REPUBLIKA E SHQIPËRISË
MINISTRIA E TURIZMIT
DHE MJEDISIT

Republic of Albania
Ministry of Tourism and Environment

Develop and institutionalize a long-term strategy for the maintenance of interventions.

Prepared by Jak GJINI, District Technical Advisor (DTA)

Project No. 5386
ALBANIA: "Building resilience of Kune - Vain Lagoon through ecosystem based adaptation (EBA)"

Task 2.1.8: Strategy of maintenance

Project Title: Building the resilience of Kune - Vaini Lagoon through ecosystem-based adaptation (EbA)			
Component 2: Climate resilience through demonstration of best practice and concrete EbA and other adaptation interventions in the Kune-Vaini lagoon system.	Outcome 2. Reduced vulnerability of communities living nearby the Kune-Vaini lagoon system to climate change-induced extreme events through pilot adaptation interventions including EbA.	2.1. An integrated suite of adaptation interventions including EbA implemented in the Kune-Vaini lagoon system.	**……..……** **2.1.8. Develop and institutionalize a long-term strategy for the maintenance of interventions.**

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Abbreviations

AFA	Agency of Forest Administration, Lezha Municipality.
AU	Administrative Unit of Lezha Municipality
CEIA	Center for Environmental Impact Assessment
CTA	Chief Technical Advisor
DA	Directorate of agriculture, Lezha Municipality.
DALR	Directorate of Agriculture , Lezha Region
DBD	Drainage Board Directory
DETCS	Directorate of Education, Tourism, Culture and Sports, Lezha Municipality.
DIPD	Directory of Integration and Programs Development, Lezha municipality
DRDI	Department of Regional Development and Integration, Council of Lezha Region
DTA	District Technical Advisor
EbA	Ecosystem based Adaptation
EIA	Environmental Impact Assessment
ECL	Ecological Club, Lezhë.
KVLS	KuneVaini Lagoon System
KMPAL	Committee of Management of Protected Area, Lezhë
LERDA	Regional Development Agency of Lezha
LM	Lezha Municipality
MTE	Ministry of Tourism and Environment
NAPA	National Agency of Protected Areas
RAPA	Regional Agency of Protected Areas, (Lezhë)
NCARBL	National Coastal Agency, Regional Branch Lezhë. (Cape of Rodoni up to Velipoja)
PM	Project Manager
PSC	Project Steering Comity
REDL	Regional Environmental Directorate, Lezhë
REC	Regional Environmental Center

Executive summary

Kune Vain Tale Protected Area, is an Albanian Protected Area, situated in the Coast of Adriatic Sea. Not planned human interventions and Climate Change effects, during times is seriously deteriorating Protecting Area Values. That's why, the Special Climate Change Fund (SCCF) project is mobilized to increase the capacity of government and local communities living nearby the KVLS to adapt to climate change using an integrated suite of adaptation interventions, including EbA, which is considered more cost effective in long term versus hard infrastructure measures.

Project Objective:

To increase the capacity of government and local communities living near the Kune-Vaini lagoon System to adapt to climate change using an integrated suite of adaptation interventions including EbA.

The specific project, Kune Vain Resilience, is considered as a pilot project that will be used as base for future EbA project. According the second of three complementary Kune Vain Resilience Project components "Demonstrating adaptation interventions within the KVLS: are implementing:

a) Opening of tidal channel between Adriatic Sea and Vaini (Ceka) lagoon,
   This action will improve the lagoon water quality, increase fish with biodiversity and economic values, that will help to increase the standard life level of the community living nearby and dealing with fishing and tourism
b) Reforestation of 7 ha of degraded forest, which in the future will improve biodiversity status and habitat restoration.
c) Dune stabilization (erosion control) by planting of 2ha with native grass and shrubs. Restoration of a part of degraded and damaged dunes on the seaside Kune area.

All interventions are treated as ecological voices and in full compliance with the requirements of the KVT management plan, protected area zoning, main issues to be faced and replicated, and promoting of EbA interventions as most efficient actions to replicate Climate Change effects.

Introduction:

,"Building the resilience of Kune-Vaini Lagoon (KVL) through ecosystem-based adaptation (EbA)" project is prepared and is developing having into account environmental demands as a protected natural area, in particular in accordance with the EBA protocols and satisfying as much as possible tourism and fishing or other activities requests, and overall avoiding conflicts with community and increasing as much as it can their interest on the environmental protection and sustainable development.

The "Develop and institutionalize a long-term strategy for the maintenance of interventions" on the project for "Building the resilience of Kune-Vaini Lagoon (KVL) through ecosystem-based adaptation (EbA)", will be very important outcome for future works to ensure the sustainability and success of project interventions over a long-term period.

Emphasize that "The Develop and institutionalize a long-term strategy for the maintenance of interventions" (DMS) is aligned with the management plan for the Kune-Vain protected area and in particular at "The monitoring and research strategy" (MRS) prepared under the project,"Building the resilience of Kune-Vaini Lagoon (KVL) through ecosystem-based adaptation (EbA)", bearing always in mind the existing human and financial capacities of the RAPA staff, opportunities for cooperation with other institutions directly or indirectly linked to the integrated coastal zone management.

