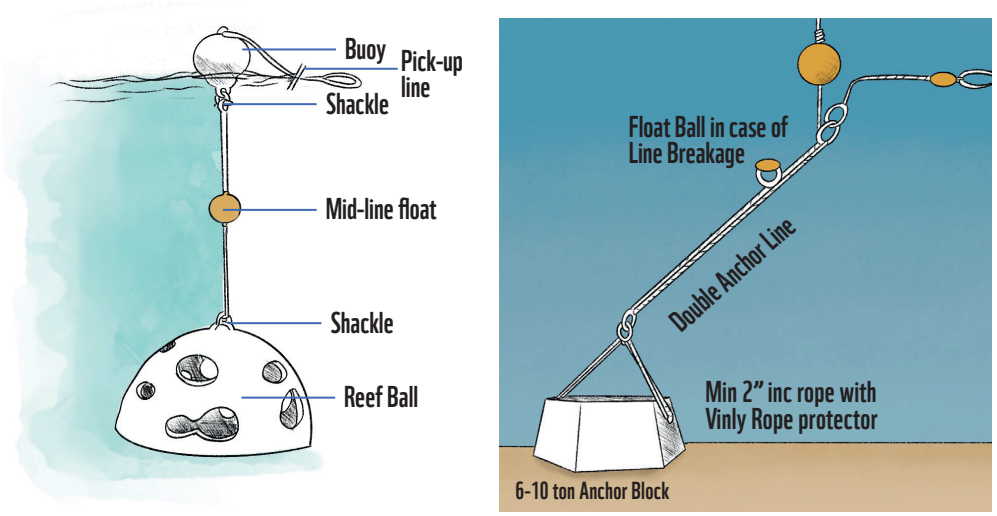
ANNEX I:

PRESENTATION OF THE DIFFERENT TYPES OF ECO-MOORINGS

According to Pioch and Leocadie (2017), 3 generations of eco-mooring have been developed so far:

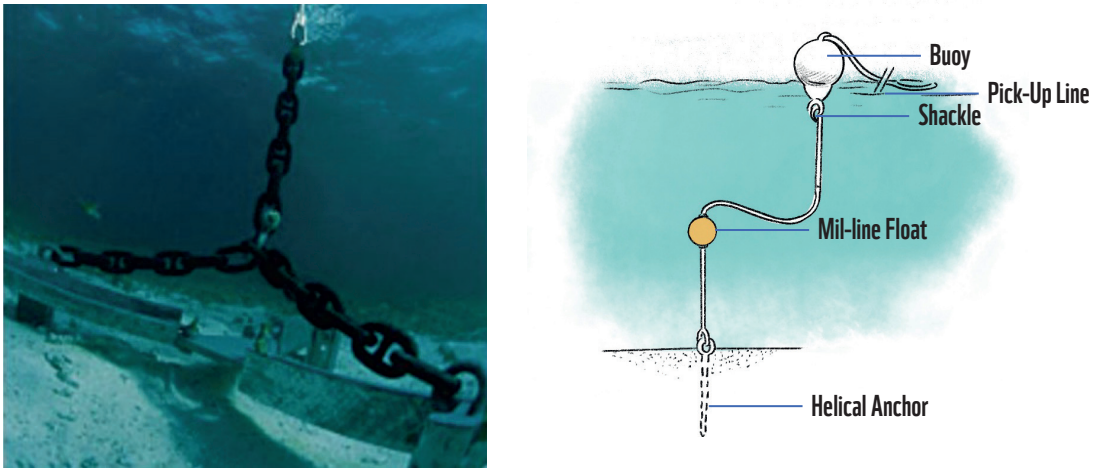
- The first generation is represented by the pre-tensed anchor line mooring systems (concrete block mooring and eco-mooring using artificial reef as anchor block).

FIGURE 4:
EXAMPLES OF FIRST-GENERATION ECO-MOORINGS (PIOCH & LÉOCADIE, 2017)