The drafting of the long-term strategy is supported and developed in harmony with the basic components of the project and more specifically on:

- All technical reports on field interventions for this project;
- The results so far in terms of realization of current maintenance interventions and services and those planned for short-term;
- Statutory legal and institutional obligations of institutions and subjects for the long-term management of intervention results in accordance with purpose of interventions;
- Technical data related to the performance of maintenance services in similar interventions;
- Consultations carried out for this purpose with RAPA staff, Albagarden Company, Member of CMPA.

1. Aim and objectives of long-term maintenance strategy of interventions

The overall objectives of the Develop and institutionalize a long-term strategy for the maintenance of interventions" to: Identify all maintenance services that will be performed in the long term for any interventions carried out after the completion of the project in accordance with the EBA protocols.

- Mobilize all financial and human, technical and institutional capacities to respond to the performance of maintenance services to ensure the success of interventions in accordance with the EBA protocol.
- The maintenance and further development of the results of the interventions realized by the project will take into account all the dynamism of extreme climatic events,
- The maintenance and further development of the results of the interventions realized by the project will take into account all the dynamism of extreme climatic events, such as increasing the frequency of powerful naval storms and seaside impact, powerful winds, floods from heavy rainfall in short periods of time, introduction of salt water in the area etc.
- Also, the maintenance of the objects as a results by interventions will be developed in accordance with the results according to the long-term research and monitoring strategy designed for the period after the completion of the project.

The maintenance strategy of EbA interventions in Kune-Vaine should focus on issues that are related with climate change impacts on intervention object bringing in this way an added value for the maintenance program.

2. Reforestation

2.1 Why intervention is needed:

As is known. forest resources represent an important natural factor in coping with climate change. Additional to the economic benefits that their usage carries along, have great value in soil protection, flood prevention and water quality. During recent years, forest coverage area in this part has been significantly reduced, with massive degradation mainly in Mediterranean pine species. These forest communities are found mainly in the Kune and Vain near at seaside area. This situation has affected not only the reduction of biodiversity in the Kune Vain and threatening of the natural equilibriums for bird nesting and breeding mammals, but has also brought along changes in micro-climate especially in the wind regime. According to estimates, the increase in sea level, in the best scenario (DMRD project) would have a significant impact in reducing the area of forests in the Kune Vain area.
The main problems of Kune Vain forestry are quite similar with those at local and national level. In order to prevent further degradation of the forests and of the possible effects on the habitats, reforestation of four plots in Kune Vain area, is realized. This measure should prevent also on time the anticipated effects of climate change. Among the degraded areas to be considered as pilot ones and with highest priority, are reforested land plots: 21a: “Stomi i Nikoll Lucës“, 27a "Ish Fazaneria", 15 C "Rera e detit" on Vaini area and 13 b, on Kune area.

Objective of the intervention: Is the installation of forest vegetation through reforestation in certain plots inside the Kune -Vain area. These measures aim to conserve the existing values and services which the local community and society benefit from this area and to promote awareness and change the attitude of local community toward the phenomenon of climate changes.

2.2 Data's on reforestation project intervention.

(Reforestation project is drafted by NCETSD & Diava Consulting).

Plot no.13.b, is located on the north part of Kune seaside area.

- Planting area 3.1 ha;
- Planting density 2x2m;
- Planting formula 0.5 Aleppo pine (P.halepensis) + 0.5 Stone pine (P.pinea).
- Seedlings number: Aleppo pine (P.halepensis) 3875; Stone pine (P.pinea) 3875; Total seedling number 7750.

Plot no. 21a. is located on the east part of Vain area, in a distance of 1.5 km from Barbulloje village's.

- **Local name: “Stomi i Nikoll Lucës“**
- Planting area 0.5 ha;
- Planting density 2x2m;
- Planting formula 0.5 Aleppo pine (P.halepensis) + 0.5 Stone pine **(**P.pinea);
- Seedlings number: Aleppo pine (P.halepensis) 625; Stone pine **(**P.pinea) 625;
- Total seedling number 1250

Plot no. 15c Vain, situated on the west part of Vain seaside area.

- Local name: “Rera e detit“
- Planting area: 3 ha;
- Planting density: 2x1.25m Marine (Tamarix parviflora D.C.) the other species 2x 2.5m.
- Planting formula: 0.19 (Stone pine) P.pinea + 0.19 Aleppo pine (P.halepensis) +0.46 Marine (Tamarix parviflora D.C.) +0.08 English oak (Q.pendinculata) + 0.08 Ash (F. ornus).
- Seedlings number: 1300 Stone pine (P.pinea), 1300 Aleppo pine (P.halepensis), 3120 Marine (Tamarix parviflora D.C.), 520 English oak (Q.pendinculata), 520 Ash (F. ornus).
- Total seedling number 6760.

Plot no. 27a, is located in the southern of the Drini estuary in a distance of 2.47 km far of it. This area is used in the past for pheasant breeding .

- Local name: “Ish Fazaneria“
- Planting area 0.4 ha;
- Planting density 2x2m;
- Planting formula 0.6 English oak (Q. pendinculata) + 0.4 Aleppo pine (P. halepensis);
- Seedlings number: English oak (Q.pendinculata) 600; Aleppo pine (P. halepensis) 400;
- Total seedling number 1000.

Reforestation along the roads

Plots no.	Surface ha	ml	Plot, local name	Fraxinus	Oleander	Marine	Total number
	0.27	2700	Argjinatura Hidrovor Shengjin	900	1800	0	2700
	0.18	1800	Argjinatura Vorbes - Hidrovor	600	0	1200	1800
	0.05	400	Rruga auto Zyrat e RAPA. Lumi Drin	0	200	300	500
Total	0.5	5000		1500	2000	1500	5000

Figure 1 Datas by the reforestation along roads, project.

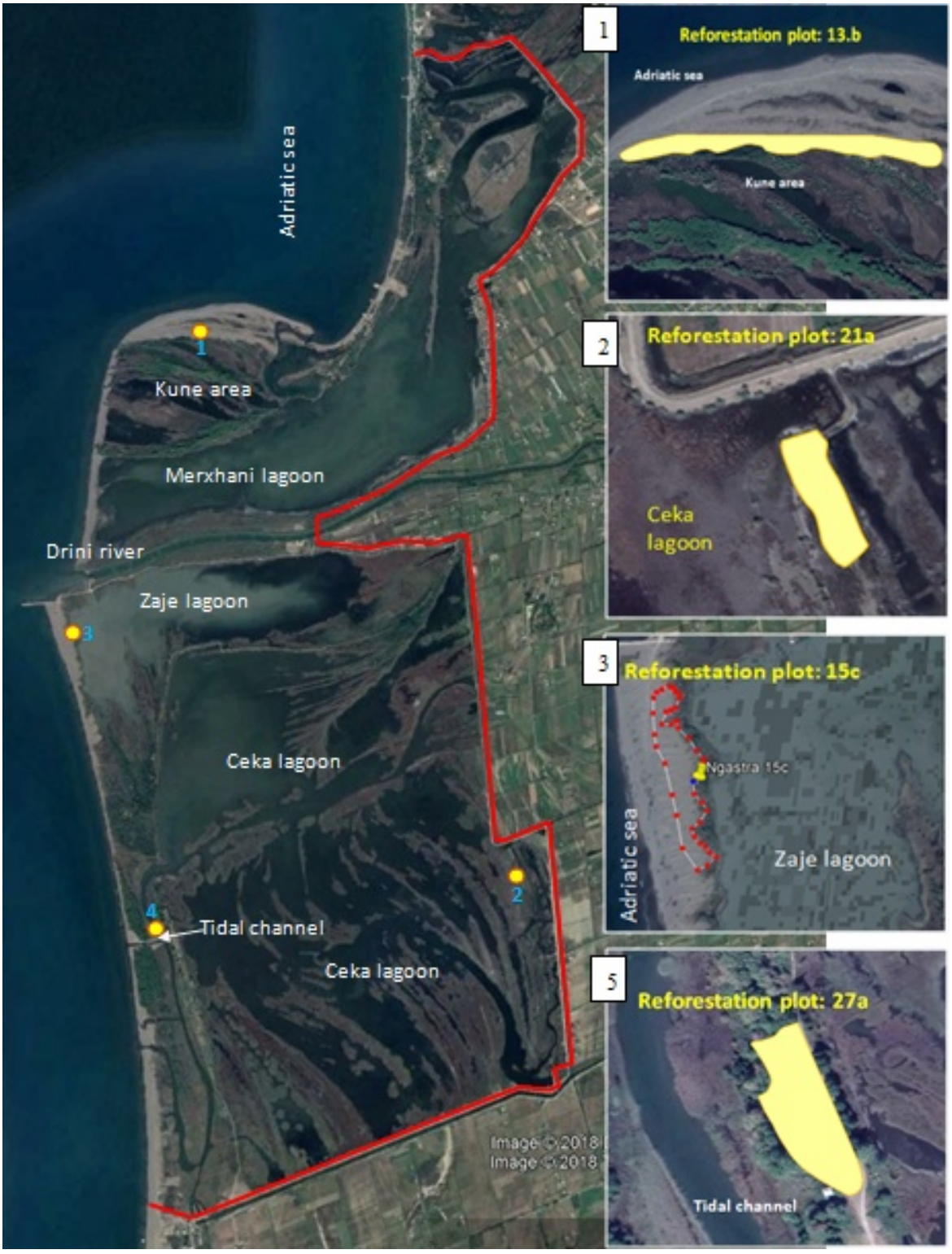

Figure 2 Locations of reforestations (KVLS)

2.3 Reforestation as a EbA approach

*"Adaptation is an adjustment in natural or human systems in response to actual or expected coastal change and climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. In terms of reforestation, the key adaptation benefit is to provide terrestrial ecosystem resilience within coastal hinterland areas, thus providing natural "green belt" buffers from storm inundation whilst enhancing ecosystem services for a range of stakeholders". (*Ecosystem Based Adaptation Protocols Report Jonathan McCue 2017).