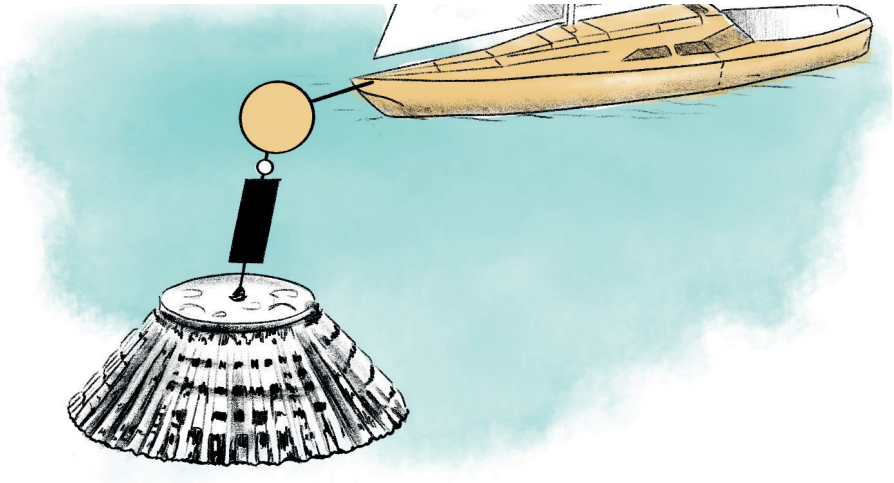
- The second generation of eco-mooring does not use a block or artificial reef to attach the mooring, but rather a screw, and all other kind of systems that helps to fix the anchor line directly to the seabed. This second generation was created "to reduce the maximum impact of anchoring fixation, by minimizing the surface in contact with the substrate".

FIGURE 5:
EXAMPLES OF SECOND-GENERATION ECO-MOORINGS (PIOCH & LÉOCADIE, 2017)



- The third generation is called the “eco-designed moorings” by the authors. In this case, the mooring block is designed with ecological considerations. The mooring has a double purpose in that case: reducing impact on *P. oceanica* while enhancing local fauna and flora (truer in coral reefs locations).

FIGURE 6:
EXAMPLES OF THIRD-GENERATION ECO-MOORINGS (PIOCH & LÉOCADIE, 2017)



Eco-designed mooring adapted for large sailing boats (S. Pioch ve J.C. Ascione)

ANNEX II:

COORDINATES OF EXPECTED BUOYS LOCATION

TABLE 5:
LIST OF COORDINATES OF EXPECTED BUOYS LOCATION

1	FD1	36°10'58.50"K 29°38'36.78"D	31	GD2	36°11'27.53"K 29°36'34.89"D	61	KVD1	36° 911.70"K 29°37'52.60"D
2	FD2	36°10'57.15"K 29°38'34.42"D.	32	GD3	36°11'27.53"K 29°36’34.89"D	62	KVD2	36° 9'11.07"K 29°37'51.54"D
3	FD3	36°10'55.64"K 29°38'34.28"D	33	GD4	36°11'24.63"K 29°36'34.37"D	63	KVK1	36° 910.61"K 29°37'47.43"D
4	FD4	36°10'54.29"K 29°38'33.40"D	34	GK1	36°11’32.61"K 29°36’36.37"D	64	KVK2	36° 910.86"K 29°37'48.45"D
5	FD5	36°10'50.65"K 	35	GK2	36°11’31.45"K 29°36’35.89°D	65	ÇOBANK1	36° 9'35.00"K 29°38'59.50"D
6	FD6	36°10'53.15"K 29°38'32.96"D	36	GK3	36°11’22.72"K 29°36’33.40"D	66	BMD1	36° 9'14.80"K 29°39'14.50"D
7	FK1	36°10'46.93"K 29°38'31.53"D	37	GK4	36°11’21.70"K 29°36'33.45"D	67	BMD2	36° 9'12.76"K' 29°39'14.75"D
8	FK2	36°10'45.39"K 29°38'31.15"D	38	ND1	36°11'17.18"K 29°36'37.37"D	68	TD1	36° 9'3.50"K 29°39'12.50"D
9	FK3	36°10'43.83"K 29°38'31.14"D	39	ND2	36°11'17.64"K 29°36'37.21"D	69	TD2	36° 9'3.50"K 29°3914.50"D
10	FK4	36°10'42.78"K 29°38'30.82"D	40	ÇD1	36°11'13.50"K 29°35'45.00"D	70	13B	36° 8'24.61"K 29°39'43.57"D
11	FK5	36°10'36.10"K 29°38'47.00"D	41	GORD1	36°11'0.88"K 29°33'1 .49"D	71	SOD	36° 7'48.55"K 29'39'32.98"D
12	FK6	36°10'33.46"K 29°38'47.33"D	42	GURD2	36°11110.84"K 29°32'54.91"D	72	UD1	36° 9'8.72"K 29°40'34.27"D
13	FK7	36°1028.40"K 	43	PD1	36° 9'44.70"K 29°37’27.00”D	73	UD2	36° 9'8.71"K 29°40’35.13”D
14	FK8	36°10'29.30"K 29°38'1.20"D	44	PD2	36° 9'44.73"K 29°3T27.81"D	74	UD3	36° 9'8.83"K 29°40'36.13"D
15	FK9	36°10'30.90"K 29°381.10"D	45	PK1	36° 9'44.59"K . 29°37'30.56"D	75	UD4	36° 9'8.31"K 29°40'36.26"D