The Kune Vain area is identified as a highly exposed area to climate change effects. Sea storms, especially in the last decade, have become quite frequent and powerful, causing above all an aggressive erosion in the coastal area of Kune Vain. In this context, the implementation of adaptive measures such as reforestation takes special importance as EbA voice.

2.4 Maintenance protocol for the reforestation in Kune Vain.

In the EbA protocols, it is emphasized that in terms of re-reforestation, the main benefit of adaptation is to enable the sustainability of terrestrial ecosystems within the coastal areas, thus providing 'green belts' that protect against the storms, while increasing services ecosystem for interest groups.
The EbA protocols provide detailed specifications for the reforestation activities in Kune Vain, such as the characteristics of the proposed areas and their physical description, the national key criteria for selecting areas, the selection of climate-resistant species, the planting density and the preferred methods of planting.
In addition, the EbA protocols, the maintenance services are also specified, which mainly depend on the substitution of dried seedlings and the taking of other protective measures.

2.5 Reforestation - maintenance.

Maintenance works are contemplated in Reforestation project, designed by NCETSD & Diava Consulting), as fellows.

	Description of maintenance works	Services scheduled for the facility,	
		First year	Second year
1	Hoeing of seedlings planted into holes with a radius of 0.5 meter	2 times	2 times
2	Fertilizer distribution after sprouting of seedlings 100gr/plant		
3	Irrigation of seedlings into reforestations with 30 litres of water over a distance of 100 meters,	2 times	2 times

Table 1. Maintenance works scheduled for reforestation

No.	Plot No	Area ha	Cost in $US/plot
1	13.b Kune north seaside	3.1	10540
2	21.a Stomi i Nikoll Luces	0.5	1700
3	15.c Rera e detit	3	7233
4	27.a. Ish Fazaneria	0.4	1188
5	Along roads, inside the lagoon 5 km		5788
	Total		26449

Table 2. Summary expenditure for maintenance works (for two years of cultivation)

The new vegetative community to be established needs maintenance services and ongoing care. Both planting and maintenance works must be carried out in compliance with the rules and conditions of the protected natural area, as fellows.

- Limiting movements of vehicles and other tools as much as possible in order to avoid damaging any other plant naturally installed.
- Noise avoidance during the execution of works especially when they are carried out in the May-July period, when the bird's breeding occurs.
- Use of chemical fertilizers in a controlled manner in terms of the standard product and care in respect of the quantity for seedlings.
- Waste generated from maintenance works as plastic bags, should be managed in accordance with the regulation for protected areas.
- When the works will be carried out by contracted subjects, they must notify before the RAPA representatives, who should do the oversight of the activity

2.4 Long term maintenance of reforestation

After the intensive maintenance work of the first two years, the services to the sown areas should not be interrupted and should focus on particular in a series of measures dealing
with their preservation and care from other damages they may suffer.
Maintenance services must be done at least until the vegetation is fully adapted to the natural environment, and competitive with other types of vegetation, for as much as the largest percentage of planted seedlings, will ensure survival and normal development. These indicators will be obtained from the results of research and monitoring activities.
After completion of the project, we recommend that maintenance services, to focus and develop according to this long term maintenance plan as fellows.

No	Maintenance activities	Frequency	Periodicity	Time-frame	Responsibilities	The budget resources
1	Replacement of dead (dried) seedlings	Once a year	2019-2020	Autumn 2019-2020	Contracted entity	EbA project
2	Control for the preservation of planted vegetation, from grazing.	Every day	2019-on		RAPA	RAPA
3	Implementation of protection measures from pests	Every yar	2019-on	According monitoring results	RAPA	NAPA
4	Control and repair of surrounding fence until vegetation cannot be damaged by grazing.	Every week	2019-on		RAPA Contracted entity	EbA project NAPA
5	Irrigation in case of prolonged drought.	According the extreme event	2019-on	According the extreme event	RAPA Contracted entity	NAPA
6	Maintenance and repair tables that showing the planting area	Every month	2019-on	According cases	RAPA	NAPA
7	Awareness of visitors, sunbathers and the community as a whole for the protection and maintenance of the planted vegetation.	Particular - Sumer period	2019-on		RAPA	NAPA KMPAL

Table 3. Maintenance activities, strategic plan.

Note: From the observations made so far, is evidenced the drying of some seedlings planted pines (Aleppo pine or P.halepensis, and Stone pine or P.pinea) on Plot 21.a "Stomi i Nikoll Lucës". As the main cause for these drying, it is estimated to be the increased presence of salt water on this site. Although the ALbGarden company has carried out drainage works, as noted, the impact from the presence of salt water in the planted vegetation has not been eliminated.

For this reason, it is recommended that the replacement of dead (dried) pines seedlings, should be done with Marine (Tamarix parviflora D.C.), which is more resistant to the impact of salt water, that is more present on this site. However, this case will be best evidenced by the implementation of the research and monitoring program.

3. Dune rehabilitation

3.1 Technical protocols for dune rehabilitation - key recommendations and benefits

On TPDR, is emphasized "The most suitable planting area for dune rehabilitation projects should be location landward of the surf zone (inland of MHW) to where sand accumulates from the wind. Vegetation shall encourage the growth of dune vegetation by capturing windblown sands. The planting of vegetation will also reduce wind speeds over the dune system thus encouraging the deposition of sand. The beach grass (Ammophila arenaria L.) is particularly effective in achieving this because it has high tolerance to enhanced solar radiation and being a native species, it is highly adapted to environmental conditions found along the Albanian coastline. It is therefore recommended to plant Ammophila arenaria for dune restoration projects in Albania, as this represents one of the few plants that is able to survive in extreme conditions often encountered.

The main adaptation benefit of dune rehabilitation is to enhance the resilience of natural dune habitats to the threat of increased sea levels, storms and climate related conditions that may impact upon the natural capacity of the system to respond to climate related threats. Separate co-benefits of the approach include the re-establishment of natural biodiversity of dune plants and animals and to help the restoring, as appropriate, of some natural processes that sustain dunes ecosystems. The key for conservation of the dune ecosystems diversity is to remove invasive non-native plants from the coastal dunes. When the invasive plants are removed, the native ones get back, creating conditions to periodically deposit sand from the natural forces like wind and sea waves. This half-sustainable system creates conditions for variety of plants and animals, including insects (native bees) and many bird species nesting there. ".(Ecosystem Based Adaptation Protocols Report Jonathan McCue 2017).

3.2 Why intervention is needed:

Seaside erosion has destroyed a significant part of the coastal dunes and forest vegetation by reducing the natural values of KVT protected area. As is prescribed in the Management Plan of the lagoon of Kune-Vain drafted in 2010 (p. 89), sea erosion is one of the main problems and need to taking action for reducing and eliminating of this phenomenon. It is classified as very important in local, regional and national level. As the main causes of changes in the coastline in this area according to studies conducted so far, are human activity and climate changes.

As a result of these factors the ecosystem of dunes in the entire coast line of the protected area Kune-Vain (with the exception of a small part at north of seaside of the island of Kune), is damaged. The damaging of this important habitat has been influenced by:

- Increasing vulnerability to coastal erosion zone and marine storms as a result of climate change.
- Reducing of biodiversity. Birds such as terns (Common Tern, Sterna hirundo) of the breeding sites are damaged.

Occupation of the dune by non-native and invasive plants by destroying the ecological balance of the natural ecosystems.
Establishment of a misbalances between the erosion and rehabilitated of natural process.
Based on the importance and consequences of this phenomenon as it is foreseen in the Kune Vain Tale Management Plan (KVTMP), the main operational objective remains keeping control of semi-natural dynamics Coast (erosion control) through adaptive measures in the ecosystem.

.Objective/aim of the intervention, is to restructure degraded dunes on the Kune coastline to increase coastal habitat resistance to expected climate change and improve coastal health. in order to restore through the implementation of biological measures (planting with native grassy species) of sand endangered dunes.

Figure 3. Location of dune rehabilitation (KVLS)

3.3 Short description of intervention.

3.3.1 The species selected for planting

Ammophilia arenaria L. (European marram grass)

The beach bar (Ammophilaarenaria L.) is xerofite plant (growing in less humid environments) that can withstand the conditions of sand and drought where most of the plants cannot survive. There is a moderate tolerance to soils in salt environments (about 15 g / l or 1.5%). It is a perennial plant and grows up to 1.2 meters in height. Grown from a network of thick rhizomes that give the plant a powerful sand support and enable it to grow out. These rhizomes may grow sideways up to 2 meters.
A bunch of plants can produce up to 100 seedlings each year. Rizomas tolerate seawater flooding and can move through currents by being placed in other areas (passing). The leaves are thick and coated on a white wax layer. They are up to 1 meter high. The Stomas are located on the inner surface of the curved leaves, minimizing the maximum loss of water. While the outer leaf side has a strong cell structure capable of resisting wind and grit (abrasion) from the sand. In the humid period, the internal cells (as part of the hydraulic system) swell as a balloon by causing the spread of leaves. The floral is cylindrical and is up to 30 centimeters long.
Ammophilaarenaria, is a species with good ability to "catch (trap)" the wind that is shifting from the wind and affects the construction of the coastal dunes system that are considered very important habitats for biodiversity (for wildlife). This plant is adapted to the dry sandy environment, which in the long periods of drought raises the leaves to reduce the loss of moisture from the vegetation.