16	FK10	36°10'32.40"K 29°391.10"D	46	HEDD1	36° 9'39.98"K 29'37'41.40"D	76	UD5	36° 9'8.92"K 29°40'37.22"D
17	FK11	36°10'35.20"K 29°39'1.20"D	47	HEDD2	36° 9'40.28"K 29°37142.19"D	77	UD6	36° 9'2.78"K 29°40'37.31"D
18	FK12	36°10'37.20"K 29°391.20"D	48	HEDD3	36° 9'43.48"K 29°37'46.62"D	78	UD7	36° 9'2.03"K 29°40'37.17"D
19	FK13	36°10'39.40"K 29°39'1.30"D	49	HEDK1	36° 9'40.67"K 29°3T41.76"D	79	IK1	36° 8'53.00"K 29°41'38.50"D
20	FK 14	36°10'41.20"K 29°391.20"D	50	BESD1	36° 9'3.59"K 29°36'57.63"D	80	IK2	36° 8'50.30"K 29°41'38.60"D
21	SAD1	36°11'48.08"K 29°37'1.44"D	51	BESD2	36° 9'3.22"K 29°36'57.38"D	81	IK3	36° 8'49.30"K 29°41'39.40"D
22	HD1	36°11'49.50"K 29°36'47.00"D	52	UB1	36° 8'56.49"K . 29°37'2.68"D	82	IK4	36° 8'45.80"K 29°41'40.70"D
23	HD2	36°11'49.96°K 29°36'48.38"D	53	KD1	36° 9'8.69"K 29°37'31.92"D	83	IK5	36° 8'44.00"K 29°41'41.00"D
24	HD3	36°11'50.29°K 29°36'49.86"D	54	KD2	36° 9'9.40"K 29°37'34.83"D	84	IK6	36° 8'47.31"K 29°41'47.65"D
25	HD4	36°11'46.90"K 29°36'47.50"D	55	KD3	36° 9'7.90"K 29°37'34.13"D	85	IK7	36° 8'45.63"K 29°41'49.35"D
26	HD5	36°11'47.51"K 29°36'47.97"D	56	KD4	36° 9'9.23"K 29°37'35.85"D	86	IK8	36° 8'43.52"K 29°41'50.34"D
27	HK1	36°11'43.18"K 29°36'45.36"D	57	KD5	36° 9'7.72"K 29°37'34.65"D	87	IK9	36° 8'42.00"K 29°41'58.00"D
28	HK2	36°11'42.13"K 29°36'44.87"D	58	KK1	36° 9'11.26"K 29°37'31.15"D	88	AK1	36° 9'30.00"K 29°47'8.00"D
29	HK3	36°11'41.04"K 29°36'44.25"D	59	KK2	36° 910.91"K 29°3T31.50"D	89	AK2	36° 929.00"K 29°47'4.50"D
30	GD1	36°11'29.68"K 29°36'35.01"D	60	KK3	36° 910.62"K 29°37'31.95"D			

Mediterranean Monk Seal(*Monachus monachus*) ©Bahattin Sürücü

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Urgent and Possible:
Eco-mooring project in Kaş Kekova
For the future of Mediterranean Seagrass:

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project

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For the Future of Sea *Posidonia oceanica*:

Eco-mooring project in Kaş Kekova

%100
RECYCLED

30

Seagrass grows very slowly and up to the age of 30 but is continuously damaged by human activities such as anchoring,

pollution and coastal development. The only way to prevent the extinction of the sea meadows in near future is to urgently stop anchoring practices and to establish mooring systems.

1000

Around 1000 marine species have been documented in the Kaş-Kekova Specially Protected Area (SPA)

450 m²

A study in Port-Cros showed that using a specific model of eco-mooring (Harmony model) could protect around 450 m² of *Posidonia meadows*.

25

The presence of *Posidonia oceanica* in the region generates a lot of benefits to the human population, in the form of 25 ecosystem services

14 L

By producing, at 10 m depth, more than 14 litres of oxygen per day per m², and by being one of the most important nursery grounds for many species, *P. oceanica* meadows directly contribute to fishery resources at an economic value ranging between 27 and 35 €/ha/year.

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