Marina (Tamarixparviflora DC.)
It is a shrub-like plant and can reach up to 5 m in height. It is easily multiplied by the calipers and it's sort of a Mediterranean climate. It requires light soils with considerable sand and groundwater close to the surface. In our country meets densely in the river beds and at the edge of the marshes or the sea.

3.3. 2 Location and the planting schema

(Dune rehabilitation project is drafted by NCETSD & Diava Consulting and data are received from this project).
The site where the project is applied is located on the island of Kune, in the coastal part of the Adriatic sea. The object belongs to the Shëngjin-Tale forestry economy in parcel 13b. The surface intervention, is 18000 m^2.

The total area planted in (m^2)	The area separated in the parcels (m^2)	% of each parcel	The planting schema for each species		Number of seedling by each parcels		Plante per unit (m^2)
			Marina	**Ammophila arenaria**	**Marina**	**Ammophila arenaria**	
18000	1146	6	1x1	1x1 m	3426	3426	3.0
	4011	22		70*50 cm	0	11460	2.85
	6876	38		60*50 cm	0	22920	3.3
	6016	34		50*50 cm	0	24066	4.0
TOTAL of the seedlings					**3426**	**61872**	

Table 4. Dune rehabilitation, planting schema

3.3.3. The field services after planting

Some of the measures to be taken are:

a- The paring all of plants which have a greater development than normal;

b- 2-3 irrigation of the seedlings planted are necessary during the period of June-August. That is in depending on the weather and temperature. The period between two irrigation is depended from the temperatures seasons, but it is recommended that irrigation to applied when we see that the plants manifest the elements of drought (drying of different parts of seedlings). For each plant is recommended to be used 0.5 -1 litter of water. The water used for irrigation will be sweet and be taken from surrounding areas. To have healthy plants is recommended that the water be digested manure. Report recommended that manure - water to be 1: 10, then for every 10 liters of water dissolve 1 kg manure.

c- The cleaning of planting surface from invasive plants in the first planting season.

According the project intervention, at the end of the first season (in autumn successor) will be applied the replacement of all plants that did not survive in the first year of planting. The replacement process will be the same as for normal sowing.

Activity	Value $/ha	Area (Ha)	Total value $ (USD)	Working days
Planting works	61473	1.8	110650.6	1 017
Maintenance works	8100	1.8	14580	5 48
TOTAL	69573		125230.6	1 565

Table 5. Total cost of dune rehabilitation.

- At the end of the first season after planting, in September will monitor the quantity and percentage of seedlings of shoots. In this phase is also determined the amount of seedlings to be re-planted.

3.3 Long term maintenance for dune rehabilitation.

All measures identified for the maintenance of the dunes are very similar to those for maintenance of sites planting for the restoration of forests, but the changes are related to it that the place where it will be done dune rehabilitation is directly confronted with marine storms and strong winds. Also, the risks of being damaged by other factors as violation feet from people during the beach, and from pollution of the area as result of mismanagement of waste, can affect its success.

Identification of long-term maintenance measures of plantings for dune rehabilitation, are based in particular on the specific conditions of the area, how accessible it is from people, is there any presence of livestock in the vicinity, etc.

No	Maintenance activities	Frequency	Periodicity	Time-frame	Responsibilities	The budget resources
1	Replacement of dead (dried) seedlings	Once a year	2019-2020	Autumn 2019-2020	Contracted entity	EbA project
	Immediate control after extreme climatic events, like sea storms accompanied by strong winds, identifying of damages and taking the necessary measures	After extreme climatic events	2019 -on		RAPA (DTA)	RAPA
2	Control for the preservation of planted vegetation, from grazing	In any routine control of rangers	2019-on	In any routine control of rangers	RAPA (DTA)	RAPA
4	Control and repair of surrounding fence until vegetation cannot be damaged by grazing.	Every week	2019-on		RAPA (DTA)	EbA project NAPA
5	Irrigation in case of prolonged drought.	According the extreme event	2019-on	According the extreme event	RAPA Contracted entity	NAPA
6	Maintenance and repair tables that showing the planting area	Every month	2019-on	According cases	RAPA	NAPA
7	Awareness of visitors, sunbathers and the community as a whole for the protection and maintenance of the planted vegetation.	Particular - Sumer period	2019-on		RAPA KMPAL (DTA)	NAPA

Table 6. Maintenance activities, strategyc plan.

4. Tidal Inlet Channel

4.1 Why intervention is needed

As is known, the main purpose of the tidal channel is to dispel the lagoon's waters during low tide, and to let in the sea water during high tide. Into this channel the water will move along two directions and for this reason the channel shall be designed without slope, i.e. horizontal.
In this way, the movement of the water shall occur as a direct result of the increased water's level from one basin to another (sea's basin and the lagoon's one).
For many years, Ceka Lagoon suffers from limited water circulation and restricted water exchange with the sea. It is connected to the sea through a meandering 3,000m-long channel (Matkeqe Channel) inland of North Tale Beach. The position of the channel mouth migrates depending on prevailing wave conditions. Two artificial cuts have been made through the beach in the past, mainly by fishermen initiatives, to improve water exchange, but they have been naturally filled with longshore transported sediment in short time. Tale Pumping Station, built in 1962/62, located to the south of Ceka Lagoon pumps untreated runoff (containing pollutants) into the connecting channel which ultimately reaches the lagoon. Because of the poor connectivity through the inlet, some of this runoff enters the lagoon. This water over freshens, reduces salinity and pollutes the lagoon and puts it at high risk of eutrophication.

4.2 objective and the choice of the intervention site:

The main objective is to build a tidal channel, which will make possible the free circulation of the Adriatic sea water and Ceka lagoon, during the high and low tide process and as a result, to improve the ecological situation of the Ceka lagoon.
According to the project intervention, (drafted by STAR ENGINEERING JV NORD-COMAT), the channel site was chosen to be on the track of the old one, for 3 main reasons,
stated below:

- It represents the shortest possible distance
- It makes use of the existing channel, i.e. less construction works
- It makes the minimal impact on the environment (the surrounding trees, flora and fauna)

This intervention as defined in the draft project designed , enjoys the complete support of the community of the local fishermen, as a party whose living is connected in a vital way with the existence of the lagoon itself. Also, the channel site was chosen after technical, economic, environmental and social requirements were satisfied.

Figure 4. Location of tidal channel contsruction (KVLS)

4.3 Technical data

The inland part of the channel has a trapezoidal shape, while the sea part there is no lateral slopes and it continue up to the point where it reaches an appropriate sea depth.
In summary the basic data of the channel section are as follows:

b - Small base of the trapezoidal section = 13 m
b - Big base, b = 33.0m (the top level is +1.50m above sea level)
m -The slope inclination m=2.5 (i.e. 1-vertical to 2.5-horizontal)
h - Depth of the channel,= 4.00m, (bottom level of the channel equal to -2.50m, resulting therefore in a depth that is h = 2.20m)

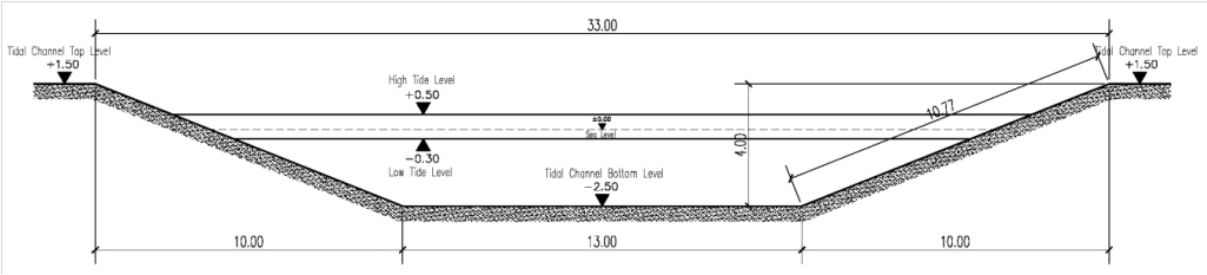

Figure 5. Section of tidal channel (project drafted by STAR ENGINEERING JV NORD-COMAT)

Figure 6. Image view of the tidal channel (project drafted by STAR ENGINEERING JV NORD-COMAT)

4.4 Tidal inlet as a EbA approach

"*A leading influence of wetlands and tidal inlets (within estuaries) and their validity as being an effective EbA measure in areas is their contribution to determining the tidal prism (i.e.: the volume of water entering an inlet during flood tide or exiting an inlet during ebb tide). As wetlands are lost or restored (through tidal inlet channel creation or change), the tidal prism is modified. Changes in tidal prism have several implications on the estuarine hydrodynamics and consequently, sediment transport and morphology*". (Ecosystem Based Adaptation Protocols Report Jonathan McCue 2017).

In our case, the lack of construction of protective barriers as part of tidal inlet, simply because of the high costs that they presents, has favored the rapid filling with sediments the tidal channel until blocking it. Under these conditions, keeping open the channel by deepening, remains a priority.
As above, the implementation of maintenance measures, has a particular importance. The Kune Vain costal area, is facing by powerful seas storms, consequently, coastal erosion is becoming increasingly aggressive. Only within 2018-2019, this situation is repeated 3 times.

4.5 Maintenance protocol for the tidal channel inlet

The reduction of water exchange capacity through Tidal channel communication between the Adriatic Sea and the lagoon system Kune Vain is a known problem for years. It is possible that the water in the lagoons will become increasingly eutrophic because of this limited exchange.
According EbA protocol, four adaptation measures are considered:

- Structural methods to restrict sediment accumulation in the channels;
- Regular maintenance dredging of the channels to maintain functionality;
- Increasing lagoon tidal prism and current flow (and hence scour) through the tidal channels by managed realignment of landward agricultural areas; and
- Controlled discharge of polluted water from the pumping stations.

4.6 Long term maintenance of tidal inlet channel, Kune - Vaini lagoon system

4.6. 1. Aim and objectives:

Identification and implementation of long term maintenance measures for optimum improvement of water exchange between the Adriatic Sea and Ceka's lagoon to ensure good ecological conditions in the Ceka lagoon, and social economic benefits services to the community.

4.6.2 Justification/ Description

On technical report Tidal Inlet Channel, Kune-Vaini lagoon system, drafted by STAR ENGINEERING JV NORD-COMAT, the maintenance program that will be implemented following the opening or construction of the channel, is compiled. In this program is clarify that in the absence of protection barriers, have to rely on a periodic maintenance schedule of the tidal channel's outfall in order to remove the deposits of sand from the channel's bed. This is because the deposits of sand are inevitable, due to the loss of the equilibrium caused by the construction of the channel itself. It is estimated that the annual amount of sand that moves within the channel is equal to 20-25% of the amount of sand that is dug (according to the design) to open the channel, i.e. ~3000m3. Each half of this quantity should be moved once in 6-months. Therefore the maintenance is essential in order to have a fully operational tidal channel. It is also essential for the tidal channel's observers, to make a periodically updated measurement (topographic/bathymetric). If there is a tendency to exceed the above foreseen quantity than the schedule should be more frequent, i.e. once in 4-months.

4.6.3 Maintenance measures to be implemented

Maintain and dredge the new tidal (Cleaning/deepening of the new Tidal Inlet Channel from deposited sediments).
Frequency: Maintain and dredge the new tidal channel bi-annually to prevent closure (according the periodically updated measurement topographic/bathymetric) . ~1500 m^3 sand, should be moved, once in 6-months. If the quantity of sediments is more than 3000 m^3/year, the schedule should be more frequent, i.e. once in 4-months).
Budget: Maintenance work should be calculated on the basis of the expenditures determined for 2019-2020. These expenditures should be planned for all subsequent years.
Based on the Kune Vain Tale protected area management plan, for annual maintenance of the channels, approximately no more than 30,000 USD, are sufficient for the maintenance of the new open tidal inlet channel between Ceka Lagoon and the Adriatic Sea.

Periodicity: Every year

Time frame: 2019 and on

Responsibilities: NAPA, RAPA Lezha, "LURA" fishing company.

Proposals related to the operation of the new Tidal Channel:
Setting barriers (terminal groynes) in the channel mouth, (where the channel communicates directly with the sea).
- Construction of the barriers with natural material as heavy rock blocks, can provide a long-term stability of the channel operation. For rapid emergency situations, can be applied, placement of bags filled with sand, but of course are less stable.

- Construction of moving gate at the point where the new tidal channel is deviated from the old channel that comes from hydro pumping station.
This gate that prevents the entry of water coming from the pumping station to the lagoon, that will open only in emergency cases. Here, we have in mind, cases of blocking the new tidal channel and the impossibility to speed up his maintenance.

4.7 Plan for the continuation of maintenance after the project has finished.

Management of the interventions made and their maintenance services by RAPA, especially in the first two years will be very intensive.

Using a portion of the project budget for the maintenance of the channels by RAPA will increase the responsibility of this latter as the direct administrator of this area. RAPA co-operation's with the Fishing Activity Unit (LURA company) is indispensable.

It is already proven and practically that keeping the channel open from the project, brings all the foreseen benefits.

The NAPA and RAPA co-operation, with the LURA fishing company, should be addressed in the maintenance of the new channel, especially after the second and the following year, to end as soon as possible the multi-annual negative impacts of the Tale hydropower, and improvement the water exchange of the lagoon with the sea. It is important to emphasize that construction of the barriers with natural material as heavy rock blocks, can provide a long- term stability of the channel operation.

The beginning of the work of KMPAL will increase the institutional responsibility in managing of all interventions through maintenances in KVLS, as EbA voices.

5. Communication plan to disseminate the results of the maintenance.

The monitoring results will create a database that will confirm the level of success of interventions and their maintenance, and how sustainable the benefits will be, as EbA voice.

Maintenance results, as a simple technical interventions, will be easy to identify, while benefits in the broader spectrum of EbA, such as impacts on improving the ecological status of the area, adaptation and facing with climate change effect, and social economic benefits will be evidenced by a number of indicators as research and monitoring activities .

The maintenance results are closely related to the results of research and monitoring, will be communicated to general public through technical reports that will be produced on a bi-annual basis.
As well as in communication plan to disseminate the results of the research monitoring, it is recommended that general public is informed about the ongoing maintenance activity, once a year through an online portal of NAPA and RAPA Lezhe, Lezha municipality.
Furthermore, will be use, other social media, such as Facebook, will be used to inform public about the maintenance activity related with EbA and climate adaptation measures and raise their awareness on climate vulnerability and adaptation. Publishing the results in scientific journals is recommended too.